

DEFINITIONS, COMPONENTS AND TOOLS OF EPIDEMIOLOGY



Definition of Epidemiology

00:01:02

- Study of **distribution** and **determinants** of health-related states/events or disease in population groups and application of the study to control health problems.
- The definition of epidemiology is given by **John M Last**

Components Studied in Epidemiology

00:04:59

- **Disease frequency** – Means the number of cases
- **Disease distribution** – Time place and person
- **Disease determinants** – Likely causes of the disease

Disease Frequency

- Talks about the incidence and prevalence of a disease.
- Incidence means the number of new cases of any disease and prevalence means the existing cases (new + old cases).
- Disease frequency is expressed in the form of 3 tools
 - **Rate**
 - **Proportion**
 - **Ratio**

Disease Distribution

- How disease is distributed according to **time, place, and person**.
 - For example, in the early stage of the incidence of COVID-19, epidemiologists described it as pneumonia of unknown origin affecting during the winter months (Time) in Wuhan China (Place), in the male population (Person) working in bird markets in china.
- Hence studying the disease and its distribution according to time, place and person is called **Descriptive Epidemiology**.

Disease Determinants

- It answers the why and how of a disease and this part of epidemiology is called **Analytical epidemiology**.

Tools of Measurement in Epidemiology

00:10:14

- Frequency of the cases is expressed in the form of Rate, Proportion, and Ratio.
 - **Rate** = Numerator/Denominator × 1000 or 10,000 or 1,00,000
→ N is a part of D
 - **Proportion** = Numerator/Denominator × 100
→ N is a part of D
 - **Ratio** = Numerator/Denominator;
→ N is **not** part of D

Rate

- It measures the occurrence of the event or disease or death in a defined population in a defined time period.

Types of Rate

- **Crude rates: Unstandardized rates i.e, age and sex composition are not considered.**
 - Crude death rate (CDR) gives rates at which deaths are happening in a population.
 - Crude birth rate (CBR) gives rates at which births are happening in a population.
- **Specific rates**
 - Age specific death rate
 - Cause specific death rate
- **Standardized rates**
- **Rate** = Numerator/Denominator × 1000 or 10,000 or 1,00,000

Proportion

- **Proportion** = Numerator/Denominator × 100
- For example,

$$\text{Prevalence} = \frac{\text{Total no. of cases (old and new)}}{\text{Total population}} \times 100$$

- Hence prevalence is a proportion

Ratio

$$\text{Ratio} = \frac{\text{Numerator } N}{\text{Denominator } D} \quad N \text{ is Not part of } D.$$

- Example of ratio
 - **Sex Ratio** = $\frac{\text{No. of females}}{\text{No. of males}} \times 1000$
 - **Relative risk** = $\frac{\text{Incidence of exposed}}{\text{Incidence of non exposed}}$

- Example of rate

$$\text{Incidence rate} = \frac{\text{Total no. of new cases}}{\text{Total population at risk}} \times 1000$$

Incidence is a rate though the numerator is a part of the denominator as the multiplier is 1000.

- Example of proportion

$$\text{Case fatality rate (CFR)} = \frac{\text{Total no. of deaths due to disease}}{\text{Total population at risk}} \times 100$$

Thus CFR is a proportion.

Incidence

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- No. of new cases of the disease or new spells or episodes of sickness occurring in a determined population during a specified time period.

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Incidence rate

$$= \frac{\text{No. of new cases of a disease in a defined population during a specified time period}}{\text{Total population}} \times 1000$$

High Yield Points

- Incidence measures the rate at which New cases occur.
- Independent of the duration of the disease.
- More important for a disease of acute onset
- The primary level of prevention focuses on reducing the incidence of the disease
- Cohort study calculates the incidence of a disease

Q. Incidence of a disease in a population of 30,000 and 300 new cases is

- A. 0.1 per 1000
- B. 10 per 1000
- C. 100 per 1000
- D. 1 per 1000

Explanation

Incidence = new cases/ total population at risk multiplied by 1000

$$= 300/30000 \times 1000$$

$$= 10/1000 \text{ population}$$

Special Incidence Rates

- **Attack Rate** used in an epidemic or outbreak of disease
- **Secondary attack Rate** is used to measure the communicability or transmissibility of a disease.

Uses of the Incidence Rate

- Control of disease
- Etiology of the disease
- Efficacy of preventive and therapeutic measures
- Effectiveness of health services provided

Prelavance

00:30:27

- It is the total number of all individuals who suffer from a disease.

$$\frac{\text{Total no. of cases in a community at a point of time}}{\text{Total population of the community at the same point}} \times 100$$

- Prevalence is actually a proportion

Q. In a population of 5000, the number of new cases of TB is 500; old cases in the same population are 150. What is the prevalence of TB?

- A. 9%
- B. 12%
- C. 13%
- D. 18%

Explanation

Total population = 5000
New cases = 500
Old cases = 150

Prevalence = total cases/ total population x 100

$$= 500+150/5000 \times 100$$

$$= 650/5000 \text{ multiplied by } 100$$

$$= 13\%$$

Measurement of Prevalence

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• **Point prevalence**

$$\frac{\text{Total number of deceased persons in a defined population at one point of time}}{\text{Total number of population at the same point of time}} \times 100$$

- o For example,
 - On April 30th, 2022 community A has a population of 10000
 - 1000 current cases of hypertension so prevalence is 1000/10000 x 100 = 10%

• **Period prevalence**

$$\frac{\text{Number of persons with an episode of illness over a defined period of time}}{\text{Number of persons in the population over the same period}} \times 100$$

- o **Period prevalence** = Number of existing cases/ total population
 - Example, during a particular time period (Jan 1. June 30th, 2022)
 - Include existing cases on Jan 1st and those newly diagnosed until June 30th

Difference between the Prevalence and Incidence

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Refer Table 1.1

Relationship between the Prevalence and Incidence



Important Information

$P = I \times D$

- P = Prevalence
- I = Incidence
- D = Duration

Examples

- Effect on incidence and prevalence
 - New preventive modality launched – incidence decreased
 - New treatment modality launched – incidence same
 - Improvement in treatment – cures the person, duration decreased, prevalence decreased
 - If a new drug is effective in reducing deaths from the disease but not curing – duration increased prevalence increased
 - If a new drug is effective in curing a disease – duration decreased, prevalence decreased
 - Treatment modality if cures the disease duration and prevalence decreased, if does not cure the disease but prolongs the survival then duration increased and prevalence increased

MCQs

- Q.** Following is true about incidence and prevalence
- A. Both are rates
 - B. Prevalence is rate incidence is not
 - C. Incidence is rate prevalence is not
 - D. Both are not rates

Explanation: Since the multiplier is 100 prevalence is proportion

- Q.** If the prevalence is very low as compared to the incidence for a disease, it implies?
- A. Disease is very fatal and/or easily curable
 - B. The disease is nonfatal
 - C. Calculation of prevalence and incidence is wrong
 - D. Nothing can be said as they are independent

Explanation

- $P = I \times D$
- Duration decreased thus prevalence decreased

Q. All the statements are true about the disease except?

- A. Incidence is the probability that a healthy individual will develop the disease during the specified period of time
- B. The incidence will decrease with the new drug is effective in reducing deaths from the disease
- C. Incidence measures the absolute risk of developing disease
- D. The incidence decreases if a particular prevention program is effective

Explanation

- If a new drug is effective in reducing deaths from the disease but not curing people who continue to suffer from disease and continue transmitting it, the incidence will remain the same and the prevalence will increase.
- If a new drug is effective in curing a disease both incidence and prevalence will decrease.

Q. If a new effective treatment is initiated and other factors remain the same which of the following is most likely to happen

- A. Incidence will not change
- B. Prevalence will not change
- C. Neither incidence or prevalence will change
- D. Incidence and prevalence will change

Explanation: A new effective treatment is initiated and all other factors remain the same, thus new cases will keep on occurring at the rate therefore incidence will not change, however over a long period of time incidence may also reduce if it is an infectious disease. As the total caseload in the community is decreasing.

Q. Improved prevention of acute, and nonfatal disease are likely to?

- A. Decrease the prevalence of disease
- B. Increase the prevalence of disease
- C. Decrease the incidence of disease
- D. Increase the incidence of disease

Explanation: As it is targeting the risk factor thus decreases the incidence of disease.

Table 1.1

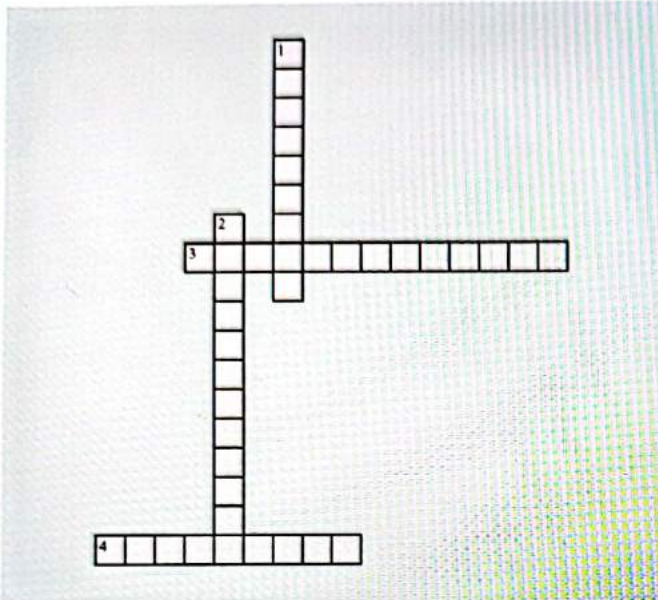
Incidence	Prevalence
Probability or chances of developing a disease	Probability of chances of already having a disease
Includes only new cases	Includes both old and new cases
Follow up is required of the individuals in a population to identify new cases	No follow up required
Independent of the duration of illness	Depends on the duration of the disease $P = I \times D$
Suited measure when studying cause and effect	Suited measure in estimating the burden of a disease or attribute
Calculated from cohort study	Calculated from cross-sectional study



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Cause specific death rate
- 4. Incidence measures the rate at which New cases occur.

Down

- 1. No. of new cases of the disease or new spells or episodes of sickness occurring in a determined population during a specified time period.
- 2. Study of distribution and determinants of health-related states/events or disease in population groups

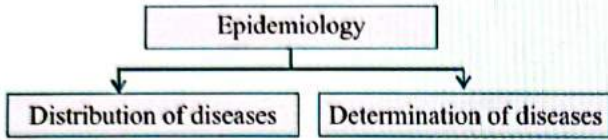
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NEED, CLASSIFICATION, UNIT & APPROACH TO STUDY DESIGNS

Need for Epidemiology Study Designs

00:01:20

- Epidemiology is the study of diseases.



- An assumption yet to be verified is known as a hypothesis.

The purpose of study designs

Formulate a hypothesis

- A hypothesis is formulated when nothing is known about a new type of disease.
- This is done by **Descriptive Epidemiology**.
- It is the process of describing the disease in terms of Time, Place, and Person when nothing is known about the said disease.
- For eg: In the case of COVID-19, in its initial stages, a hypothesis was formulated by terming it as a form of pneumonia.

Test a hypothesis

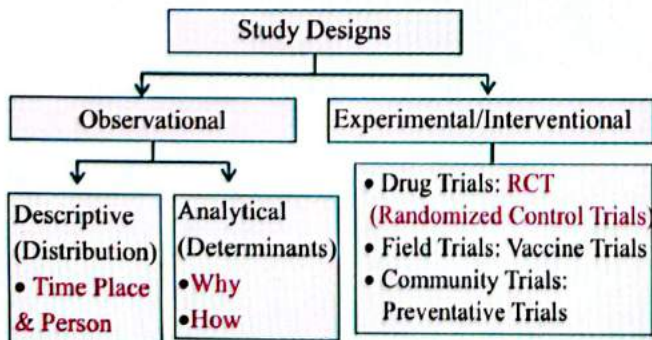
- Testing a hypothesis basically answers the question: why and how (a disease took place).
- It deals with **Analytical Epidemiology**.
- For eg: The people who suffered from COVID-19 were compared to people who did not suffer from COVID-19.

Confirm a Hypothesis

- The disease is confirmed by means of **Experimental or Interventional Epidemiology**.
- For eg: After the confirmation of the COVID-19 virus, vaccines and drugs manufacturing took place.

Classification of Epidemiology Study Designs

00:07:38



Difference between Descriptive and Analytical Study

Descriptive Epidemiology	Analytical Epidemiology
<ul style="list-style-type: none"> No Comparison Group Examples: Case Report & Case Series 	<ul style="list-style-type: none"> A comparison group is always present Examples: Case-Control study design, Cohort study design, Cross-Sectional study design, and Ecological study design.

Difference between Case Report and Case Series

Case Report	Case Series
<ul style="list-style-type: none"> Case report pertains to a single individual. It is an individual case with a finding. 	<ul style="list-style-type: none"> A Case Series is an aggregation or a collection of case reports. In a Case Series, all the collections of case reports have similar findings.

Q. Interventional Study is used for

- Hypothesis formation
- Hypothesis testing
- Hypothesis confirmation**
- Hypothesis manipulation

Q. Case study is a type of

- Descriptive study**
- Observational study
- Analytical study
- Interventional study

Q. Ecological study is a type of

- Descriptive study
- Observational study
- Analytical study**
- Interventional study

Q. The difference between Descriptive and Analytical studies

- Descriptive studies are used to test hypotheses
- Analytical studies are used to formulate a hypothesis
- Descriptive studies are the first phase in epidemiology**
- Analytic studies observed distribution of disease
- Descriptive studies answer why and how of a disease

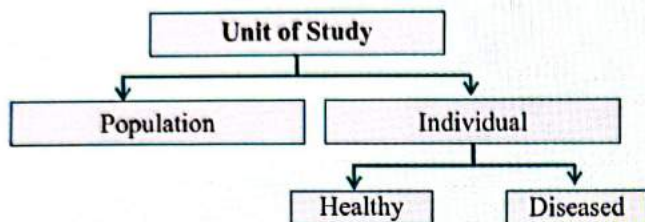
High Yield Point

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Correlational	Ecological Study
Prevalence	Cross Sectional Study
Case Reference	Case Control Study
Incidence/follow up	Cohort Study

Unit of Study

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Golden point

- All study designs have individuals as the unit of study except the Ecological Study design which has a population as the unit of study.
- In all the study designs, whether it is a case-control or Cohort, cross-sectional have individuals as units of study.
- In the case of RCT or Randomized Control Trials, the unit of study is diseased individuals.

Q. The analytical study where the population is the unit of study is

- A. Cross-sectional
- B. Ecological
- C. Case-control
- D. Cohort

Q. The best study of first choice for assessment of Unknown or New Disease with no etiological hypothesis

- A. Cohort study
- B. Case-control
- C. Cross-sectional
- D. Descriptive Epidemiology

Summary of Types of Epidemiological Studies

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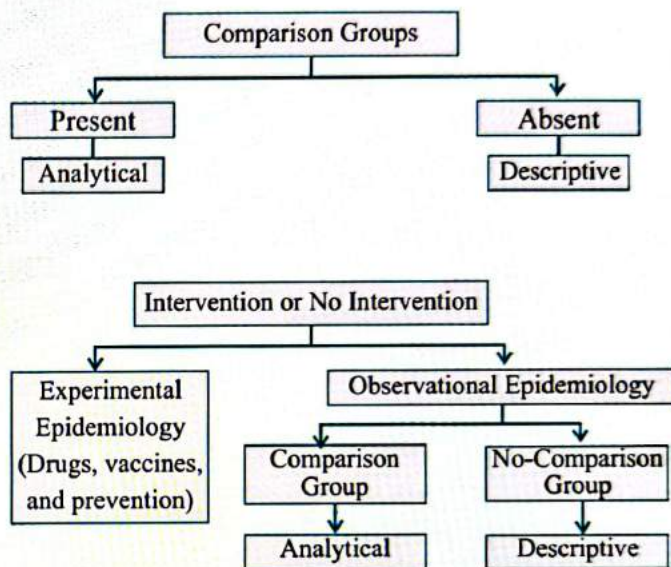
Types of Epidemiological Studies		
Types of studies	Alternative name	Unit of Study
Observational Studies		
Descriptive Studies	Case Report, Case Series	Individual
Analytical Studies	Ecological or Correlation	Populations
Analytical Studies	Cross-Sectional or Prevalence	Individuals
Analytical Studies	Cohort or Follow-up	Individuals

Summary of Experimental Studies

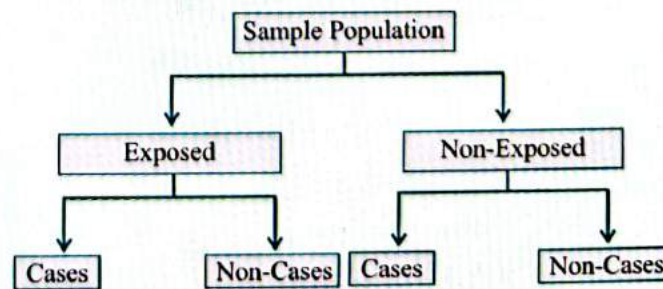
Experimental Studies (Intervention Studies)		
Randomized Control Trials	Clinical Trials	Patients/Diseased Individuals
Field Trials (Vaccine Trials)	-	Healthy People
Community Trials	Community Studies	Communities

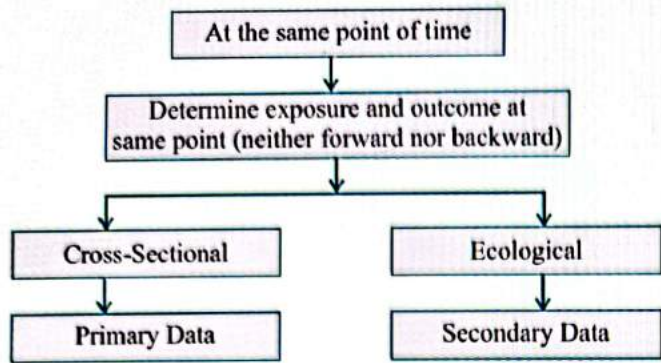
Basic Approach to Identify Study Designs

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- In case of Analytical Epidemiology, keep the following point in mind
 - Start of the Study
 - Comparison: Exposed vs Non- Exposed (Cohort) or Diseased vs Non-diseased (Case-Control)
 - The direction of Arrow:
 - Forward → Cohort,
 - Backwards → Case Control,
 - At the same point of time → Determine exposure and outcome at the same point (neither forward nor backward)





Q. A total of 5000 patients of glaucoma are identified and surveyed by patient interviews regarding family history of glaucoma. Such a study design is called?

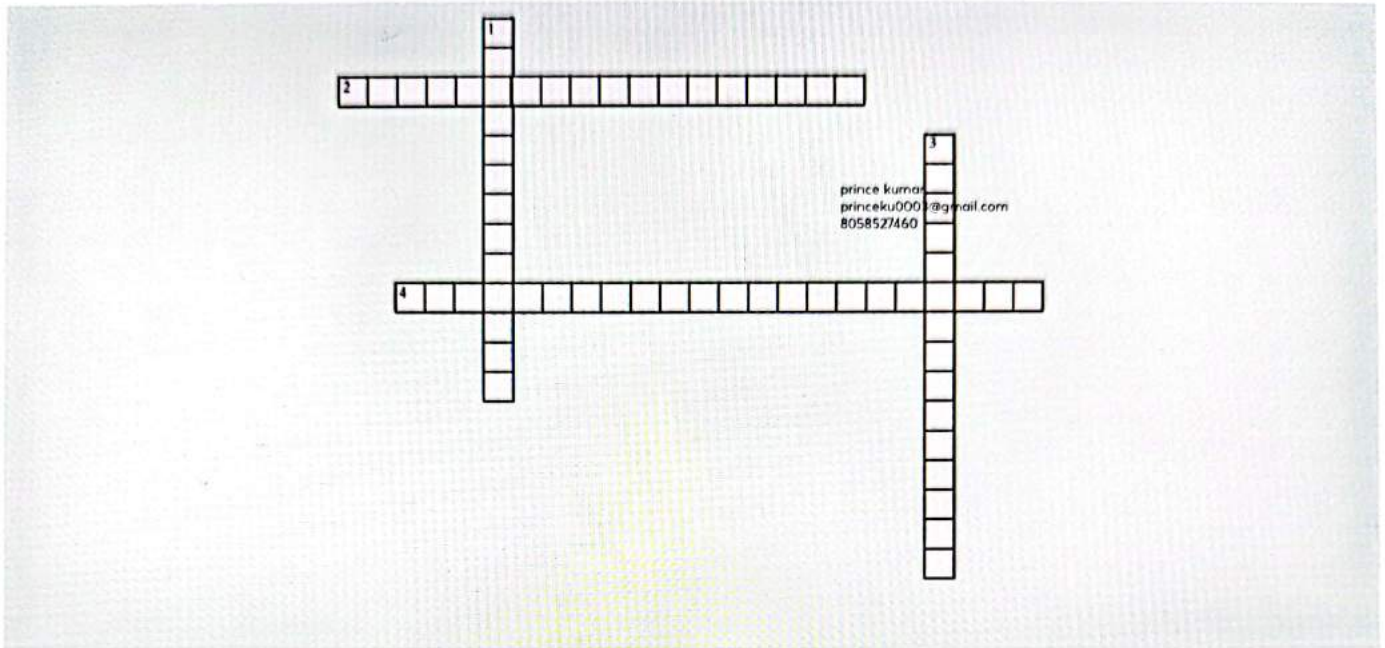
- A. Case Series Report
- B. Case-Control Study
- C. Clinical Trial
- D. Cohort Study



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. First phase in epidemiology
- 4. Interventional Study is used for

Down

- 1. The study of diseases
- 3. Ecological study is a type

3

DESCRIPTIVE STUDY DISEASE DISTRIBUTION

Descriptive Epidemiology: Definition & concept

- Epidemiology: Study of distribution & determinants

Definition of Descriptive Epidemiology

- Study of distribution of disease/health-related events & identification of characteristics associated with the disease.

Salient features

00:04:00

- 1st phase of epidemiology investigation
- It helps us formulate a hypothesis: when the disease is new, or nothing is known about it.
- It helps us to study the distribution of disease: in terms of time (when), place (where), and person (whom).

Person distribution

- Socio-Demographic profile of a person
- Meaning which age groups, genders, religions, or occupations are affected by the disease.

Place distributions

- Determines which place the disease is affecting.
- Whether it is a rural area, urban, city, town, or village.

Time distribution

- Determines which time or months of the year is affected.
- Identifies when it occurs during winter or summer.

Steps in Descriptive Study Design

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Defining the population to be studied

- Population should be identified.
- It should be clear in terms of what age, gender, and socioeconomic status of a person.
- Sociodemographic profile of the population must be done.
- Certain essentialities that we demand in population
 - It should be stable
 - No migration
 - Includes community participation - meaning people of the community should come forward.
 - Consider the entire population of the area or can take a sample of the population.
 - In the second case, the sample should be representative of the population.

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Defining the disease under study

- Clinical definition may not be specific; it can vary.
- But in this, Epidemiologists should have clear-cut definitions, which should not change throughout the study.
 - All the eligibility criteria or Diagnostic criteria need to be specified.

Describing disease by

- Time - when
- Place - where
- Person - whom

Measurement of disease

- Determine
 - Mortality statistics
 - Morbidity statistics
 - Disability statistics

Comparing with known indices

Formulation of an etiological hypothesis.

- Where the disease is happening in terms of time, place & person.

Q. Which study design helps us to formulate a hypothesis?

Ans. Descriptive Study Design

Q. Studying the distribution of disease or health-related characteristics in the human population and identifying characteristics with which disease seems to be associated is

- Descriptive Epidemiology
- Experimental epidemiology
- Analytical epidemiology
- Interventional epidemiology

Time Distribution of Disease

00:15:16

- In the occurrence of disease
 - Short-term fluctuation: Epidemic
 - Period-term fluctuation: Cyclical & seasonal distribution
 - Long-term fluctuation: Secular trend.

Short-term fluctuation

- The best example of Short term fluctuation is the occurrence of an Epidemic.

Endemic

- Constant presence of disease in a population. E.g., malaria, TB, etc.

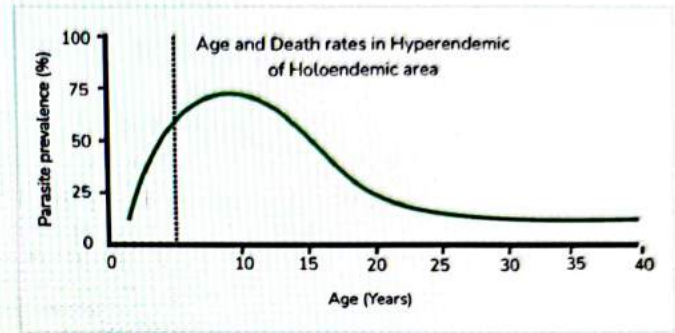
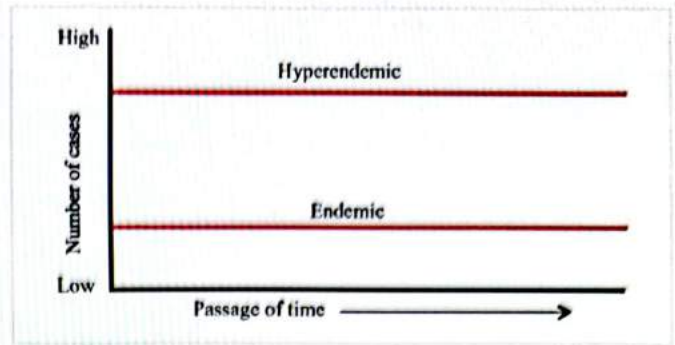
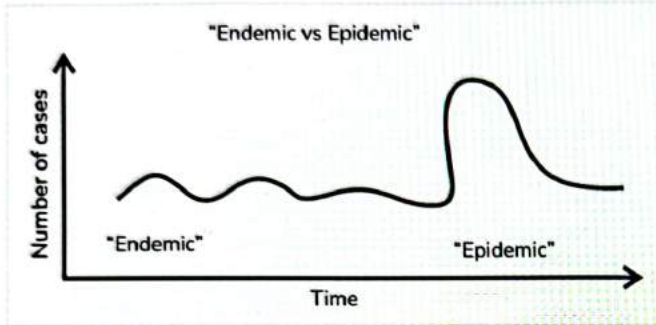
Epidemic

- Occurrence of disease clearly over normal expectancy.
- For example, think about any disease 'X.' What is its normal expectancy? Take an average or mean of the number of cases occurring in the previous or last 3-5 years.
 - Suppose, 2017- 100, 2018 - 150.....2022 = Average
 - Mean = sum of all observations/ total no of observation

- o Either you can say it occurs in frequency more than 2 Standard deviations + mean
- o Or is it more than 80% of the expected frequency.
- o The occurrence of even a single case of a previously eliminated disease is an Epidemic.
- o Occurrence of a single case of an exotic disease. E.g., Yellow fever in India.

Endemic

- Constant presence of disease in a population. Epidemiologically link cases in terms of time, place, or person.



Pandemic

- Worldwide distribution of cases. The disease needs to cross:
 - o Two continents
 - o Two WHO-specific regions.
 - o E.g. HIV/AIDS, influenza, Covid.

Sporadic

- Haphazard distribution in the occurrence of a disease.
- Cases cannot be epidemiologically linked in terms of time, place, and person.

Outbreak

- Similar to Epidemic.
- But an Outbreak is a localized distribution.

Exotic

- Disease does not occur in the country but is imported. E.g., Yellow fever.

Hyperendemic

- means disease occurring at higher prevalence, higher incidence, and affects all age groups equally.

Holoendemic

- Infection begins early in childhood, increases, and attains an equilibrium level such that adults suffer from lesser infections. E.g., Malaria.

Q. The following are the disease frequencies in a population. Based on the number of cases, which of the following is the correct match?

- Disease 1: Number of cases last week 52, this week 53.
- Disease 2: Number of cases last week 3 and present week 52.
- Disease 3: Number of cases last week 7 and present week 1.

- A. Endemic, epidemic, sporadic
- B. Endemic, sporadic, epidemic
- C. Sporadic, endemic, epidemic
- D. Pandemic, endemic, sporadic

Q. Pandemic is defined as?

- A. Endemic in small population
- B. Endemic in large population
- C. Epidemic in small population
- D. Epidemic in large population

Epidemic Curve

- An epidemic curve is a graphic depiction of the number of outbreak cases by date of illness onset.
- It is useful because it can provide information on the outbreak's:
 - o Pattern of spread
 - o Magnitude
 - o Outliers
 - o Time trend,
 - o Exposure, and or disease incubation period
- Epidemic means an increase in cases, so with time, cases increase.

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Types of Epidemics

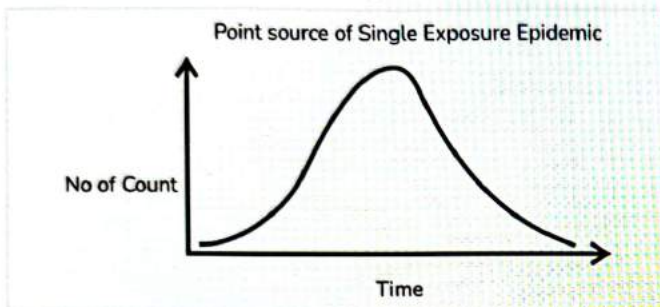
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- Common source epidemics
 - Single exposure or point source
 - Continuous exposure or multiple exposures
 - Intermittent exposure.
- Propagated Epidemic
 - Person to person transmission
 - Arthropod vector
 - Animal reservoir
- Slow (Modern epidemic)

Common source epidemics

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- Point source or single exposure epidemic.

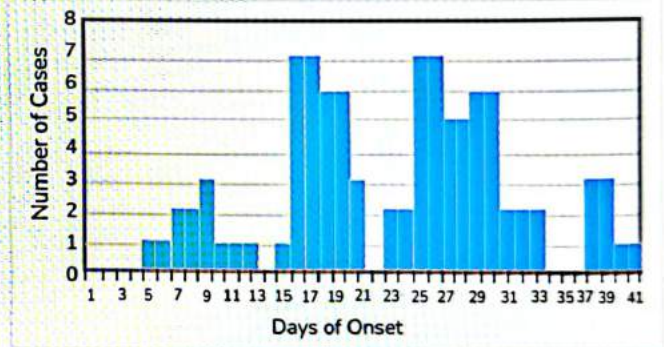


- properties of this curve
 - There is a rapid rise & rapid fall in cases.
 - Cases occur over a single incubation period of the disease.
 - Explosive in nature: Clustering of cases within one incubation period of the disease.
 - Single peak: no secondary phase.
 - Mostly but not always infectious in origin. E.g., food poisoning.
- Non-infectious at the time of origin:
 - Bhopal gas tragedy,
 - Minamata disease Japan
 - Chernobyl tragedy.
- **Hyp:** If the epidemic continues over more than one incubation period, it can be:
 - Common source
 - Continuous exposure
 - Repeated exposure
 - Intermittent exposure
 - Propagated Epidemic

Properties of graph

- Smooth Gradual rise in the number of cases and gradual fall.
- Cases occur over multiple incubation periods of the disease
- They represent multiple peaks (secondary waves).
- Not explosive in nature; there is no clustering of cases.
- Multiple peaks - multiple incubation periods - secondary waves are present.
- Prolonged plateau phase
- Epidemic extended or irregular.
- E.g., Commercial sex worker in a Gonorrhoea Outbreak, drinking water from a contaminated well. The source of infection must be determined.
- Example of continuous exposure:
 - A prostitute and gonorrhoea outbreak
 - A well of contaminated water
 - Contamination of surface/ground or piped water with human excreta, as in infectious cholera or food-borne typhoid fever outbreaks due to carriers or contaminated canned foods.

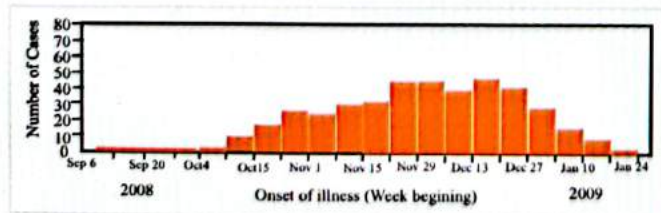
Common Source /Intermittent Exposure



- No relation to Incubation period
- Multiple peaks
- Exposure is intermittent
- E.g., Contaminated food or tinned product which is sold over a period of time.

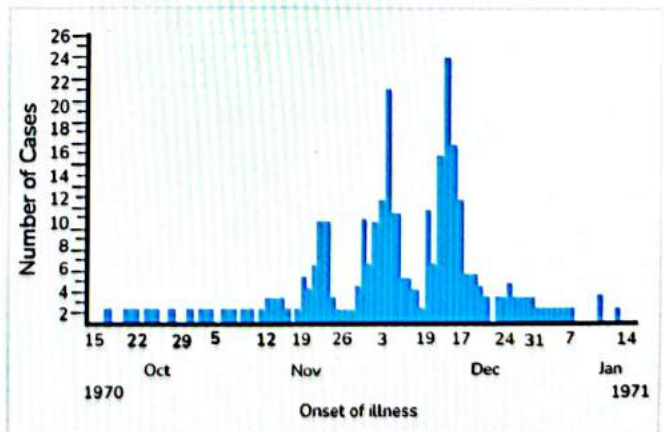
Common source, continuous or repeated exposure

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- First, there will be a gradual rise of cases, have some incubation period and then it will gradually fall.

Propagated epidemic



- Not a smooth rise in cases. Bumpy gradual rise
- Cases occur over Multiple incubation periods.
- Exposure to infectious agents is not simultaneous but through a chain of transmission.
- It is an **example of a Propagated Epidemic.**
 - Person-to-person transmission happens.
 - Mostly infectious in origin
 - Cases occur over multiple incubation periods
 - Gradual rise of cases, not smooth rise.
 - Shorter plateau phase
 - Multiple spurts
 - Taller peaks.
 - E.g. Epidemics of hepatitis A, Epidemics of polio.
- In some cases, for example, the outbreak type is a mixed outbreak pattern, which can involve both a common source outbreak and secondary propagated spread to others (usually household members).
- Many foodborne pathogens (such as Norovirus, Hepatitis A, Shigella, and E. coli) commonly exhibit this mode of spread.

Q. The epidemic of vector-borne diseases is usually presented by

- A. Slow epidemic
- B. Continuous epidemic
- C. Point source epidemic
- D. **Propagated epidemic**

- **Vector-borne diseases follow propagated epidemics.**
 - Propagated or progressive epidemics occur when the infection spreads from person to person.
 - The infectious agent causing the disease passes from one host to another either directly from person to person or indirectly via vectors (e.g., mosquito in case of malaria) or in water, food, or another medium.

Q. In the case of an epidemic, 3 villages are affected simultaneously by typhoid cases. Upon study, it is found that one milkman is going to all these 3 villages. Which type of epidemic does this represent?

- A. Point source
- B. Common source, propagative
- C. Common source, single exposure,
- D. **Common source, continuous exposure**

- **Note:** it is like a mixed Epidemic. And for household contacts, it's also like a propagated epidemic. Though not an option, we choose option d.

Q. All are true for the Point source epidemic, except

- A. Epidemic curve rises and falls sharply
- B. Clustering of cases within a short period of time
- C. **Person-to-person transmission**

Golden points

Sl. No	Point source/ Single exposure	Common source / continuous exposure	Propagated
1	Rapid rise and rapid fall of cases.	Gradual smooth rise and gradual fall of cases - till everyone is infected or we found the source of infection	Gradual unsmooth rise of cases (bumpy rise) with multiple spurts.
2	Cases occur over one incubation period of disease	Cases occur over multiple incubation period	Cases occur over multiple incubation period
3	Explosive	Not explosive	Not explosive
4	Single peak reflects single incubation period	Multiple peaks (reflects multiple incubation periods) - secondary waves	Secondary waves are present but not as prominent as in common source.
5	No plateau phase	Prolonged plateau	Very short plateau
	Not having a tall peak	Shorter peaks	Taller peaks,
	E.g., Food poisoning (Bhopal gas tragedy),	E.g., • Contaminated well • Commercial sex worker,	E.g., Person to person transmission • Hepatitis A • Polio

Periodic fluctuation of disease

01:01:01

Types of periodic distribution

- **Cyclical distribution of disease**
 - the disease is repeated in certain cycles
 - Every 2-3 years in unvaccinated area measles epidemic is happening
 - Rubella - every 5-7 years
 - Influenza - every 7-20 years
- **Seasonal distribution of disease**
 - these diseases occur in particular seasons
 - Gastrointestinal infections - more prominent in summers as it helps in the propagation of the flies.
 - Respiratory ailments like pneumonia - more common in winter months

Q. Do road traffic accidents show periodic fluctuations?

Ans. Yes, it is cyclical (more during weekends) and seasonal (more common in winter months).

Q. Increased occurrence of Road traffic accidents on weekends is described by which term?

- A. Cyclic trend
- B. Secular trends
- C. Seasonal trends
- D. Transitional trends

Long-term fluctuation 01:03:49

- Also called secular change
- Means **progressive change** in disease occurrence at least over a decade (10 years).
- **Epidemiological transition**
 - Meaning cases of non-communicable diseases are increasing over a decade.
 - Shift from an era of communicable diseases to non-communicable diseases.

Q. A gradual progression in the number of cases of communicable disease compared to the previous year is referred to as

- A. Cyclic trend
- B. Periodic trend
- C. Seasonal trend
- D. Secular trend

Explanation

- With non-communicable disease, the word is secular, which is a progressive change in the occurrence of a disease.

Place Distribution 01:06:34

- Geographical distribution of a disease
- International variation
 - Certain cancers are more common in a particular country, whereas certain cancers are common elsewhere.
- National variation
 - Rural and urban differences in diseases
 - TB is more common in rural areas
- Local distribution of cases
 - Used in the case of outbreaks
 - **Spot maps** are drawn to show the local distribution of cases
 - Drawn by John Snow during the cholera epidemic in London.
 - He represented the clustering of cases around the source of infection.

Note

- Migration study in a randomized control trial
- It can also come under place distribution
- It is taken up to study the effect of genetic and environmental conditions
 - Twins - similar genetic lineage - one has migrated, and the other has not migrated.
 - Two groups with different genetic lineages, but they have migrated - people of Japan migrating to the USA and the effect of cardiovascular diseases on them.

Person Distribution

- Everything about the socio-demographic profile is considered here.

Use of descriptive epidemiology

- **Descriptive epidemiology helps us formulate a hypothesis - describe a disease**

Investigation of an epidemic 01:10:14

- To define the magnitude of an epidemic in terms of time, place, and person
- To identify factors responsible for the occurrence of an epidemic
- To identify the cause, source of infection, and modes of transmission to determine measures necessary to control the epidemic
- To strategize to prevent reoccurrence

Q. What is the most important step in the investigation of an epidemic?

Ans. Verification of diagnosis.

Q. When will you stop investigating an epidemic?

Ans. When no more cases occur for twice the incubation period of the disease from the occurrence of the last case.

Steps of investigation of an epidemic

Verification of diagnosis

- Most important step
- Examination of a **sample of cases** and verify the diagnosis
 - Because based on signs and symptoms, a **spurious diagnosis** can come up, so we need to avoid that.

Confirmation of the existence of an epidemic

- Compare the data collected with the previous year's data
 - It's occurring more than two standard deviations
 - At least the cases occur at more than 80% of expected frequency.

Define the population at risk

- Obtain a map of the area affected
- Start counting the population
- Go on a house-to-house survey and try to find the entire population at risk.

Rapid search for all cases and their characteristics

- Two things can be done to do this
 - Medical survey
 - Epidemiological case sheet
 - Have the details of everything like
 - Who has come into contact
 - Who are the exposures

Data analysis

- It is done in terms of
 - Time,
 - Place,
 - Person.
- We will try to identify which type of epidemic it is by drawing the epidemic curve

Formulation of hypothesis

- It will have all the information about
 - Agent
 - Host
 - Environment
 - Modes of transmission
- Formulation of hypothesis is the work of descriptive epidemiology

Testing of hypothesis

- Next step after descriptive is to do an analytical study design
- First thing - case-control study
 - All of those who have suffered have become the cases and compare them with those who have not become the cases.
 - It will help to answer why and how

- Second step - Plan a cohort
 - Compare the attack rates in exposed vs non-exposed groups.

Evaluation of etiological factors

- Etiological factors such as
 - Effect of humidity
 - Effect of sanitary conditions
 - Effect of water supply

Further investigation of the population at risk

- Keep looking for any other population which is at risk.

Writing a report

- To provide a strategy at the end
- Prevent the future occurrence

Note

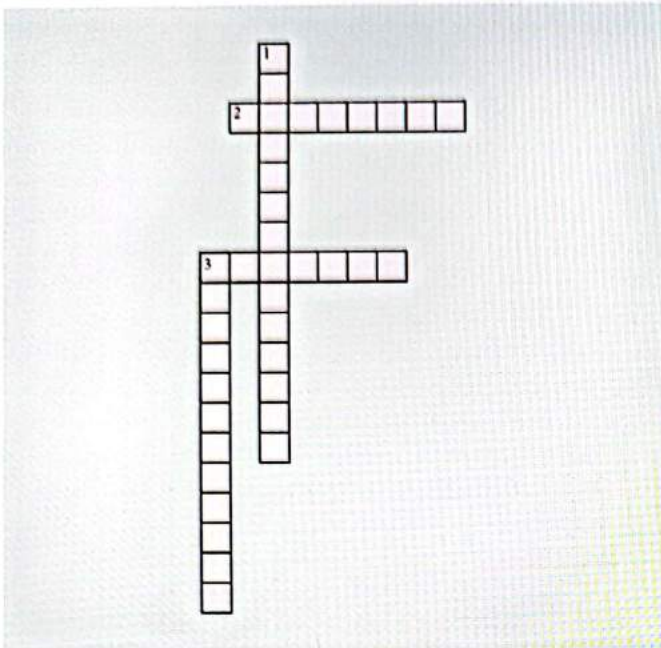
- When should the investigation of the Epidemic be stopped?
 - When no more cases occur for twice the incubation period of the disease from the occurrence of the last case, the investigation is stopped.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Haphazard distribution
- 3. Constant presence of disease in a population

Down

- 1. Disease occurring at higher prevalence,
- 4. Study of distribution & determinants

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4 COHORT STUDY

- **Observational Analytical Study**
- It provides **evidence** to support the existence of an association between exposure and outcome.
- Cohort study can be performed after a case control study
- Time taking.

Cohort 00:03:16

- A group of individuals who share a common characteristic.
- **Examples**
 - Birth cohort: All Children born in a hospital in Delhi on 5th Jan 2023
 - Marriage cohort

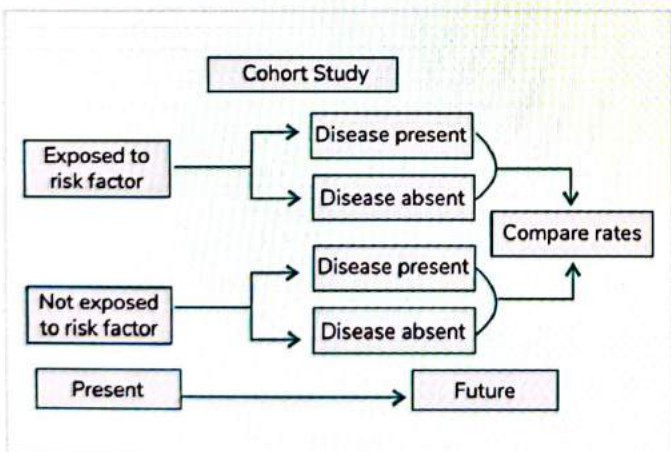
Pre-Requisites of a Cohort 00:05:20

- Cohorts are identified **prior** to the appearance of disease under investigation.
- Cohorts have to be **free from the disease** at the time of start of study.
- Both **exposed and non exposed** groups should be **equally susceptible** to the disease under the study.
- Diagnostic and eligibility criteria should be clearly defined.
- Both groups should be **similar** with respect to all the possible variables that can influence the frequency of the disease.

Types of Cohort Study 00:09:53

1. Prospective Cohort study (**Concurrent Cohort study**)
2. Retrospective Cohort study (**Non-Concurrent Cohort study**)
3. Mixed Cohort study (**Ambispective Cohort study**)

Prospective Cohort Study 00:10:51



Example

- **Time:** Present - future
- **Cohort:** College students who got admission in a medical college in 2023

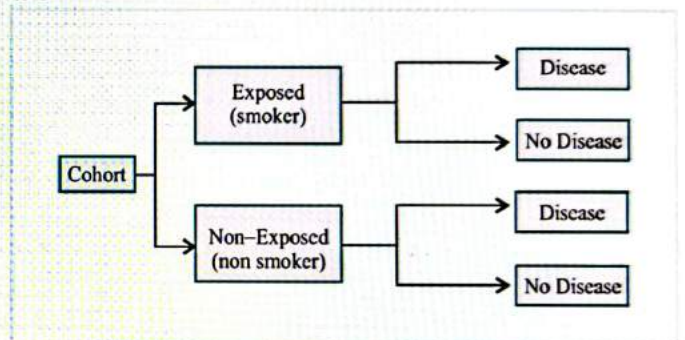
- **Groups:** Exposed and Non exposed
- **Risk factor:** Alcohol or smoking
- Moving parallel/ forward/ concurrently with time
- Identify the rates of presence or absence of disease in both groups
- **Compare the rates**

Basic Design 00:12:45

- Start of study: Present time
- Compare exposed and non-exposed
- Direction of arrow: moving forward with time

Synonyms of Cohort Study 00:17:54

- Prospective Cohort study
- Concurrent Cohort study (move parallel with time)
- Cause to effect
- Forward looking study
- Incidence study



Framingham heart study 00:22:03



- **Largest** prospective cohort study
- Effect of risk factors on CVD studied
- Outcomes are observed for **every 2 years**

Dolls and Hill study on lung cancer 00:22:55

- Another example of Prospective cohort study
- Studies effect of smoking on Lung cancer.

Advantages 00:23:15

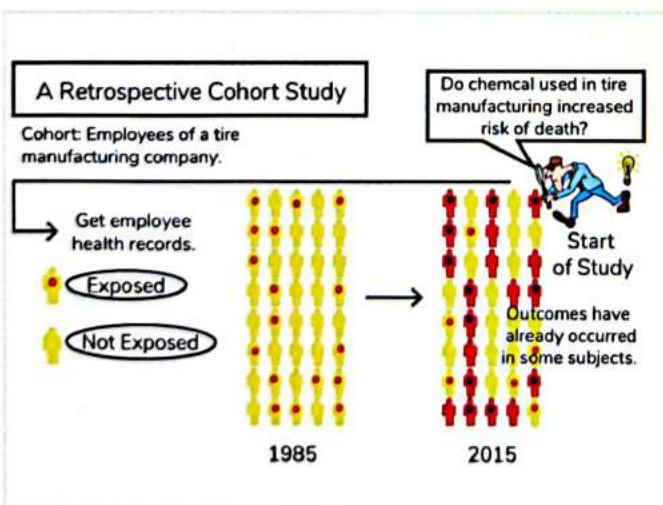
- **Multiple outcomes**
- Establish temporality of a disease. (**cause precedes effects**)
 - **Ex:** Smoking leads to lung cancer
- Calculate incidence of a disease
- Calculate relative risk

Disadvantages 00:27:23

- **Time taking**
- Expensive
- Large sample size required
- Administrative problems
- Ethical concerns (letting people expose to risk factors, eg- letting people smoke)
- **Attrition bias**
 - loss to follow up
 - drop outs in between will affect the final outcome.
 - Maximum Attrition bias allowed in any study is 5%.
- **Hawthorne bias** (subjects modify their behavior on being observed)
 - **Ex:** Smokers may quit smoking in between.
- Selection of comparison group can be challenging.

Retrospective Cohort Study 00:33:05

1. Start study at present time
2. **Move backwards (retrospectively) and use historical data**
3. Based on historical data divide study participants into exposed and non exposed groups.
 - **Ex:** Based on Medical college register of 2010 divide students into exposed and non exposed groups
4. Determine outcomes (diseased and non diseased rates) at the time study begins.



Synonym 00:40:16

- Non concurrent cohort (not moving with time)

Advantages 00:40:36

- Saves money
- Saves time
- Prevent Attrition bias
- Prevent Hawthorne bias
- Establish temporality
- Calculate incidence
- Multiple outcomes are studied

Disadvantage 00:42:40

- **Recall bias to some extent**

Important Points

- Cohort study (prospective or retrospective) always compares exposed and non exposed.
- Case control study compares diseased (cases) with non diseased (controls)
- Helps in calculating incidence of a disease.
- Retrospective Cohort is always better than Prospective Cohort in establishing causality

Q. Outcomes have ~~not~~ **not yet** occurred?
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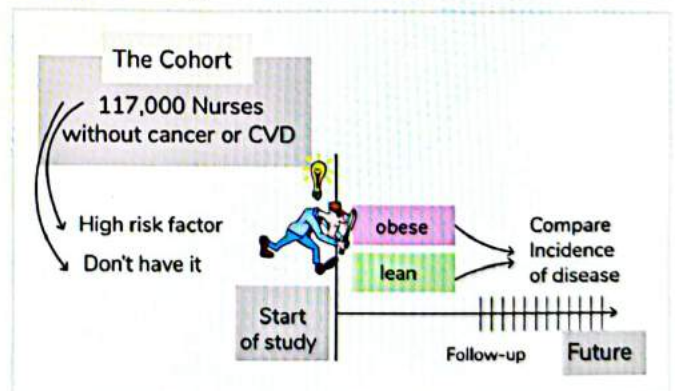
Ans: Prospective Cohort study

Q. Both exposure and outcome occur in?

Ans:

- If starts with outcome, Case control study
- Outcome is determined at the time study begins, Retrospective Cohort study

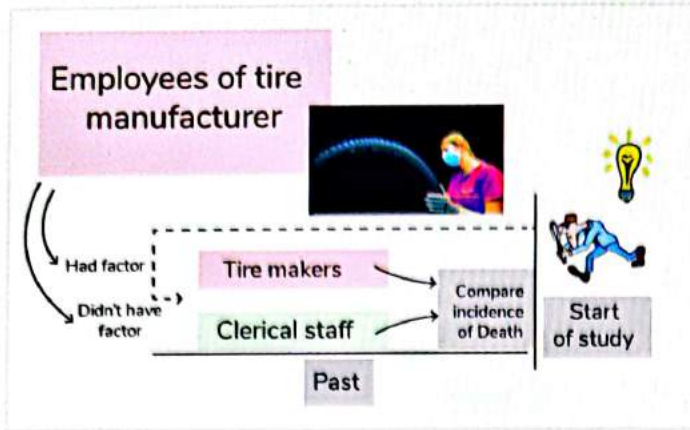
Example of Prospective Cohort Study 00:46:32



- Cohort: 1,17,000 nurses without cancer or CVD
- Start: 2023
- Risk factors: Obese, lean
- **Follow up into future**
- Outcomes not yet occurred

Example of Retrospective Cohort Study

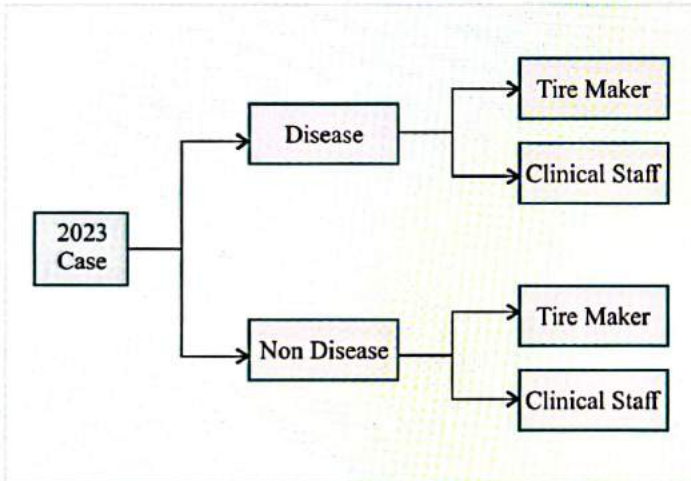
00:47:14



- Cohort: Employees of tyre manufacturers
- Start: 2023 (present)
- Follow backwards based on historical data
- Groups compared tire makers and clerical staff
- Compare incidence of death at start of the study

Example of Case Control Study

00:49:19



- Control: Non diseased
- Case: Diseased
- Start: 2023 (present)
- Follow backwards based on available data
- Compare cases and controls

Q. In a study begun in 1965, a group of 3000 adults in Baltimore were asked about alcohol consumption. The occurrence of cancer was studied in the group between 1981 and 1995.

Ans: Prospective Cohort study

- Cohort: 3000 adults in Baltimore
- Start: 1965
- Risk factor: Alcohol
- Outcome: Cancer
- Outcomes seen in 1981 and 1995

Q. 500 women aged 40-54 who present for routine check-ups are asked about their meat consumption. 20% of the women turn out to be vegetarian. During the ensuing 5 years, 5 vegetarians and 43 non vegetarians develop colorectal cancer. Which of the following best describes the study design?

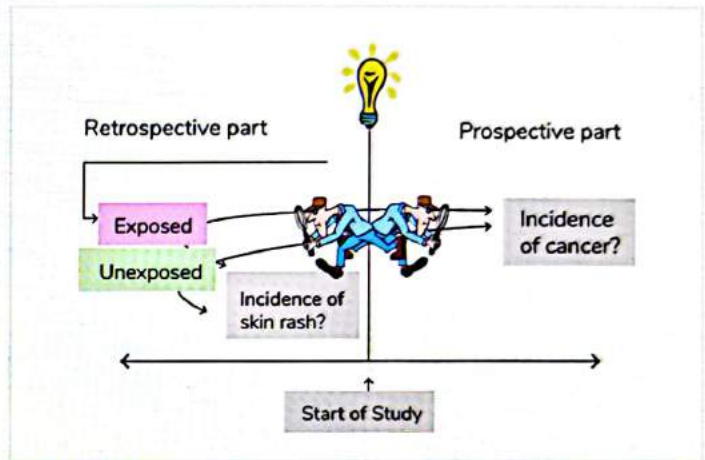
Ans: Prospective Cohort study

- Exposure: Vegetarians and Non vegetarians
- Outcome: Colorectal cancer or no cancer
- Vegetarians: Exposed
- Non vegetarians: Non exposed

Mixed Cohort Study

00:54:44

- Ambispective Cohort study
- Both Prospective and Retrospective Cohort studies are done



Example of Ambispective Study

Retrospective Part

- Start: 2023
- Cohort: Register population
- Risk factor: Exposed and Non exposed
- Outcomes in present: Skin rash

Prospective Part

- Start: 2023
- Cohort: Register population
- Risk factor: Skin rash
- Outcomes: Cancer

Q. After Retrospective Cohort study if another study is done in forward direction for another 15-20 years it is known as?

Ans: Mixed Cohort study or Ambispective cohort study

Steps of a Cohort Study

00:56:54

Selection of Study Objects

00:57:20

- General population
 - External validity: Sample should be true representative of the entire population

- **Special groups**
 - Professional groups-Medical doctors, Government employees
 - Homogeneous
 - Readily accessible
 - Stable population
- **Occupational exposures**
 - Exposure groups
 - Cohort study is done in rare exposures
 - Retrospective Cohort study is generally done.

- **Incidence among exposed:** $a/a+b$
- **Incidence among non exposed:** $c/c+d$
- RR is also known as **Risk ratio**
- **Interpretation**
 - $RR > 1$: Positive association (**risk factor**)
 - $RR = 1$: **No** association
 - $RR < 1$: Negative association (**inverse association/protective factor**)
- Example- study on smoking and lung cancer,
 - If $RR=5$, smokers are at 5 times more risk of lung cancer than non-smokers.
 - If $RR=1$, whether a person smokes or does not smoke has nothing to do with lung cancer.
 - If $RR=0.25$ (75% reduction in incidence rate among exposed compared to non exposed) protective factor.

Obtain Data on Exposure

01:00:13

- Interviews
- Questionnaires
- Surveys

Selection of Comparison Group

01:00:39

- **Internal comparison**
 - Divide groups based on **degree of exposure**
 - Ex: People smoking <10 cigarettes and >10 cigarettes per a day
- **External Comparison**
 - **Comparison between two groups**
 - Ex: Smokers and Non smokers

Follow Up

01:01:57

- Periodic medical examination at regular intervals
- Home visits
- Telephone calls

Analysis

01:02:38

- Compare **incidence** among exposed and non exposed groups

Measure of Strength of Association of Cohort Study

01:03:30

- Relative Risk
- Attributable Risk
- Population Attributable Risk

1. Relative Risk

01:04:23

- Ex: Association between smoking and lung cancer

Exposure	Lung cancer	
	Yes	No
Smoker	a	b
Non smoker	c	d

$$RR = \frac{\text{Incidence of disease in exposed}}{\text{Incidence of disease in non exposed}}$$

2. Attributable Risk

01:11:11

$$AR = \frac{\text{Incidence among exposed} - \text{Incidence among non exposed}}{\text{Incidence among exposed}}$$

- **Example-Study** on association between smoking and lung cancer
- **Interpretation**
 - $AR=75\%$, 75% lung cancer cases are attributed to smoking
- Important for epidemiologists and community physicians

3. Population Attributable Risk

01:12:50

- PAR is important to Policy makers or administrative personnels.

$$PAR = \frac{\text{Incidence among total population} - \text{Incidence among Non exposed}}{\text{Incidence among total population}}$$

Exposure	Lung cancer	
	Yes	No
Smoker	a	b
Non smoker	c	d

- **Incidence among total population** = $a+b+c+d$
- **Incidence among lung cancer population** = $a+c$
- **Incidence among non exposed population** = $c+d$

$$PAR = \frac{a + c/a + b + c + d - c/a + b + c + d}{a + c/a + b + c + d}$$

Q. Study on smoking and lung cancer, $PAR=90\%$, interpret the statement

Ans:

- **Interpretation:** If smoking is eliminated as a risk factor, there will be 90% reduction in annual incidence of lung cancer cases in the population.
- Preventive measures must be established to prevent lung cancer cases due to smoking

Q. In a cohort study conducted, out of those exposed to risk factor 10 are diseased and out of those non exposed to risk factor only 5 are diseased. What is the relative risk?

- a. 1.33
- b. 2
- c. 0.5
- d. 50

Ans:

$$RR = \frac{\text{Incidence of disease in exposed}}{\text{Incidence of disease in non exposed}} = 10/5 = 2$$

- RR > 2, people exposed to risk factors are 2 times at risk of developing disease compared to non exposed persons.
- Positive association

Q. An epidemiologist wants to know about the risk of developing Pulmonary embolism in users of OCP's as per information given below. Calculate the relative risk

Women using OCP'S	Yes	No
Yes	120	80
No	10	70

- a. 0.48
- b. 4.80
- c. 2.40
- d. 0.24

Ans

$$RR = \frac{\text{Incidence of disease in exposed}}{\text{Incidence of disease in non exposed}} = \frac{120/120 + 80}{10/70 + 10} = \frac{120/200}{10/80} = 4.8$$

- Women using OCP'S are at 4.8 times risk of developing Pulmonary embolism when compared to women not taking OCP'S

Q. The health authorities are launching a smoking cessation program by designing different activities for the smokers. These are very expensive but still useful as a large proportion of lung cancer will be eliminated if smoking is stopped. This proportion of lung cancer can be indicated by?

- a. Relative Risk
- b. Prevalence
- c. Attributable Risk
- d. Population Attributable Risk
- e. Incidence density

Q. A study found the relative risk of alcohol addiction to have depression to be 2.03, what is the interpretation?

- a. Positive association
- b. No association
- c. Negative association
- d. Not significant

Q. A study found the relative risk of alcohol addiction to have depression to be half (1/2), what is the interpretation?

Ans: Half = 0.5, Negative association

Q. In a prospective study comprising 10000 subjects, 6000 subjects were put on beta carotene and 4000 were not. 3 out of the first 6000 developed lung cancer and 2 out of the second 4000 developed lung cancer. What is the interpretation of the above?

- a. Beta carotene is protective in lung cancer
- b. Beta carotene is not protective in lung cancer
- c. The study design is not sufficient to draw any meaningful conclusions
- d. Beta carotene is carcinogenic

Ans: Beta carotene is not protective in lung cancer (most suited)

Explanation

- Study: Cohort
- Exposure: Beta carotene
- Outcome: Lung cancer

$$RR = \frac{\text{Incidence of disease in exposed}}{\text{Incidence of disease in non exposed}} = \frac{3/6000}{2/4000} = 1$$

- RR = 1, no relative association between Beta carotene and lung cancer

Indications of Cohort Study

01:24:44

- Evidence of an association between exposure and disease present as obtained from clinical observations and supported by **descriptive and case control studies**.
- Exposure is **rare** because incidence of disease is high among those exposed.
- **Example**
 - Special exposure groups like those in industries, exposure to X-rays
 - Asbestos exposure: Mesothelioma, chances are rare
- Cohort is stable and follow up is easy, cooperative and easily accessible
- Sufficient funds are available to carry out the study



Important Information

- **Rare disease:** Case control
- **Rare exposures:** Cohort study
- **Multiple exposures:** Case control
- **Multiple outcomes:** Cohort study
- Cohort study (prospective or retrospective) always compare exposed with non exposed
- Case control always compare diseased with non diseased
- Unless mentioned as a retrospective study, consider it as a prospective cohort study.

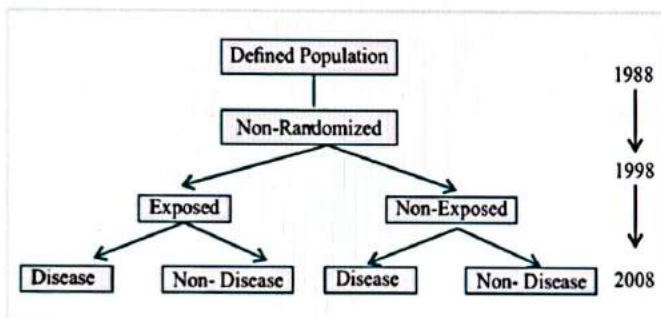
Q. All are disadvantages of Cohort study except

- Attrition
- Recall bias
- Cohort studies are expensive
- Cohort study involve a large number of subjects

Explanation

- Recall bias is seen in case control and some extent in Retrospective Cohort study
- Sample size is same in both Prospective Cohort study and Retrospective Cohort study

Q. Identify the study design in image below taking 2008 as present year



Ans

- Determine disease in 2008, divide into exposed and non exposed groups from the past.
- The study is Retrospective Cohort study.
- If the study started in 2008 and continued in future. It is a prospective cohort study.



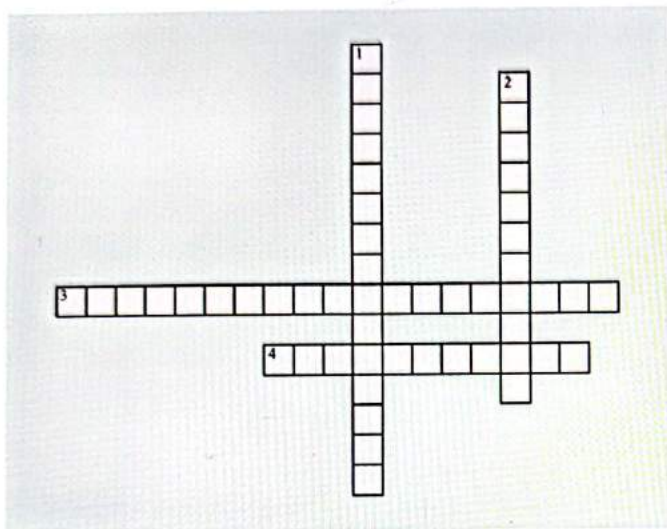
Important Information

- Unless mentioned as a retrospective study, consider it as a prospective cohort study.
- In a cohort study always compare exposed to non exposed, move in forward direction to determine the outcome.
- In Retrospective Cohort study- saves money, time, bias by moving backwards using historical data to divide exposed and non exposed determine outcomes at time of study.
- Retrospective Cohort study exposed and non exposed are compared.
- It can establish temporality, calculate incidence.
- Retrospective study is **always better** than Prospective Cohort study.
- In Case control study start at present time with cases and control.
- In Retrospective study outcomes are determined when study begins.
- Case control: Odds ratio**



CROSS WORD PUZZLES

Crossword Puzzle



Across

- 3. Start study at present time
- 4. Compare diseases with non diseased

Down

- 1. Register population
- 2. Children born in a hospital in Delhi on 5th Jan 2023

5 CASE CONTROL STUDY

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Case-control Study

00:01:11

- It is an **observational, analytical study**.
- First approach towards testing a causal hypothesis.
- Cases have already occurred, allowing the researcher to distinguish people who have the disease versus people who don't.
- This distinction helps us analyse why and how a disease has progressed.
- Both exposure and outcome have occurred before the start of the study.
- Uses 2 groups:
 - Control group who do not have the disease.
 - Case group who have contracted the disease.
- Study **precedes backwards** from effect to cause.
 - Outcome is used to determine the cause.

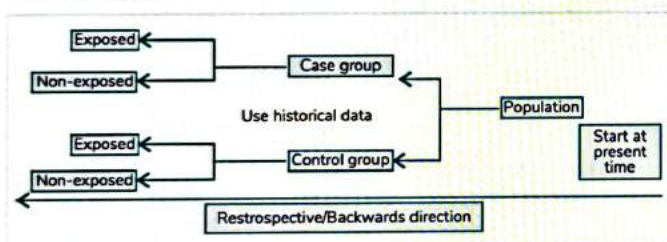
Selection of controls

00:17:18

- Controls must be **free from the disease**.
- Cases and controls should be similar in almost all the aspects or variables that can affect the study except the disease being studied.
- These variables are known as **confounders**.
- Examples of confounders include age, economic status, etc.
- The similarity of confounders ensures comparability between cases and controls.
- Sources of controls:
 - Hospitals-these patients can suffer from other diseases or may have come for a check-up.
 - Relatives-especially siblings (unreliable if they have genetic diseases).
 - Neighbourhood controls-people living under the same conditions.

Basic Design

00:06:04



- Historical data such as past records, surveys is used.
- The study **compares diseased vs non-diseased**.
- Retrospective direction.

Synonyms of Case-control Study

00:11:19

- Retrospective study.
- Backward looking study.
- Effect to cause study.
- Outcome to exposure study.
- Disease to risk factor study.
- TROHOC (opposite of COHORT)

Steps of a Case-control Study

00:13:41

1. Selection of cases and controls
2. Matching
3. Measurement of exposure
4. Analysis and interpretation

Selection of cases

00:14:29

- Diseased; already suffering from the disease.
- Clear diagnostic criteria.
- Eligibility criteria - **incident/new cases are preferred** over the existing/prevalent cases.
- Source of cases:
 - Hospitals.
 - General population using surveys or disease registries.

Questions

Q. Can controls be selected from more than one source?

Answer: Yes. Using multiple sources minimises selection bias.

Q. How many controls are needed in a case-control study?

Ans.: If the cost of selecting cases and controls are similar, then 1 case : 1 control principle is sufficient. If the target sample size is less than 50, then 1 case : a maximum of 4 controls.

Matching

00:24:08

- **Exclusively found in case control studies**.
- Technique that **ensures comparability** between cases and controls.
- Matching ensures similarity between cases and controls.
- Selection of cases in such a way that they are similar to controls in every possible variable that can affect the outcome of the disease and, if inadequately matched, can distort the final result.
- These **variables** are known as **confounders**.
- Example- In a smoking and cardiovascular disease study, alcohol is a confounder as it is common in both instances.
- Matching eliminates all known confounders.
- All variables that can distort the result are equally distributed between the cases and controls.
- **Two matching techniques**:
 - **Group matching**- Selected cases of a particular age, occupation, or socio-economic status and select appropriate controls.
 - **Pair matching**- If a 50 year old mason with disease is the case, a 50 year old mason without disease is selected as the control.

Measurement of exposure

00:30:01

- Exposure is assessed.
- Methods of measuring exposure:
 - Handing out surveys.
 - Filling questionnaires.
 - Study past records.
 - Conduct interviews.
- Multiple exposures assessed.
- An advantage of case control studies is its ability to assess multiple exposures.

Analysis and interpretation

00:32:03

- Analysis given as the strength of association.
- For example-a study involving lung cancer and smoking (effect to cause) looks into how strong is the association between the two factors.
- Steps taken in analysis:
 - Measurement of exposure status.
 - Estimation of risk.
- Analysis involves the calculation of **Odds Ratio (OR)**
- OR is the odds ratio or cross product ratio.

Odds Ratio

00:33:13

- Also known as Cross Product Ratio
- Presented in a 2x2 table.
- Golden rule of the table:
 - The **outcome** is always represented as the **column**.
 - The **exposure** is always represented as the **row**.

Exposure/Risk Factors	Lung Cancers	
	YES	NO
	Cases	Controls
Smokers	a	b
Non-smokers	c	d

a-Exposed cases, b-Exposed controls, c-Non-exposed cases, d- Non-exposed controls.

- The table is used to calculate the odds ratio.
- Odds ratio provides an estimation of relative risk.

$$OR = ad/bc$$

Interpretation of odds ratio

- Odds ratio may be presented as OR>1, OR=1, OR<1.
- OR>1 means positive association or possible risk factor.
- OR=1 means no association.
- OR<1 means negative association, inverse association, or protective factor.

Example

- In a study of lung cancer and smoking, the OR value is 2. Interpretation: Odds of smoking are two times more in lung cancer cases than controls.

- If the OR value is 1, smoking has no effect on lung cancer cases or people who do not have lung cancer.

Questions

Q. The association between coronary artery disease (CAD) and smoking was found to be as follows:

	CAD	No CAD
Smokers	30	30
Non-smokers	20	20

The Odds ratio can be estimated as:

Answer: -

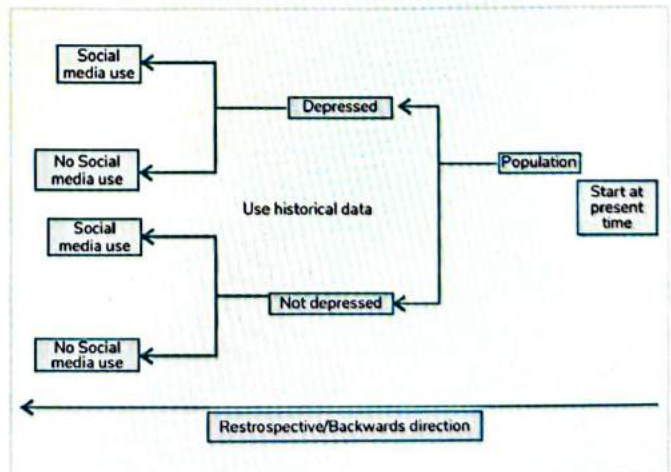
$$OR = ad/bc = 30 \times 30 / 20 \times 20 = 2.25$$

Interpretation: OR>1, Positive association. Odds of smoking among CAD cases is 2.25 times more than among control (non-CAD)

Q. A researcher wants to study relations of depression with history of social media usage. One group had social media users with depression and another group had social media users without depression. Which study design does this reflect?

Answer: -

- Exposure - Social media usage.
- Outcome - Depression, treated as a rare outcome/disease.
- Approach-Select a population. Identify and separate depressed and non-depressed groups and enquire on their social media usage.
- Study design - Case-control study.

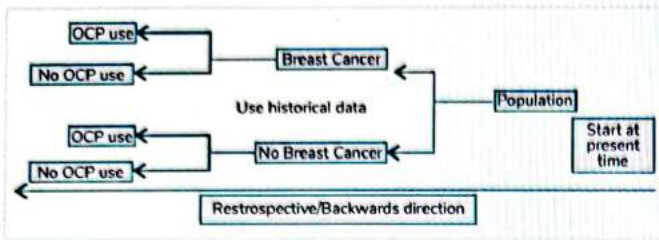


Q. The most feasible design to assess the relationship between breast cancer and risk factor oral contraceptives (OCP) use can be established by:

Answer: -

- Exposure – Oral contraceptives.

- Outcome – Breast cancer.
- Study design - Case-control study.



Advantages of Case-control Study

00:46:46

- Less time taken.
- Inexpensive.
- Ethical (minimal ethical problems).
- Multiple exposure studied.
- Rare disease can be studied.
- Attrition bias not present (no loss to follow-up).
- Forms the rationale for prevention and control programmes based on risk factors.

Q. An investigator suspects that acetaminophen used during the first trimester of pregnancy can cause neural tube defects. She estimates the risk of neural tube defects in the general population is 1:1000. Which of the following is the best study design to investigate the hypothesis?

Answer: -

- Exposure- Acetaminophen use
- Outcome- Neural tube defects, rare outcome/disease.
- Approach-Select a population. Identify and separate children with NTDs and those without. Conduct interviews with their mothers to find out if they did or did not use acetaminophen during their first trimester.
- Study design - Case-control study.

Disadvantages of Case-control Study

00:49:04

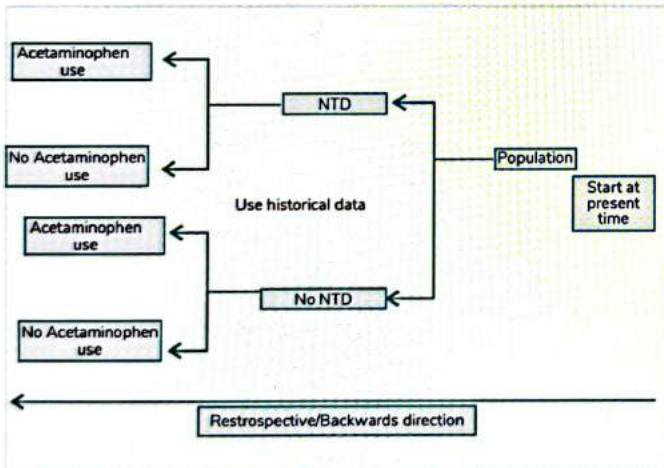
- Selection bias.
- Recall bias.
- Interviewer bias.
- Cannot measure incidence (it only provides estimation of relative risk).
- Cannot differentiate between causes and associated factors (cannot differentiate between causality and association).



Important Information

Salient features of Case control study:

1. Can determine multiple exposures
2. Useful for rare diseases



6 NESTED CASE CONTROL



- A smaller case control in a bigger cohort
- Ex: If a tree is a cohort the bird nest on it is the case control

Nature of Case Control 00:00:30

• Consider 100 children born in a hospital in Delhi.
100 children are considered as a cohort.

↓

Get the **ANC history** of the mother and keep it documented.

↓

The blood sample, urine sample and stem cells have been preserved for these 100 children

↓

Start following the 100 children

↓

After 50 years, 10 developed disease but 90 don't.

↓

The 10 become cases and 90 are controls.

↓

Initiate a small case control in a bigger cohort.

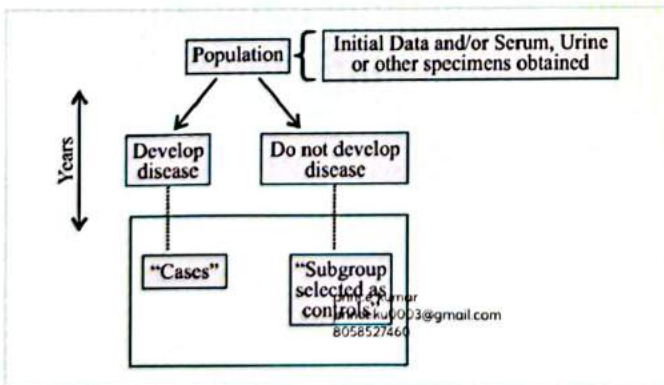
↓

Analyze the sample of 10 cases only to see what could be the cause of disease 50 yrs later

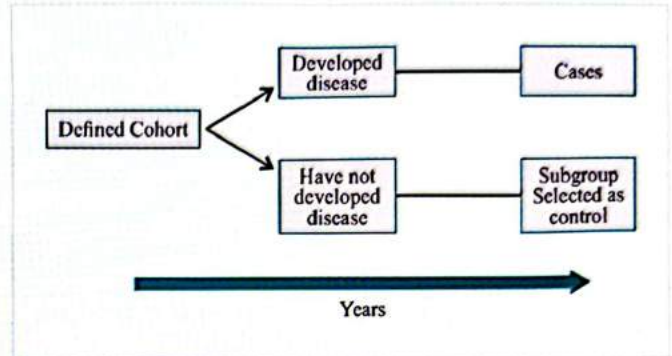
To Remember

- The design of a nested case control is **prospective** so temporality is maintained
- This is a rare investigation.

Steps of Case Control 00:04:30



Case Control Study Initiated within Cohort Study 00:04:48



Advantages of Nested Case Control 00:04:58

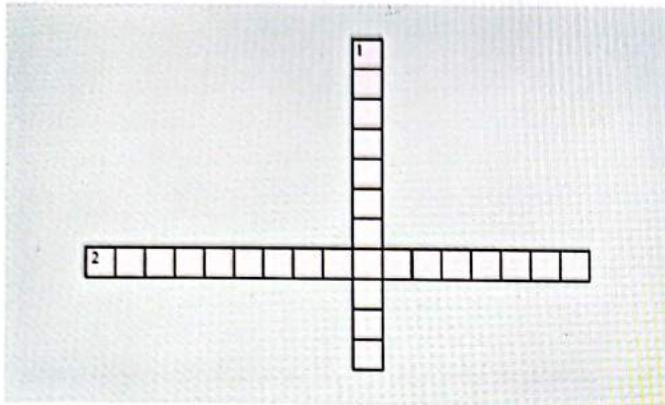
- Temporarily established
- Recall bias eliminated
- Economical
- Used when measurement of exposure is expensive
- Rare investigations
 - Rare disease: Case control
 - Rare risk factor (exposure): Cohort
 - Rare (expensive investigation): Nested case control



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. A smaller case control in a bigger cohort

Down

- 1. Case control

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7 CROSS-SECTIONAL, ECOLOGICAL, AND LONGITUDINAL STUDY DESIGNS

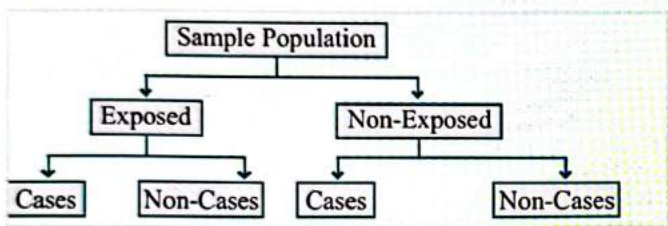
Topics

1. Cross-sectional
2. Comparison cross-sectional study vs. Longitudinal study
3. Ecological study
4. Ecological fallacy
5. Synonyms for various research designs

Cross-Sectional Study

00:00:52

Salient Features



- Image has
 - no arrows
 - not moving forward or backward
 - standing at one time
- Type: This is an observational and analytical study.
- Synonyms: a prevalence study.
- Determines: both exposure and outcome at the same time.
- Snapshot of population
- A disadvantage of cross-sectional study designs
 - They cannot establish temporality.
- A cohort can establish temporality
 - Temporality causes a preceding effect
→ Smoking leads to lung cancer.
- Since in a cross-sectional study there is no follow-up
- exposure and outcome are determined simultaneously, temporality cannot be established.
- A cross-sectional study can calculate the prevalence
- It relies on primary data collection
 - The researcher himself collects the data
 - Not taking information already existing.

Q. All are true about cross-sectional study except

- A. Established temporality.
- B. Calculate the prevalence of disease
- C. Better for descriptive than analytical purposes.
- D. Provides a snapshot of the population.

Q. A study was done in 3 states to see the mean blood pressure in each community. Health workers were assigned and visited each house in the three communities. The mean blood pressure community was found and compared. What type of study design is represented here?

A. Cohort study

B. Cross-sectional study

C. Case control study

D. Field trial

Q. A natural history of a disease best studied by?

A. Case-control

B. Longitudinal study

C. Ecological

D. Case series

- Natural history - here, the full life journey of disease and how it evolves and progresses.- best established by cohort study.
- The case series is a descriptive study.
- Longitudinal study
 - A cohort study
 - where outcomes are determined at fixed time intervals.

Comparison Cross-Sectional Study V/s Longitudinal Study

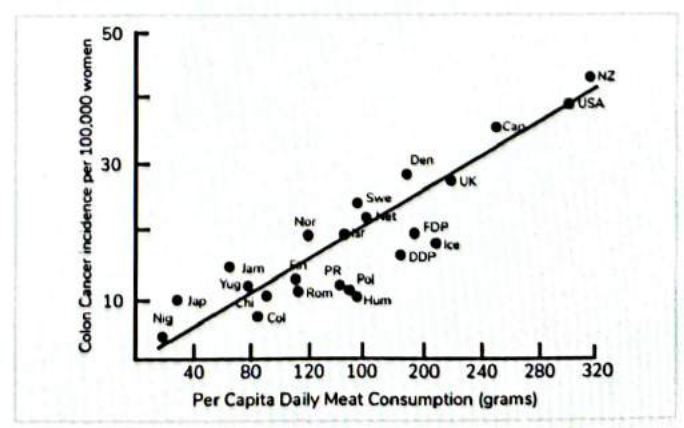
00:17:56

Cross-sectional study	Longitudinal study
<ul style="list-style-type: none"> • Different groups were compared at the same time • Time is still. And three different groups were compared at the same time. 	<ul style="list-style-type: none"> • Same group reached overtime • The outcome is accessed at a fixed time

Ecological Study

00:19:21

Salient Features



- This is known as a scattered diagram.
- It determines the correlation between two continuous variables which are quantitative variables.
- Expressed in decimals.
- An ecological study is an Observational and analytical
- The unit of study is a population.
 - Population study
 - Correlational study
 - Geographical study
 - Aggregate study
- In the ecological study,
 - We determine exposure and outcome simultaneously – similar to cross-sectional study.
 - The difference is using secondary data → already collected data.
- There is an upward moving arrow
- The positive correlation
- means an increase in the x-axis will increase the data on the y-axis.

Interpret the diagram

- Those countries with higher per capita meat consumption report a higher incidence of Colon Cancer.
- The catch here is that all those people suffering from colon cancer might not be eating meat
- this can also be a possibility
- extrapolating the information from a country's meat consumption and colon cancer incidence.
- Generalizing the findings of a population to an individual who might not possess them as individuals. This gives rise to a concept called **Ecological Fallacy**.
 - Usage of secondary data
 - More used in nutritional surveys.

Q. What is the need for ecological studies?

- A. Required to study population characteristics
- B. Monitor population health to develop and direct public health strategies
- C. Used in nutritional, occupational, and social class studies.

Comparison Cross-Sectional Study Vs. Ecological Study

00:32:16

Cross-sectional study	Ecological study
Exposure and outcome determined at the same point of time	
Usage of primary data	Usage of secondary data – rely on already collected data

Q. A person wants to study the relationship between smoking and lung cancer, so he collects data about people diseased with lung cancer from government hospitals and the number of cigarette packets sold at the same time period. Which type of study is this?

- A. Cross-sectional
- B. Ecological
- C. Experimental
- D. Quasi-experimental

- Exposure is smoking, and the outcome is lung cancer
- At the same time(question)
- It is not an experiment
- No intervention– RCT
- The catch is the person collects PRIMARY DATA

Q. A person found a correlation between fatty food intakes and disease due to obesity. He did this by collecting data from food manufacturers and hospitals, respectively. Such a study is called?

- A. Ecological study
- B. Cross-sectional study
- C. Psychological study
- D. Experimental study

- Nutritional survey
- Secondary data collected

Synonyms

00:37:49

Cohort Study

- Prospective Study/concurrent cohort
- Forward Looking Study
- Cause to effect study
- Risk factor to disease study
- Exposure to outcome study
- Follow-up study

Case-Control Study

- Retrospective study
- Backward looking study
- Effect to cause study– very important
- Disease to risk factor study
- Outcome to exposure study
- Opposite of cohort

Cross-Sectional

- Prevalence study
- Snapshot of population study
- Usage of primary data – determined at some point of time

Ecological Study/ Correlational

- Populational
- Geographical
- Aggregate

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Case-control	Cohort	Cross-sectional	Ecological
Backward looking	Forward-looking	Same point of time	Same point of time
Compare disease cases & non-diseased	compare exposed and non exposed	Determine exposure and outcome at the same point of time- using primary data	Determine exposure and outcome at the same point of time- using secondary data
Odds Ratio- strength of associations	Relative risk Attributable risk Population Attributable risk	Prevalence	NA
Unit of study- individuals	Unit of study- individuals	Unit of study- individuals	Unit of study- population
No incidence- provides estimate of relative risk	Beautifully incidence	Cross-sectional prevalence	Populational characteristics
No temporality- cases have already occurred	Best established temporality	No temporality - at the same point of time	No temporality
Effect to cause	Cause to effect	No follow up	No follow up

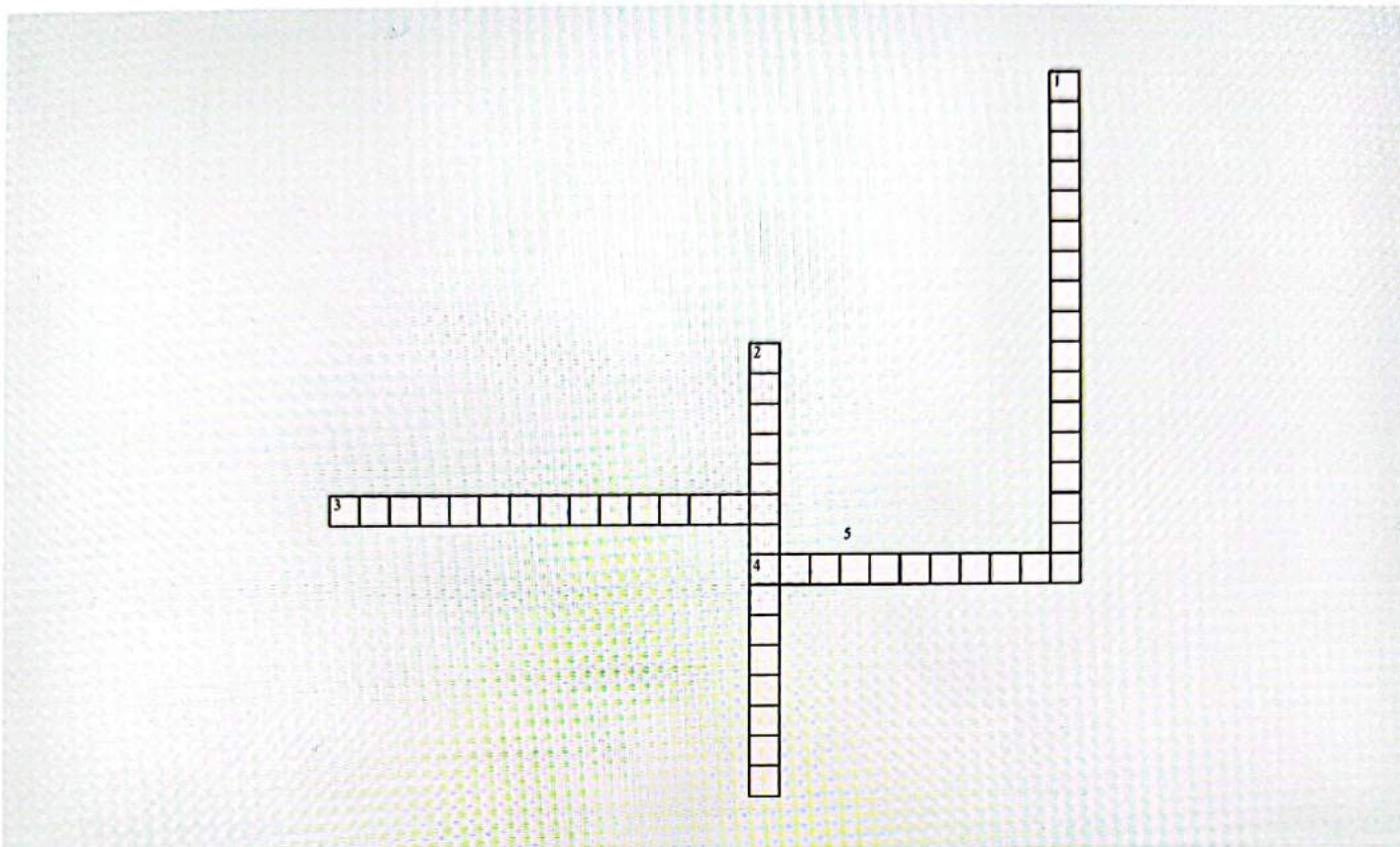
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Compare disease cases & non-diseased
- 4. Forward Looking Study

Down

- 1. History of a disease best studied by
- 2. Scattered diagram

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8 BIAS



Introduction

00:00:21

- Bias is a **systematic error**
- Occurs during
 - Design
 - Conduct
 - Analysis of study
- **Leads to faulty results** of the association between exposure and outcome.
- It is a non-random error and **doesn't occur by chance**
- It is a serious error and **cannot be eliminated** even when the sample size is increased. **Ex:** When a faulty sphygmomanometer is used to record the BP of 10 patients or 100 patients, an error cannot be eliminated.
- Due to bias, relative risk estimate increases or decreases
- Also termed as **non-random error or non-sampling error.**

Errors in Epidemiology

00:03:40

- **Two types**
 - Non-random errors
 - Random errors

Non-random errors	Random errors
Non-sampling errors	Sampling error
Doesn't occur by chance	Occurs by chance
Cannot be eliminated by increasing sample size	Can be eliminated by increasing sample size
More serious	Less serious

Types of Bias

00:05:24

- Any study involves Subject, Investigator and Analyzer.
- Three types:
 - Subject Bias
 - Investigator Bias
 - Analyzer Bias

Subject Bias

00:06:40

Recall Bias

- Seen in **case-control studies.**
- Committed by a subject who under-reports



Important Information

- **Ex:** In the case of a baby with NTD (neural tube defect), a mother who forgets to give all the details that she has done during the pregnancy leads to Recall bias.

Hawthorne Bias

- Seen in **cohort studies.**
- Subjects modify their behavior on being observed.

Reporting Bias

- Seen in both **cohort and case-control studies.**
- Subjects over or under-report due to pragmatic stigmatization
- **Ex:** Smokers may say the false duration of their smoking history.

Non-response Bias

- Subjects choose **not to enroll in a study** even when they are selected.
- More the non-response rates to questionnaires, the more the errors

Investigator Bias

00:11:31

Selection Bias:

- Arises when non-randomization methods are used.
- Participants are not the true representatives of the population.
- Types:
 - **Berksonian Bias/ Hospital admission Bias**
 - It is a **hospital admission bias.**
 - Affected by different hospital admission rates.
 - Disease is only studied in hospitals but **not** in all the target population.
 - **Ex:** It cannot be interpreted that cancer cases are arising in an area by going to single hospital of that area as it has good accessibility or services.
 - **Elimination of Bias:** Select different hospitals and patients having a variety of conditions.
 - **Neyman Bias/ Prevalence Bias**
 - Very ill and/or very healthy are excluded from the study thus true target population is not achieved
 - Two scenarios-
 - Eliminating demised patients makes the disease look less severe.
 - Eliminating recovered patients makes the disease look more severe.
 - Seen with chronic diseases like Hypertension and TB.
 - **Elimination of Bias:** Using incident cases rather than prevalent cases
 - **Reporting bias**
 - Investigators or researchers may not report certain data which can influence the findings
 - Investigator reports only data that he needs.

Publication Bias

00:17:35

- The researcher publishes only required positive results and excludes negative results.

Observational Bias/ Misclassification Bias 00:18:34

- Inaccurate measurement or classification of disease, exposure, or other variables

Interviewer Bias 00:19:02

- Interviewer interviews cases for longer hours than controls

Pygmalion Bias 00:19:53

- Motivation is proportional to performance.
- Gives an exaggerated response.
- **Ex:** Increased motivation by teacher increases student performance

Golem Bias 00:20:17

- Motivation is proportional to performance.
- Gives decreased response.
- **Ex:** Decreased motivation by teacher decreases student performance

Methods to Eliminate Bias 00:22:05

- Blinding is the method used.

Types of blinding 00:22:15

- **Single blinding**
 - Subject is unaware of intervention.
 - Investigator and analyzer know the intervention being given.
- **Double blinding**
 - Both the subject and the investigator are unaware of intervention given.
 - It is the most common form of blinding.
- **Triple blinding**
 - Subject, investigator and analyzer are unaware of the intervention given.
 - It is the best form of blinding.

MCQ's

Q. Systematic error in the determination of association between exposure and disease is termed as-

- Chance
- Probability
- Bias**
- Confounding

Q. Recall information bias is unlikely to affect cohort studies because

- Data collection is prospective
- A large number of subjects is usually included
- Exposure is usually determined prior to disease occurrence**
- Actual relative risk can be determined

Q. Double-blind means

- Observer is blind about the study
- Person or groups being observed are blind about the study
- Both observer and observed group are blind**
- Interpreters and analyzers are blind about the study

Q. Matching reduces which bias in case-control study

- Selection bias
- Response bias
- Confounding bias**
- Berksonian bias

Q. Matching is done for removal of-

- Bias
- Known confounding**
- Unknown confounding
- Known + Unknown confounding

Q. A researcher wishes to compare the blood lipid profile of smokers and non-smokers. But is concerned that smokers might differ from non-smokers in their diet, exercise etc. This is an example of

- Recall bias
- Information bias
- Hawthorne bias
- Selection bias**

Q. Hawthorne bias is associated with which type of disease

- Case-control
- Cohort**
- Cross-sectional
- Ecological

Q. Interview bias is associated with which type of study

- Cohort
- Case-control**
- Cross-sectional
- Ecological

Q. Berksonian bias is a type of

- Selection bias**
- Interviewer bias
- Information bias
- Recall bias

Q. Hospital patient admission rates differ in different hospitals with different diseases. This causes which type of bias

- Subject bias
- Investigator bias
- Berksonian bias**
- Analyzer bias

Q. Selection bias can be eliminated by

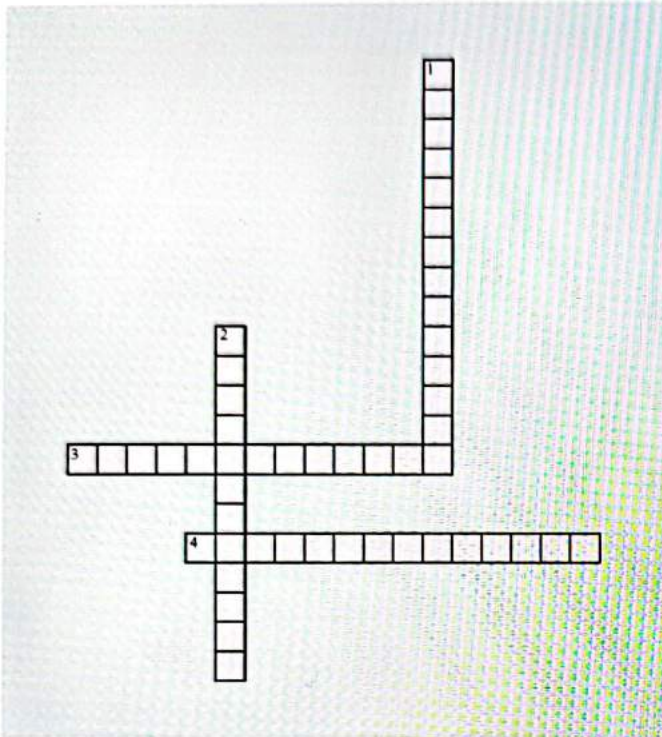
- Randomization**
- Single blinding
- Double blinding
- Matching



CROSS WORD PUZZLES



Crossword Puzzle



Across

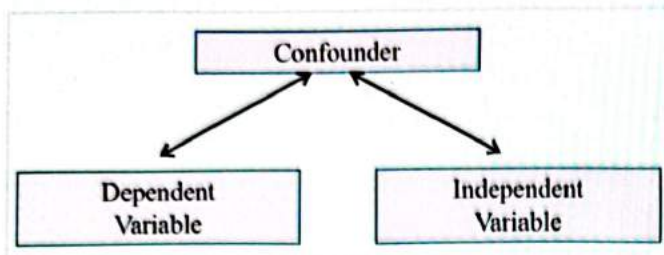
- 3. Seen in cohort studies where Subjects modify their behavior on being monitored
- 4. Best form of blinding where the subject, investigator and analyzer are unaware of the intervention given

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Down

- 1. It is a hospital admission bias and affected by different hospital admission rates
- 2. What can be eliminated by increasing sample size?

9 CONFOUNDERS



- Independent variable (exposure)
- Dependent variable (outcome)

Example:

- In the study of smoking and lung cancer, smoking is the exposure and lung cancer is the outcome.
- The outcome becomes the dependent variable.
- Exposure related to lung cancer becomes an independent variable.

What is a Confounder?

00:02:00

- For example in the study of alcohol on cardiovascular disease (CVD).
- Smoking is the third variable here, which can be termed a confounder.
- A confounder is any variable which has to fulfil certain **criteria to call it a confounder**-
 - Any variable which is associated both with exposure and outcome
 - It is an independent risk factor (association) for the outcome
 - In any study, there are both known and unknown confounders present.
 - Confounders are distributed unequally between the exposure and outcome groups (study and control groups).
- In the above example, smoking is associated both with exposure and outcome.
 - Alcohol - exposure
 - CVD - outcome
 - Meaning those who drink also smoke (possibility)
 - Smoking is an independent risk factor for the outcome

Note:

- In any study design, there are known confounders that we know will affect the outcome of the study, like - age, religion, socio-economic status and gender.
- There can be unknown confounders which are present in the study - factors that one is not often aware of.
- Technique known as matching.
 - Matching in a case-control study eliminates the known confounders.
- Randomization (done in a randomised control trial) eliminates both known and unknown confounders.

Examples of confounders

00:08:15

1. To Study the role of alcohol in aetiology of esophageal cancer, smoking is a confounding factor because:

Explanation -

- The Independent variable is alcohol, and the outcome is oesophageal cancer
- Smoking is a **confounder here** because
 - It is associated with alcohol
 - Smoking alone can also cause esophageal cancer.

2. Association between coffee drinking and Heart Disease (Expected MCQ)

Tobacco use is the confounder

Explanation -

- Independent variable coffee drinking and the outcome is heart disease
- The confounder is tobacco use. Why?
 - Research shows tobacco use (smoking) is associated with coffee drinking
 - Tobacco use has an independent association with heart disease

Disadvantages of confounders

- Faulty interpretation of study outcomes
 - Affect the **internal validity of the study** meaning
 - The association between exposure and outcome will become questionable.
 - The association might not be a true association.

Techniques to eliminate confounders

00:10:57

Matching

- Done in a case-control study
 - Cases are matched with the control
 - Cases should be similar to control in every possible variable which can affect the outcome of the study except the disease in question
- Matching eliminates only the known confounders

Restriction

- This means restricting the participation in the study to individuals who are similar in relation to confounders.
 - E.g-restricting the study to only non-smokers will eliminate the effect of smoking.

Randomisation

- Dealt in detail in the randomised control trial
- The technique where every participant is going to get an equal and known chance of being allocated to either the treatment group or the control group.
- Eliminates both known and unknown confounders

Stratification (segregate)

- Stratify the participants of the study or segregate them.
- Eg. To eliminate the effect of smoking as a confounder, one can further stratify or segregate participants into smokers and non-smokers.

Standardisation

- Eliminate or control the effect of age and gender.

Multivariate regression models

- When there are multiple confounders in a study, this model is utilised.

Note:

- The best technique to eliminate confounders is stratified randomization.
- Post applying the techniques to eliminate confounders - confounders get distributed equally between the two study groups. That's why it removes their effect. Once you apply the techniques, they get distributed equally.

Q. Which one of the following is true regarding confounding factors except:

- A. It is associated with exposure under investigation
- B. It is distributed equally in study and control groups**
- C. It is associated both with exposure and disease
- D. It is related to matching in a case-control study

Note: It is distributed unequally between the groups or control groups.

Q. Confounding factor is defined as?

- A. Factors associated with both exposure and disease & are distributed unequally in study and control groups.**
- B. Factor associated with exposure only & is distributed unequally in study and control groups.
- C. Factors associated with both exposure and the disease & are distributed equally in study and control groups.
- D. Factors associated with the disease & are distributed equally in study and control groups.

Q. A study done to establish a relationship between smoking and lung cancer found that the association was more in people who exercised less and less in people who exercised more. Here exercise is?

- A. Selection bias
- B. Effect modifier**
- C. Confounding factor
- D. Any of the above

Trick

- First access: is it a confounding factor?
 - o Exposure - smoking.
 - o Outcome - Lung cancer.

- Is exercise associated with smoking?
 - o No. Is exercise an independent risk factor, or is it independently associated with lung cancer? –
 - o No. So, this is not confounding.
- This question is not related to selection bias. So, the answer is the effect modifier.
- An effect modifier is a variable that differentially (positively and negatively) modifies the observed effect of a risk factor on disease status. So, either it is going to increase the effect of exposure on the outcome or decrease the effect of exposure on the outcome.
- It means suppose you are studying smoking and lung cancer, and you consider the third variable, Exercise.
 - o If a person exercises, the effect of smoking on lung cancer reduces.
- The magnitude of the effect of an exposure on the outcome will vary according to the presence of a third factor (effect modifier).
- For effect modification, true relation must be there between the outcome(disease) and independent variable (risk factor).
- E.g. malnutrition increases the impact of exposure (high bilirubin) on an outcome (brain damage).
 - o High bilirubin can have an effect on brain damage.
 - o If a person has high bilirubin in the presence of Malnutrition, it will aggravate the effect of high bilirubin on brain damage.

Q. A study in India of 5000 births at home and 11000 births in hospitals showed perinatal mortality rates of 4.4/1000 in home births and 26/1000 in hospital births. This observed association between perinatal mortality and hospital births is called as

- A. Spurious association**
- B. Inappropriate study
- C. Indirect association
- D. Confounder association

Types of Association

00:24:29

Spurious Association

- This is an association which appears due to improper comparison.
- The observed association between a disease and a suspected factor may not be real.
- Eg. Neonatal mortality was observed to be more in the newborns born in a hospital than those born at home. (Imp PYQ)
 - o This is likely to lead to the conclusion that home delivery is better for the health of a newborn.
 - o It's not because of the hospital services that mortality happened. But it is because of home delivery.

Indirect Association

- Indirect Associations are confounders only.
- The statistical association between a variable of interest and disease is due to the presence of a third Factor, known or unknown, that is common to both variable and disease. **The third variable is referred to as the confounding variable.**
- E.g. Altitude and endemic goitre. If we say those who are residing in higher Altitudes suffer from endemic goitre. It is not because of altitude that endemic goitre happens, and it is because of a third variable that is seen in higher altitudes known as **Iodine deficiency.**
- Iodine deficiency is associated with exposure, and it is also an independent risk factor for goitre. So, it demonstrates an indirect association.

Direct (causal) association

- One-to-one causal association
 - Two variables are causally related if a change in A is followed by a change in B.
 - When factor A is present, disease B must result. (When the HIV virus is present, AIDS will be there)
 - When disease B is present, factor A must be present
 - E.g. Tb and Mycobacterium (if Tb is present, Mycobacterium has to be present)
- Multifactorial causation

10

EXPERIMENTAL STUDIES, RANDOMIZED AND NON-RANDOMIZED CONTROL-TRIALS



Classification of study design 00:01:32

Observational study

- Descriptive study: To describe a disease in terms of time, place, and person e.g., Case report and case series. It is associated with the distribution of a disease.
- Analytical study: This type of study answers "why" and "how" e.g., cross-sectional study design, ecological study, case-control and cohort study. It is associated with the determinant of the disease.

Experimental or interventional study

- It covers the drug and vaccine study e.g., Covid vaccine was studied as an experimental type of study after it was determined that the cause of symptoms was due to Covid e.g., RCT (drug trials), field trials (vaccine trials), and community trials (preventive trials).

Key point: clinical trial vs field trial vs community trial

- Clinical trials (Phase 3/RCT) involve therapeutic interventions for sick patients e.g. drug trials and chemotherapy trials. Phase 3 of the clinical trial involves RCT. The first group receives the drug and the second group receives the placebo
- Field trials involve preventive interventions for healthy individuals e.g., vaccine trials. The first group receives the vaccine and the second group does not receive the vaccine. The results of both groups are compared.
- Community trials(preventive trials) involve interventions to aggregate units as follows:
 - o Carrying out fluoridation of public water for effective reduction in the occurrence of dental caries
 - o Achieve vector control to reduce malaria
 - o To test whether iron-fortified salt can reduce the incidence of anemia in the community.

- o The investigator determines the exposure (including an action, intervention or manipulation like application or withdrawal of suspected cause) for each individual or community through a controlled process.
- o The investigator follows up with the individuals or communities over some time to determine the effect of the exposure. This is prospective.

Use of experimental epidemiology 00:08:12

- It provides scientific proof or additional evidence of risk factors (disease causality) that can help in disease control.
- It provides a method to measure the effectiveness and efficacy of health services for the control, prevention, and treatment of disease and helps in the improvement of community health provides a method to measure effectiveness and efficacy of health services for control, prevention, and treatment of a disease and helps in the improvement of community health.

Types of experimental studies 00:09:33

- There are two types of experimental studies
 - o Randomized controlled trials (RCT): These types of studies involve a process of random allocation.
 - o Non-randomized trials: These types of studies do not involve "strict randomization" for practical purposes. There's no technique of randomization used in these trials.

Randomized Control Trial (RCT) Concept 00:10:46

- Randomization is the statistical procedure by which study participants are divided into study and control groups to either receive or not receive an experimental or therapeutic procedure, intervention, or maneuver.
- The study group receives the new drug, whereas the control group receives the placebo.

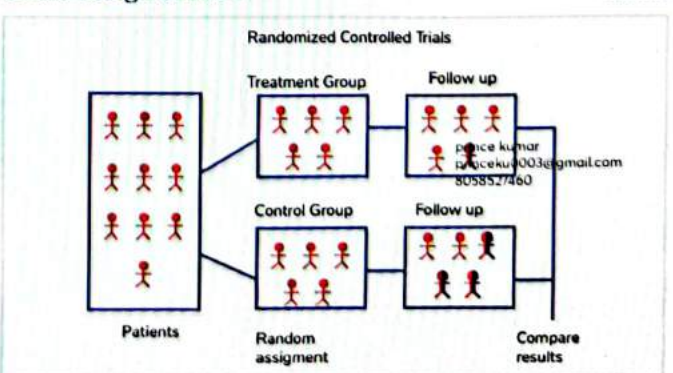
Important Information

- An intervention, either a drug, a vaccine or a preventive measure is involved in experimental or interventional study.


Experimental epidemiology 00:07:02

- In this type of study, the investigator has direct control over the conditions in which the study is carried out.
- The two important steps in experimental epidemiology are as follows:

Basic design of RCT 00:12:58



- In an RCT, the unit of study is patients.
- The first step is to select the patients.
- The next step is to divide the patients into a study or a control group i.e., random assignment.
- The study group receives the new drug, while the control group receives the placebo.
- Both groups are studied over time and the results are compared.
- RCTs are always prospective.



Important Information


- RCTs are always prospective in nature.

Importance of RCT 00:15:15

- The meaning of "random" in randomization is "equal and known chance" of being allocated either in the study (treatment group) or the control group (placebo group).

Advantage 00:18:28

- It eliminates selection bias by ensuring comparability between the two groups.
- It eliminates the known and unknown confounders. This ensures the internal validity of the study.
- It gives the confidence of like being compared with like.
- It achieves internal validity i.e. the results are not being distorted by confounders.



Important Information

- The elimination of selection bias is a more advantageous property of an RCT.

Q. At what stage is randomization done? 00:22:30

- Selecting Patients for the study.
- Allocating study participants into treatment and control groups.**
- Follow-up of study participants.
- Compare results.

Q. What is the best technique to achieve randomization?

- Lottery method or chit method.
 - Flip a coin method.
 - Table of random numbers.**
- Explanation: It is a computer-generated method.

Key Point:

- The actual randomization should be delayed until immediately prior to therapy initiation after the receiving consent.

Q. How is RCT different from analytical studies?

- Answer: RCT is phase 3 of an interventional clinical trial in a group of patients receiving either a drug or a placebo. The analytical study is an observational study and involves no intervention.

Steps of RCT


- An RCT has the following steps:
 - Protocol design.
 - Selection of reference (receives placebo) and experimental (receives drug) populations.
 - Randomization.
 - Manipulation and intervention.
 - Follow-up.
 - Outcome assessment.

Protocol Design 00:27:46

- Specify the aims and objectives of a study.
- Select criteria of study and control groups.
- Select sample size.
- Procedures of allocation into two groups.
- Standardizing working procedures.
- Treatment application.
- Investigatory roles and responsibilities.
- To ensure that the protocol prevents bias and reduces errors in the study.

Selection of reference or target and experimental population 00:28:50

- The reference of the target population can involve the whole human population or limited people of a specific age, sex, occupational, social or geographical group e.g., Industrial workers, a whole city population, etc.
- Experimental or study population.
- The study population should be derived from the reference population.
- The study population should be similar to the reference population to ensure external validity.
- The study population should provide informed consent.
- The population should be qualified or eligible for the trial.



Important Information

- The study population should be derived from the reference population.
- The study population should be similar to the reference population to ensure external validity.
- External validity is defined as the findings of the study population (sample) that can be generalized to the reference population (the whole population).

Randomization

00:32:02

- This is done to eliminate selection bias as well as the elimination of both known and unknown confounders.

Manipulation and intervention

- It means to intervene or manipulate the study population.
- This involves the application, withdrawal, or reduction of the suspected causal factor.
- The suspected causal factor can include a drug, vaccine, habit, or dietary component.
- The effect is measured as decrease in incidence, prolonged survival time, and recovery period.

Follow up

- The RCT is always Prospective.

Q. What is the intention to treat in an RCT?

- Answer: In RCT, dropouts are not excluded from the study as interim analysis can be performed.

Outcome Assessment

00:34:46

The outcome is assessed as follows:

- Positive outcome:
 - Reduction in the severity of the disease.
 - Reduction in the health service cost.
- Negative outcome:
 - The severity of complications
 - The frequency of side effects and complications
 - Participant deaths.

Bias in a RCT

00:35:54

- Subject variation: The subject can feel better or report an improvement when they are aware that they are receiving a new form of treatment.
- There are two types of bias:
 - Observer bias: In case the investigator measuring the outcome is aware in advance of the procedure or therapy being administered to the subject, it may influence the outcome of the trial.
 - Evaluation bias: The investigator can subconsciously provide a favorable report of the trial outcome.

Advantages of RCT

00:37:48

- It measures the impact of new therapies, health services, or procedures to prevent, treat, or control diseases.
- It's always prospective.
- It eliminates bias by the assurance of comparability between the control and the experimental group.
- It eliminates the known and unknown confounders in a trial.

Disadvantages of RCT

- There are ethical concerns, especially concerning the control group as they are not receiving the treatment.
- It is costly.
- It is time-consuming.
- The protocol is not clearly defined.
- The sample size is small.
- Sometimes due to a smaller sample size, there isn't proper randomization or blinding.
- It can get affected by funding agencies to present a positive effect of an intervention.

Study design of control trial

- There are three types of study design of control trials: Concurrent parallel trial, cross-over trial, and factorial design.

Concurrent parallel trial

00:39:48

- These are referred to as parallel RCT.
- Two randomly assigned study and control groups are compared.
- Study subjects remain in the same group (study or control group) for the total duration of the investigation.
- It is the most common study design.
- It is the easiest to analyze.


Cross-over trial

00:40:30

- In this type of trial, every participant acts as their self-control.
- Every participant gets the new drug at least once.
- It involves a wash-out period where both groups are put off their drug or placebo for some time.
- Then these groups are crossed over and get the other intervention than they were receiving earlier i.e., The control group crosses over to the study group and receives the drug and the study group crosses over to the control group and starts receiving the placebo.

Advantages of cross-over trial

- Every participant has an assurance of receiving the new treatment at least once during the study course.
- Every participant serves as their self- control, which eliminates the inter-subject variability.
- It is economical as smaller sample sizes may be evaluated with accuracy.

 **Important Information**

- Cross over trial is identified by the presence of the washout period.

Disadvantages of cross over trial 00:43:48

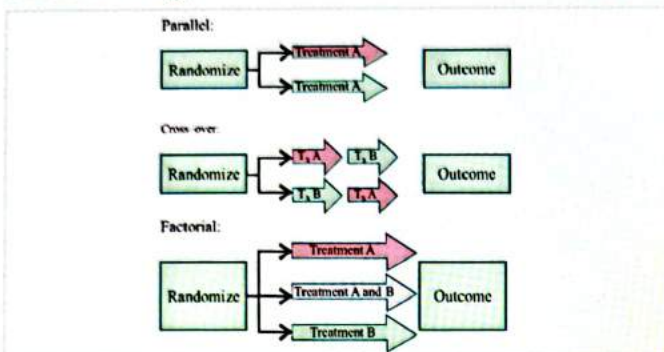
- Study is not suitable for the drug being evaluated that cures the disease.
- Drugs are effective only during a certain stage of the disease.
- Disease changed radically during the period of time required for the study.

Types of RCT

00:49:08

Clinical Trials

- Clinical trials (phase 3 RCT) mainly evaluate therapeutic agents like diagnostic, drugs, therapeutics, surgical interventions, etc. e.g., Evaluating beta blockers' effect in reducing cardiovascular mortality.
 - Limitation: Not all clinical trials require blinding e.g., surgical procedures like a tonsillectomy.

Factorial design 00:44:10

- This type of trial is efficient in case of interest in studying more than one intervention at a time.
- It can test two or more hypotheses simultaneously. This is advantageous since clinical trials have cost and feasibility issues.

Types of Factorial Design

- Two-by-two factorial design: In this, the subjects are first randomized to treatment arm A or B to address one hypothesis and thereafter within each group, there is further randomization to treatments X or Y for evaluation of the second hypothesis.
- Two-by-two-by-two factorial design: In this type, each subgroup is further randomized into two more groups P or Q e.g., Physicians Health Study (by: Hennekens CH et al).
- For example, a researcher wants to experiment on the potential negative effect of sleep deprivation on reaction times during a driving test.
 - If the researcher only wants to perform the experiment using these variables, where sleep deprivation is the independent variable and the performance on the driving test is the dependent variable, it would be an example of a simple experiment.
 - If the researcher is now interested in learning about sleep deprivation's impact on the driving abilities of men and women differently, then she has added a second independent variable of interest into her study (sex of the driver), which makes it a factorial design.

**Important Information**

- In a factorial design, we assess more than one intervention at a time.

Preventive Trials

00:50:28

- These are the trials of preventive measures e.g., a trial of vaccines and chemo-prophylactic drugs.
 - Preventive trials should disclose the benefit to the community, risks involved, and cost to health service in terms of money, material and man.
 - Field trials and community trials are a type of preventive trial.

Risk Factor Trials

00:50:43

- In these trials, the investigator interrupts the usual sequence in the disease development in those subjects, who are exposed to the risk factors for developing the disease.
 - A type of preventive trial is also called a modification of risk factor trial.
 - It can be a single factor or multiple factors trial e.g.,
 - Multiple risk factor intervention trial for the prevention of Coronary Heart Disease (MRFIT),
 - B. Stanford three community study
 - Oslo study
 - North Karelia project.
 - Primary Prevention of Coronary Heart disease using clofibrate to lower serum cholesterol.

Key point: difference between preventive and risk factor trial

- In a preventive trial, the intervention is an actual medical procedure, like a vaccine, which might or might not be given to individual subjects.
- The intervention isn't an actual physical administration, but an abstract phenomenon in risk factor trial e.g., asking a randomly assigned group of subjects to start regular physical exercise is an intervention of interest (a conceptual procedure).

Cessation experiment

00:53:02

- This involves the evaluation of termination of a habit or causal agent related to the disease occurrence e.g., cessation of smoking and rate of incidence of lung cancer.

Trial of etiological agents

- This is done to evaluate and find the etiological agent e.g., Administration of oxygen to premature babies and development of retrolental fibroplasia.

Evaluation of hospital services

00:53:38

- assess effectiveness and the efficacy of hospital services
- assess interventions and impact in the community. For example:
 - Domiciliary management and home-based care of TB in India.
 - Gadchiroli trial for home-based newborn care.
 - Evaluation to check whether to provide free ORS packets or to provide health education to mothers.

Non-randomized controlled trial

00:55:56

- A non-randomized controlled trial is an experimental epidemiology/experimental study in which people are allocated to different interventions using methods that are not random.

Indications of a non-randomized controlled trial

- A non-randomized controlled trial preferred when RCT is not possible ethically or for administration reasons e.g., smoking and lung cancer and viral induction of cancer.
- When preventive measures can be applied to only a group or a community e.g., community trials of water fluoridation.
- When the frequency of disease is low with long natural history requiring larger sample size with long follow-up e.g., cervical cancer.
- Limited logistics and cost.

Types of non-randomized trials

Uncontrolled trial

00:57:30

- The Uncontrolled trial has no comparison group e.g. PAP smear and cervical cancer screening.
- It relies on historical controls based on the earlier experience of untreated patients affected by the same disease.

Natural experiments

00:57:30

- In this type, the individuals are exposed to experimental and control conditions determined by nature or factors outside of the investigator's control.
- It uses naturally existing groups i.e, naturally occurring circumstances mimicking an experiment e.g.
 - Religious/ethnic/social groups
 - Migrant population
 - Natural disasters like famines, earthquakes and floods
 - Atomic bombing of Japan
 - John Snow's experiment showing cholera as a water borne disease,
 - Cigarette smoking and lung cancer

Key Point

- Natural experiments are also called Quasi-experimental study designs as they describe a real or naturally occurring event.

Before and after comparison studies

- These are of two types:
 - Before and after comparison studies without control.
 - Before and after comparison studies with control.

Before and after comparison studies without control

01:01:12

- In this type, the experiment serves as its self-control.
- The disease incidence before and after the intervention is introduced is measured.
- The standard for comparison includes the events that took place before the new treatment or intervention's use. For example:
 - Scurvy prevention in sailors by James Lind.
 - John Snow's study on cholera transmission.
 - Polio prevention by polio vaccination.
 - Seat belt legislation introduced to prevent deaths and injuries due to motor vehicle accidents in one of the Indian states.

Before and after comparison studies with control

01:02:36

- It is used when results are misleading in the absence of a control group.
- It is also preferred when a naturally occurring group is identified as a control group e.g., The effect of seat belt legislation on road traffic related accident-related mortality in one district compared to another district without the legislation.

Interpretation of experimental designs: (analysis and results)

Intention to treat analysis

01:03:50

- It is also called a randomized or method effectiveness analysis.
- It involves the inclusion in the analysis of all participants randomized who participated in the trial regardless of their adherence to the entry criteria, the status of treatment received, completion status, withdrawal from treatment or deviation from the protocol.

As treated analysis (per-protocol analysis)

01:04:33

- It is the opposite of the intention to treat analysis.
- Only those cases who completed the treatment are analyzed.
- Randomization isn't preserved.
- It shouldn't be used in the main analysis or alone.

Expressing results of experimental study design

01:05:09

- The results are expressed in the following ways:
 - Absolute risk reduction.
 - Relative risk reduction.
 - Number needed for treatment.
 - Number needed to harm.

Absolute risk reduction

01:05:36

- It is also called risk difference. It is the absolute difference in the outcomes between the control and the treatment group.
- It gives the percentage of decrease in the risk of occurrence of disease due to the intervention.

Relative risk reduction

- Relative risk reduction is the comparison of risk reduction between the experimental and control group.

	TOTAL PATIENTS	ADVERSE OUTCOME
Placebo	1000	50
drugs	1000	10

- CER: event rate in control group
 - 50/1000
- EER: event rate in experimental group
 - 10/1000
- ARR: CER-EER
 - $50-10/1000=0.04$
- RRR: CER-EER/CER
 - $0.04/0.05=0.8$

Number needed for treatment

01:09:32

- It is the measurement of the impact of a medicine or therapy with the estimation of the number of patients required to be treated to have an impact on one person.
- It is the number of patients that would require to receive the treatment for one of the patients to receive the benefit.
- NNT: $1/ARR=25$
 - 25 patients have to be treated to see benefit in at least one

Number needed to harm

01:10:28

- It is the number of patients required to receive the treatment for one of them to experience an adverse effect.
- NNH: $1/ARI$
 - ARI: absolute risk increase: EER-CER

Q. What is the difference between absolute and relative risk?

- The risk of something is the odds of it taking place.
- The absolute risk of something happening is the odds of it happening over a specified period e.g., a woman living in India has an absolute risk of 15% of developing breast cancer in her lifetime. This means that out of every 100 women, around 15 would develop the disease at some point in their life.

Calculating the absolute risk

- Absolute risk is always written as a percentage. It is the ratio of people with medical events compared to all of the people with the potential of having an event e.g., If out of 100 people, 30 people will get hypertension in their lifetime, then the absolute risk is 30/100 or 30%.
- In relative risk, two groups of people are compared e.g., smokers might be at a 30% greater risk of getting breast cancer compared to non-smokers. This means the relative risk increase is 30% in smokers.

Reporting results: consort

- The gold standard for reporting RCTs is consolidated standards of reporting trials.
- The CONSORT 2010 checklist contains 25 items (sub-items included) that focus on individually randomized two parallel group trials which are the most common type of RCT.

Q. The heart of randomized controlled trials is?

- Protocol
- Intervention
- Randomization
- None of the above

Q. Random in randomization in a clinical trial means?

- Equal but unknown chance
- Unequal and unknown chance
- Unequal but known chance
- Equal and known chance

Q. Randomization predominantly eliminates?

- Confounding variables
- Selection bias
- Both
- None

Q. Intention to treat analysis is done in?

- Cohort study
- Survival analysis study
- Randomized control trials
- Case-control study

Q. All of the following are experimental/interventional studies except?

- Randomized control trials
- Field trials
- Community trials
- Ecological studies

Explanation: These are observational and analytical.

Q. Case acts as its own control in which of the following study?

- a. Cross-over study
- b. Retrospective study
- c. Prospective study
- d. Case-control study

Migration study

- It is also known as a natural experiment.
- It is a Quasi experiment and has no randomization.

Q. What is studied in the migration study?

- a. Socio-demographic reasons for the migration of a population
- b. Prevalence of disease in a population
- c. **Environmental and genetic factors in a disease population**
- d. Disease with a long incubation period

Natural Experiment

- It is an experiment based on a natural phenomenon like the cholera study by John Snow.

Q. All are true about natural experiments except?

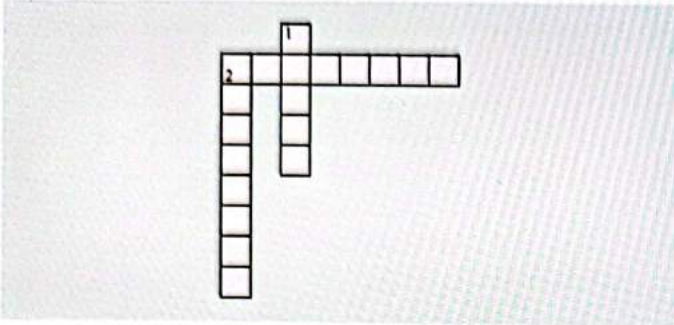
- a. The researcher has no control over the allocation of subjects
- b. John Snow's experiment is an example
- c. **Includes RCT**
- d. Done when experimental studies are not possible in the human population



CROSS WORD PUZZLES



Crossword Puzzle 1



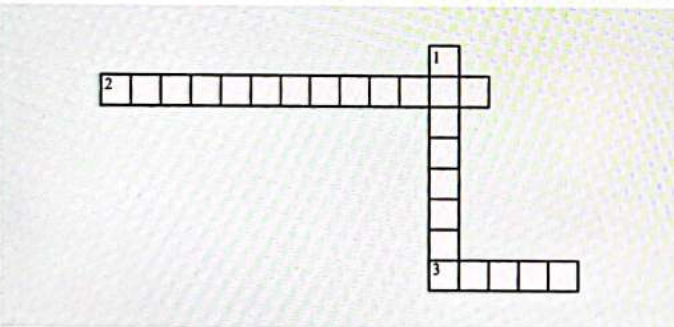
Across

2. _____ Trials (Phase 3/RCT) involve therapeutic interventions for sick patients e.g., drug trials and chemotherapy trials.”

Down

1. _____ trials involve preventive interventions for health individuals e.g., vaccine trials. The first group receives the vaccine and the second group does not receive the vaccine. The results of both groups are compared.
2. _____ Trials involve interventions to aggregate units.

Crossword Puzzle 2



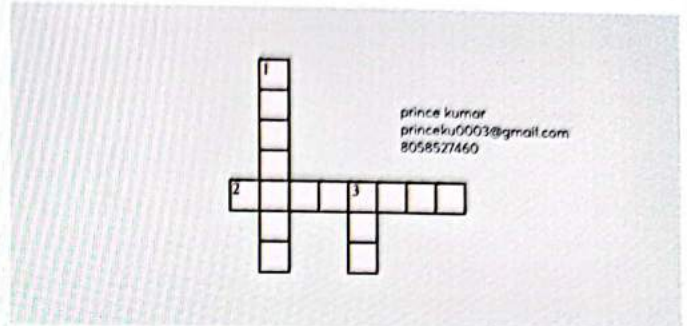
Across

2. _____ is the statistical procedure by which study participants are divided into study and control groups to either receive or not receive an experimental or therapeutic procedure, intervention, or maneuver.
3. _____ and known chance of being allocated either in the study (treatment group) or the control group (placebo group) is the meaning of "random" in randomization.

Down

1. _____ outcome includes reduction in the severity of the disease.

Crossword Puzzle 3



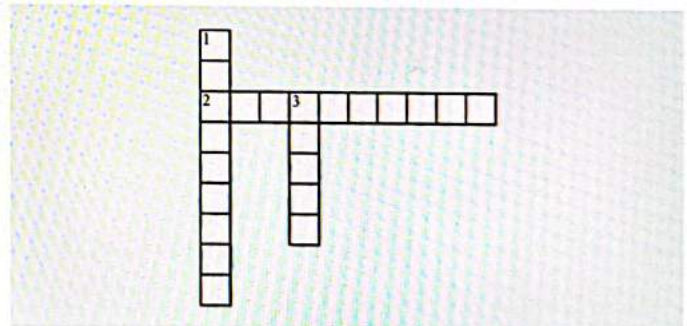
Across

2. _____ outcome includes the severity of complications.

Down

1. _____ variation occurs when the subject can feel better or report an improvement when they are aware that they are receiving a new form of treatment.
3. _____ randomly assigned study and control groups are compared in a concurrent parallel trial.

Crossword Puzzle 4



Across

2. _____ parallel trial is the easiest to analyze.

Down

1. _____ design can test two or more hypotheses simultaneously.
3. _____ over trial is the trial in which every participant acts as their self-control.

11

CLINICAL TRIALS



- It is an example of experimental or interventional epidemiology.
- **Preclinical trials:**
 - It is done among animals.
 - Ethics should be considered for preclinical trials.

- Healthy human volunteers- Phase 0, Phase 1
- Maximum tolerated dose- Phase 1
- Maximum drug failure - Phase 2
- Actual RCT- Phase 3
- Drug launched in the market- After phase 3
- Longest phase- Phase 4
- Post marketing surveillance- Phase 4

Phases of Clinical Trials

00.00.18

Phases	Purpose
<p>Phase 0:</p> <ul style="list-style-type: none"> • It is tested on Healthy human volunteers. • Up to 10 participants. 	<ul style="list-style-type: none"> • Micro dosing: 1/100 of a dose because high doses may be fateful.
<p>Phase 1:</p> <ul style="list-style-type: none"> • It is also tested on Healthy human volunteers. • Extends from months to years (10-100 participants) 	<ul style="list-style-type: none"> • Safety • Nontoxicity of drugs • Maximum tolerated of a drug. • Adverse effects of a drug
<p>Phase 2:</p> <ul style="list-style-type: none"> • It is tested on Patients • 50-500 participants • Lasts for 1-2 years. 	<ul style="list-style-type: none"> • Effectiveness • Efficacy • Maximum drug failure always occurs in Phase 2
<p>Phase 3:</p> <ul style="list-style-type: none"> • Patients can be 500-3000 in number. • This phase lasts 3-5 years. 	<ul style="list-style-type: none"> • Comparison with existing drugs • RCT (Randomized Control Trial)
<p>After phase 3 drug is launched in the market.</p>	
<p>Phase 4:</p> <ul style="list-style-type: none"> • It also tested on Patients • Study is unending till the drug removal. • Longest phase. (at least till 10-25 years) 	<ul style="list-style-type: none"> • Monitor Long-term and rare side effects. • Post marketing surveillance

MCQs

Q. Which of the following statements about clinical trials is true.?

- Post marketing is done in phase 3
- Safety and nontoxicity are evaluated in phase 2
- RCT in patients is done in phase 3**
- The unit of study in phase 1 is patients

Q. All are false about experimental trials except.?

- Can't double blind in animal trials
- All animal trials are unethical
- Can't do an interim analysis
- Are always prospective**

Q. The efficacy of a new drug A is compared with an existing drug B in.?

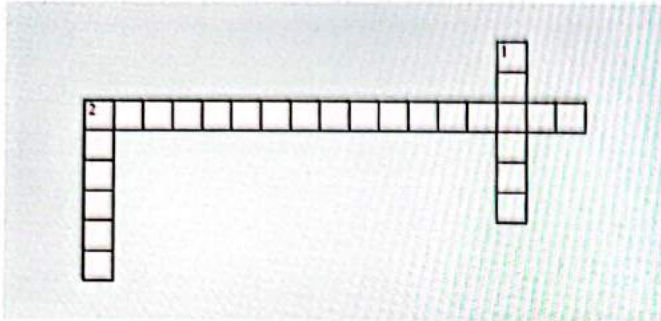
- Clinical trial phase 1
- Clinical trial phase 2
- Clinical trial phase 3**
- Clinical trial phase 4



CROSS WORD PUZZLES



Crossword Puzzle



Across

2. done among animal

Down

1. Healthy human volunteers

2. Longest phase

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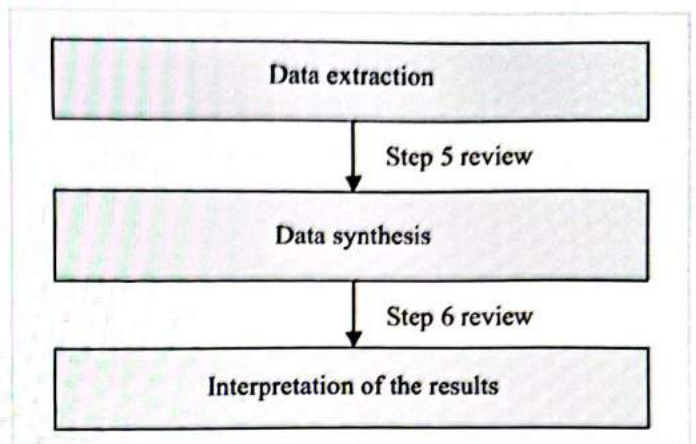
SYSTEMATIC REVIEW, META-ANALYSIS AND EVIDENCE-BASED STUDIES



Systematic Review

00:09:08

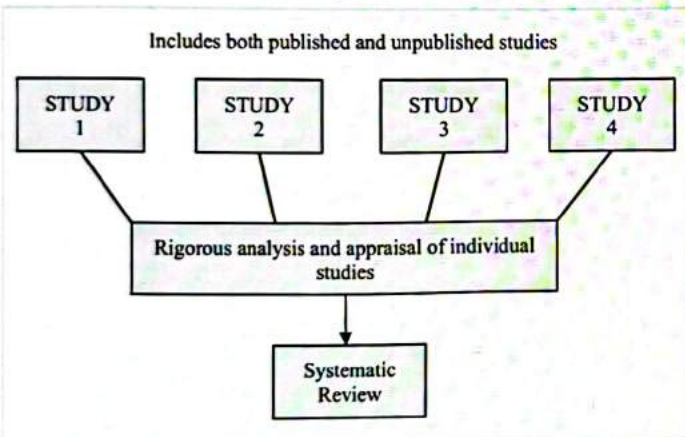
- **Systematic Review** is a type of literature review that collects and critically analyzes multiple research studies.
- Systematic Review does not include **quantitative synthesis**. In other words, it just gives a range.
 - Further steps, if we perform quantitative analysis, it means we will do an analysis known as **Meta-Analysis**. In a meta-analysis, we do an analysis of analysis (it will be an analysis of individual values obtained in cross-sectional studies, we will analyze these individuals' analyzed figures).
 - Then, we will give an **overall estimate or overall pooled value**. In Meta-Analysis, instead of providing a range of depression, we will give a **single value of depression**. By doing the **statistical analysis step** in Meta-Analysis (which the software does), we will get a single value of depression. (say 20% here)



Meta-Analysis

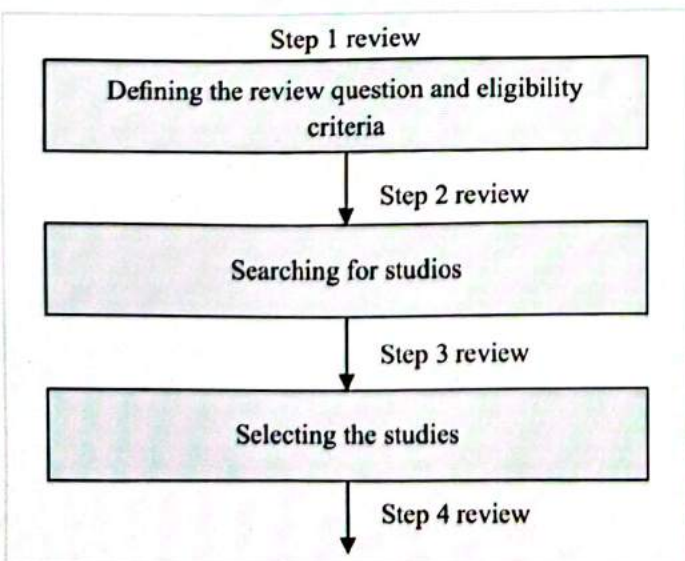
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- Meta-Analysis is a **quantitative approach** for systematically combining results of previous research to arrive at conclusions about the body of research.
- It is the same as a systematic review, but the last step here is a quantitative approach (**an analysis of analysis**).
- When individual studies are conducted, chances of errors increase.
- Meta-Analysis involved aggregation of many individual studies, conducting analysis of all the studies together, and providing pooled estimates from multiple studies.
- Analysis of multiple studies together.
- Example: A study collects data from individual subjects (such as 100 subjects = 100 data points) -
 - This is an individual study
- Meta-Analysis collects data from individual studies (Such as 100 studies = 100 points) -



Steps of Systematic review

00:14:56



Steps of Meta-Analysis

00:18:11

- Formulate review question and define inclusion criteria:
- Focused research question
 - ↓
 - Identify relevant studies:
 - Literature searches
 - Screen title and abstract
 - Retrieve full-text papers
 - Apply inclusion criteria
 - ↓
 - Extract data and assess study quality:

When assessing of quality is required, we have to draw Funnel Plot (both for systematic of meta Analysis)
 - ↓
 - Analyze data:
 - Meta-Analysis/Narrative synthesis
 - Assess the risk of reporting bias

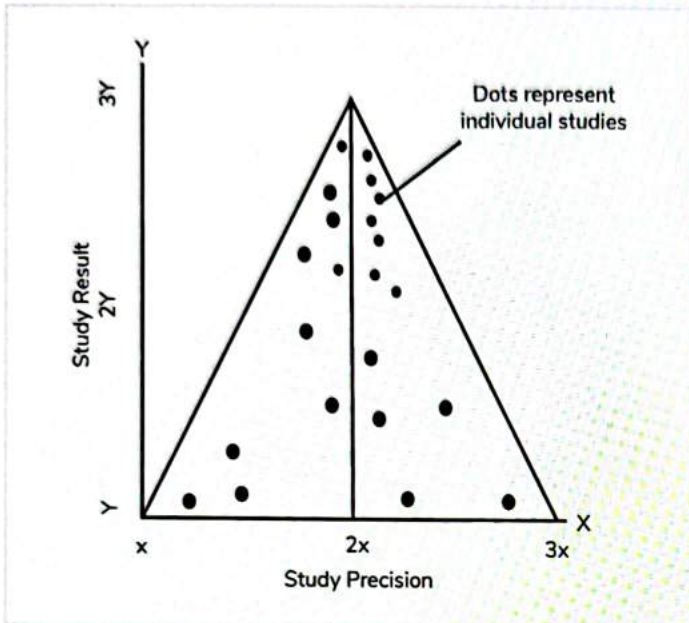
Present Results: **Result in Meta-Analysis** is known as a Forest plot

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- Narrative summary
- Tabular overview of study features, quality, and result
- Graphical display of results

Funnel Plot

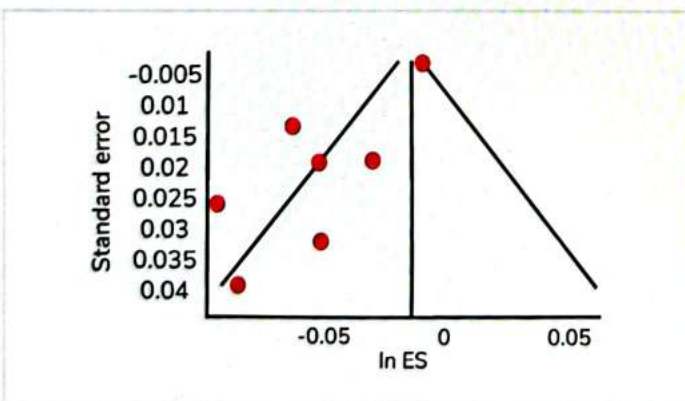
00:21:03



- Funnel Plot is drawn for both the systematic review and Meta-Analysis.
- It checks for publication bias.
 - Funnel Plot is checking for the qualities of the studies included and it checks for publication bias.

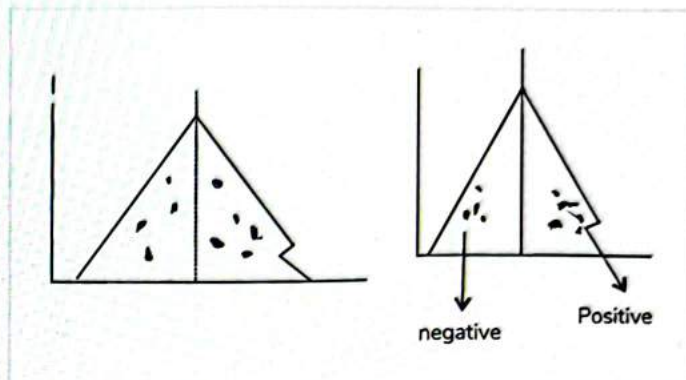
File Drawer Effect

00:24:01



- If there is no publication bias, studies with high precision will be plotted near the average.
- Studies with low precision will be spread evenly on both sides of the distribution.
- This gives a funnel-shaped distribution.

- Deviation from this shape leads to publication bias resulting in a file drawer effect.
- In the file drawer effect, studies are not spread evenly on both sides of the distribution.
- If more studies are placed on the left side of the funnel it depicts a bias towards the publication of negative result studies.
- If more studies are placed on the right side of the funnel depicts a bias towards the publication of positive result studies.



- Graphed design to check the existence of publication bias.
- Commonly used in Systematic reviews and Meta-Analysis.

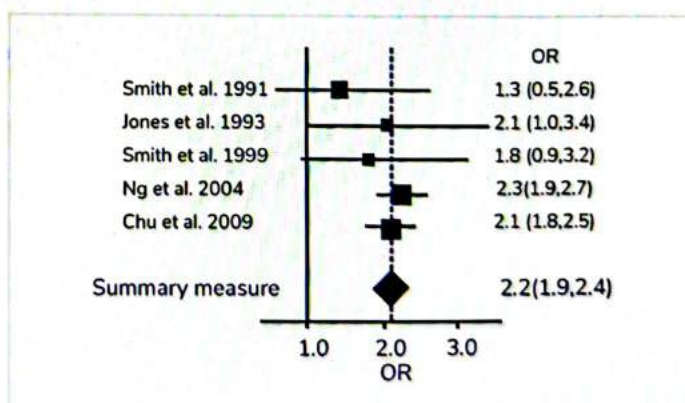
Forest Plot

00:26:39

- Graphical representation of overall estimated results derived by analyzing and estimating results from a number of studies addressing the same question.
- Overall summary measure depicted by diamonds represents the overall effect size or pooled estimate.
- Forest Plot is only made for a Meta-Analysis.
- Forest Plot known as a **Blbogram**.

Interpretation of a Forest Plot

00:28:34



- Suppose we were studying the association of risk factors (Age, Smoking, Alcohol, Diet, Socioeconomic Status on Breast Cancer).
- We included 5 studies.
 - The first one Smith et al (effect of Age)

- Jones et al (effect of smoking)
- Smith et al (effect of alcohol)
- NG et al (effect of diet)
- Chu et al (effect of SES on Breast Cancer)
- If interval Includes 1: not significant,
- If interval Does not include 1: **Significant association.**
- OR ratio
 - > 1 **Positive Association**
 - $= 1$ **No association**
 - < 1 **Inverse association or Protective factor**

Q. Is Not a feature of Systematic Review:

- A. **Meta-Analysis is always performed**
- B. Search for literature is compulsory using explicit search category
- C. Critical appraisal is always criterion based
- D. Research question always focused

Reporting formats used in Systematic Review and Meta-Analysis

00:39:25

Prisma

- It is a reporting format used in Systematic Review and Meta-Analysis. Preferred reporting items Systematic Review and Meta-Analysis.
- These are a predefined set of items to assess Systematic Review and Meta-Analysis to assess the **final effect of the intervention.**

Cochrane

- A database collection of Cochrane reviews for systematic review and Meta-Analysis.

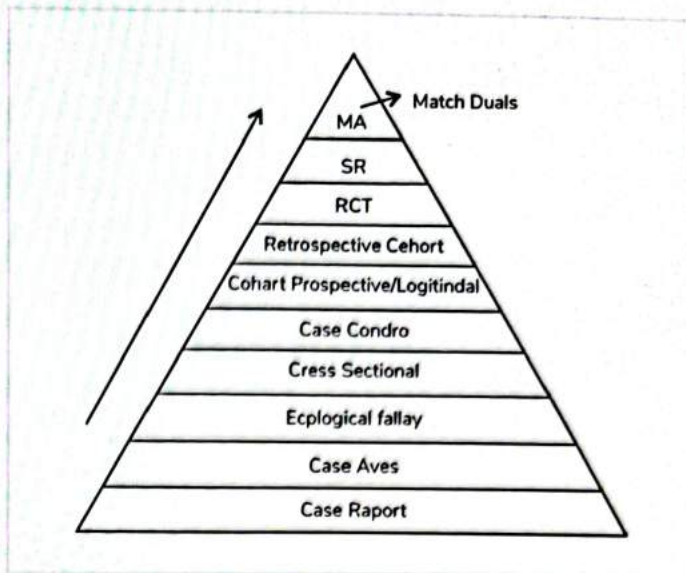
Quorum

- Acronym used for quality of reporting of Meta-Analysis standards developed by quorum group.

Evidence-based medicine

00:40:45

- Integration of best research evidence with clinical expertise and patient values.
- Explicit, judicious, and conscientious use of current best evidence from medical care research to make decisions about the medical care of individuals. It means we want to obtain maximum evidence to **assess causality.**
- Father of Evidence-based medicine is **David Sackett.**
- Founder of Evidence-based medicine is **Gordon Gunjatt.**
- Studies are arranged in order to **establish causality.**



- **Gold standard of evidence based medicine: Meta analysis**

MCQ

Q. An Evidence-based medicines refers to

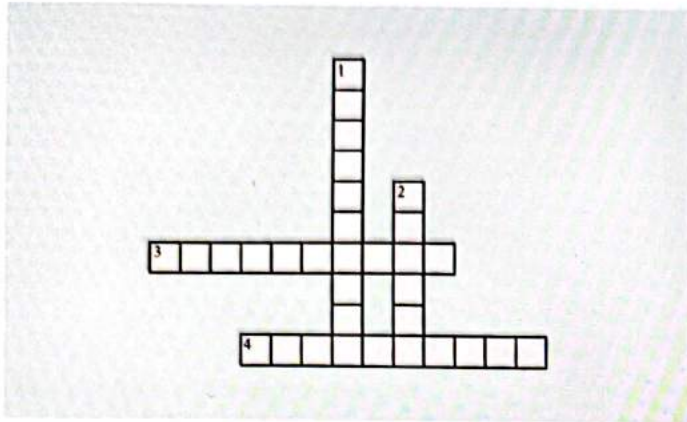
- A. Clinical trials to prove the adverse effect of drugs
- B. Clinical trials to prove the safety of drugs
- C. **Use of various research findings for taking decisions about best patient care**
- D. All the above



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Drawn for both the systematic review and Meta-Analysis
- 4. A cross-sectional study is done to calculate the Prevalence of a condition/ disease.

Down

- 1. Overall summary measure depicted by diamonds represents the overall effect size or pooled estimate.
- 2. Acronym used for quality of reporting of Meta-Analysis standards developed by group.



Hill's Criteria	Description
Most important	<ul style="list-style-type: none"> • Most important Hill's criteria is temporality. • Temporality: Cause precedes effect. • Example: Smoking can lead to lung cancer.
Least important	<ul style="list-style-type: none"> • Specificity is difficult to establish and is of least importance. • Specificity: One exposure, one outcome. • Example: Smoking only leads to lung cancer. • It's possible, always false.
Biological plausibility	<ul style="list-style-type: none"> • There should be support by biology mechanism/ bodily mechanism/ pathogenesis. • Example: Smoking causes inflammation of lung parenchymal tissue.
Consistency of findings	<ul style="list-style-type: none"> • Findings are repeatable/ replicable/ reproducible. • Involved in study.
Coherence of association	<ul style="list-style-type: none"> • Researchers support each other's findings.
Cessation of exposure	<ul style="list-style-type: none"> • If smoking is stopped, the chance of lung cancer may be reduced.
Dose response relationship	<ul style="list-style-type: none"> • If exposure increases, outcome increases. • Exposure \propto outcome
Strength of association	<ul style="list-style-type: none"> • Case control study: Odds ratio (OR)/ Gross product ratio. • Cohort study: Relative risk (RR).
Experiment	<ul style="list-style-type: none"> • Any condition can be altered: <ul style="list-style-type: none"> ◦ Prevented or ◦ Ameliorated • Needs a well designed experiment. • Example: Randomised control trial.
Analogy	<ul style="list-style-type: none"> • Similar causal relationship between another exposure and outcome.

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Some Questions

Q. Is one Hill's Criteria sufficient to establish causality?
Ans. No! It is not!

Explanation: To judge or evaluate causal significance of an association, all the above criteria must be utilised no one of which by itself is self sufficient for drawing causal inferences from statistical associations but each adds to the quantum of evidence, and all put together contribute to a probability of association being causal

Q. Group of people worked at uranium mines for 5 years. Among them few developed cancer due to uranium exposure. What type of association would it be?

- A. Biological plausibility
- B. Coherence of association
- C. Temporal association**
- D. Spurious association

Explanation

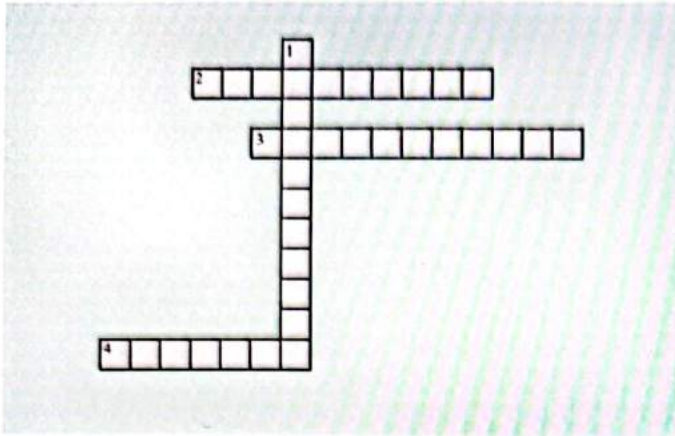
- There is no biological process support.
- There is no support for findings.
- Not spurious as it comes under false criteria.
- Uranium is the cause of disease cancer here, thus it is a temporal association (cause precedes effect).



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Needs a well designed experiment.
- 3. Least important
- 4. Similar causal relationship

Down

- 1. HILL'S CRITERIA



PREVIOUS YEAR QUESTIONS



Q. Incidence is best measured by? (FMGE Jun 2018)

- A. Cross-sectional study
- B. Cohort study**
- C. Case-control study
- D. Double-blind study

Q. Researcher was conducting a study on 'relation of depression associated with the history of social media usage'. One group had social media users with depression and another group has social media users without depression. Which type of study design is used? (FMGE Aug 2020)

- A. Cohort study
- B. Case-control study**
- C. Cross-sectional study
- D. Random sampling

Q. What is the study design used for consanguineous marriage and genetic abnormalities? (NEET 2018)

- A. Twin study
- B. Family study
- C. Case-control study
- D. Nested case-control study**

Q. Study design of choice for finding out a diurnal variation of fat in expressed breast milk (EBM) for preterm babies? (AIIMS Nov 2019)

- A. Prospective cohort
- B. Retrospective cohort
- C. Case-control
- D. Cross-sectional**

Q. All of the following are done to remove confounding except? (AIIMS Nov 2019)

- A. Randomization
- B. Random selection
- C. Matching**
- D. Blinding

Q. Bias in which variation occurs due to incidence of different diseases in different hospitals? (NEET 2018)

- A. Neyman bias
- B. Berksonian bias**
- C. Attention bias
- D. Recall bias

Q. A new drug is introduced in the market after which phase of clinical trials of? (FMGE Dec 2020)

- A. Phase I**

B. Phase 2

C. Phase 3

D. Phase 4

Q. Best 6 quantitative method to study previous research studies is? (INICET Nov 2020)

- A. Systematic reviews
- B. Meta-analysis**
- C. Surveys
- D. Group interviews

Q. Nutrient deficient in Breast milk is? (FMGE Jun 2022)

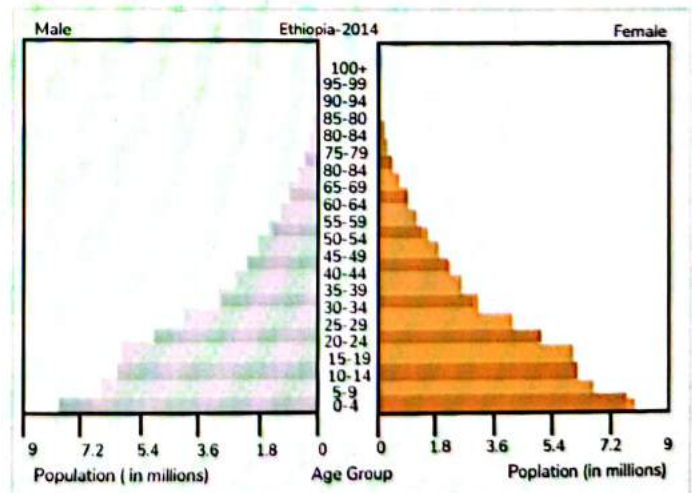
- A. Vitamin A
- B. Vitamin C
- C. Vitamin D**
- D. Vitamin K

Q. Relative risk (RR) is calculated in which study? (FMGE June 2022)

- A. Cohort study**
- B. Case-control study
- C. Cross-sectional study
- D. Ecological study

Q. Correct statement about the Double histogram of the Population pyramid shown is? (FMGE June 2022)

- A. Increased height means low life expectancy
- B. Middle part Males > Females
- C. Broad base represents high fertility and high dependency**
- D. Broad base means more working population





14

CONCEPT OF DISEASE

Concept of Disease

00:00:01

- Health is a state of complete mental and social well-being.
- Disease is defined as deviation from the normal functioning of the body or state of physical, mental and social well-being.

Limitations of disease definition:

- There is no set point when it can be elaborately said that the disease has started.
- Cannot measure disease
- Disease outcome is variable.
 - Recovered/ cured
 - Disability
 - Death

High Yield Point: Difference between disease, sickness and impairment.

- The disease is a physiological/ psychological dysfunction.
- **Illness** is a subjective state of a person who feels aware of not being well.
- **Sickness** is a state of social dysfunction in which an individual takes up a sickness role.

Theories of Disease Causation

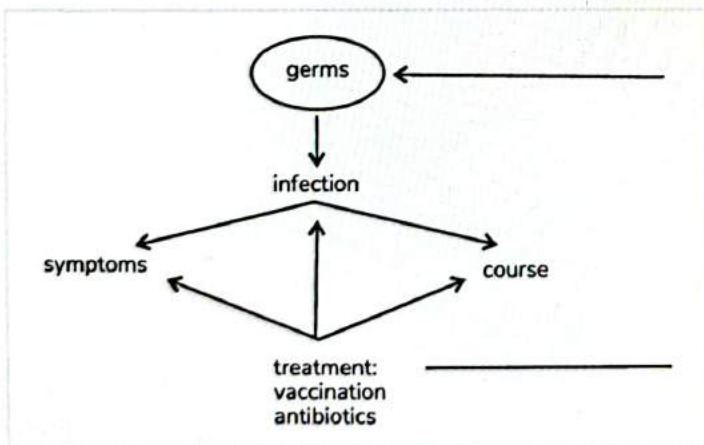
00:08:24

Miasma Theory

- This theory was introduced by William Furr. Which states that disease occurs due to bad clouds means the person is sick or has a disease because their time is not right.

Theory of Spontaneous Generation

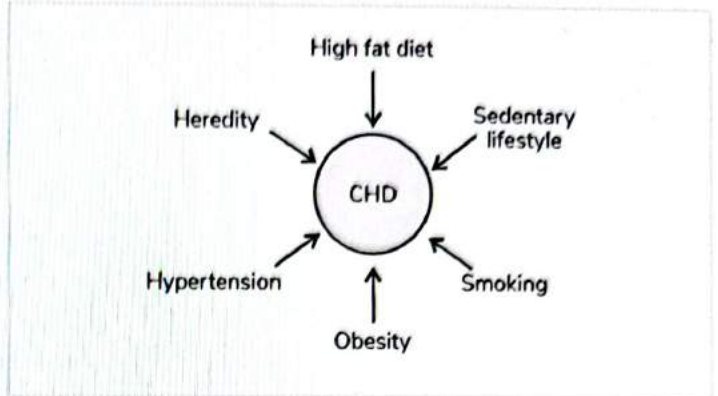
- This theory was given by Aristotle, which means that disease happens on its own.



The Germ Theory of Disease Causation

- This theory was introduced by Louis Pasteur. He also coined the term vaccine. According to this theory, diseases are caused due to germs entering our bodies.

Theory of Multifactorial Causation



- This theory states that not only germs but other factors in a person's lifetime can cause diseases.
- This theory was given by PettenKofer.
- This theory hints at the possible aetiology of the disease.
- When a person is aware of the various causes of the disease so they can adopt a lifestyle which would prevent those diseases.

Web of Causation

- This theory indicates how the possible causes of a disease are interlinked or interdependent and ultimately lead to the occurrence of the disease.
- This theory was suggested by MacMahon and Pugh.
- This theory highlights the possible modes of transmission of the disease.

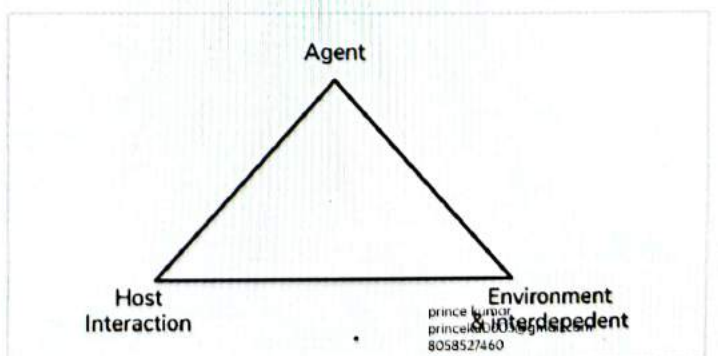
Refer Table 14.1

- If it is figured out on time the most important link in the disease transmission can be stopped or controlled.

Epidemiological Triad

00:20:33

- In the epidemiological triad there is an interaction and interdependence of the three elements which are required for the disease:



Agent:

- Biological agents such as bacteria, viruses, protozoa etc. While discussing the agent of disease three things must be kept in mind:
 - Infectivity: Ability of an infectious agent to invade and multiply.
 - Pathogenicity: Ability of the infectious agent to produce clinically Apparent illness.
 - Virulence: Severity or killing power of the disease. One of the very important indicators to measure the virulence of disease is **Case Fatality Rate**.
- Physical agents such as temperature, humidity and radiation.
- Chemical agents can be further divided into endogenous and exogenous:
 - Endogenous chemical: Chemical substances produced inside our body such as urea, ketone bodies and bilirubin.
 - Exogenous chemical: Chemicals to which humans are usually exposed and which are present in the atmosphere.
- Nutrient agent: When consumption of excess nutrients is taking place more than the recommended balanced diet.

Host:

- The person who harbours the infection as the host. Following are the features that are considered while identifying the causes of the disease:
 - Socio-demographic features such as age, gender, area of Residence of the host must be considered.
 - Lifestyle factors which lead to the occurrence of the disease.
 - Dietary factors of the host that lead to the occurrence of the disease

Environment:

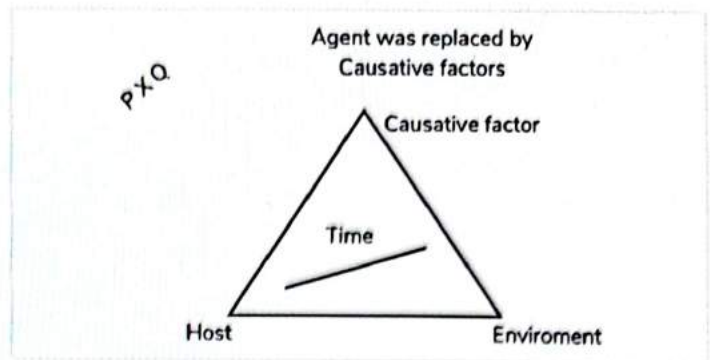
- In the environment, the external environment is crucial to be not asked what means to what the person is exposed.
- When the agent host and environment are in equilibrium the disease is said to be under control.

Epidemiological Triangle

00:31:03

- Just as the epidemiological triad epidemiological triangle also suggests the interdependence of the agent host and environment but time is a factor that is taken into consideration.
- Time refers to the duration of the disease.
 - In the case of communicable diseases the incubation **Period**.
 - **Latent period in terms of non-communicable diseases.**

Advance model of the triangle of epidemiology



- In this model the agent was replaced by the causative factors.

Beings a Model of Disease Causation

- **B**- Behavioural & Biological factors responsible for disease.
- **E**- Environmental Factors responsible.
- **I**- Immunological Factors responsible
- **N**- Nutritional Factors responsible.
- **G**- Genetic Factors responsible.
- **S**- Social services (accessibility to health services) and spiritual factors (act to forgiveness, how spiritual and emotional are you)

MCQS

00:34:59

- Q. Disease in humans was due to bad clouds. This reflects which theory:
- a. Web of Causation
 - b. Germ theory
 - c. Multifactorial Causation
 - d. Miasma Theory
- Q. In advanced model of epidemiological Triad, agent is replaced by:
- a. Determinant risk factors
 - b. Causative bacterium/ virus
 - c. Causative factor
 - d. Determinant factors
- Q. Web of Causation of disease, which statement is most appropriate?
- a. Most applicable for common diseases
 - b. Requires complete understanding of all factors associated with causation of Disease
 - c. Epidemiological ratio
 - d. Helps to suggest ways to interrupt the risk of transmission

Note:

- **Epidemiological Transition** (Shift from communicable to era of non communicable disease)
- **Epidemiological Ratio** (Daly which is due to communicable disease / Daly due to non communicable disease).

Theory of Necessary And Sufficient Cause By Rothman

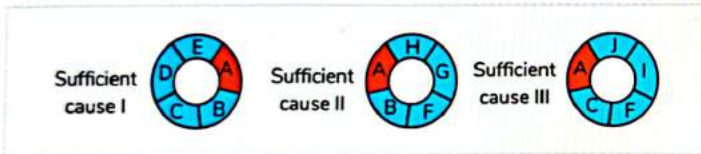
00:39:45

- The term necessary cause means its presence is essential for the disease to occur. But it may or may not be able to cause the disease by itself alone.
- Sufficient cause: Its presence will always result in disease.
- Necessary cause may by itself be sufficient to cause for example HIV or AIDS.
- Necessary caused by itself may not be sufficient cause for example MTB for TB disease.
- In most non-communicable diseases an optimum mix of 2 multiple factors is needed to produce the sufficient cause.

Causal PIE Model

00:42:44

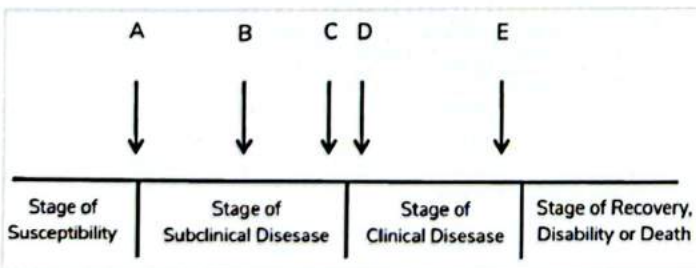
- This model was given by Rothman following the theory of necessary and sufficient cause. The presence of various factors is necessary for the disease to occur.
- Each single component cause is rarely sufficient to cause by itself, but may be necessary for disease causation.
- Control of a disease may be achieved by removing one of the components in each and if there was a factor common to all the component pies the specified disease would be eliminated by removing that component alone.



Natural History of a Disease

00:44:42

- It is a progression of the disease over time from pre pathogenesis phase in the environment to its termination as recovery or death in absence of any treatment or prevention.
- Which means how a disease evolves or progresses with time without any intervention. For instance measles, most children are vaccinated in order to prevent this disease but when the child has not been vaccinated the evolution of this disease over time in the child will come under the natural history of the disease.



A: Expose factors enter the body.

B: Pathological changes (No signs or symptoms).

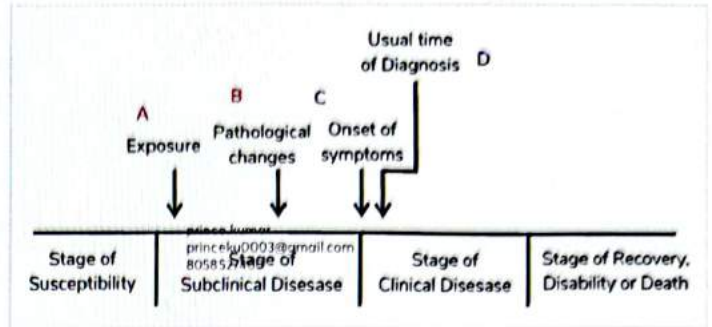
C: Pathological changes start.

- It is a stage of subclinical disease.
- Pre-pathogenesis phase the disease has just entered the body.

D: Usual time of the diagnosis of the disease.

- The stage is also called late pathogenesis.

E: This stage refers to the outcome of the disease which can be disability recovery or even death.



- Three pathogenesis phases are happening in the environment when the person is exposed to the risk factor and the disease can be prevented at the primary level.
- The pathogenesis face can be divided into early and late.
 - In **early pathogenesis** the agent has already entered the body and this stage is also known as the stage of subclinical disease.
 - Subclinical disease means no signs and symptoms.
 - The patient won't be aware of the disease but it can be diagnosed and can be prevented with secondary care, with the technique of screening.
 - **Late pathogenesis** is a stage of the clinical disease which means the disease has progressed.
 - In this stage as well the disease can be controlled or prevent disability by applying tertiary-level care.

Summary

Pre pathogenesis phase	Pathogenesis phase
Phase in environment i.e. disease agent has not entered man	Phase in human agent has entered man
Interaction between agent, host and environment	Disease agent enters man, multiplies and leads to disease progression
Human is exposed to disease in environment i.e. in pre pathogenesis phase of communicable and non communicable disease	Infection in pathogenesis phase can be subclinical, clinical become a carrier. Final outcome is recovery, disability or death
Primary level of prevention	Secondary and tertiary level of prevention

MCQ

Which of the following is not true regarding the pathogenesis phase of a disease?

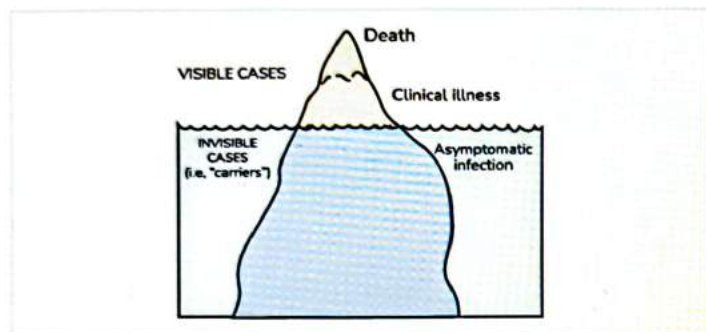
- a. Screening is of no use in Changing phase of disease
- b. Tertiary Prevention is possible
- c. Entry of organism occurs
- d. Includes subclinical cases

- High yield point: Cohort study/ Longitudinal study best establishes the natural history of the disease.

Iceberg Phenomenon of Disease

00:58:30

- In this concept the disease is compared to an Iceberg.



- The tip of the Iceberg is the diagnosis of the disease or the apparent infection.
 - The tip is of concern to the physician.
 - Unhealthy or diseased
 - Diagnostic test
- The hidden portion covers the people who are undiagnosed or they are asymptomatic.
 - The hidden portion of the Iceberg is of concern to the epidemiologist.
 - Apparently healthy (no signs/symptoms but the pathogenesis has started in the body)
 - Screening test
- The water around the Iceberg represents the healthy population.
- Line of demarcation separates the area of apparent infection from the inapparent infection.

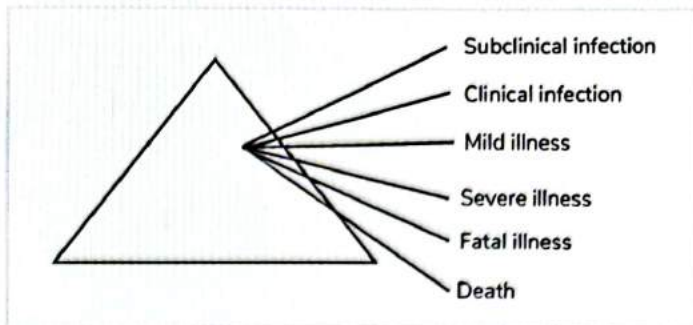
Diseases that follow the Iceberg phenomenon are

- Non-communicable diseases.
- Cancer.
- Protein energy malnutrition cases.
- Tuberculosis.
- HIV

Diseases that don't follow the Iceberg phenomenon are.

- Measles.
- Rabies(highest CFR rate).
- Tetanus.
- Rubella.

Spectrum of Diseases



- It is a graphical representation of variation in the manifestation of diseases.
- When a person suffers from a disease It could become either a clinical case or the person could recover or in an inverse case scenario the person could even die. Those are called the **spectrum of disease**.
 - Subclinical infection,
 - Clinical infection,
 - Mild illness,
 - Severe illness,
 - Fatal illness
 - Death.
- The disease that does not follow the spectrum of disease principle is rabies. Leprosy is a disease that perfectly follows the spectrum of disease principles.

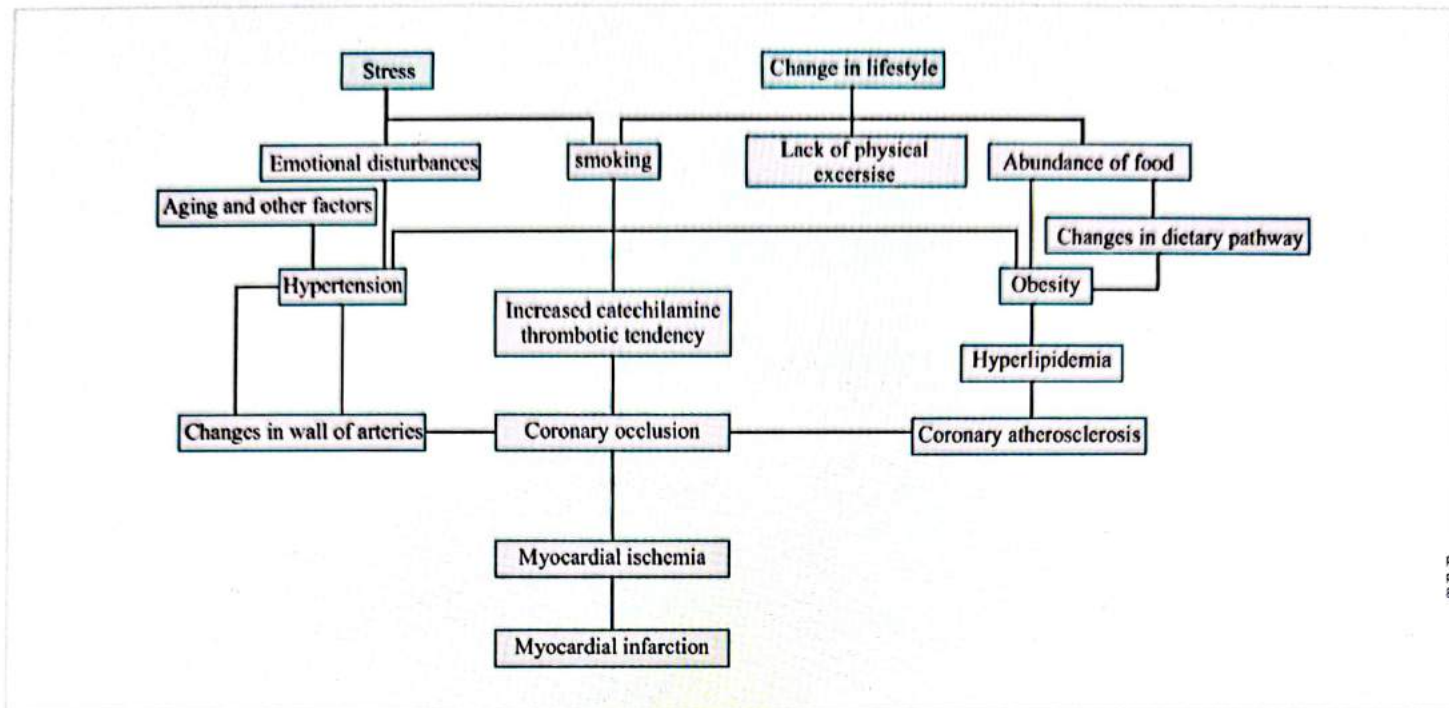
ICD-11 MMS: International classification of diseases for mortality and morbidity statistics (WHO)

- 11 stands for the 11th edition which is the improvised version of the 10th edition as this has three volumes and 26 chapters with v and x.
- Chapter 6 dealt with behavioural and mental diseases.
- Chapter 26 included traditional medicines.
- The three volumes are:
 - T: Tabular guide.
 - R: Reference Guide.
 - A: Alphabetical index.

Advantages over ICD-10

- Reflects current medical terminology and information needs.
- Functions in digital and electronic health record environments.
- More comprehensive for use in broader clinical settings, and allows more international compatibility with no country specific variation.

Table 14.1



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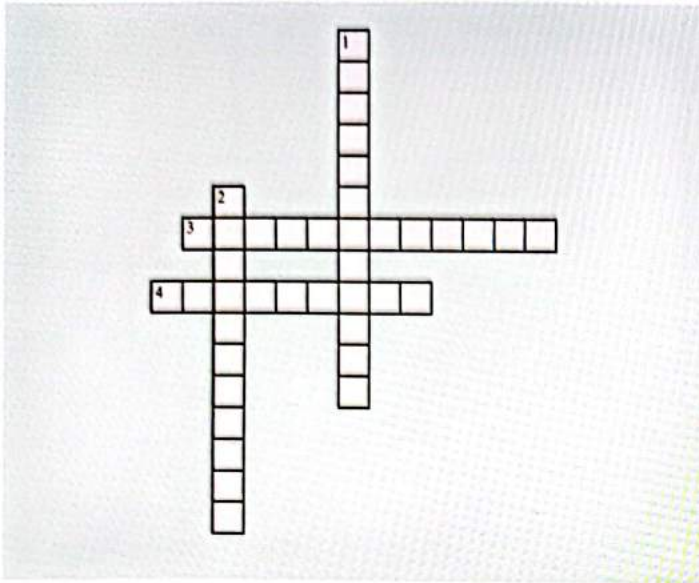


CROSS WORD PUZZLES



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Crossword Puzzle



Across

3. This theory was given by Willian Furr. It says that disease occurs due to bad clouds.
4. Theory of spontaneous generation

Down

1. Germ theory of disease causation
2. Cannot label/ No set point when we can elaborate say disease has started.



Introduction

00:01:12

- Well-being is of two types:
 - Objective component
 - Independent of subject perception
 - Standard of living
 - Subject component
 - Affected by subjects perception
 - Quality of life

Q. What is the most important indicator of standard of living/level of living in a country?

- GNP - Gross National Product
 - Income the country makes and receives from abroad.

Objective Component

00:07:46

Standard of Living/Level of Living

- Standard of living refers to our usual scale of expenditure, goods we consume, services we enjoy, and other comforts of modern living.
- Includes level of education, employment status, food, dress, house, amusements, and comforts of contemporary living.

High Yield Point:

- **Best Indicator for Standard of Living**
- GNP is the best indicator.
 - This is the income of people in a country.

Level of Living

00:09:03

- Parallel term for the standard of living given by UN (United Nations)
- Depends on
 - Housing
 - Clothing
 - Food
 - Education level
 - Occupation level
 - Work conditions
 - Recreations and leisure activities
 - Social Security
 - Human rights
 - Health

Subjective Component

00:12:03

Quality of Life

- Quality of life refers to the product of interplay between social, health, economic and environmental conditions which affect human and social development.

Q. How can the quality of life be improved?

When we can reduce mortality, morbidity or disability due to diseases. We can improve the physical, mental and social well-being of people.

Q. How to measure the quality of life?

PQLI - Physical quality of life index
HDI - Human development index

PQLI

00:15:12

- Physical quality of life index
 - Life expectancy at one year
 - Literacy level
 - IMR - infant mortality rate
 - Value ranges from 0 to 100
 - Current value of PQLI for India is 65.

Q. High Yielding Point: How can PQLI measure economic growth?

No. Because it does not consider per capita income.

- For example, Kerala and Sri Lanka have high PQLI but less per capita income.
- Middle East countries have high per capita income but low PQLI.

Note:

HYP:

- PQLI can measure the effect of political, economic, and social policies which are launched, but it cannot measure the economy.

HDI - Human Development Index

00:22:09

- Longevity: life expectancy at birth
- Knowledge: Knowledge index/ education index = $(EYS + MYS)/2$
 - Expected year of school - EYS
 - Mean year of school - MYS
- Ability to achieve a decent standard of living - measured by Gross National Income per capita in purchasing power parity US dollars.
- UNDP gave the HDI concept.
- UNDP is a part of the UN.
- Scoring: 0-1
- Countries can be compared based on HDI.
- India's current rank is 132
- Score: 0.633

Q. How to estimate the human development index?

Create a dimension index

Each dimension index will have maximum and minimum values.

Maximum values are the highest recorded in the time series (1980-2011)

Minimum values are conceived of as subsistence values.

HDI Calculation: Goal posts for HDI

DIMENSION	Observed Maximum	Observed Minimum
Life expectancy	83.2 yrs	20 yrs
Mean years of schooling	13.2	0
Expected years of schooling	20.6	0
Continued education index	0.951	0
Per capita income (PPP)	10821	163

Dimension Index

- $DI = \frac{\text{Actual value} - \text{Minimum value}}{\text{Max value} - \text{Minimum value}}$
 - Calculate longevity index
 - Knowledge index
 - Income index
- Aggregate the sub-indices to produce HDI
 - HDI is the geometric mean of 3 dimension indices.
 - $HDI = I^{1/3}(\text{life}) \times I^{1/3}(\text{knowledge}) \times I^{1/3}(\text{education})$

Ranking of Countries According to HDI

HDI Value	Rank
>0.800	Very high
0.799 - 0.700	High
0.699 - 0.550	Medium
<0.550	Low

High Yielding Point: Is the link between economic property and human development obvious?

- No. Countries can have high income per capita but different HDI values.

High Yielding Point: How can the HDI of a country be improved?

- By providing quality education and better healthcare facilities.

Difference between PQLI and HDI

PQLI	HDI
1. Life expectancy at one year.	1. Life expectancy at birth.
2. Literacy rate	2. Knowledge index / Education index
3. IMR	3. Gross National income per capita
4. Infant mortality rate -> 0 - 100	4. 0 - 1

Q. PQLI is

- Disability indicator
- Quality of life indicator
- Standard of living indicator
- Level of living indicator

Q. HDI includes

- IMR
- Life expectancy at birth
- Life expectancy at 1-year
- Literacy rate

Q. True about PQLI

- Literacy rate, birth rate, life expectancy at birth
- Life expectancy at 1 year, IMR, literacy rate
- Life expectancy at birth, income, literacy rate,
- Soon to be replaced by GNP

Q. HDI includes

- IMR
- Life expectancy at birth
- Life expectancy at 1-year
- Longevity
- GDP

Q. True about PQLI is all except

- 0-100

- b. Kerala state has low per capita income but high PQLI
- c. It measures economic growth
- d. Includes infant mortality, life expectancy at age 1, and literacy

Q. PQLI lies between

- a. 0 and 1
- b. 0 and 10
- c. 0 and 100
- d. 1 and 10

Q. Minimum and maximum values established life expectancy for calculation of index in HDI are

- a. 0 yrs and 65 yrs
- b. 0 yrs and 85 yrs
- c. 20 yrs and 85 yrs
- d. 0 yrs and 100 yrs

Gender Development Index

00:42:04

- The gender-related development index (GDI) is an index designed to measure gender equality
- The GDI is defined as “distribution-sensitive measure that accounts for the human development impact of existing gender gaps in the three components of the HDI.”
- Similar to HDI but measured separately for males and females.
- Adjusting for gender inequalities, achievements in basic human development are reflected by 3 components:
 - Life expectancy: LE at birth
 - Knowledge: Male adult literacy rate + Male gross enrollment ratio and female adult literacy rate + female Gross enrollment ratio
 - Standard of living: Estimated earned income for both male and female
- As per the HDR 2020, the GDI value of India is 0.820, with the GDI value for females standing at 0.573 and that for males at 0.699, showcasing a stark contrast.

Types of poverty

- Absolute poverty -
 - Family or household earning below the minimum threshold level.
 - They cannot provide basic needs - food, shelter, and clothing.
 - Someone earning less than the minimum threshold, that is 2.15 US \$ per person/ day- set by World Bank
- Relative poverty - when someone is not benefiting from the services others are benefiting from. E.g The median national income of people in a country is 100 US \$, and you are earning 60 US \$.

HPI: Human Poverty Index

00:48:17

- It is a measure of relative poverty.
- There are 3 indicators:
 - Longevity - the proportion of people not surviving until the age of 40 yrs
 - Knowledge - Adult literacy rate
 - Standard of living - No access to safe water supply
 - Standard of living - % of children underweight.

High Yielding Point: HPI measures absolute or relative poverty?

Relative poverty

Q. Not included in the human poverty index is

- a. % of the population not surviving up to 40 years of age
- b. Under nutrition for age
- c. Occupation
- d. % of the population not using safe water sources.

Limitation of HPI

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- Not specific for any group of people.
- HPI was replaced by MDPI in 2010.

Multi-Dimensional Poverty Index (MDPI)

- The global multidimensional poverty index is an international measure of acute multidimensional poverty covering over 100 developing countries.
- It complements traditional monetary poverty measures by capturing the acute deprivations in health, education, and living standards that a person faces simultaneously.

MDPI Includes 3 Dimensions

- Health
- Education
- Living Standard

Refer Table 15.1

MDPI

- Range is 0-1
- India: 0.121 with 27.5 % poor population
- Interpretation of MDPI:

MDPI	
20 - 33.3 %	Vulnerability of poverty
>33.3%	Poverty
>50%	Severe poverty

Overall deprivation in $> \frac{1}{3}$ rd of indicators: Poverty in Country

Utility of MDPI- MDPI is the measure of acute poverty.

Global Hunger Index

00:55:17

- Inadequate food supply
- Undernutrition
- Child mortality
- In the 2022 Global Hunger Index, India ranks 107th out of the 1221 countries with sufficient data to calculate 2022 GHI scores. With a score of 29.1, India has a level of hunger that is serious.

Q. Global Hunger Index does not include

- IMR
- U5MR
- Child Mortality Rate
- Child undernutrition,
- Child undernourishment



Table 15.1

10 indicators

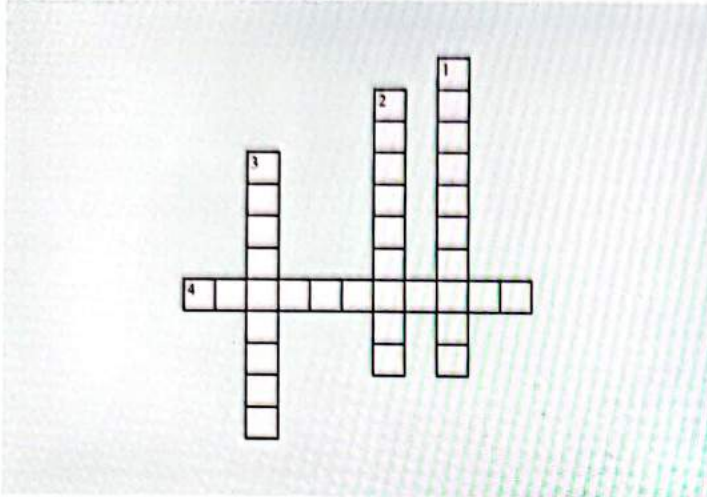
Nutrition (1/6)	Child mortality (1/6)	Years of schooling (1/6)	School attendance (1/6)	Cooking fuel (1/18)	Sanitation (1/18)	Drinking water (1/18)	Electricity (1/18)	Housing (1/18)	Assets (1/18)
Health (1/6)	Education (1/3)	Living standards (1/3)							
3 Dimensions of Poverty									



CROSS WORD PUZZLES



Crossword Puzzle



Across

4. The gender-related development index (GDI) is an index designed to measure gender equality

Down

1. It is a measure of relative poverty.
2. The proportion of people not surviving until the age of 40 yrs
3. Calculate longevity index

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16

DISEASE CONTROL, ELIMINATION AND ERADICATION OF DISEASE



Concept of control of disease

00:00:39

- The term disease control describes ongoing operations aimed at **reducing**:
 - **Frequency of disease** (Incidence of disease)
 - The **financial burden** to the community
 - Effects of infection, including both **physical and psychological complications**
 - **Duration and transmission** of the disease
- So that the disease **ceases** to be a **Public Health Problem**.

Golden Points

- In control of disease: Is the disease agent persisting in the community?
 - Yes, the **agent, host, and environment are in equilibrium**. The agent persists at a level that ceases to be a public health problem according to the **local tolerance of the community**.
 - For example: Control of Malaria or Tuberculosis.
- Control activities focus on which level of prevention?
 - The **primordial and primary level** of prevention.

Concept of elimination of disease

00:10:03

- Disease elimination is used to describe:
 - **Interruption** of modes of transmission of disease.
 - Agents **still persist** in the community.
 - **Regional relevance**: The disease is eliminated from a geographical distribution, and no new case has presented **3 years after the last known infection**.

Important Information

- Elimination from a geographical distribution means from a **particular country or WHO-specific region**.

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Diseases eliminated from India

- Leprosy in 2005.
Elimination criteria: Occurrence of case <1/10,000 of the population at the sub-national and district level.
- Maternal and neonatal tetanus:
Elimination criteria: < 1 case/1000 live birth
- Yaws
- Guinea worm infection/ Dracunculiasis
- Polio: India has been declared **POLIO-FREE (Elimination)**, with the last case presented in 2011.

- **Infectious trachoma free**

Diseases targeted by India for elimination

- Kala Azar
Elimination criteria: Prevalence rate <1/10,000 population.
- Filariasis
Elimination criteria: <1% microfilariae carrier rate.
- Measles
Catch Up, Keep Up, Follow Up vaccination campaigns
- Diphtheria
- HIV/AIDS by 2024
- TB by 2025
- Malaria by 2030

Concept of eradication of disease

00:21:07

Disease eradication is used to describe:

- **Termination** of all modes of transmission of the infection
- **Extermination** of the disease agent
 - The agent no longer exists
- Tearing of the agent from the roots
- **Global occurrence**
- All or none phenomenon



Important Information

- Extinction of a disease: After the eradication, the agent is **no longer maintained** under supervised conditions in CDC or WHO labs. It can no longer be used as a **bio-terrorism weapon**.

Diseases eradicated:

- Smallpox
- Wild poliovirus (WPV) type 2 - In September 2015
- Wild poliovirus (WPV) type 3 - In October 2019

Diseases targeted for eradication:

- Polio
- Measles
- Dracunculiasis

Extinction

- After eradication when the agent is no longer maintained under supervised conditions under CDC/WHO lab

Important Questions

Q. Consider the following statements: the term 'disease control' describes ongoing operations aimed at reducing the?

- 1. Incidence of the disease
- 2. The financial burden to the community
- 3. Effects of infection including both physical and psychological complications
- 4. Duration of disease and its transmission

Which option is correct?

- a. 1,2,3 are correct
- b. 1,3,4 are correct
- c. 1, 2, and 4 are correct
- d. **1,2,3 and 4 are correct**

Q. Disease elimination refers to?

- a. Extinction of disease agent
- b. Termination of all diseases
- c. Global removal of the disease agent
- d. **Regional removal of the disease agent**

The answer is the regional removal of the disease agent.

Q. Cessation of infection and disease from the whole world?

- a. Control
- b. Elimination
- c. Extinction
- d. **Eradication**

Q. Causative agent is present but there is no transmission known as?

- a. **Elimination**
- b. Control
- c. Eradication
- d. Endemic

Q. Why did eradication programs against malaria, yaws, plague, kala-azar, and yellow fever fail?

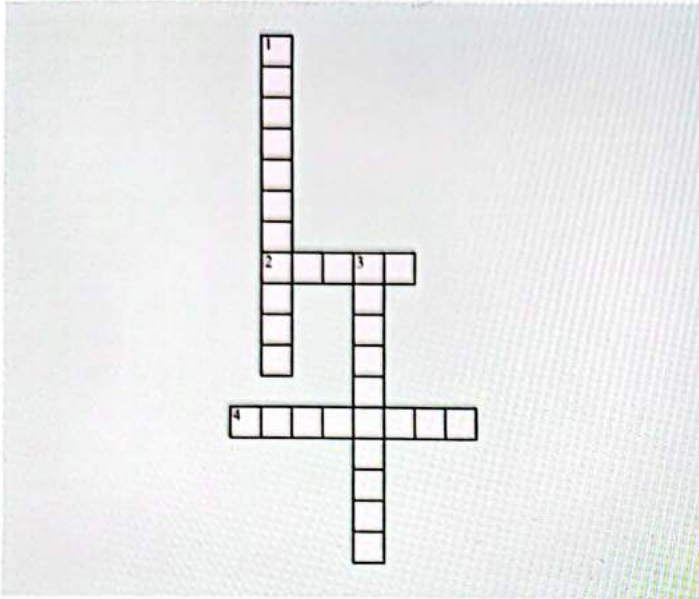
- a. Hidden foci of infection
- b. Unrecognized method of transmission
- c. Resistance of the vector or organism
- d. **All of the above**



CROSS WORD PUZZLES



Crossword Puzzle 1



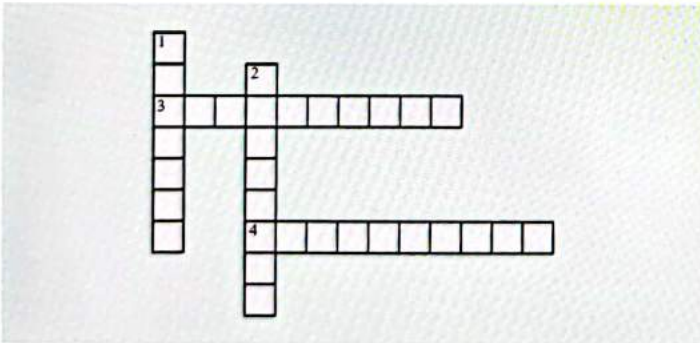
Across

- 2. WPV ___ not eradicated in INDIA
- 4. Disease control describes ongoing operations aimed at ___

Down

- 1. ___ is the cessation of disease from India
- 3. ___ is the cessation of disease from the whole world

Crossword Puzzle 2



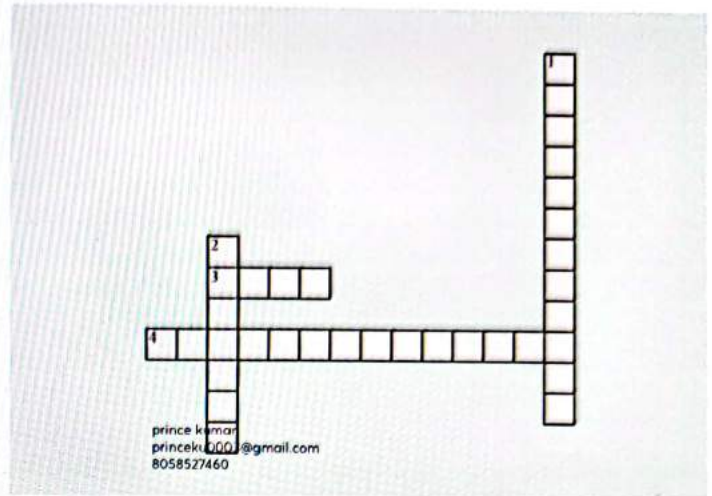
Across

- 3. ___ prevention is the best way to avoid disease occurrence
- 4. ___ rate $< 1/10000$ is the elimination criteria for Kala-azar

Down

- 1. ___ was eliminated from India in 2005
- 2. ___ was eradicated from the world

Crossword Puzzle 3



Across

- 3. ___ is expected to be eliminated by 2024
- 4. ___ is targeted for elimination

Down

- 1. ___ is expected to be eliminated by 2025
- 2. ___ is expected to be eliminated by 2030



17

LEVELS OF PREVENTION

Levels of Prevention

- Types of level of prevention which are
 - Primordial
 - Primary
 - Secondary
 - Tertiary
 - Quaternary

Primordial Prevention

00:02:02

- It is a level of prevention that is applied before the **emergence of risk factors**.
- Example:
 - Do not start smoking.
 - Prevention of Childhood obesity.

Mode of Intervention

- It is achieved by **health education**.
- Example: Do not start smoking and drinking.

Primary Prevention

- **The risk factor is present** but the disease has not started.
- Example:
 - Reduce smoking/Quit smoking,
 - Change lifestyle.

Mode of Intervention

- It is achieved by
 - **Health Promotion:** It enables people to **lead a healthy life**. It is achieved through **health education**. Example: Lifestyle & Behaviour modification (exercise). A person going to gym daily can prevent them from a number of diseases.
 - **Specific Protection:** **targeting something specifically**. Example: Immunization, Rubella vaccine for measles (disease is not there, we are giving to protect from disease)

Q. Which stage of natural history of disease can primary prevention be applied?

The Prepathogenesis phase was happening in the environment. We were all exposed to risk factors. Pathogenesis phase is when the agent has entered humans. It has two phases- **early and late pathogenesis** where we use Secondary or Tertiary Prevention.

- Primary Prevention promotes the **concept of positive health**. Positive Health is the achievement and maintenance of an acceptable level of health that will enable every individual to lead a socially and economically productive life.

Secondary Prevention

00:10:22

- Disease process has started but there are **no complications**.
- This means the **disease is still reversible**.

Mode of Intervention

- It is to make an early diagnosis and provide treatment.
- Right now a person is not showing signs or symptoms, but we can identify the disease by screening.

Tertiary Prevention

- It means that the disease has progressed to a **stage of irreversibility**.
- **complications are present**.

Mode of Intervention

- **Disability Limitations:** **Limit further damage** to the complication. Example: A student who continuously smokes. Teacher asked to smoke but he didn't. Then he developed hypertension. He still does not stop so in the future he gets a stroke. Now when he will quit smoking that will be Disability Limitations.
- **Rehabilitation:** It means making the person a **part of the society again**.

Quaternary Prevention

- It is a level of prevention that wants to **prevent overdiagnosis and over treatments**.
- It is a new term denoting- actions **taken to identify patients at risk of over treatment** to protect them from new medical procedures and ethically acceptable alternatives to be advised.

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High Yield points

00:14:21

- Prevention of the occurrence of risk factors: Primordial Prevention
- Prevention of the occurrence of disease: Primary Prevention
- Prevention of the occurrence of complications from disease: Secondary Prevention
- Prevention of occurrence of Disability or fatality due to complications from disease: Tertiary Prevention
- Action taken prior to the onset of disease which removes the possibility that a disease will ever occur: Primary Prevention
- Action which halts the disease at its incipient stage and prevents complications: Secondary Prevention
- Establish and maintain conditions that minimize Hazards to health: Primordial Prevention
- Reduce incidence of disease: Primary Prevention
- Reduce prevalence of disease by shortening it's duration: Secondary Prevention

- Reduce number and impact of complications: Tertiary Prevention
- If we shorten the disease, the prevalence of disease will decrease. And we can shorten it by early diagnosis.
- Secondary level of prevention always focuses on reducing prevalence. Primary level of prevention will always focus on incidence.

Health Promotion (Primary Prevention)

00:22:18

- It enables people to lead a healthy life.
- It is achieved through health education.

Ottawa charter, 1986

There was a conference which was held in **Ottawa in Canada in November, 1986** where the concept of Health Promotion was adopted and was put forward.

- **Enable:** Enable people to live a healthy life.
- **Mediate:** mediate means to provide a suitable environment for people to adopt that healthy Behavior.
- **Advocate:** To realize the importance of it.

Components of Ottawa Charter

- Strengthen community action which means community participation, **make people think about themselves.**
- Health & develop their personal skills.
- Create a supportive environment for them.
- Reorient health services.
- Build healthy public policies.

Jakarta Declaration

- There was a Jakarta Declaration that happened in **Jakarta in July, 1997.**
- This also promoted the **concept of health promotion.**

Health promotion includes

- **Health education**
 - It is a way of educating people to lead a healthy life.
- **Environment modification**
 - Providing safe water supply, providing sanitary latrines.
 - If there is a safe water supply, it means general measures which are favoring good health.
 - They are **not particularly targeting anything.**
- **Nutritional intervention**
 - Control of Insects and Rodents.
 - It will also save us from a lot of diseases and is not particularly targeting any disease.
- **Lifestyle and behavioral changes**
 - Exercise and meditation.
 - If someone meditates or exercises, it will help them to protect themselves from a lot of disease and not from a single disease.

Specific Protection

- **Immunization.**
- **Prophylactic Iron Folic acid supplementation.**

Approaches to Primary Prevention

1. Population Strategy
2. High-risk Strategy

MCQ

Q. Discouraging children from adoption harmful lifestyles:

- A. Primordial
- B. Primary
- C. Secondary
- D. Tertiary

Q. Action taken prior to the onset of disease which removes the possibility that a disease will ever occur:

- A. Primordial Prevention
- B. Primary Prevention
- C. Secondary Prevention
- D. Tertiary Prevention

• Examples of Primary Prevention (Health Promotion)

- Providing safe water
- Providing sanitary latrines
- Controlling Insects and Rodents
- Improvement in housing conditions
- Promoting breastfeeding
- Promoting small family norms
- Counseling for marriage
- Improvement in overall socioeconomic status of population

• Examples of Primary Prevention (Specific Protection)

- Control of health, noise pollution
- Chlorination of water
- Use of helmets and seat belts to protect against head injuries
- Use of mosquito nets
- Use of contraception to prevent unwanted pregnancy
- Avoidance of allergens
- Immunization
- Chemoprophylaxis
- IFA supplementation
- Vitamin A prophylaxis
- Protection against occupational hazards
- Protection from carcinogens
- Avoidance of allergens

H.Y.P

- All types of immunization is Primary Prevention (specific Protection) except the use of **BCG vaccine for treatment of bladder cancer.** Here we are using the BCG vaccine for diagnosis. So, **this is secondary prevention.**

Secondary Prevention

00:41:19

- Early diagnosis and treatment.
- Disease has started but there are no complications.
- In pathogenesis, and that early pathogenesis.
 - Early pathogenesis means disease agents have entered the human body but right now a person is in a stage of subclinical illness.
 - The person has no signs or symptoms but pathogenesis has started.

Examples: All the below are done for some purpose of early diagnosis.

- Active search for Malaria causes by MPW male
- School health examination (most common ailments are dental ailments)
- Health camps
- PAP smear
- Self-breast examination
- Dots For Tuberculosis: It's a form of treatment that means secondary prevention.
- MDT for Leprosy: It is also a form of treatment that means secondary prevention.

Exception

- Medical examination of industrial workers before placement: This is a pre-placement examination. This is done to see whether you are fit to work or not. This is **Primary Prevention**.
- Medical examination of industrial workers after placement: this is a post placement examination. This is done on a yearly basis to see whether you are developing a disease due to working in that occupational environment. This is **secondary prevention**.

Mass Treatment

- Mass treatment is being done for
 - Trachoma
 - Filariasis
 - Yaws
 - Pinta
 - Bejel
- The mass treatment is done for these diseases because if we see there is the existence of **at least 4-5 cases of latent infection** for every active clinical case in the community.

Tertiary Prevention

00:48:33

- Disease has progressed to a stage of Irreversibility.
- It means complications are present.
- We have to limit further damage.
- It is achieved through Disability Limitations and Rehabilitation.

Concept of Disability

- Sequence of events leading to Disability and handicap are as follows:
 - First there is a disease/ Health event.
 - Somebody suffers from an accident, it could be a disease/ health event. Suppose the person has suffered loss of legs due to the accident. This is **impairment**. **Impairment means any loss or abnormality of physiological, psychological function or anatomical structure**. Here, loss of leg is an anatomical impairment.
 - Now, because of the loss of legs the person cannot walk. And this is **Disability**. **Disability is restriction or inability to perform an activity**.
 - Now, as the person cannot work he cannot do his job and loses his job. And this is said as **Handicapped**. **Handicapped is when someone cannot fulfill his roles and responsibilities**.

Rehabilitation

- Combined and coordinated use of medical, social, education and vocational measures for training and retraining the individuals to the **highest possible level of functional ability**.
- **Rehabilitation is making someone feel he/she belongs to the society**.

Types of rehabilitation

00:56:23

Restoration of function	Medical
Restoration of capacity to earn a Livelihood	Vocational
Restoration of family and social relationship	Social
Restoration of personal dignity and confidence	Psychological

Social integration

00:57:13

- **Social Integration is a tertiary level of prevention**.
- It is a form of rehabilitation.
- Examples
 - Resting affected limbs in neutral position to prevent stress in paralyzed muscles. (Disability)
 - Reconstructive surgery (Rehabilitation)
 - School for blind (Rehabilitation)
 - Crutches for patient suffering from polio (Rehabilitation)
 - Provision of artificial limbs (Rehabilitation)
 - Providing hearing aids (Rehabilitation)
 - Restoration of personal dignity and confidence (Psychological) (Rehabilitation)
- Contact lenses/ Spectacles: They stabilize the vision and they provide visual clarity. It is limiting further damage.
 - Disability > Rehabilitation.
- LASIK, which is a treatment for myopia, is a secondary prevention as it is a treatment.

MCQ

- Q. A person is going for self-health check up to a hospital as his father died last week due to ischemia. Which prevention is this?
- Primary
 - Primordial
 - Secondary**
 - Tertiary
- Q. The prevention of emergence or development of a risk factors in countries or population groups in which they have not yet appeared is:
- Primordial Prevention**
 - Primary Prevention
 - Secondary Prevention
 - Tertiary Prevention
- Q. Which of the following is health promotion i.e. first level of prevention?
- PAP
 - Use of helmet
 - Root canal treatment
 - Encouraging physical activity**
- Q. Specific Protection includes:
- Personality development**
 - Immunization against specific disease
 - Specific nutritional diet
 - Protection from occupational hazards
 - Environmental modification
- Q. An example of Primary Prevention:
- Measles vaccination**
 - Smoking cessation after a heart attack
 - Self breast examination for lump
 - Cervical cytology screening
- Q. Use of seatbelt while driving car is example of:
- Health promotion
 - Specific Protection**
 - Early diagnosis and treatment
 - Disability Limitations
- Q. Desk provided with table top to prevent neck problem is an example of:
- Primordial Prevention
 - Primary Prevention**
 - Secondary Prevention
 - Disability Limitation
- Q. School health check up comes under which level of prevention:
- Primordial Prevention
 - Primary Prevention
 - Secondary Prevention**
 - Tertiary Prevention
- Q. Fetal cardiac monitoring is type of:
- Primary Prevention
 - Secondary Prevention**
 - Tertiary Prevention
 - Primordial Prevention
- Q. After excision of breast for Ca breast, surgical reconstruction of breast tissue was done. This reflects:
- Primary Prevention
 - Secondary Prevention
 - Tertiary Prevention**
 - Medical Treatment
 - Surgical Treatment
- Q. The chest x ray sputum analysis and DOTS therapy for TB detection constitute:
- Medical Treatment
 - Primordial Prevention
 - Primary Prevention
 - Secondary Prevention**
 - Tertiary Prevention
- Q. Use of condoms for protection against sexually transmitted diseases qualifies are:
- Primordial Prevention
 - Health promotion
 - Specific Protection**
 - Secondary Prevention
- Q. Vitamin A prophylaxis to a child is:
- Health promotion
 - Specific Protection**
 - Primordial Prevention
 - Secondary Prevention
- Q. Secondary level of prevention includes all the following except:
- Health screening for diabetes mellitus
 - Case finaling for falciparum malaria
 - Contact tracing for STIs
 - Reconstructive surgery leprosy**
- Q. Which of the following is an example of Disability Limitations in poliomyelitis:
- Reducing occurrence of polio by Immunization
 - Arranging for schooling of children suffering from PRPP
 - Resting affected limbs in neutral position**
 - Providing calipers for walking

Q. Early ambulation after a major operation is example of:

- A. Health promotion
- B. Specific Protection
- C. **Disability Limitations**
- D. Rehabilitation

Q. National iron plus initiative is an example of:

- A. Primordial Prevention
- B. **Primary Prevention**
- C. Secondary Prevention
- D. Tertiary Prevention

Q. Example of Disability Limitations:

- A. DOTS
- B. quits smoking
- C. BCG vaccine
- D. **Spectacles for refractory errors**

Q. Installation and uses of sanitary latrine by the general public constitute which level of prevention?

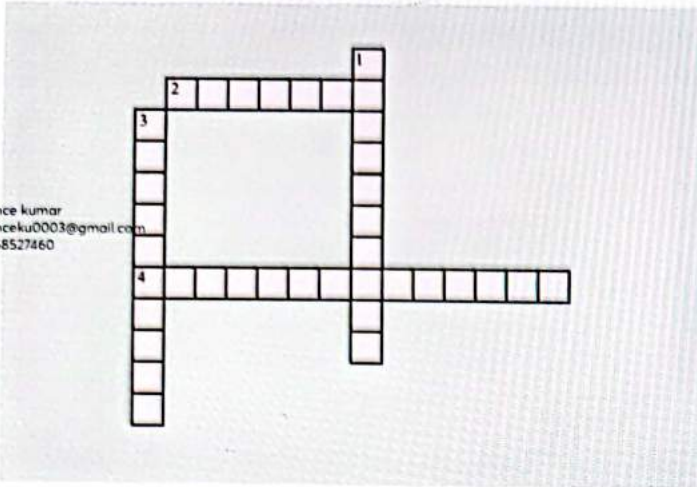
- A. **Health promotion**
- B. Specific Protection
- C. Early diagnosis and treatment
- D. Disability Limitations and Rehabilitation



CROSS WORD PUZZLES



Crossword Puzzle



Across

2. It means that the disease has progressed to a stage of irreversibility.
4. It means making the person a part of the society again.

Down

1. It is a level of prevention that is applied before the emergence of risk factors.
3. It is a level of prevention that wants to prevent overdiagnosis and over treatments.



18

HEALTH INDICATORS

Introduction

01:16:00

- Variables that reflect the health characteristics of a community.
- Reflect on the health status of a community.

Need of Health Care Indicators

03:40:00

- They reflect the health status of a community.
- Compare the health status of different communities.
- To assess the health care needs of the community.
- To allocate resources
- Also monitor and evaluate health care services
- To monitor whether the objectives of the target of a program are being achieved.

Difference between Health Indicator and Health Index

- **Indicator:** A variable which reflects change
- **Index:** An amalgamation of indicators

Q. Health indicators are used for

- A. Health status of community
- B. Requirement of health needs
- C. Assess the rate of infection
- D. To meet basic needs

Characteristics of Health Indicators

09:19:00

- Valid - Should measure what they should measure.
- Sensitive - Sensitive to the changes in the situation.
- Specific - Should reflect only the changes in the situation concerned.
- Reliable/ repeatable/ replicable/ reproducible - Answers should be the same if measured under different observers under similar circumstances.
- Relevant - Should contribute to the understanding of the phenomenon of interest.
- Feasible - Data needed should be feasible/ obtainable.

Q. Health indicators include all except

- A. Validity
- B. Reliability
- C. Affordability
- D. Feasibility

Various Health Indicators

15:51:00

- Mortality indicators
- Morbidity indicators
- Disability indicators
- Nutritional status indicators
- Health care delivery indicators

- Health care utilization indicators
- Indicators of social and mental health
- Environmental indicator
- Socio-economic indicators
- Health policy indicators
- Indicators of quality of life

Mortality indicator

18:25:00

- Starting point of the health evaluation of a community.

Crude death rate

- Total no. of deaths in a community / MYP (Mid-year population) in the same area x 100
- The mid-year population is taken in July
- It is basically the rate at which people are dying
- Limitation: It does not consider the age and sex of the population

Age-specific death rate

- $ASDR = \frac{\text{Total no. of deaths in a particular age group in a given area in a year}}{\text{MYP of the age group in the same area and year}} \times 1000$

The expectation of life -

- Life expectancy at birth
- Average no. of years a newborn is expected to live, considering the current age-specific mortality rates in a community.
- Human Development Index (HDI) is an important component
- Life expectancy at one year is PQLI
- This is a positive mortality indicator

IMR - Infant mortality rate

- $IMR = \frac{\text{total number of deaths in a given year}}{\text{total number of live births in the same year}} \times 1000$
- Important health indicators for the status of a population,

U5MR - under-five mortality rate → child mortality

- $U5MR = \frac{\text{Total number of deaths in a given year}}{\text{Total number of live births in one year}} \times 1000$
- An important indicator for health status and socio-economic development of a country

Maternal mortality rate - MMR

- Maternal Mortality Rate (MMR) = total no. of maternal deaths/women in the reproductive age group (15-49 years) x 100000
- Maternal Mortality Ratio (MMR) = total no. of maternal deaths/Life Births) x 100000
- Maternal deaths - deaths during ante maternal period/delivery/post-maternal period that is up to 6 weeks post delivery excluding accidental/incidental causes.

- E.g., pregnant women who suffer electric shock and die - do not count as maternal death.

Adult mortality rate

- Probability of dying between 15 to 60 years of life.

Proportional mortality rate

- The simplest measure of a burden is a disease
- $(\text{Total deaths due to disease } x / \text{Total deaths in a community}) \times 100$

Case fatality rate

- How severe is the disease
- $\text{CFR} = (\text{Deaths due to diseases } x / \text{total no of cases of disease "x"}) \times 100$

Year of potential life lost

- Premature death
- E.g., arbitrary cut-off - the person should survive up to 75 years. But a person dies at 30 years. So, $75 - 30 = 45$ years of potential life lost.

Morbidity Indicators

39:58:00

- Morbidity means spells of sickness or illness due to disease.
- Eg: Mental illness, Rheumatoid arthritis
- Supplement mortality statistics

Types of Morbidity Indicators

- Incidence (new cases) and prevalence (new + old cases) of disease
- Notification rate
- Attention rate at OPD
- Admission/readmission and discharge rates
- Duration of stay in a hospital
- Spells of sickness due to disease

Drawback of Morbidity Indicators

- They can ignore the inapparent or subclinical infection.
- **Disability rates: Any restriction or lack of ability to perform an activity.**

Disability Indicators types

46:47:00

Event type disability indicators

- Eg: no of days restricted to bed due to sickness
- Bed disability rates
- Work/school days within a specified period

Person type disability indicators

- Limitation of mobility - confined to bed
- Limitation of activity - not able to perform activities.

Q. The following indicator is not an event type indicator of disability-

- A. Number of days restricted activity
- B. Bed disability days
- C. **Limitation to perform the basic activities of daily living**
- D. School loss days

DALY - Disability-adjusted Life Year

- 1 DALY - Years of life lost to premature death + years live with disability
- **1 DALY = 1 healthy year of life lost**
- It is a measure of the burden of disease and effectiveness of intervention
- Global standard life expectancy of Japan is 85 years.
- Year of life lost (YLL) - calculated from the number of deaths at each age multiplied by the expected remaining years of life according to a global standard life expectancy
- Years lost of disability (YLD) - where the number of incident cases due to injury and illness is multiplied by the average duration of the disease and a weighing factor reflecting the severity of disease on a scale from 0 (perfect health) to 10 (dead).
- High yielding point on DALY

HALE - Healthy Life Expectancy

- $\text{HALE} = \text{Life Expectancy at birth} + \text{adjustment of time spent in poor health}$
- LE - Average no. of years a newborn is expected to live considering the current age-specific mortality rate.
- Average no. of years a newborn is expected to live in total health considering the current age-specific mortality rate.

QALY - Quality-adjusted Life Years

- Quality and quantity of life lived.
- Assessing the value for money of medical intervention.
- No. Of years of life added due to the intervention.

Comparison of DALY and QALY

- 1 DALY - 1 year of healthy life lost.
- 1 QALY - 1 year of life lived in perfect health

Sullivan's Index

- Advanced disability indicator
- LE - duration of stability
- It is disability-free life expectancy

Q. One DALY signifies

- A. 1 year of disease-free life
- B. **1 lost year of healthy life**
- C. 1 month of bedridden life
- D. None of these

Nutritional Indicators

01:03:38

- Prevalence of low birth rate
- Anthropometric measurement of pre-school children
- Height and weight of children at the time of school entry

Health Care Delivery Indicators

01:04:50

- Doctor population ratio
- Doctor nurse ratio
- Population bed ratio
- Sub Centres
- TBA

Health Care Utilization Indicators

01:05:56

- Services being utilized
- Percentage of children fully immunized
- Percentage of eligible couples using family planning methods
- Bed occupancy rates
- Bed turnover ratio
- Average length of stay in hospital

Q. All of the following are utilization rates except

- A. Population bed ratio
- B. Bed occupancy rate
- C. Bed turnover ratio
- D. The average length of stay

Environmental Indicators

- Percentage of the population has access to safe water supply and sanitation.
- Percentage of households have a water source at home or within 15 m of the home.

Indicators of social and Mental Health

- Suicide rate
- Mental illness

Socioeconomic Indicators

01:10:20

- Age of population increase
- Per capita GNP

- Level of unemployment
- Dependency ratio
- Literacy rate
- Family size
- Housing
- Per capita calories availability

Q. Which one of the following is NOT a socio-economic indicator?

- A. Literacy rate
- B. Family size
- C. Housing
- D. Life expectancy at birth - Quality of life - HDI

Health Policy Indicator

- Proportion of GNP (Gross National Product) spent on health
 - Income from abroad.
- GDP - Gross domestic product
 - Income within a country

Quality of Life Indicators

- PQLI
- HDI

Basic Needs Indicator

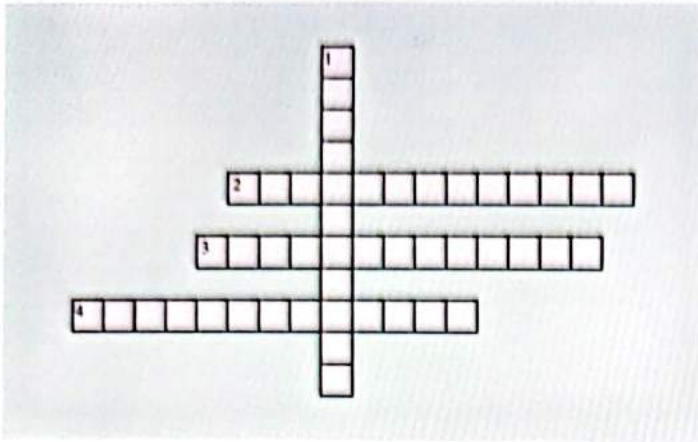
- Given by ILO (International Labor Organization)



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Percentage of the population has access to safe water supply and sanitation.
- 3. Advanced disability indicator
- 4. Age of population increase

Down

- 1. Prevalence of low birth rate



19

MONITORING, EVALUATION AND SURVEILLANCE

Monitoring

00:00:34

- An analysis of routine activities.
- It is directed toward the process.
- Monitoring is done by self.

Evaluation

00:01:44

- Periodic assessment.
- It is always done at the end.
- It assesses the outcome and how it impacted you.
 - It is done by external organizations or external bodies.

Monitoring Versus Evaluation

00:03:54

Monitoring	Evaluation
Data collected on program activities	Data collected to answer specific questions
Ongoing and routine process	Periodically done
Focus on activities and output compared to target	Focus on the outcome, impact
Are we doing the work we planned?	How effective were our activities? Did we achieve what we were supposed to?

MCQ

Q. Analysis of routine measurement is aimed at detecting changes in the environment?

- Monitoring
- Surveillance
- Isolation
- Evaluation

Elements of Evaluation

00:05:32

- Relevancy
- Adequacy
- Accessibility
- Acceptability
- Effectiveness
- Efficiency
- Impact

Q. All are elements of evaluation except?

- Repeatability
- Relevancy
- Acceptability
- Effectiveness

Steps of Evaluation

00:06:27

1. Determine what is to be evaluated
2. Establish standards and criteria
3. Plan the methodology to be applied
4. Gather information
5. Analyze the result
6. Take action
7. Reevaluate

Evaluation of Health Care Establishment

00:06:57

- Evaluation of **structure**:
 - Whether
 - Facilities
 - Equipment
 - Manpower
 - Organization meet a standard accepted by experts as good
- Evaluation of **process**– the process of medical care includes the following:
 - Problems of recognition
 - Diagnostic procedures
 - Treatment and clinical management
 - Care and prevention
- Evaluation of **outcomes**:
 - Persons using health services experience measurable benefits
 - Improved survival
 - Reduced disability

Traditional outcome components

- 5D of illness
 - Disease
 - Discomfort
 - Dissatisfaction
 - Disability
 - Death

Q. For analysis of the functioning of a health center with respect to evaluation, which of the following is the most important for assessing clinical management?

- Input
- Output
- Process
- Structure

Effectiveness vs Efficiency

00:11:34

Effectiveness	Efficiency
Why is this being done?	What needs to be done?
Doing the right things	Doing things the right way in the best possible manner
Aligns with the objective and goals	Focuses on process
Future looking with the desire for a better future	About current work, what must improve now
Not easy to measure	Easily measurable by analyzing specific metric
Requires external view outside organization	Internal within the bounds of organizations
Requires subjective visioning	Requires objective analysis

Q. Minimum input with maximum output is?

- a. Efficiency
- b. Effectiveness
- c. Impact
- d. Any of the above

Public Health Surveillance

00:15:54

- The ongoing systematic collection, analysis, interpretation, and dissemination of data on health
- Related events for use in public health action to reduce mobility and morbidity and to improve health
- The program to do constant scrutiny is IDSP- Integrated Disease Surveillance Programs
 - o We are searching for 33 diseases
 - o Certain diseases under routine surveillance – food borne, water borne, etc.
 - o Sentinel surveys-HIV-AIDS
 - o Disease under regular periodic surveys- NCDs
- Surveillance increases the notification rate of diseases.

Types of Surveillance

00:17:34

- Constant search of diseases has been achieved through-
 1. Active Surveillance
 2. Passive Surveillance
 3. Sentinel Surveillance
- Active surveillance
 - o House-to-house search for cases
 - o Practiced in most of the national health programme.
 - o Diseases like malaria, TB and leprosy are included.
 - o Secondary level of prevention

Passive Surveillance

- o Cases received by the hospital are to be reported to the higher authority.
- o Done within 30 days usually.
- o Done by the HMIS system-health management information system
 - HMIS system reports cases that it has seen in a month
- o Feasible type of surveillance

Sentinel Surveillance

- o Done for missing cases.
- o STDs and HIVs
- o For HIV- Antenatal clinics are used as sentinel sites and then the data is extrapolated to the general population.

MCQs

Q: Continuous activity of factors that determine the occurrence and distribution of diseases and other conditions of ill health is defined as?

- a. Monitoring
- b. Surveillance
- c. Evaluation
- d. Disease control

Q. Measures involved in sentinel surveillance include all of the following except?

- a. Identifying missing cases in the notification of diseases
- b. Identifying new cases of infection
- c. Identifying old and new cases
- d. Identifying cases free of disability

Q. A collection of stool samples under the national polio elimination program is an example of?

- a. Active surveillance
- b. Passive surveillance
- c. Sentinel surveillance
- d. Any of the above

Q. What is sentinel surveillance for?

- a. Border districts
- b. Malaria surveillance
- c. Effective sanitary surveillance
- d. Supplementary to routine notification

Q. Surveillance actually targets?

- a. Prevent disease
- b. Health planning
- c. Disease eradication
- d. Disease monitoring

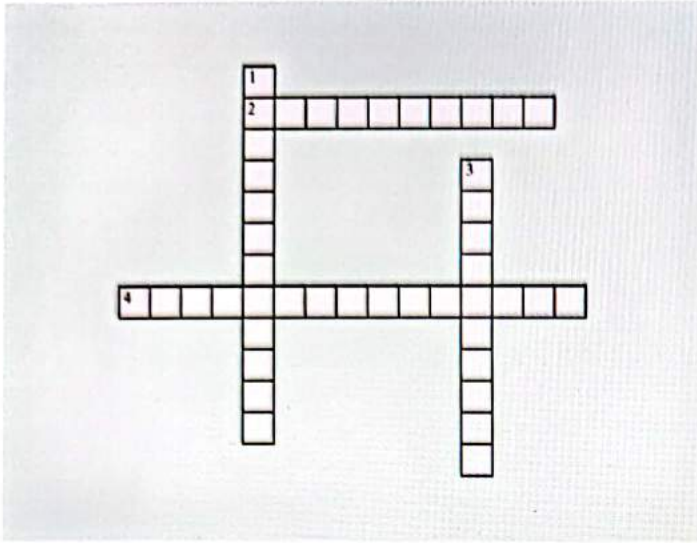
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. What is a periodic assessment and is always done at the end?
- 4. The 5D's of illness are disease, discomfort, disability, death and _____

Down

- 1. An objective and systematic way of evaluating the nurse and physician performance is known as a _____
- 3. Analysis of routine measurement is aimed at detecting changes in the environment?

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PREVIOUS YEAR QUESTIONS



- Q. Food poisoning is an example of? (FMGE Dec 2017)
- A. **Point source epidemic**
 - B. Propagated source epidemic
 - C. Common source epidemic
 - D. Pandemic
- Q. A well of contaminated water resulting in an epidemic of acute watery diarrhea is a typical example of? (FMGE Jun 2018)
- A. Common source single exposure epidemic
 - B. **Common source continuous exposure epidemic**
 - C. Slow epidemic
 - D. Propagated epidemic
- Q. On Republic Day, a camp was organized, and people were screened for HTN by checking BP and for DM by checking their BMI and blood sugar level, level of prevention is? (FMGE Dec 2019)
- A. Primary
 - B. Primordial
 - C. **Secondary**
 - D. Tertiary
- Q. A man came for checkup after his father had a cerebrovascular accident due to hypertension. What type of prevention is this? (FMGE Aug 2020)
- A. Primordial
 - B. Primary
 - C. **Secondary**
 - D. Specific protection
- Q. Interval between primary and secondary case is known as? (NEET 2018)
- A. **Serial interval**
 - B. Generation time
 - C. Incubation time
 - D. Lead time
- Q. Long term changes/ sequelae of a disease are seen in? (FMGE Aug 2020)
- A. **Secular trend of a disease**
 - B. Cyclical trend of a disease
 - C. Disease changing its traits according to herd immunity in the population
 - D. Disease changing the symptoms as per seasons
- Q. Counseling and Screening is done for Tuberculosis in an HIV positive patient at ICTC centre (NACP program). This is which level of prevention? (FMGE June 2022)
- A. Primary
 - B. **Secondary**
 - C. Primordial
 - D. Tertiary
- Q. TB sputum assessment comes under which type of mode of prevention? (FMGE June 2022)
- A. Primary
 - B. **Secondary**
 - C. Primordial
 - D. Tertiary
- Q. A person working in an industry lost his hand. He is unable to do his daily activities including writing and machine working. Which is an Impairment in this guy? (FMGE June 2022)
- A. Accident in industry
 - B. Can't do his machine work
 - C. **Loss of anatomical structure**
 - D. Unemployment



20

VACCINES

Concept

00:01:15

- Vaccines are immunobiological substances designed to produce specific protection against disease.
- **Vaccination is the primary level of prevention (specific protection)**
- Primary level of prevention:
 - Health promotion- general measure
 - Specific protection- for specific diseases when the risk factor is present, but the disease has not started.
 - A 9-month child is vaccinated with a measles-rubella vaccine to prevent developing measles disease, as all antibodies from the mother disappear during this time.
- **All forms of vaccination are the primary level of prevention (specific protection), except for using the BCG vaccine (intravesical instillation) for bladder cancer treatment.**
- The **BCG vaccine** used for the mode of intervention early diagnosis and treatment is a **secondary level of prevention.**
- **Vaccine is an example of active immunity.**
- Immunity: How efficient is the body in fighting against a disease
 - Active: Antibodies produced within the body (vaccine)
 - Passive: Readymade antibodies are injected into the body. → Immunoglobulins

Art of administering vaccines. Vaccines can be given by

- Oral route
- Intradermal route- parallel to the skin surface (10-15 degrees)
- Intramuscular route- 90%
- Subcutaneous route- 45%

Process of antibody formation that starts once the vaccines are injected.

3.

Drop outs

Left outs

Incomplete complete vaccination (discontinued)

Vaccination never reached

Types of Vaccines

00:15:26

Live Vaccine

- An organism is injected into the body in the live form.
- If an organism is in full capacity to produce a disease, then it might harm the body.
- So the **live organism is injected but in attenuated form.**
- Attenuated form means that we have reduced the organism's virulence (killing power), but immunogenicity (antibody-producing capacity) is maintained.
- There are live plague vaccines.

Important: Examples of Live Vaccine

- **I** - Influenza live- via nasal root
- **Love** - Live
- **Chick** - Chicken pox/varicella vaccine, Stain: Oka strain
- **E** - Encephalitis (Japanese- live)
 - Stain: SA-14-14-2
 - Used in NIS
- **M** - Measles/measles-rubella
- **B** - BCG
- **R** - RotaVirus vaccines
- **Y** - Yellow fever vaccine
- **O** - Oral polio vaccine (OPV- Found by Sabin)

History

00:09:11

Scientist	Work Done
Louis Pasteur	<ul style="list-style-type: none"> • Coined the term "vaccine" • Germ theory of disease causation
Edward Jenner	<ul style="list-style-type: none"> • Discovered the first vaccine -the smallpox vaccine • Smallpox is eradicated • Coined the term "vaccination"

Important terms

00:09:54

1.	Fully Immunised	Complete Immunisation
	A child who received all due vaccines according to NIS up to the age of 1 year.	A child who received all due vaccines according to NIS up to the age of 12 to 23 months.

2.	Vaccination	Immunization
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Killed/Inactivated Vaccine

00:19:53

- Organisms are injected in killed forms
- Killed by
 - Heat
 - Chemicals (formalin)
- Can be given during pregnancy.
- There are live plague vaccines

Important: Examples of Vaccine

- **K - KFD** (Kyasanur Forest disease)
- **I - IPV** (discovered by SALK)
- **LL - KiLLeD** Influenza- A7 California 2009
- **E - Encephalitis** (Japanese- Killed)
 - Stain: Nakayama Beijing
 - Not used in NIS
- **D - Dog bite-Rabies** (not a part of NIS)
 - It can be given for pregnant women with dog bite
- Killed cholera vaccine

Important Points

00:23:51

- Live vaccines multiply in the host and the resulting antigenic dose is larger than what is injected.
- Live vaccines have all major and minor antigenic components.
- Live vaccines engage certain tissue of the body.
 - Example, intestinal mucosa by OPV.
 - Both humoral and local immunity
- Live vaccines are more potent than killed vaccines.
- **Two live vaccines can be given together at different sites.**
 - NIS at 9 completed months
 - Measles-rubella- Right hand
 - Japanese Encephalitis - Left hand
 - Both 0.5 ml at the subcutaneous route
- 3 weeks of a minimum gap between 2 live vaccines, if required.
- Single vaccine doses are sufficient to produce the required immunity. Except for the Oral polio vaccine.
 - **In OPV other than primary, booster doses are required to produce sufficient immunity.**
- Relevance of additional vaccines in case of vaccines is to ensure Seroconversion
 - For example, measles
 - MR1 given in 9 completed months and MR2 given in 16-24 months.
 - **95-98% of recipients will respond to a single dose of measles vaccine, but the 2nd dose ensures that 100% of individuals are immune.**

- Live vaccines are more efficacious.
- 2 or 3 primary doses plus booster doses are required to ensure the required immunity in case of a killed vaccine.
- Immunity with killed vaccines lasts from months to years.
- Mostly, killed vaccines are given by IM subcutaneous routes.

Features	Live Vaccines	Killed Vaccines
No. of doses required to produce immunity	Single (except OPV)	Multiple
Duration of immunity produced	Longer	Shorter

Effectiveness of protection	Greater	Lower
Immunoglobulin produced	IgA and IgG	IgG
Mucosal, and cell-mediated immunity produced	Good	Poor
Reversion to virulence	Possible	No
Excretion of vaccine virus	Possible	No
Transmission to non-immune contacts	Possible In OPV (live) leads to circulatory vaccine-derived poliovirus	No
Need for adjuvant (immunity enhancers like aluminium hydroxide or phosphate)	No	Yes
Stability at room temperature	Low	High

MCQs-1

Q. Which of the following statements regarding live vaccines is false?

- A. **Two live vaccines cannot be administered simultaneously.**
- B. Booster doses are not required when live vaccines are administered.
- C. Single doses give lifelong immunity.
- D. The live vaccine contains major and minor major antigens.

Q. Minimum gap that would be maintained between two live vaccines?

- A. 2 weeks
- B. 3 weeks**
- C. 4 weeks
- D. 6 weeks

Subunit Vaccines

00:35:34

- Prepared from extracted cellular fractions of organism
- Toxoids (detoxicated toxin)
 - Exotoxins produced by live organisms are used.
 - Diphtheria, Tetanus, anthrax
 - Highly efficacious
 - Highly safe

Types

- **Protein vaccine**
 - Influenza vaccine (hemagglutinin and Neuraminidase)
 - Acellular pertussis vaccines
- **Polysaccharide vaccine:** Antibody is produced against capsular polysaccharide of pathogenic bacteria

- Adv: **Serotype specific immune response**
- Hib, Meningococcal, Pneumococcal (Pneumococcal polysaccharide vaccine PPV)
- PPV not used in NIS
- **Conjugate vaccine:** Polysaccharide antigen is chemically linked to a protein recognized by T cells.
 - Advantage: More efficient in children < 2 years
 - Disadvantage: Serotype specific
 - E.g., Pneumococcal (Pneumococcal conjugate vaccine PCV), Meningococcal
 - PCV used in NIS
- **Recombinant Vaccine**
 - Prepared by DNA technology.
 - Antigens are expressed on E.coli, yeast, and mammalian cells
 - Eg: Hepatitis B, HPV (human Papillomavirus), cholera toxin B, Lyme disease
 - **Hepatitis B vaccine is prepared using HbsAg**
 - Advantage: Safe
 - Disadvantage: Less immunogenic and need an adjuvant to enhance efficiency

Combination Vaccine

00:40:56

- More than one immunising agent
- E.g.
 - MMR vaccine protects from measles, mumps, and rubella.
 - DPT: Diphtheria, tetanus, and pertussis.
 - **Pentavalent vaccine protects from DPT (Diphtheria, pertussis and tetanus), HbsAgS (hepatitis B), and Hib (Haemophilus influenzae)**
 - T series vaccine given by IM route
 - Given in the anterolateral aspect of the left thigh.
 - 0.5ml dose
 - 6 weeks- Penta 1
 - 10 weeks- Penta 2
 - 14 weeks- Penta 3

MCQs-2

Q. Which of the following is/are a combination vaccine?

- A. **DaPT vaccine**
- B. Pneumococcal vaccine
- C. Hepatitis B vaccine
- D. OPV vaccine,
- E. **MMR vaccine**

- DaPT: Acellular pertussis
- DwPT: Whole cell pertussis (not safe)

Q. Salk vaccine is a?

- A. Live vaccine
- B. Live attenuated vaccine
- C. **Killed vaccine**
- D. Toxoid

Q. Hepatitis B vaccine is a type of

- A. Live vaccine
- B. Killed vaccine
- C. DPT vaccine
- D. **Recombinant vaccine**

Q. All of the following are killed vaccines except?

- A. Salk polio
- B. Japanese encephalitis
- C. Rabies
- D. **Yellow fever**

Contraindications of Vaccines

00:47:47

- All vaccines are contraindicated, whether live or Killed.
 - Previous anaphylactic reaction
- Live vaccines are contraindicated during pregnancy, radiation therapy, and severe symptomatic immunodeficiency.
- In cases of cold and diarrhoea, all vaccines can be given.

Conditions	Contraindication
Pregnancy	All live vaccines are contraindicated except yellow fever. In India, the yellow fever vaccine is not used due to the required storage temperature. Yellow fever is an exotic disease in India.
Fever	All vaccines are given, while mild to moderate fever except the typhoid vaccine.
Asymptomatic HIV	None are contraindicated
Symptomatic HIV	Adult: All live vaccines are contraindicated except measles, measles-rubella, MMR, and varicella vaccines. Newborn: Vaccines are contraindicated except for measles, OPV, and BCG (TB endemic areas).
Progressive neurologic disease	DPT contraindicated (pertussis component) For a child suffering from cerebral palsy (non-progressive disorder), DPT is not contraindicated. DPT can be given to people who have convulsions controlled by anti-epileptics.
Immunosuppression and corticosteroids	All live vaccines are contraindicated
Egg Allergy	Yellow fever, and Influenza vaccines are contraindicated.

Telegram - @nextprepladdernotes

Vaccine Protocol During a Disaster and Epidemics 00:54:46

- To the victims, all vaccines are contraindicated except the measles vaccine (within 3 days of exposure).
- Post-disaster gastrointestinal infections are the most common ones. Still, typhoid and cholera vaccines are not given to all, as the time needed to produce antibodies is much larger than the natural incubation period.
- More measles have a natural incubation period of 10-14 days, and antibodies are produced after vaccination in 7 to 10 days.
- For all health professionals who work in disaster endemic areas, all vaccines are given, like typhoid, cholera, hepatitis, and tetanus, except measles.
- Epidemics:
 - Outbreak of polio- OPV is given to at least to 500 children in the vicinity
→ In case of an outbreak, IPV is not given as it precipitates paralysis.

MCQs-3

- Q. Vaccine contraindicated during pregnancy is
- Hepatitis A
 - Hepatitis B
 - Rabies
 - Varicella
- Q. All live vaccines are contraindicated in asymptomatic HIV except
- Yellow fever vaccine
 - MMR
 - Varicella and Zoster
 - None
- Q. An eight-month-old child had a history of unusual crying and convulsion following previous vaccination after BCG, DPT and OPV (first dose), and Hepatitis B. Now parents have brought children for the next doses of vaccination. Which vaccine is contraindicated in the situation?
- Measles
 - DPT
 - Hepatitis B
 - DT

Strains of Vaccines 00:58:04

Vaccines	Strains
Measles	Edmonston Zagreb Not used • Schwarz • Moraten
Mumps	• Jeryl Lynn strain • RUBINI (not used)

Rubella	RA 17/3
Typhoral vaccine	Ty21a
Influenza (killed)	A7/California/2009
Chicken pox vaccine/ Oka Varicella vaccine	
HIV	Modified vaccinia AnKARA
Anthrax	Sterne
BCG- Protects from extrapulmonary TB	Danish 1331
Leprosy	<small>prince kumar princeku0003@gmail.com 8058527460</small> Mycobacterium indicus pranii
Vector borne disease	
Japanese Encephalitis live	SA-14-14-2
Yellow fever	17 D

MCQs-4

- Q. The strain used for the measles vaccine
- Oka strain
 - Edmonston Zagreb Strain
 - Danish 1331
 - RA27/3

AEFI (Adverse Event Following Immunization) 01:02:47

- An AEFI is an untoward medical occurrence that follows immunisation and which does not necessarily have a causal relation with the usage of the vaccine.
- Adverse events may be any unfavourable or unintended sign, abnormal laboratory finding symptom or disease.

Types of Adverse Events

- Vaccine-related event
 - Vaccine product-related reaction: Inherent properties of vaccines, vaccine handled and administered.
 - Vaccine quality defect-related reaction: Manufacturing process, the administrative device provided by the manufacturer.
- Immunisation-related event
 - Immunisation error-related reaction: Programme error - inappropriate vaccine handling, prescribing, or administration.
 - Immunisation anxiety-related reaction
- Coincidental event: Other than vaccine product, immunisation error or anxiety.

List of adverse events

01:04:42

Vaccine	Side-effects
Influenza (inactivated)	GBS (Guillain-Barré syndrome)
Japanese Encephalitis	Neurologic events
TT, Td	Brachial neuritis
OPV	Precipitates paralysis; CVDPV, VAPP
Hep B>DPT	Hypersensitivity, shock
Measles	Toxic shock syndrome (TSS), febrile seizures, anaphylaxis, encephalopathy
Rotavirus (After 1 month)	Intussusception
Pertussis	Inconsolable crying, convulsion, HHE (Hypotensive hyporesponsive encephalopathy)
BCG Dose: 1 month, 0.5ml, intradermal After 1 month 0.1 ml	Increased dose in 1-month leads to Osteomyelitis, lymphadenopathy
MMR	Thrombocytopenia
Rubella, MMR	Arthralgia

MCQs-5

Q. If you are a medical officer of a PHC. A child is due for the measles vaccine however, he is having diarrhoea. What should be the plan of action?

- A. Do not give the vaccine
- B. Can give the vaccine to the child and ask the mom to wait for one and a half hours at PHC
- C. Can give the vaccine to the child and ask the mother to leave
- D. Not sure

Role of Aluminum Hydroxide

- Additional immunity enhancer
- Used with Diphtheria, DPT vaccines
- Used with killed and recombinant vaccines

Other Constituents

01:08:20

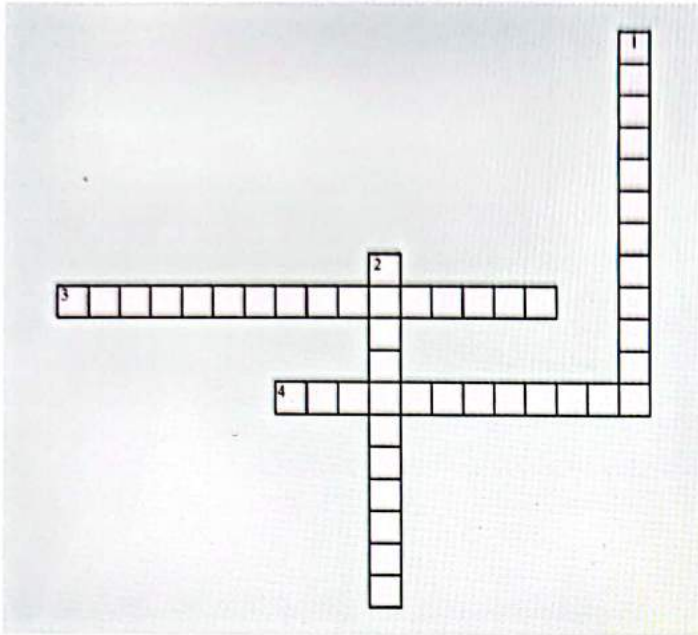
- **Preservatives:** Stop unwanted microbial contamination of vaccine
 - E.g.: Phenoxyethanol (most widely used), phenol and thimerosal
- **Stabiliser:** Inhibit chemical reactions and prevent components separating or sticking to the vial during transport and storage.
 - E.g. Lactose, sucrose, amino acid (glycine) and their salts (monosodium glutamate), albumin, gelatin.
- **Residuals:** Minute quantities of substance used during the manufacturing or protection process of the individual vaccine.
 - **Antibiotics:** To prevent bacterial contamination of tissue culture cells in which the virus is cultivated.
 - Neomycin/or polymyxin B is used in varicella vaccines, some influenza vaccines, DTPa, IPV, and MMR vaccines.
 - Gentamicin is used in some influenza vaccines
 - Streptomycin, Neomycin in IPV
- **Immunity enhancer:** Aluminium hydroxides



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. More than one immunizing agent
- 4. Coined the term "vaccine"

Down

- 1. Discovered the first vaccine -the smallpox vaccine
- 2. Primary level of prevention

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21

**NATIONAL IMMUNIZATION & SCHEDULE
DELAYED IMMUNIZATION**



NIS- National Immunization Schedule

00:02:29

Beneficiaries of NIS: Birth to 16 years

At birth	BCG, OPV ₀ , HepB
6 weeks	OPV ₁ , RV ₁ , Penta ₁ , fIPV ₁ , PCV ₁
10 weeks	OPV ₂ , RV ₂ , Penta ₂ , - , -
14 weeks	OPV ₃ , RV ₃ , Penta ₃ , fIPV ₂ , PCV ₂
9 completed months (Vit A drops also given)	MR ₁ , JE ₁ , PCV booster, fIPV ₃
16-24 months	MR ₂ , JE ₂ , OPV booster, DPT 1st booster
5-6 years	DPT 2nd booster
10 years	Td ₁
16 years	Td ₂



Important Information

- What is the total number of doses of VitA?
 - 9
- What is the total dose of Vit A given?
 - 17 LIU

Routes of vaccines

00:16:49

Refer Table 21.1

To remember

- 2 drops of polio can save life
- Rotavirus - associated with diarrhea - 5 drops
- After 5 years absorption from leg decreases so DPT₂nd booster given in either of upper arm

BCG (golden points)

00:22:22

- BCG scar takes 8-12 weeks to form
- It can also be given on right upper arm
- Left upper arm has been taken for uniformity in the country for proper identification
- BCG vaccine offers no protection from pulmonary TB , it **protects against extrapulmonary TB**
- BCG scar not present not necessarily means that the child is not vaccinated so you need not revaccinate

Highlighting point

- OPV₀ → 0 means birth dose
- Order of giving vaccine at birth - BCG, OPV , Hepatitis B
- fIPV → 1/5th of IPV full dose
- PCV - Pneumococcal conjugate vaccine
- JE - Japanese encephalitis

Direct BCG v/s indirect BCG

- BCG vaccine till 1 year can be given directly
 - No need to perform tuberculin test
- BCG vaccine **after 1 year** will be given **only after performing tuberculin test** called **indirect BCG**

MCQs

Q. Mark true or false the following statements:

- Pneumococcal conjugate vaccine is given as 0.5ml SC, in right arm
- Rotavirus is given as 2 drops oral
- Hepatitis B is recombinant vaccine
- Pentavalent is given as 0.5ml I/M in anterolateral thigh (LEFT)
- JE vaccine is given as 0.5ml SC in left upper arm

Explanation:

- Pneumococcal conjugate vaccine is given as 0.5ml **IM, right thigh**
- Rotavirus is given as **5 drops** oral

Important Information

- **Introduction of third dose of FIPV from 1st January, 2023**
- What will be the number of doses of fIPV to be given from 1st January, 2023?
 - 3 doses at 6 weeks, 14 weeks and 9 completed months
 - At 6 weeks, 14 weeks - 0.1 ml ID right upper arm
 - At 9 months - 0.1 ml ID left upper arm
 - (as MR vaccine is given at right upper arm)

VITA drops

- 9 completed months - 1 ml or 1 LIU
- Thereafter every 6 months till 5 years of age - 2 ml or 2LIU

Telegram - @nextprepladdernotes

- c. True. C. hepatitis B is a recombinant vaccine. Also, HPV vaccine is a recombinant vaccine.
- d. True. Pentavalent is given as 0.5ml I/M in anterolateral thigh (LEFT)
- e. True. JE vaccine is given as 0.5ml SC in left upper arm

Beneficiaries of NIS: Pregnant women

00:33:48

- Primi-pregnant for first time
- Or
- Multi with last childbirth more than 3 years ago
 - 2 doses of Td vaccine
 - First dose - as soon as possible
 - Second dose - 4 weeks or 28 days later
 - Multi with last childbirth less than 3 years ago
 - Booster dose of Td vaccine around 7th month of pregnancy

Q. A 26-year-old primigravida in her second trimester presented to the hospital to take her Td dose. Which of the following is true regarding Td dose in pregnancy?

- a. 1 dose in 2nd trimester
- b. 2 doses (1 month apart) in second trimester
- c. 1 dose anytime as soon as possible in pregnancy
- d. 2 doses (1 month apart) as soon as possible in pregnancy

Q. Zero dose of polio vaccine is given

- a. Within 24 hrs of birth
- b. At birth
- c. At 6 weeks
- d. When child suffers from polio

Q. Dose of vitamin A administered at 16 months

- a. 5000 IU
- b. 1 lac IU
- c. 2 lac IU
- d. 1.5 lac IU

Q. You are posted at a PHC and you have to ensure that the routine vaccination process is carried out smoothly. All of the vaccines are given at 16-24 months except:

- a. DPT booster
- b. OPV booster
- c. Japanese encephalitis 2nd dose
- d. PCV booster

Delayed Immunization

00:40:37

- OPV birth dose can be given till 15 days
- Hepatitis B- birth dose given till 24 hours

Vaccines that can be given upto 1 year -

- BCG
- Rotavirus Vaccine
- Pentavalent
- IPV
- PCV
- Hepatitis B vaccine alone can also be given till 1-year

Vaccines that can be given upto 5 years

- OPV
- Measles vaccine
- MR vaccine
- Vit A drops

Vaccines that can be given upto 7 years

- DPT

Vaccines that can be given upto 15 years

- JE

Note

- Td can be given lifelong

MCQs

Q. An 18 months old unvaccinated child comes to the PHC for the first time. Vaccines to be given include:

- a. OPV, DPT
- b. Pentavalent vaccine
- c. BCG, OPV
- d. BCG, OPV, MMR, Pentavalent

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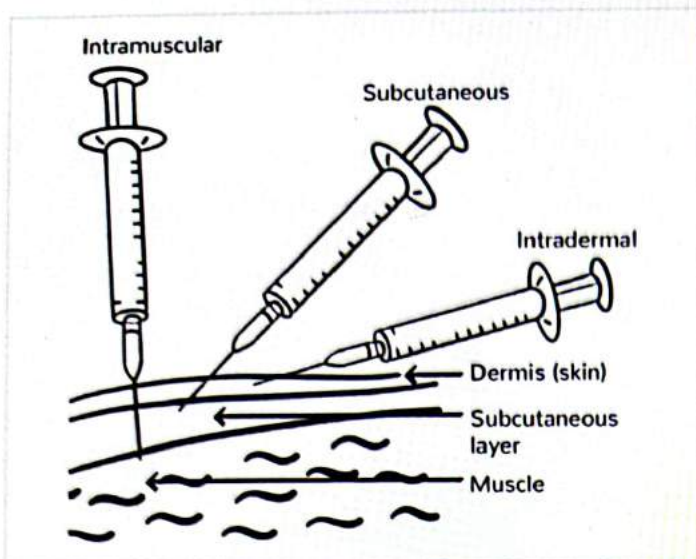
Q. Identify the route of administration



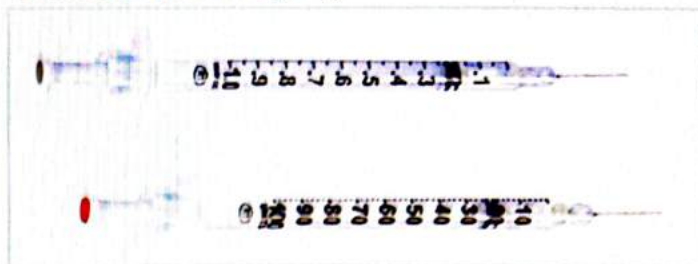
- a. Intramuscular injection
- b. Subcutaneous injection
- c. Intradermal injection
- d. Any of the above

Ans.

Intramuscular injection - angle is 90 degree



Tuberculin vs Insulin Syringe



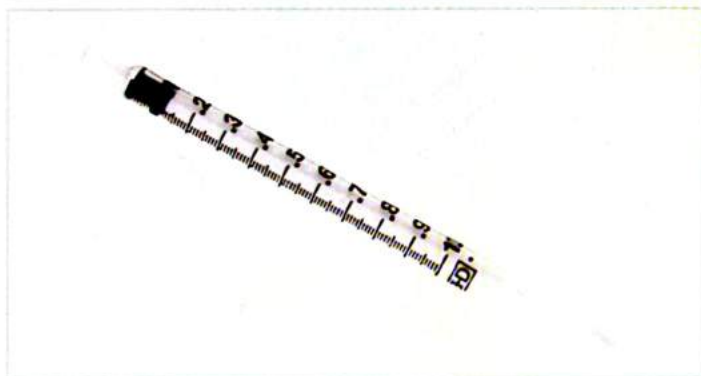
- Tuberculin syringe has (0.1 ml to 1 ml) markings
- Insulin syringe has units 10 to 100 units
- There is no interchangeability between the syringes

Hub cutter



Covid vaccine by intramuscular

Q. Identify the type of syringe



- Tuberculin syringe
- Insulin syringe
- Any of the above
- None of the above

Ans.

Tuberculin syringe (0.1 ml to 1 ml) markings

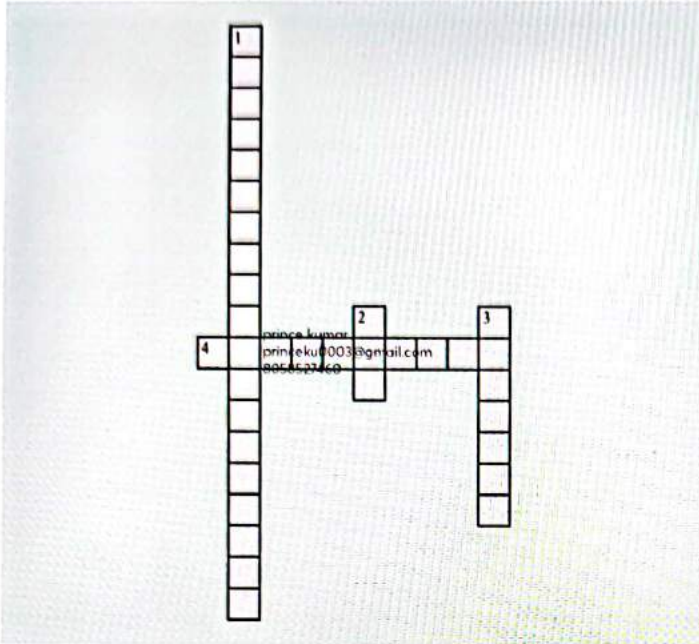
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ORAL	ID - 0.1 ml Angle- 10-15 degree	S/C - 0.5 ml 45 degree	IM - 0.5ml 90 degree
OPV - 2 drops	BCG - 0.05 ml upto 1 month After 1 month till 1 year - 0.01 ml Site - left upper arm	9 completed months - MR - right upper arm	't' series vaccine Letter t in it <ul style="list-style-type: none"> • Hepatitis B • Pentavalent • DPT (upto 1st booster) Anterolateral aspect of left thigh
Rotavirus Vaccine - 5 drops	fIPV- 1/5 of full dose - 0.1ml Site- right upper arm fIPV3- left upper arm	JE - left upper arm JE only in endemic areas	PCV - right thigh



CROSS WORD PUZZLES

Crossword Puzzle



Across

4. Syringe has (0.1ml to 1 ml) markings

Down

1. OPV birth dose can be given till 15 days
2. It can also be given on right upper arm
3. Syringe has units 10 to 100 units



Definition and Concept

00:00:32

- System of storing and transporting vaccine at the recommended temperature from the manufacturer to point of use.
- Cold chain temperature of vaccines in India is +2°C to +8°C.
- Cold chain delivers
 - The right vaccines
 - In right quantity
 - At right place
 - At right time
 - And right conditions

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Storage of Vaccines in Cold Chain

00:02:17

Different levels that vaccines are stored

- National level
- State level
- Regional level
- CHC
- SDH (Sub District Hospital)
- PHC (Primary health centers)



Important Information

Vaccine are not stored but Carried

- **Sub center** - Vaccine carrier (24 to 48 hours)
- **Village level** - Day carrier (24 to 48 hours)
- **Ice pack** - 1 to 4 hours

- Temperature of vaccines can be maintained by carriers for up to 24 to 48 hours only.

Primary health centers

- Small ILR (**Ice Lined Refrigerators**)
 - Stored upto 1 month
- Small DF (**Deep Freezer**)
 - Maintain the temperature only used to prepare the **ice packs** (-15°C to -25°C)

CHC/SDH (Sub District Hospital)

- Large ILR containing 300 liters capacity.
 - Stored up to 1 month.
- Large deep freezers used to prepare ice packs at the temperature -15°C to -25°C.

National, State, and Regional level

- Walk in cold rooms
 - Maintain the temperature of the vaccine for up to 3 months.

- Walk in freezers

- Maintain the temperature by using ice packs for a longer time.

High Yield Points

00:09:36

- The cold chain temperature of vaccines in India is +2°C to +8°C (Exception: OPV is stored for long term storage, up to three months below the freezing temperature).
- Yellow fever vaccine below freezing temperature for storage



Important Information

- The most important equipment to maintain the cold chain is ILR (Ice Line Refrigerator).

- Maximum chance of **failure of cold chain** is seen at Sub centers and Village levels, thus vaccines are not stored.

MCQs

Q. Storage temperature for vaccine is

- A. -4°C to 0°C
- B. 0°C to 4°C
- C. +2°C to 8°C
- D. +4°C to 12°C

Q. Maximum chance of failure of cold chain is

- A. Sub Centre
- B. PHC
- C. CHC
- D. District

Q. Most important component of cold chain is

- A. Vaccine carrier
- B. Ice pack
- C. ILR
- D. Deep freezer

Q. Vaccine stored at top of the ILR is

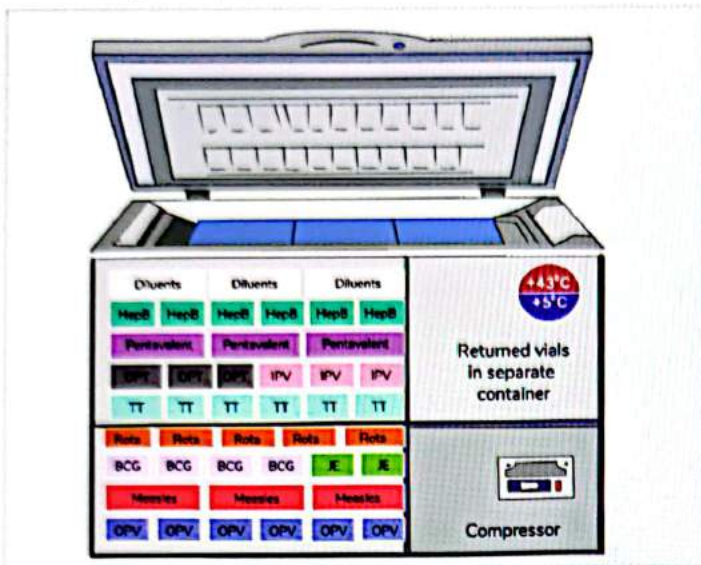
- A. Measles
- B. BCG
- C. JE
- D. Pentavalent
- E. Hepatitis B

Cold Chain Equipments

00:12:43

Ice Line Refrigerator

- The most important equipment of the cold chain is ILR (Ice line refrigerator).



- This is a top load refrigerator opened from the top
- Mechanism of the ILR** - All cold air goes and settles at the bottom.

Rule

- At the bottom of ILR **never place freeze sensitive vaccines.**
- Always **place heat sensitive vaccines only.**

Freeze sensitive vaccines are T series vaccines

- To remember** (Letter T vaccines)
 - Hepatitis B
 - DPT
 - Pentavalent
 - Td

Golden Point: Most freeze sensitivity vaccine is Hepatitis B vaccine, so it is placed at the top most level of ILR.

Heat Sensitive Vaccines

- Mnemonics: RBOM**
 - Reconstituted BCG
 - OPV
 - Measles

Golden Point: Most Heat sensitive vaccine is the OPV vaccine.

Important Information

- At the bottom of ILR:** OPV, measles.
- At the top most of ILR:** Pentavalent hepatitis B, JE, T series vaccines.

Q. Can diluents be stored at room temperature?

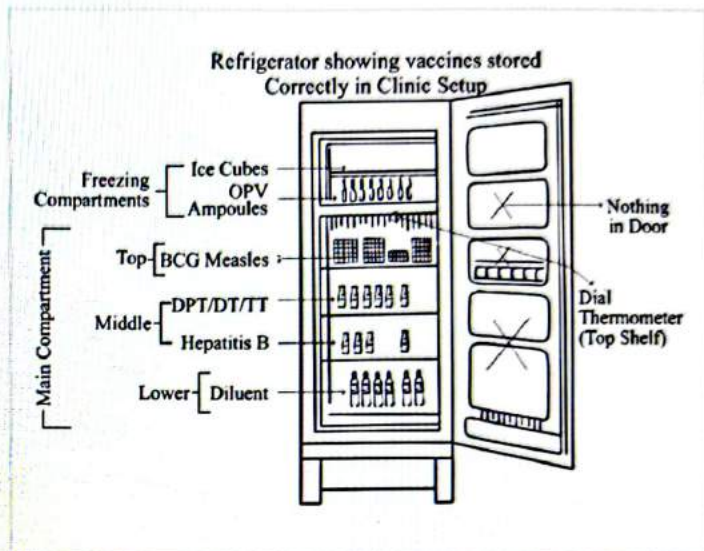
Ans: YES diluents can be stored at room temperature.

- Examples:** Sterile water, distilled water, normal saline, buffer solution.
- 24 hours prior to the session diluents have to be brought at the same temperature as vaccines. Otherwise, it will lead to **Toxic Shock Syndrome.**

Domestic Refrigerator

00:24:24

- If no ILR, Domestic refrigerator is used.



- Domestic refrigerator can also be used for storing the heat sensitive vaccines in the freezing compartment.
- OPV ampoules can be stored for long term.
- BCG, measles vaccine at the top shelf.
- At the bottom place the hepatitis B vaccines (free sensitive vaccine).
- Never keep any vaccine at the door side of the refrigerator

Important Information

- Domestic refrigerator should only be used if ILR is not available.
- Place a heat sensitive vaccine (Hepatitis B) next to the freezer compartment only.

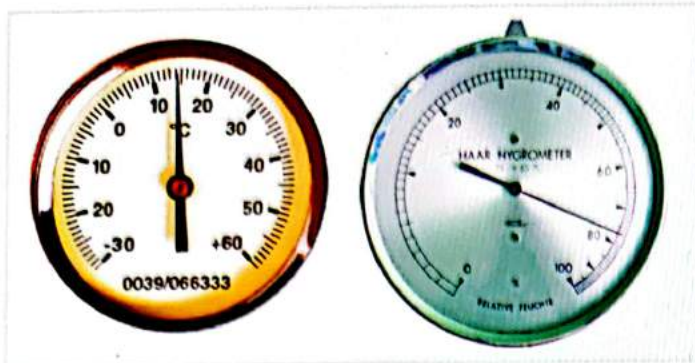
Dial Thermometer

Monitor the temperature of the ILR

- Based on the principle of thermocouple
- Dial thermometer monitors temperature of ILR twice in a day.
- Done by a medical officer.
- ILR will keep the vaccine safe with a minimum of 8 hours of electricity supply in a 24 hours period.

Hygro thermometer

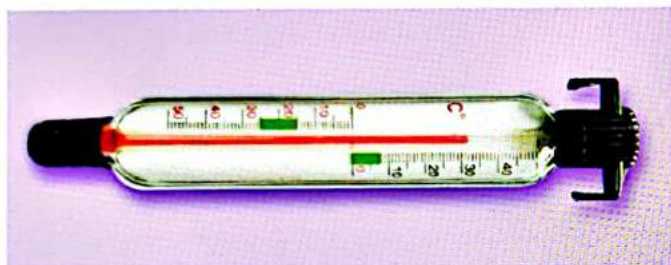
- Used to determine the Air humidity.



Stem Alcohol Thermometer

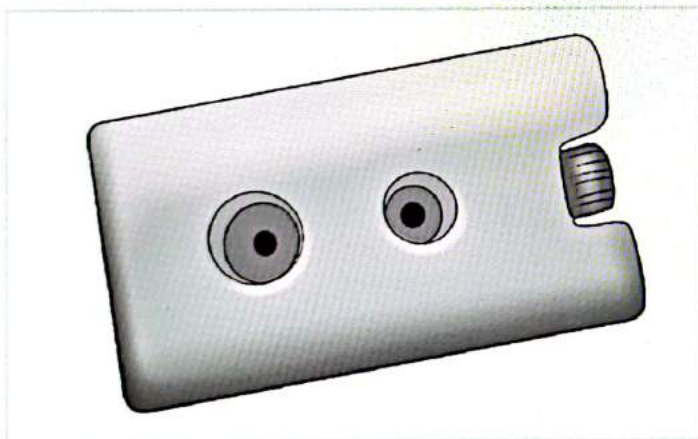
- Monitor the temperature of ILR/DF

ILR/ DF Thermometer



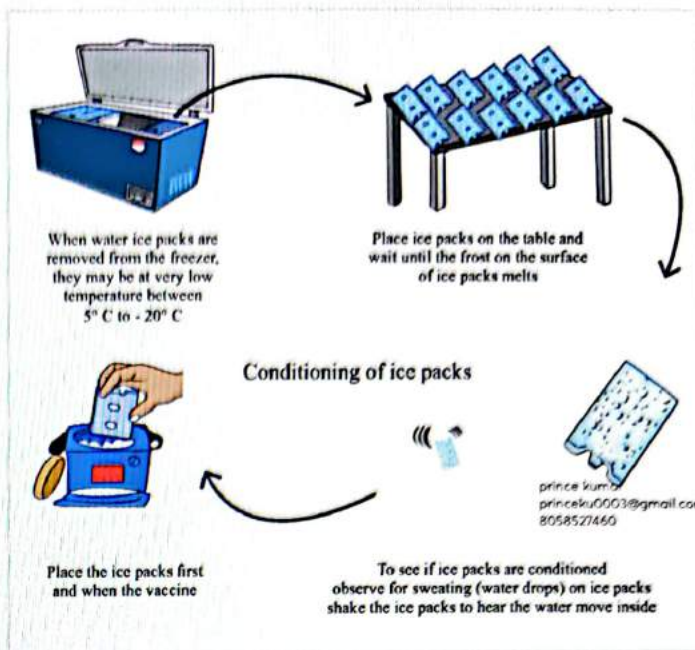
Ice Pack

00:29:28



- Prepared in deep freezer
- Temperature:** -15°C to -25°C
- Carry out sessions: Sub center, village levels or outreach sessions.
- Ice packs have 2 holes for keeping the vaccines.
- Water is filled only up to the horizontal level.
- Water expands on freezing.
- Nothing is added to water (plain water).
- Ice packs can maintain the temperature of the vaccine for up to 1-4 hours.

Conditioning of the Ice Pack

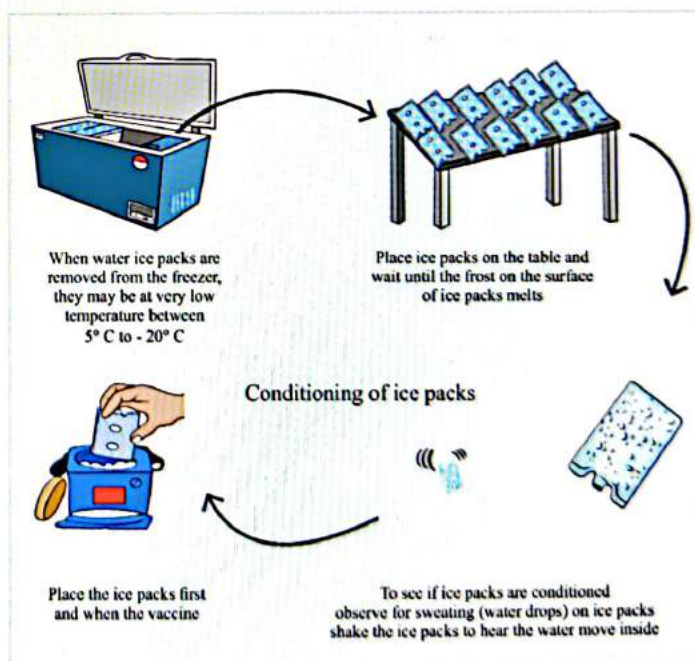


Important Information

- Water droplets signifies the conditioning of the ice pack.
- Conditioning brings down the temperature from frozen ice to required temperature ($+2^{\circ}\text{C}$ to $+8^{\circ}\text{C}$).

MCQs

Q. The picture shown is an example of?



- A. Vaccine distribution session
- B. Storage of vaccine in ILR
- C. Freezing of ice pack
- D. Conditioning of ice pack

Vaccine carrier

00:36:00



- Career for outreach session
- Lined by 4 ice packs.
- Can carry 16 to 20 vaccine vials.
- Maintains vaccines up to 24 to 48 hours.
- The vaccine carrier may be blue or white color.
- Vaccines are kept in polythene bags and placed in the vaccine carrier.

Reverse Cold Chain

- Carry stool sample from suspected AFP (acute flaccid paralysis)
- Red carriers can carry reverse cold chain products.
- The temperature required to carry the stool sample is +2°C to +8°C same as the temperature of the vaccine.
- This carrier can be transported to the National Institute of Virology in Pune within 72 hours.

Day Carrier

00:40:06



- Lined by two ice packs.
- Carries 6 to 8 vaccine vials
- Maintain vaccines for up to 24 to 48 hours.
- Carry out less number of vaccine vials compared to Vaccine carriers.

Cold Box

- 4-36 Ice packs.
- 48-96 hours
- 0.9-1.6 liters
- Large number of vaccines can be carried by using cold boxes.

MCQs

Q. Vaccine which should not be given to an elderly man is

- Measles vaccine
- H. influenzae vaccine
- TT Vaccine
- Pneumococcal Vaccine

Vaccines Given to Elderly

00:41:57

Influenza	1 dose annually
Pneumococcal	1 dose
Zoster	1 dose
Tetanus, Diphtheria	Tb booster 10 years

Vaccines Disposal

00:42:20

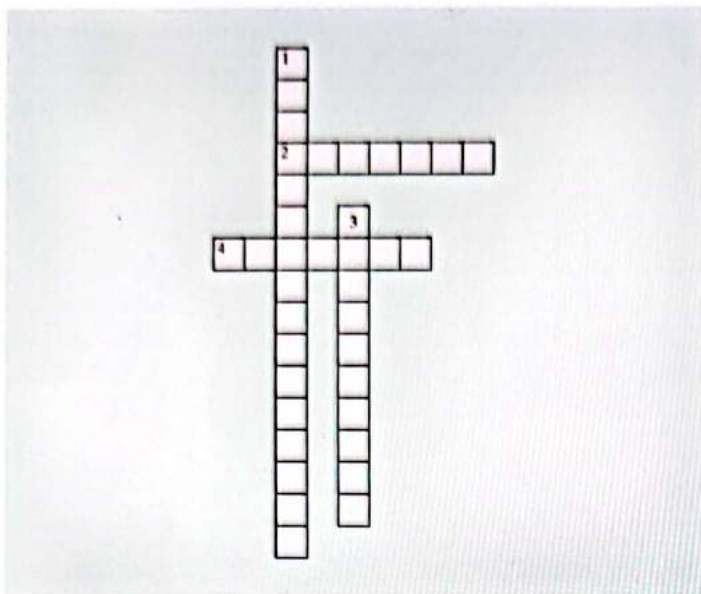
- Vaccine vials are discarded in blue bags.
- Empty vaccine vials also discarded in a blue bag.
- Damaged vaccine vials are discarded in yellow bags (Biotechnology waste).



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Large number of vaccines can be carried by using
- 4. Prepared in deep freezer

Down

- 1. Damaged vaccine vials are discarded in yellow bags (Biotechnology waste).
- 3. Maintain vaccines for up to 24 to 48 hours.

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PREVIOUS YEAR QUESTIONS



Q. Pneumococcal Vaccine PCV 23 Polysaccharide has shown the best results in the following condition?

(AIIMS Nov 2019)

- A. Sickle cell anemia
- B. Cystic fibrosis
- C. Child less than 2 years age**
- D. Recurrent otitis media and sinusitis

Q. Assertion (A): WHO recommends typhoid vaccine for prophylaxis in disaster management

Reasoning (R): Vaccines are cost-effective measures of reducing disease outbreak. (AIIMS Nov 2019)

- A. A and R are true statements and R is the correct explanation of A
- B. A and R are true statements But R is not the correct explanation of A
- C. A is true but R is false
- D. Both A and R are false**

Q. All of the following live vaccines are contraindicated in pregnancy except?

(FMGE Dec 2017)

- A. Yellow fever**
- B. BCG
- C. Rubella
- D. OPV

Q. Which is not a contraindication for OPV?

(FMGE Dec 2019)

- A. Leukemia
- B. Diarrhea**
- C. Malignancy
- D. Immunocompromised

Q. BCG vaccine is diluted with?

(FMGE Dec 2018)

- A. Normal saline**
- B. Distilled water
- C. Dextrose
- D. Colloids

Q. At PHC, vaccine storage is done in?

(FMGE Dec 2018)

- A. Vaccine courier
- B. ILR**
- C. Walk-in cold rooms
- D. Cold box

Q. Which vaccine is not included in Mission Indradhanush?

(NEET 2018)

- A. Tuberculosis
- B. Measles
- C. Meningococcal meningitis**
- D. Diphtheria

Q. Vaccine with faster seroconversion time as compared to Incubation period?

(FMGE June 2018)

- A. Mumps vaccine
- B. Measles Vaccine**
- C. Rubella
- D. Polio

Q. Which vaccine is given at birth?

(FMGE June 2022)

- A. BCG, OPV birth dose, Hep B birth dose**
- B. BCG, Hep B birth dose, MR birth dose
- C. BCG, Hep B birth dose, DPT birth dose
- D. BCG, MR vaccine, DPT birth dose

Q. Which of the following vaccine is recommended at birth?

(FMGE June 2022)

- A. BCG**
- B. Measles
- C. JE
- D. Vitamin A

Q. A 1-year-old child presented to OPD for vaccination. He had 1 dose of DPT 6 weeks after birth. After that other doses were not administered. What should be the next step?

(INICET May 2022)

- A. Restarts DPT
- B. Give only DT
- C. Give 2nd dose**
- D. Not to give anything

24

SCREENING TEST



Topics

1. Screening
2. Difference between screening and diagnostic test
3. Concept of lead time
4. Criteria for diseases that are suitable for screening
5. Types of screening tests
6. Categories of screening

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Definition of screening

00:01:48

- The search for unrecognized disease or defect using rapidly applied tests, examinations, or other products in apparently healthy individuals.
- The purpose is to discover the disease before the person presents signs and symptoms.

Concept of Iceberg

- The visible portion of the iceberg - cases diagnosed/ symptomatic
- The invisible portion - Hidden portion, which is apparently healthy. These do not have signs and symptoms.
- The water around the iceberg - Healthy population
- Screening test is applied to the hidden portion of the iceberg.
- Hidden portion has the maximum burden of disease.

Advantage of Screening

00:07:48

- Identifies disease in its early stage.
- Provide timely treatment for prolonged survival.

HYP: Screening is at which level of prevention?

Secondary level of prevention

Early diagnosis before the person presents with signs and symptoms to provide timely treatment.

Difference between a screening test and diagnostic test

00:10:49

ST	DT
1. Done on apparently healthy people	1. Done on those who are sick.
2. Applied to groups.	2. Applied on individuals
3. Test results are arbitrary, and final	3. Diagnosis is not final but modified in the light of new evidence/ sum of evidence.

4. Based on one criterion or cut-off value,	4. Based on the evaluation of signs and symptoms and lab findings.
5. Less accurate	5. More accurate
6. Less expensive	6. More expensive
7. It cannot be used as a basis for treatment	7. It can be used as a basis for treatment.
8. Initiative comes from govt organization	8. The initiative comes from the patient.

Q. A characteristic of a diagnostic test as compared to a screening test is:

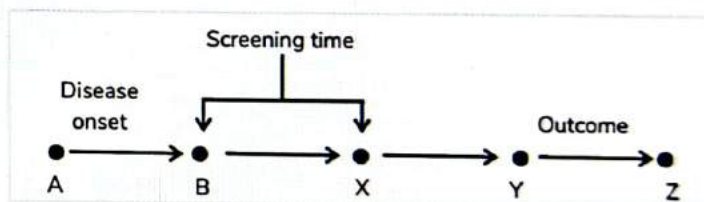
- a. Test results are arbitrary and final
- b. Based on the criterion or cut-off point,
- c. Less accurate
- d. Done on those with indication or sick.

Q. Screening test has the following features except

- a. Done on apparently healthy population
- b. It is less accurate
- c. Test results are arbitrary and final
- d. It can be used as a basis for treatment

Lead Time

00:21:24



- A is the point of disease onset
- B- 1st point of detection (no signs and symptom)
- X- a critical point of detection
- Y- usual time of diagnosis
- B - Y -> lead time (early detection of the disease)
- B - X -> Screening time

HYP

- Time gained by early detection of disease: lead time
- Time difference between the earlier possible point of diagnosis and critical point of diagnosis: screening time
- Time difference between the earliest possible point of diagnosis and point of diagnosis: lead time.

Lead time bias:

- When a disease is detected before symptom development, but the treatment does not make the patient live longer, it appears as life expectancy increases, but really it was simply detected earlier.

Lead time bias arises when:

- No treatment for the disease available
- Or there is no change in the prognosis of diseases; simply an easy diagnosis of a disease would mean an apparent increase in survival due to detecting a health condition like cancer at an early stage. Meanwhile, there is no actual effect on survival; instead, there is just a longer period with diagnosis.
- Subjects the patient to added anxiety as the patient has to live with the knowledge of the disease.
- Distort the result and appear to decrease mortality rates or increase survival rates.

Q. Which diseases are suitable for screening?**Ans.**

1. Diseases should be an important public health problem.
2. Natural history of the disease should be clearly understood from the latest phase to the developed disease.
3. Prolonged latent phase so that it will be possible to apply a screening test.
4. Test to detect the presence of disease before developing signs and symptoms.
5. Facility available to confirm the diagnosis.
6. Treatment should be available.
7. Evidence shows that early detection and timely treatment will reduce mortality and morbidity due to disease.

Q. Screening for condition recommended when

- a. Low case fatality rate
- b. Diagnostic tools not available
- c. No effective treatment possible
- d. **Early diagnosis can change the disease course because of effective treatment.**

Types of Screening Test

00:36:13

Mass screening

- All individuals are screened irrespective of higher risk.
- This is the least efficient type of screening.

High-risk screening (Selective screening)

- Only high-risk individuals are screened.
 - Screened only the elderly for hypertension.
 - The screen is only lower socio-economic for TB.
 - Screen women for breast cancer who have a family history of breast cancer.
 - A most efficient form of screening.

Multiphase screening

- Application of 2 or more screening tests in combination to a large number of people at one time to detect a single disease.
- Health camp for cervical cancer
 - Questionnaire
 - Pap smear
 - Visual inspection

Multipurpose screening

- Screen the population with more than one test done simultaneously to detect more than one disease.
- Screening of pregnant females,
 - Hemoglobin
 - RA
 - HIV
 - VDRL
 - HbsAg

Case finding or opportunistic screening

- This presumptive identification was not raised at the patient's request.
 - Screen everyone above 30 for hypertension

 1. Random blood sugar for people residing in an urban slum? Mass screening
 2. Screening for CVD in the elderly? High risk
 3. Screening for TB in resettlement colonies? High risk
 4. Screening for cervical cancer in lower socio-economic status? High risk
 5. Annual health checkups? Multiphase screening
 6. Health camps? Multiphase screening
 7. Screening of pregnant women? Multipurpose screening

Example of screening tests

00:46:14

- Blood cholesterol - Heart disease
- HIV - ERS
- BSE (less than 40 yr) and Mammography
- PSA - Prostate cancer
- VIA, PAP test, LBCC - Cervical cancer
- Glucose tolerance test - Diabetes Mellitus
- Tandem mass spectroscopy - Phenyl ketonemia
- TSH, T4 (Umbilical cord blood) - Hypothyroidism
- Bimanual oral inspection - Cancer
- Alpha-fetoprotein - Congenital defects

Key Points

- Least efficient type of screening - mass screening
- Very costly with reduced yield - mass screening
- Most efficient type of screening - high risk
- Economical use of resources - high risk
- No substantial benefit to the population in terms of mortality and morbidity reduction - multi-phase

- Increase cost of health services without any substantial observable benefit - multi-phase

Categories of screening

00:48:53

- Prescriptive screening - done for one's own benefit
- Prospective screening (presumptive, predictive screening) - done for others' benefit

Difference between prospective and prescriptive screening

Prescriptive screening	Prospective screening
Own benefit	Others benefit
Secondary level of prevention	Primary level of prevention
Early case identification	Control of disease
Eg: screening a natal for hypothyroidism	Eg: screening migrant people

Examples of prescriptive screening:

- Screening neonates for neonatal hypothyroidism
- Deafness in children
- Blood glucose testing for diabetes mellitus
- Mammography for breast cancer
- PAP smear for cervical cancer
- Visual acuity for refractive errors.

Examples of prospective screening:

- Screening of immigrants for infections diseases like TB and COVID
- HIV screening for blood donation
- HIV screening in ANC cases
- Health checkups for persons working in a food industry

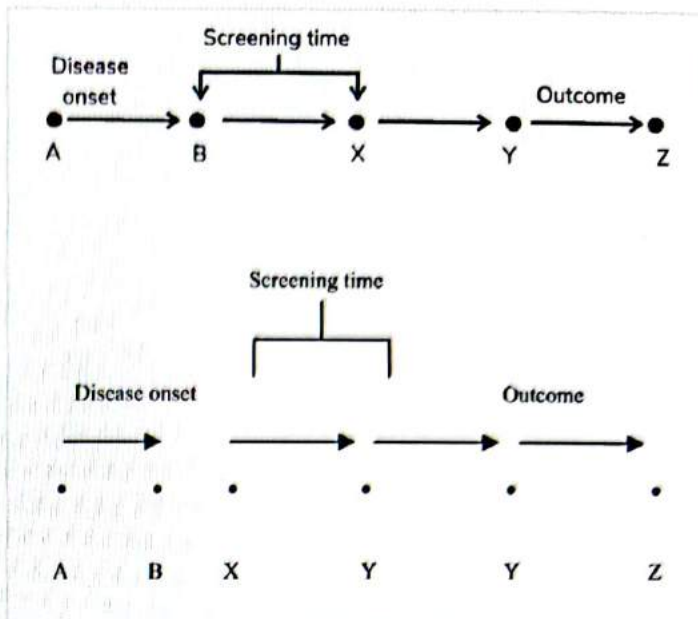
Q. Lead time refers to the time between

- Disease onset and first critical diagnosis
- Disease onset and first possible point of detection
- A first possible point of detection and final critical point
- A first possible point of detection and usual time of diagnosis**

Q. Screening of immigrants to protect the home population is an example of

- High-risk screening
- Prospective screening**
- Prescriptive screening
- Periodic health examinations

Q. In the following figure, which point is the usual time of diagnosis



- A
- B
- X
- Y**

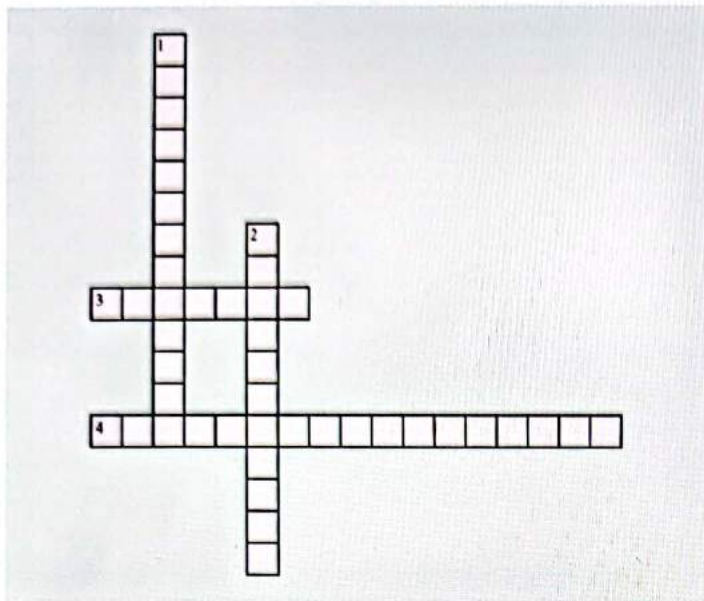
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Hidden portion has the maximum burden of disease.
- 4. The screen is only lower socio-economic for TB.

Down

- 1. All individuals are screened irrespective of higher risk. This is the least efficient type of screening.
- 2. The purpose is to discover the disease before the person presents signs and symptoms.



Properties of a screening test

00:01:17

- Screening is trying to help us identify different diseases before the person goes on to present signs and symptoms.
- Three properties -
 - Acceptability
 - Reliability /Reproducibility/ Repeatability / Consistency /Precision
 - Validity /Accuracy

Acceptability

- Acceptability means the test should not be embarrassing.

Reliability

00:03:04

- Also known as Reproducibility/ Repeatability / Consistency / Precision.
- Findings have to be repeatable when performed by different observers or even performed by the same observers in similar settings.
- Depends on three factors:

Observer variation

- Intra - observer variability -
 - Differences in repeated measurement within the same observer on the same subject or material at the same time.
- Inter-observer variation -
 - variation between different observers on the same subject or material. Inconsistency in the way different observers apply or interpret results.

Key Point:

- Within observer variation - Intra-observer variability
- Between observer variation - Inter-observer variability

Example:

Q. One observer examines a blood smear and finds a malaria parasite, while the second observer examines the same slide and finds it normal.

Ans: Inter-observer variability as it is between two different observer

Q. Interobserver variations can be reduced by:

- Rigorous training of all observers
- Standardized procedures and protocols for obtaining measurements and classifications
- Making use of two or more observers for independent assessment

Biological (subject) variation:

- Changes in parameter observed
- Variations in the way patients perceive their symptoms
- Regression to the mean
- E.g., blood pressure

Errors related to technical methods:

- Defective instruments
- Faulty reagents

Tests for precision

- R charts
- LJ charts

Validity (Accuracy)

00:09:38

- Ability of a screening test to differentiate disease from nondisease.
- Measure of degree of closeness to the true value or gold standard value -
 - It means how close the screening test result is to the gold standard result.
- Test for accuracy: Mean chart, Levy Jenning (LJ) chart, Shewhart control chart
- Validity of a screening test has two components:

Assessment of a screening test

00:12:27

Sensitivity -

- Ability of a screening test to identify correctly all those who have the disease. We want to identify true positives. The disease will be on the column side of a table.

Result of a Screening Test	Disease	
	Yes	No
+ve	a	b
-ve	c	d

- A - those who have the disease and screening test is positive. They are known as TP (true positive).
- B - those who do not have the disease and the screening test result is positive. They are known as FP (False positive).
- C - the disease is present, but the screening test shows negative. They are known as FN (False Negative).
- D - the disease is not present, and the screening test shows negative. They are known as True Negative.
- Sensitivity Formula = $\frac{a}{(a+c)} \times 100$
= TP/(TP + FN)

- ST → Sensitivity = 90%
- If an ST is applied to 100 diseased people, it will identify 90 as true positives and the remaining 10 as false negatives.

Specificity

- Ability of a screening test to identify correctly all those who do not have the disease.

Result of a Screening Test	Disease	
	Yes	No
+ve	a	b
-ve	c	d

- Specificity Formula = $d/(b+d)$
= $TN/(TN+FP) \times 100$
- ST → Specificity = 90%
- If an ST is applied to 100 non-diseased people, it will identify 90 as true negatives and the remaining 10 as false positives.

Q. Which one is the most useful property of a screening test?

It should have good sensitivity.

A screening test should have good sensitivity and fair specificity.

Positive Predictive Value

00:25:40

- Out of all the tested positive for ST, how many actually have the disease?

Result of a Screening Test	Disease	
	Yes	No
+ve	a	b
-ve	c	d

- $PPN = TP/(TP+PP) \times 100$

Negative Predictive Value

- How many do not have the disease
- $NPV = TN/(TN+FN) \times 100$

Q. The ability of a screening test to identify correctly all those who have the disease?

- Specificity
- Sensitivity**
- Positive predictive value
- Negative predictive value

Q. Probability of a person out of those who tested positive on a screening test has, in fact, the disease known as?

- Sensitivity
- Specificity
- Positive predictive value**
- Negative predictive value

Note:

- Sensitivity - those who have disease
- Specificity - those who do not have disease
- Positive predictive value - positive and actually have disease
- Negative predictive value - negative who does not have disease

Q. Which of the following is sensitivity?

- TN/TN+FP
- TN/TN+FN
- TP/TP+FN**
- TP/TP+FP

Q. For the calculation of the negative predictive value of the screening test, the denominator is comprised of:

- True negative - False negative
- False positive - True negative
- True positive - False positive
- True positive - True Negative

Q. If a test is 90% specific, then:

- 90% of disease persons will be the positive
- 10% of diseases people will be false negative
- 90% of non disease persons will be negative**
- 10% of non disease persons will be false negative

Q. Ideal screening test should be?

- Safe
- Reliable
- Valid
- All of the above**

Q. Reliability of screening does not mean

- Reproducibility
- Recision
- Repeatability
- Validity**

Q. Diagnostic power of test is reflected by

- Sensitivity
- Specificity
- Predictive value**
- Attribute risk

Q. Most important factor for a good screening test:

- a. Specificity
- b. Sensitivity
- c. Reliability
- d. Predictive value

Q. Out of 1000 population a screening test found 90 to be diabetic correctly, y Then a gold standard test during 100 to be diabetic. What is the sensitivity of the test?

- a. 90/100
- b. 1000/110
- c. 80/100
- d. 100/100

Q. Calculate sensitivity and specificity of ELISA in a population screened for HIV, data is given below:

Result of a Screening Test	Disease	
	HIV Present	HIV Absent
ELISA +ve	80	40
ELISA -ve	20	60

- a. 60% 80%
- b. 80% 60%
- c. 66.6.% 75%
- d. 75% 66.6. %

Q. A screening test was positive in 50% of diseases and 10% of a healthy population. What is the specificity of the test?

- a. 0.5
- b. 0.9
- c. 0.83
- d. 0.064

• Validity Formula = $(TP + TN) / (TP + FP + FN + TN) \times 100$

Accuracy Vs precision

00:39:54

- The central point indicates the gold standard value. It should come closer to the true value.
- Accuracy - closeness to true value
- Precision - findings replaceable
- A is the best. Every line is hitting the central point. So, it is exactly at the gold standard value.
- B has every time we get the same finding, but it is far from the true value. So, true/gold standard value. But not accurate.
- It is accurate as the ST result is closer to the true value in the first circle. It is not precise.
- It is not precise or accurate.

Q. A test which produces similar results when repeated by values obtained are not close to the actual. This test will be termed as?

- a. Precise but inaccurate
- b. Precise and accurate
- c. Imprecise and accurate
- d. Imprecise and inaccurate

Q. A senior resident was trained during her graduation to examine the palpebral conjunctiva for anemia. She uses that method to identify anemia in a patient. This method of detecting anemia?

- a. Lacks reliability
- b. Lacks validity
- c. Lacks both validity and reliability
- d. Has both adequate validity and reliability

Predictive accuracy:

- Performance of a screening test depends on:
 - Sensitivity
 - Specificity
 - No of people participating

Relation of predictive values with the prevalence of a disease

00:46:52

- PPV directly proportional to prevalence
- NPV indirectly proportional to prevalence

Example:

Q. Prevalence of Hypertension in the community decreased from 80% to 50%. Which parameter/ statement is most appropriate?

- a. Affects both sensitivity specificity
- b. PPV increased
- c. Both PPV and NPV increased
- d. PPV decreased
- e. NPV decreased

Golden point:

- If the prevalence of a certain disease increases there is going to be fewer false positives.
- Higher prevalence -> Higher PPV
- Less FP -> Increased specificity

Yield of a screening test

00:51:50

- The amount of disease that was previously unrecognized is now recognized because of a screening test in place.

• The yield of the screening test depends on:

- Sensitivity
- Specificity
- Prevalence
- No of participants

Q. All comprise inherent properties of a screening test except?

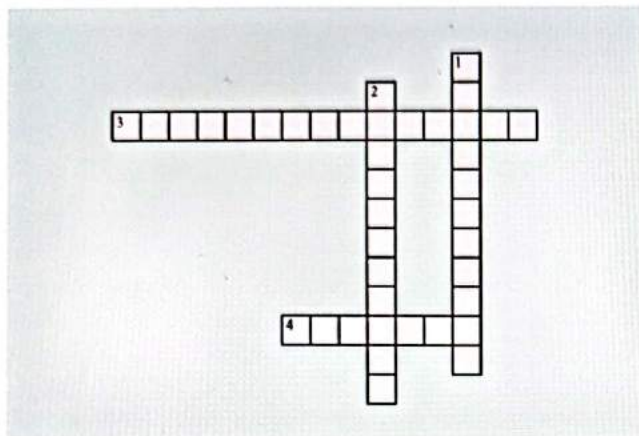
- a. Sensitivity
- b. Specificity
- c. Yield
- d. Predictive accuracy



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Diagnostic power of test is reflected by
- 4. Ability of a screening test to differentiate disease from nondisease.

Down

- 1. Findings have to be repeatable when performed by different observers or even performed by the same observers in similar settings.
- 2. The ability of a screening test to identify correctly all those who have the disease

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Series vs Parallel

00:00:48

Test in Series (Sequential Testing/Two Stage Testing)

- Any individual is subjected to the first test (screening test), and those who test positive will undergo the other test.
- A person will be **considered diseased** if all the test **results are positive**. Only one test cannot prove it.
- Suppose there is a community. We apply for the first screening test 1. And this test has a sensitivity (the ability of a screening test to identify all those who have the disease) of 90%. It means that if we apply the test to 100 diseased people and sensitivity is 90%. The **true positives** are 90 here.
- Now if I want to apply a second test. The second test will be applied only to those who tested positive on the application of the first test. If the sensitivity of the second test is also 90, the result will be 90% of 90. And the true positives will be decreased. In this way, the **sensitivity decreases**. And if sensitivity decreases, **specificity increases**. For a screening test to be a good test, it has to have **good sensitivity and fair specificity**. So, when we apply a test in Series, the sensitivity decreases and specificity increases.

Test in Parallel (Simultaneous Testing)

- It means that individuals will go through **all the tests at the same time**.
- The person will be considered diseased if any of the tests are positive. It is not required that all the **tests should be positive**.
- It means all tests have to be **applied simultaneously**.
- When all tests are applied simultaneously, the **sensitivity increases and specificity decreases**.

Golden Point

- Specificity is the ability of screening tests to identify all those who do not have the disease (TN / TN + FP)
- **Sensitivity = TN + FP**
- **Test in Series = TN more + FP less**
- If false positives are less - **High Prevalence, PPV increases**.
- **PPV is directly proportional to Prevalence**.
- **NPV is indirectly proportional to Prevalence**.
- The same reverse condition is followed in Test in Parallel- **sensitivity increases and specificity decreases**
- If **specificity decreases**, true negatives are less and false positives are more.
- **False positives are more when prevalence is less**.

- **Low false positives- more prevalence - PPV is more**

	Series	Parallel
Sensitivity	Decreases	Increases
Specificity	Increases	Decreases
PPV (Positive Productive Value)	More PPV	Less PPV
NPV (Negative Productive Value)	Less NPV	More PPV

Q. If two screening tests are used in Series, then there will be:

- Increased sensitivity and decreased specificity
- Increased specificity and decreased sensitivity**
- Increased sensitivity and increased specificity
- Decreased sensitivity and decreased specificity

Screening of Syphilis

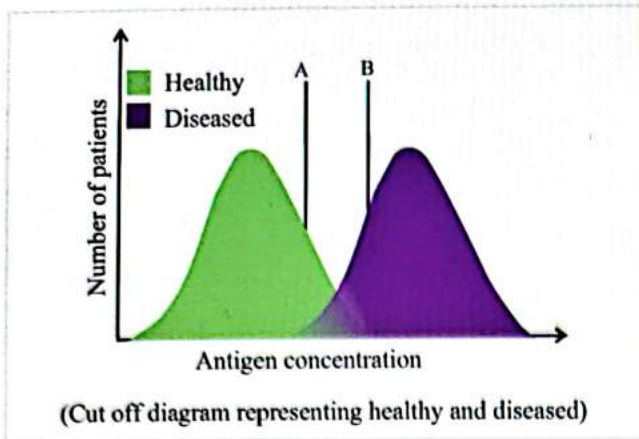
The RPR test is done first. All those positives on RPR are submitted to FTA-ABS.

- First, RPR is done. And all those who tested positive are submitted to the next test. So, the second test is only done for those who had tested positive, which means Test in Series. A person will be considered diseased when **both tests are positive**.

Deciding Cut off of a Screening Test

00:20:32

- Ideal situation of a screening test would be required to be **100% sensitive and 100% specific**.
- Suppose the cut-off here is 120-80. For all who scored > 120/80, it means screening test positive (True Positives). For all who scored < 120/80, this means the screening test is negative (True Negatives). It means the test has all those who are positive and negative. But this is **not possible for a test**. Whenever a screening test detects **True Positives**, it will also detect some **False negatives**. Similarly, whenever a screening test detects **True Negatives**, it will also detect some **False Positives**.



- Suppose the cut-off is in the center. If you are on the lesser side of the cut off line, then you are a true positive. Along with True Positives, False negatives would be present on the left side. Similarly, those who are getting less than the cut-off will be True negatives. So, for them, False positives would be on the right side.
- Suppose a cut-off is increased from O to B. One part of the cut-off is True Positives with False negatives on the opposite side, and another part will be True Negatives with False Positives on the opposite side. When the cut-off is increased from O to B, the left side increases, which means True Negatives will increase, which results in an increase in Specificity. So, automatically the False positives will be decreased.
- Suppose a cut-off is decreased or lowered. One part of the cut-off is True Positives with False negatives on the opposite side, and the other part will be True Negatives with False Positives on the opposite side. When we lower the cut-off, the right part will increase, which means True Positives increase which results in an increase in Sensitivity. And automatically, the False negatives will be decreased.

Golden Point

- If the cut-off of a screening test is lowered- Sensitivity increases and Specificity decreases. If the cut-off of a screening test is raised- Sensitivity decreases and Specificity increases.

Factors that Decide Cut-Off

- **Disease Prevalence:** if prevalence is high, the cut-off is set at a lower level.
- If the disease is lethal and early detection improves prognosis, the cut-off is set at a lower level.

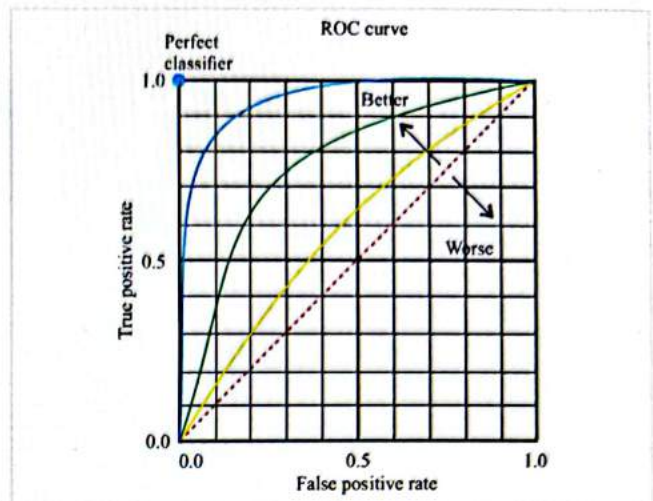
Q. If the cut off point of a screening test is lowered, then:

- Sensitivity increased, Specificity decreased
- Sensitivity increased, Specificity increased
- Sensitivity decreased, Specificity decreased

d. Sensitivity decreased, Specificity increased

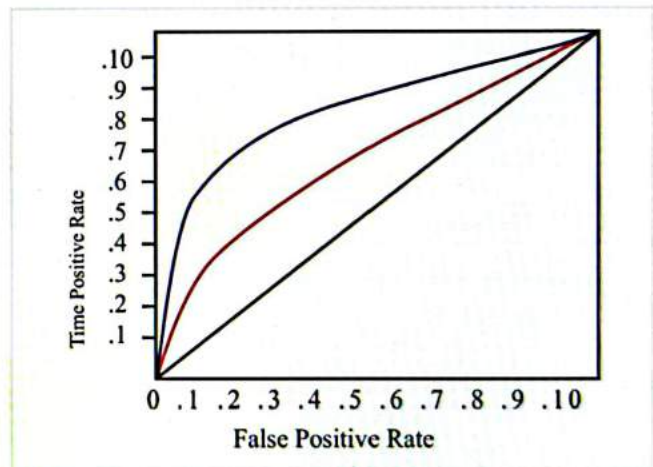
ROC Curve (Receiver Operating Curve)

00:36:45



- It is a plot that depicts the trade-off between sensitivity and (1-specificity) across the series of cut-off points when the diagnostic test is continuous or an ordinal scale.
- 2 or more diagnostic tests can be visually compared on ROC.
- Effective method for assessing the performance of a diagnostic test.

Interpreting the ROC Curve



(ROC Curve with example curves to compare them)

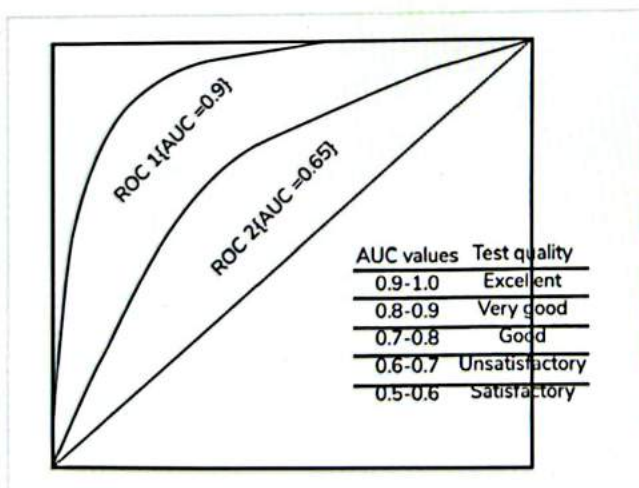
- Curve A has maximum sensitivity and the lowest false positive.
- Best investigation in one which has the curve which is most upward and left on ROC.
- Any relevance of the area under the ROC curve? Yes, whichever curve has the maximum area under it is the best.

- Area under the ROC curve is an effective measure of the inherent validity of a diagnostic test.
- Index used to represent the area under the curve: **YOUDEN'S Curve**
- **YOUDEN'S index** summarizes the performance of a diagnostic test.
 - Value ranges from 0-1.
 - 0 = not useful test; 1 = highly useful test
 - A value of 1 indicates that there are no false positives or false negatives, i.e., the test is perfect.
 - Higher the **YOUDEN'S INDEX**, the better the test for a particular condition.
- **YOUDEN'S Index = Sensitivity / Specificity - 1**
- 1 is the **perfect classifier**. Up to 0.6 is **satisfactory**.

AUC Values	Test Quality
0.9-1	Excellent
0.8-0.9	Very Good
0.7-0.8	Good
0.6-0.7	Satisfactory
0.5-0.6	Unsatisfactory

Use of ROC Curve

- Deciding the optimal cut-off points to prevent misclassifying diseased or non-diseased subjects.
- Compare the efficiency of two or more tests for assessing the same disease.
- Compare interobserver variability.



Q. New Hepatitis B virus-specific serologies are developed by different research laboratories. The test performance characteristics are used to create the receiver operator curve, as shown in the image. What does X-axis represent?

- a. True negatives

- b. Prevalence of disease
c. False negatives
d. **False Positives**

Survival Analysis

00:45:22

Kaplan Meier Survival Analysis

- Screening test was applied to identify the disease early in its natural history. Give timely treatment and prolonged survival. So, for people who have not gone through screening tests and now have developed the disease, the chance of survival decreases.

To show that **Kaplan Meier Survival Analysis** is plotted-

Diagram

00:46:23

- Depict the fraction of patients who are alive for, for example, one year after the onset of treatment.
- Estimating the survival is complicated by the fact that while some patients may still be alive at the end of the study, others may have dropped out of the study early.
- Plotted to know about the **survival analysis**.
- The latter is also known as "censored observations" and are typically noted by tick marks on the estimated K-M curve. The Kaplan-Meier approach estimates the survival curve in the presence of **censored observation**.
 - Suppose we started with a fixed number of people and subjected them to screening tests, and we wanted to see if they were going to remain alive after treatment at the end of 6 months or a year. But some of them **dropped in between**; those are known as censored observations.
- Log rank test (Statistical test) to compare survival curves between two or more groups.

Likelihood Ratio

00:49:05

- It is the likelihood that a given test result would be expected in a patient with a **target disorder** compared to the likelihood that the same result would be expected in a patient **without the target disorder**.
 - Interpret diagnostic test
 - It points out how likely a patient has a disease or condition.
 - Higher the ratio, the more likely a patient has a disease or condition.
 - Lower the ratio, the less likely a patient has a disease or condition.

Positive LR = Sensitivity / 1 - Specificity

- Demonstrates how much to increase the probability of having a disease-positive test result.
- **Positive LR = (probability a person with the condition test positive) / (probability a person without the condition test positive)**
- **Positive LR = (Probability of TP) / (Probability of FP)**

Negative LR = 1-sensitivity / specificity

- Demonstrates how much to decrease the probability of having a disease given a negative test result.
- **Positive LR = (probability a person with the condition test negative) / (probability a person without the condition test negative)**
- **Positive LR = (Probability of TN) / (Probability of FN)**
- Likelihood ratio can be used to find Pre and Post-test Probability of the test.
 - Pre-test odds correspond to the Prevalence of a disease
 - Odds of a person having the disease → $p = 1-p$
 - Post-test Probability of a positive test is the odds of a person having the disease with a positive test.
 - Post-test Probability is the positive predictive value.

Bayes Formula

- **Positive Predictive Value**
 - $\text{Sensitivity} \times \text{Prevalence} / (\text{Sensitivity} \times \text{Prevalence}) + (1 - \text{Specificity}) \times (1 - \text{Prevalence}) \times 100$
- **Negative Predictive Value**
 - $\text{Sensitivity} \times (1 - \text{Prevalence}) / (\text{Sensitivity} \times (1 - \text{Prevalence})) + (1 - \text{Specificity}) \times (\text{Prevalence}) \times 100$

Cronbach's alpha (Reliability Coefficient) 00:54:19

- Most common measure of internal consistency or reliability.
- Multiple Likert questions in a survey/questionnaire can form a scale, and the reliability of the scale can be determined by Cronbach's alpha.
- Internal consistency should be determined before a test can be employed for research or examination purposes to ensure validity.
- Expressed between 0 & 1.
- Value of Cronbach's alpha is not acceptable less than 0.5.

Key Points

- Survival Analysis: Kaplan Meier curve
- Interobserver variation = Cohen's kappa (Kappa statistical measures interobserver measures)
- Reliability coefficient = Cronbach's alpha
- Ideal cut off: ROC curve
- Performance of a diagnostic test: ROC curve

Cronbach's Alpha	Internal Consistency
Alpha >= 0.9	Excellent
0.9 > alpha > 0.8	Good
0.8 > alpha > 0.7	Acceptable
0.7 > alpha > 0.6	Questionable
0.6 > alpha > 0.5	Poor
0.5 > alpha	Unacceptable

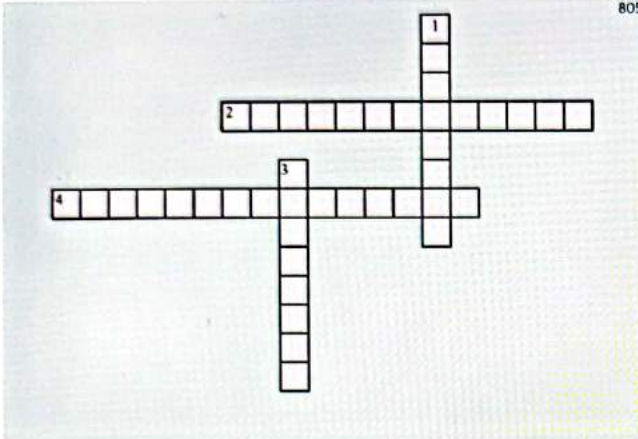
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CROSS WORD PUZZLES



Crossword Puzzle



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Across

- 2. Most common measure of internal consistency or reliability.
- 4. Target disorder compared to the likelihood that the same result would be expected in a patient without the target disorder.

Down

- 1. The RPR test is done first. All those positives on RPR are submitted to FTA-ABS.
- 3. Effective method for assessing the performance of a diagnostic test.



PREVIOUS YEAR QUESTIONS



Q. Best breast cancer prevention level is?

(NEET 2019)

- A. Specific protection
- B. Early diagnosis and treatment**
- C. Disability limitation
- D. Rehabilitation

Q. Probability that a person out of those who tested positive on a screening test has in fact, the disease is known as?

(NEET 2019)

- A. Sensitivity
- B. Specificity
- C. Positive predictive value**
- D. Negative predictive value



27

DEMOGRAPHY

- Epidemiology is the study of diseases.
- Demography is the study of the population.
 - A population's **size, composition, and distribution** are studied in demography.
- The size of a population is its growth or decline over time. For example, India's population is continuously growing, currently 1.4 billion-plus.
- A population's composition is its percentage of males and females, children vs. adults, etc.
- Distribution is the geographical segregation of the population. In India, the majority of the population resides in rural areas.

Demographic Processes

00:03:12

Demographic processes govern the changes in the demographic structure of the population.

- Demographic processes govern the changes in the demographic structure of the population.
- These include things that affect a population's size, composition, and distribution. **Marriage**
 - **Fertility**
 - **Migration**
 - **Mortality**
 - **Social Mobility**: It is a movement at socioeconomic levels.

Important Question

Q. Demographic Processes does not include:

- Fertility
- Morbidity
- Mortality
- Social Mobility

- **Morbidity** is not included in the demographic processes.
- It's because the parameters of morbidity deal with sickness-related incidents. It doesn't bring about any change in demography unless there's mortality.

Demographic Gap

00:06:50

- The demographic gap is **Crude Birth Rate (CBR) - Crude Death Rate (CDR)**.
- CBR is the total number of live births per thousand estimated mid-year population.
- The mid-year population is considered on the **1st of July**.
- India's current CBR is **19.5/1000 MYP**.
- CDR is the total number of deaths per thousand estimated

mid-year population. It gives a rough estimate of the rate at which people are dying.

- "**Crude**" is a rough measure because it doesn't consider the age and sex composition of a population.
- India's current CBR is **6/1000 MYP**.

GOLDEN POINT

World population day is the 11th of July.

Demographic Transition Model

00:12:35

- It reflects changes/transitions that a country or defined population undergoes as overall development takes place over time.
- The demographic gap governs the demographic transition model.

Stage I: High Stationary

- When a country forms, birth and death rates are both high (CBR and CDR).
- Its population is stable.
- As a country progresses, healthcare services get better, and the CDR rate declines while CBR is still high.

Stage II: Early Expanding

- The population is increasing at a very rapid rate.

Stage III: Late Expanding

- Hospital services get better. CDR continues to decline.
- CBR starts to decline due to family planning services put in place.
- The population still expands but at a slower rate.

Stage IV: Low Stationary

- Hospital services are further revolutionised.
- CDR declines even more.
- There's an improvisation of family planning services, so the birth rate declines as well.
- Both CBR and CDR are low.
- The population is again stable.

Stage V: Declining Phase

- There's an extent to which hospital services can be improved.
- The death rate becomes stable with a slow decline, whereas the birth rate keeps declining.
- Family planning services are much more efficient now.
- So, **CBR < CDR**.

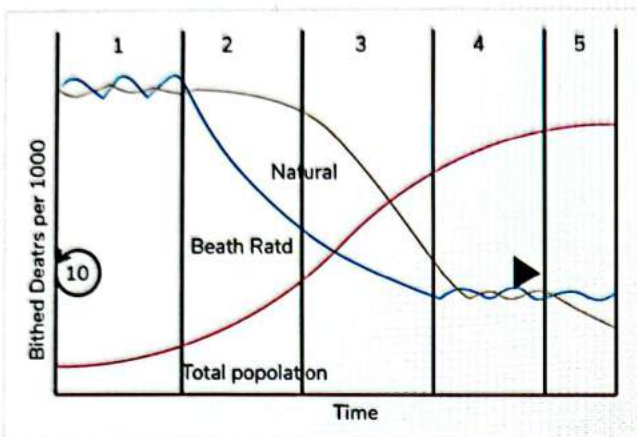
Important Questions

Q. What is the stage that no country would want to be in?

The answer is **Stage II: Early Expanding**. It's called a **demographic trap**.

Q. Which stage is the most desirable for any country?

The answer is **Stage IV: Low Stationary**. A stable population with low CDR and CBR.



- The graph shown above depicts all the stages in a transition model.
- The X-axis is the total population, and Y-axis is the births/deaths per thousand.
- The blue line represents the crude birth rate, whereas the orange line represents the crude death rate.
- In stage I, both death and birth rates are high. The population is stable.
- In stage II, CDR starts to decline, but the birth rate is still high.
- In stage III, CDR keeps declining, and CBR starts to decline.
- In stage IV: Both CDR and CBR become low. The population has become stable.
- In stage V, the death rate becomes stable or declines at a slower rate. CBR becomes less than CDR.

Important Questions

Q. Where's the demographic gap minimum?

It's minimum in **stages I and IV**.

Q. Where's the demographic gap maximum?

The demographic gap is maximum in **late stage II**.

Q. When does the demographic gap start contracting?

The demographic gap starts contracting in the **early stage III**.

Q. Where is the demographic gap negative?

The demographic gap is negative in **stage V**.

Q. India is currently in which phase and why?

- India is currently in the **late expanding phase**.
- That means the population is growing in India at a slower rate.
- The current CBR has come to 19.5 from 30, and the birth rate to 6. So, the birth rate is declining at a slower rate than the death rate or vice versa.
- The death rate is declining at a faster rate than the birth date.

Stage	Countries
I (High stationary)	India till 1920
II (Early expanding)	African and South Asian countries
III (Late expanding)	India
IV (Low stationary)	Austria, Denmark, Sweden
V (Declining)	Germany, Hungary, UK, Japan, Spain, Italy

- The table shown above conveys information about the different stages of the transition model for different countries.

Important Definitions

00:38:45

- **Demographic Transition:** A transition from high CBR and CDR to low CBR and CDR. Countries progress from high birth and death rates to low birth and death rates.
- **Demographic Trap:** It means that a country gets trapped in stage II: Early Expanding. CBR is high, and CDR starts to decline.
- **Epidemiological Transition:** It refers to the transition from an era of communicable diseases to **non-communicable diseases**.
- **Growth Rate (GR):** It is the change in population over time and can be quantified as the 'change in the number of individuals in a population per unit of time.'

Rate/phase	AGR	Population doubling time
Stationary	No growth	
Slow growth	<0.5	>139 years
Moderate growth	0.5-1	139-70
Rapid growth	1 - 1.5	70 - 47
Very rapid	1.5 - 2	47 - 35
Explosive or population explosion	>2	35 - 18

- **Annual Growth Rate (AGR):** It is the average population growth in a year. In 2021, India reported an AGR of 0.97%.
- As per the table above, India's growth rate is moderate, between 0.5 and 1 AGR, and the doubling time is 139-70 years. Earlier, the AGR was above 1.5, or the doubling time was also lower.

Population Growth Models

00:43:33

Malthusian Growth Model

- It's a simple exponential growth model.
- This model tells us when the population of a country is expected to double.
- **Rule of 70** is followed here. 70 is a constant, and the denominator is the annual growth rate.
- For example, the population of country X in 1992 is 1.2 billion and its AGR is 2%. When will the population of country X double? The Malthusian formula, $70/AGR$, will solve the problem. $70/2 = 35$ years is the answer. In the next 35 years, the population of this country is expected to double. So, by 2028, the population of this country will double.
- If the AGR of a country is 1, its population doubling time becomes 70 years.

Important Questions

Q. Movement of socioeconomic level is?

- Social Equality
- **Social Mobility**
- Socio-economic upliftment
- Social mobilisation

The answer is social mobility.

Q. Demographic gap is maximum in which stage?

- Early part of stage 3
- **Late part of stage 2**
- Stage 1
- Stage 5

The answer is the late part of stage II.

Q. Late expanding stage of the population in India due to?

- Birth rate stationary, death rate continues to fall
- **The death rate declines faster than the birth rate**
- Birth rate declines, death rate same
- The birth rate is less than the death rate

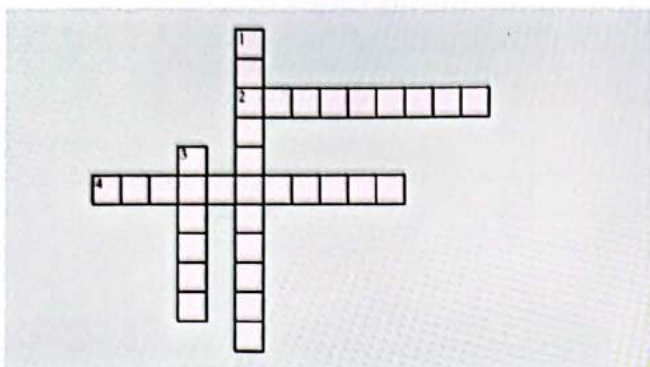
The answer is the death rate declines faster than the birth rate. It also means that the birth rate is declining slower than the death rate.



CROSS WORD PUZZLES



Crossword Puzzle 1



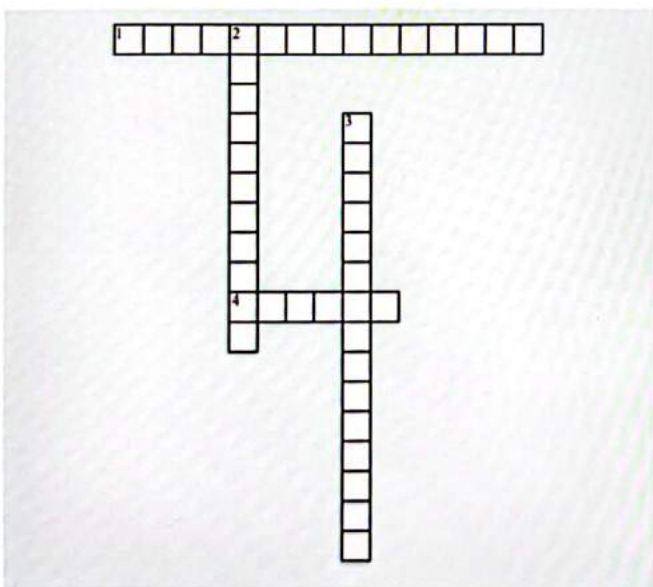
Across

- _____ is not included in the demographic processes.
- _____ processes govern the changes in the demographic structure of the population.

Down

- _____ gap is Crude Birth Rate (CBR) - Crude Death Rate (CDR).
- _____ mobility is movement at socioeconomic levels.

Crossword Puzzle 2



Across

- _____ Transition refers to the transition from an era of communicable diseases to non-communicable diseases.

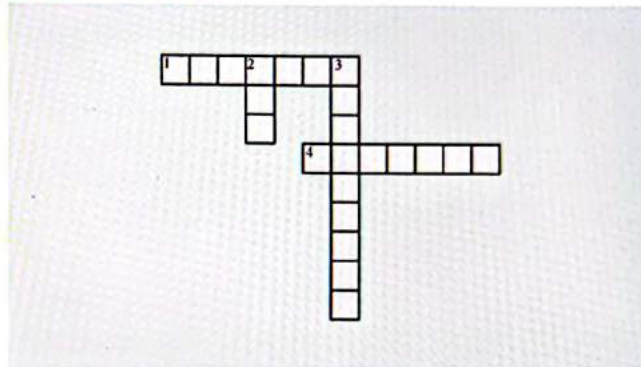
- 70 is a constant, and the denominator is the _____ growth rate.

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Down

- Malthusian Growth Model is a simple _____ growth model.
- _____ means that a country gets trapped in stage II: Early Expanding. CBR is high, and CDR starts to decline.

Crossword Puzzle 3



Across

- In stage II, CDR starts to _____, but the birth rate is still high.
- The demographic gap is _____ in late stage II.

Down

- In stage IV: Both CDR and CBR become _____. The population has become stable.
- India is currently in the late _____ phase.

28

INDICATORS OF DEMOGRAPHY



Population statistics

- Population size
- Sex ratio
- Literacy rate
- Dependency ratio
- Population density

00:01:42

Refer Diagram 28.1

Features	Image A	Image B
Country	• United states (Developed country)	• Nigeria (Developing country)
Base	• Narrow base (less fertility)	• Broad base (more fertility)
Apex	• Obtuse (more older people)	• Acute (few elder people)
Height of pyramid	• Taller (more life expectancy)	• Shorter (Less life expectancy)
Shape	• Spindle shape (more working population)	• Upward triangular (less working population)
Type of pyramid	• Constrictive	• Expanding
Span	• More life expectancy	• Less life expectancy
Symmetry (ideal sex ratio)	• Symmetrical	• Asymmetrical

Vital statistics (Important events of life)

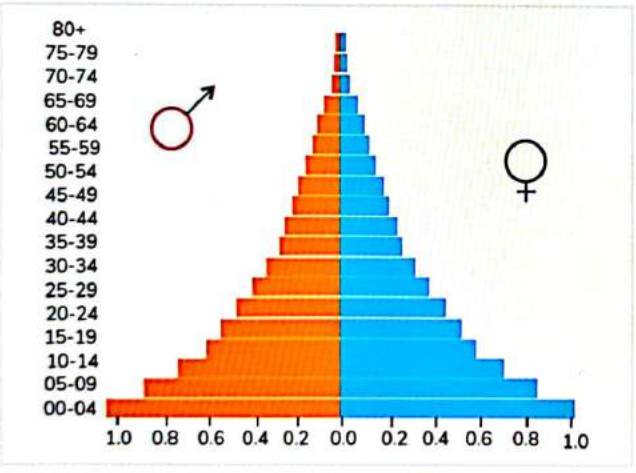
- Birth rate
- Natural growth rate
- Life expectancy at birth (positive mortality indicator)
- Mortality Rate
- Fertility Rate

Q. All are an example of population statistics except

- A. Population density
- B. Sex Ratio
- C. Literacy Rates
- D. Life expectancy at birth

Population Pyramids

- **Representation:** Age and sex composition or gender distribution of a population.
- Different pyramids are present in both developed and developing countries.



Explanation

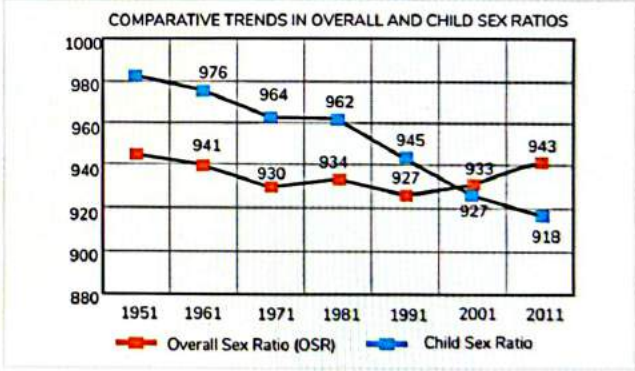
- **Shape:** Triangle PR upward pyramid (representing child to adult to elder)
- **Lower most:** Children
- **Middle:** Working class
- **Upper:** Elderly

Population statistics

Sex Ratio

00:16:04

- Number of females per 1000% no. of males



According to census 2011

- Overall sex ratio is 943
- Child sex ratio is 918

Child Sex Ratio

$$\frac{\text{No. of females children (0 - 6 years)}}{\text{No. of boy child (0 - 6 years) per 1000}}$$

- **Current sex ratio:** 1020 (first time in India)
- **Current child sex ratio:** 929 (India)

Female Deficit Syndrome

- **Other Name:** Adverse sex ratio
- Adverse sequel of gender inequality, gender preferences, poor political legislations which leads to an unstable population.
- If there are fewer no. of females per 1000 males.

Dependency Ratio

00:19:38

- $$\frac{\text{Children 0-14 years} + \text{Population >65 years age}}{\text{Population between 15-64 years age per 100}}$$
 - **Children 0-14 years:** Young age dependency
 - **Population >65 years age:** Old age dependency
 - **Population between 15-64 years age:** Working class
- Total dependency ratio: 48.27%
- Young age dependency ratio: 38.89%
- Old dependency ratio: 9.8% (increased due increased life expectancy, initially 8%)

Definitions (Expected MCQs)

00:22:23

Demographic Bonus: Connotes the period when the dependency ratio in a population declines because of decline in fertility until it starts to rise again because of increasing longevity.

Demographic Bonus	Demographic Burdens
<ul style="list-style-type: none"> • Bonus: Added advantage • Decline in dependency ratio due to decrease in fertility 	<ul style="list-style-type: none"> • Burden: Older people are considered • Increase in the total dependency ratio due to increased old-age dependency ratio

Demographic Burdens: Connotes the increase in the total dependency ratio during any period of time mostly caused by an increased old-age dependency ratio.

Demographic dividend: A rise in the rate of economic growth due to a rising share of working age people in a population.

Demographic Window: A period of time in a nation's demographic evolution when the proportion of the population of the working age group is particularly prominent.

Demographic gift: The initially favorable effect of falling fertility rates on the ratio of the working population to the dependent population.

Literacy Rate

00:29:28

- **Other Name:** Proved literacy rate
- **Literate:** Anyone who can read and write with an understanding of any one language.

- **Age:** 7 years and above (cut off)

$$\text{Effective Literacy Rate} = \frac{\text{No. of literates 7 years and above}}{\text{Total population (7 years and above)}} \times 100$$

- The National Family Health Survey 2019-21 (NFHS-5), points to a literacy rate amongst **adult women** (15-49 years) at **71.5%**, & **adult men** (15-49 years) at **87.4%**.
- **Average literacy rate (India):** 77.7% (National Statistical Office -2021)

Carrying Capacity

- Ecological habitat of a country sustains its current population.
- Maximum population size of a particular species that a given part of the environment can maintain indefinitely.

Overshooting Population

- Carrying capacity is not supporting the current population
- Population growing larger than the carrying capacity of its environment and uses resources faster than generated, degrades the environment, and
- Produces waste products faster than the environment can absorb without being degraded.

Population Density

00:33:34

- Ratio between the total population and surface area.
- The current population density of India in 2022 is **427.90** people per square kilometer.
- It is increased to **0.95% from 2021**.

Life Expectancy

- It comes under vital statistics.
- It is a positive mortality indicator.
- The average number of years a person of that age may expect to live according to the prevalent mortality pattern in that country.
- One of the best indicators of a country's development level and overall population health status.
- **India's current life expectancy** is 69.7.
- India targets to achieve an **expectancy of 72.6 years** by 2022.
- Helps calculate the human development index (**International comparisons**)
- HDI has a life expectancy at birth.

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Golden Points

Areas	Explanation
Isolated dwelling	Less than 10 families in a small area
Village	1000-2000 population headed by a panchayat
Small village	Up to a few 100 populations usually less than 600

Town	1000-20000 under the jurisdiction of a local governing body (municipality)
City or Large town	20000-100000 population under a municipal corporation
Block	Up to 100,000 population
Mega city	City with population >10 million or more

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MCQ

Q. Community X has 30% below 15 yrs of age and 10% over 65 years age. Dependency ratio for community X is:

- A. 20%
- B. 40%
- C. 66.0%
- D. 3%

Answer: 66.0%

Explanation:

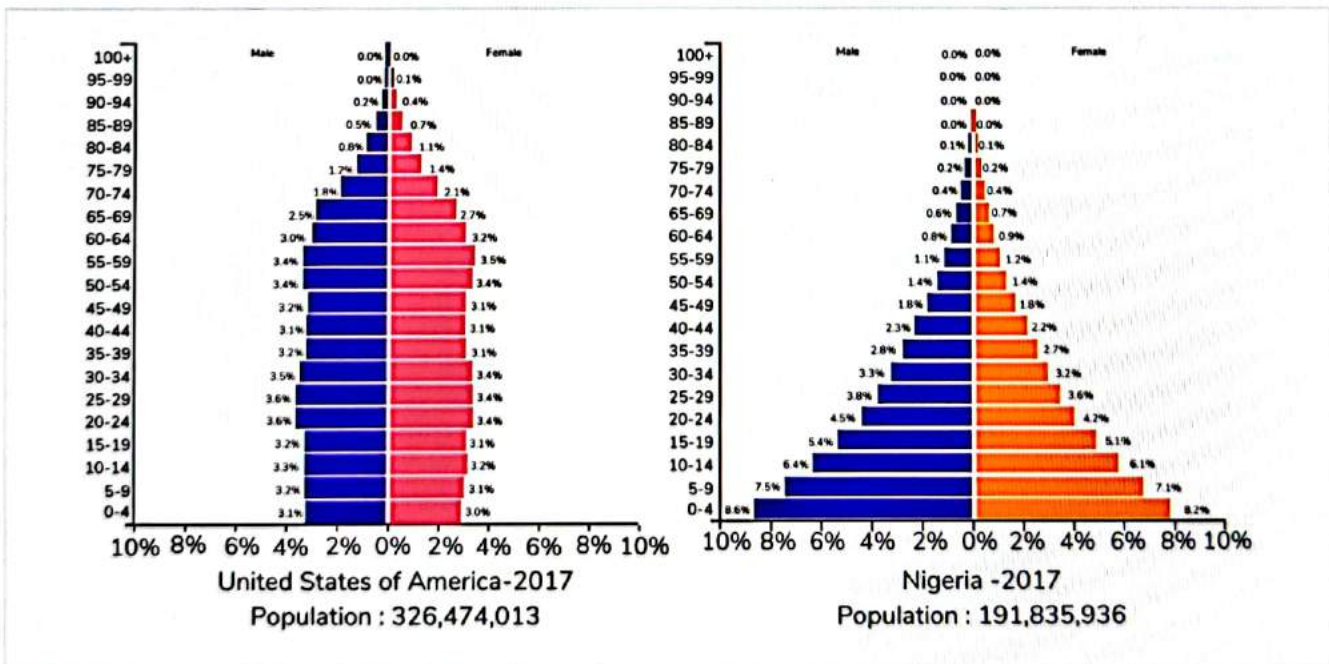
- Young age dependency: 30
- Old age dependency: 10
- Total dependence: 30 + 10 = 40
- Working class: 100 - 40 = 60

Dependency ratio: 40 divided by 60 × 100 = 66.6%

Difference between Urban and Rural Community 00:36:06

Rural Area	Urban Area
Population: Up to 5000	Population: > 5000
Agriculture sector: 75% is male working population	Non-Agriculture sector: 75% is male working population

Diagram 28.1

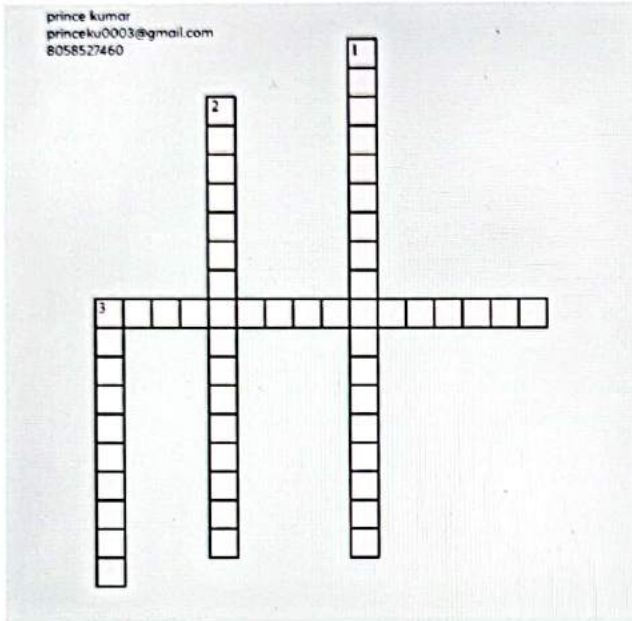




CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Decline in dependency ratio due to decrease in fertility

Down

- 1. Increase in the total dependency ratio due to increased old-age dependency ratio
- 2. Ecological habitat of a country sustains its current population.
- 3. In this we will come to know about Population Pyramid,

28 FERTILITY INDICATORS



CBR (Crude Birth Rate) 00:03:29

- CBR is the total number of live births in a year per 1000 estimated mid-year population.
- Mid-year population is measured on **1st July every year**.

$$CBR = \frac{\text{Total number of live births in a year}}{\text{Estimated Mid - year population}} \times 1000$$

- According to the latest SRS (sample registration system) in India currently the CBR is **19.5/1000** mid-year population.
- Simplest measure of fertility, without any specifications.
- Rough measure of fertility, it gives birth rates, and not everyone in the denominator is exposed to childbirth.

GFR (General Fertility Rate) 00:08:05

- GFR is the total number of live births in an area in a year per 1000 women in the reproductive age group (15-49 years) in a year.

$$GFR = \frac{\text{Total number of live births in an area in a year}}{\text{Women in the reproductive age group in a year}} \times 1000$$

- Not everyone in the reproductive age group is exposed to the risk of childbirth.

GMFR (General Marital Fertility Rate) 00:10:13

- GMFR is the number of live births in a year per thousand married women in the **reproductive age group** (15 to 49 years).

$$GMFR = \frac{\text{Number of live births in an area in a year}}{\text{Married women in reproductive age group}} \times 1000$$

ASFR (Age Specific Fertility Rate) 00:12:09

$$ASFR = \frac{\text{Number of live births in a particular age group}}{\text{Mid year female population in the same group}} \times 1000$$

Advantages of ASFR 00:26:55

- As a measure of age pattern of fertility, that is the relative frequency of a child being among different ages.
- As an intermediate computation in the derivation of TFR. Unlike CBR, ASFR is unaffected by:
 - Differences
 - Changes in population age composition
- ASFR gives **fertility trends of a country**.
- ASFR is more useful in comparing:
 - Different populations
 - Sub-groups of the same population.
 - Measuring changes in fertility over time in the same population.

ASMFR (Age Specific Marital Fertility Rate) 00:13:54

$$ASMFR = \frac{\text{Number of live births in a particular age group}}{\text{Mid year married female population in the same age group}} \times 1000$$

TFR (Total Fertility Rate) 00:16:15

- TFR is computed by summing age-specific fertility rates for all ages.
- TFR gives the average/ total number of children a woman will have throughout her reproductive age (15-49 years), bearing children at the same rate as the women in each age group.
- TFR is an indicator of **complete family size**.
- **Family size** is the number of children a woman has at a particular age in her reproductive age (15-49 years).

Q1. A 32-year woman has 3 children; what is her family size?

Ans: 3

- **Complete family size** is the number of children a woman will bear throughout her reproductive age (15-49 years).

Q2. A woman has 4 children till 49 years; what is her family size?

Ans: 4

- TFR is computed by the age-specific fertility rates for all ages, if 5-year age groups are used, then the sum of rates is multiplied by 5.

$$TFR = 5 \times \sum_{15-19}^{45-49} ASFR / 1000$$

- For the population of a country to stabilize, a TFR of 2.1 is required.
- It explains that every couple is giving birth to 2 children.
- For TFR to be 2.1, NRR (Net Reproduction Rate) must be equal to 1.
- NRR is equal to 1 when the contraceptive prevalence rate is >60%.

Q3. Which country's population is stabilized?

- TFR: 2.8
- TFR: 2.4
- TFR: 2.3
- TFR: 2.1

GRR (Gross Reproduction Rate) 00:27:47

- GRR is the average number of girls a woman will have throughout her reproductive age, considering the current age-specific fertility pattern and with no mortality.
- GRR is given by TFR for girl children.

NRR (Net Reproduction Rate) 00:29:40

- NRR is the number of daughters or girls a newborn girl will bear or will have throughout her reproductive lifespan, considering the current age-specific fertility patterns and mortality rates.
- NRR is a mortality dependent fertility indicator.

Recall:

- $CBR = \frac{\text{Total number of live births in a year}}{\text{Estimated Mid-year population}} \times 1000$
- $GFR = \frac{\text{Total number of live births in an area in an year}}{\text{Women in the reproductive age group in a year}} \times 1000$
- $GMFR = \frac{\text{Number of live births in an area in a year}}{\text{Married women in reproductive age group}} \times 1000$
- $ASFR = \frac{\text{Number of live births in a particular age group}}{\text{Mid year female population in the same group}} \times 1000$
- $ASMFR = \frac{\text{Number of live births in a particular age group}}{\text{Mid year married female population in the same age group}} \times 1000$
- TFR is the total number of children a woman will have throughout her reproductive life span.
- GRR is the total number of girls (15-49 years).
- NRR is the total number of girls remaining alive.

- Complete family size is the number of children a woman will bear throughout her reproductive age (15-49 years).

Q6. In demography, family size means?

- Total number of persons in a family
- Total number of children in a family
- Total number of women in a family
- Total number of women in the reproductive age group (15-49 years) in a family

Ans: Total number of children in a family

Q7. If TFR = 4, calculate GRR.

Ans: We know

- TFR is the total number of children a woman will have throughout her reproductive life span.
- GRR is the total number of girls (15-49 years).
- By the law of probability, 50% have to be girls, and 50% are boys.
- $TFR = 4$
- $GRR =$

Q8. If TFR = 2.2, calculate CBR.

Ans: $CBR = (8TFR) + 1$
 $= (8 \times 2.2) + 1$
 $= 18.1$



Important Information

- Widely accepted measure for the impact of family planning: TFR
- Indicator of complete family size: TFR
- Most popular indicator for the impact of family planning: TFR
- TFR for girl child: GRR
- Sensitive indicator for family planning services implementation in a country: NRR
- Best measure for growth of a population: NRR
- Measuring changes in fertility over time in same population: ASFR
- Mortality dependent fertility indicator: NRR

Q4. True about total fertility rate is:

- Sensitive indicator of family planning achievement
- Completed family size
- Number of live births per 1000 married women in reproductive age group
- Average number of girls born to a woman

Ans: Completed family size

Q5. Is there any difference between family size and complete family size?

Ans: Yes.

- Family size is the total number of people related by blood, marriage or adoption that live together.

Interpretation and Public Health Importance of NRR

00:40:00

- Replacement-level fertility:
 - It is the average number of children a woman would need to have to replace herself with a daughter who survives to childbearing age.
 - It corresponds to an NRR of 1, which corresponds to $TFR=2.1$
 - If replacement level fertility is sustained over a sufficiently long period, each generation will exactly replace itself in the absence of migration.
 - If $NRR=1$, the population is stabilized. To achieve an NRR of 1, the contraceptive prevalence rate should be $>60\%$.
 - If $NRR>1$, the population is increasing.
 - If $NRR<1$, the population is decreasing.
- According to NFHS-5, for India
 - $TFR=2$
 - Couple protection rate/ Contraceptive prevention rate (CPR)=66.7%
 - This doesn't mean the population has been stabilized; it has to be sustained over a period of time.

Important Point

- Very low fertility is total fertility levels below 1.3 children for women.
- Very high fertility would be above 5 children for women.

Q9. What does each signify?

- A. If $NRR=1$
- B. If $NRR>1$
- C. If $NRR<1$

Ans:

- $NRR=1$, the population is stabilized.
- $NRR>1$, the population is increasing.
- $NRR<1$, the population is decreasing.

Q10. What is the meaning of replacement level of fertility?

Ans: We know for the population of a country to stabilize, a TFR of 2.1 is required.

- It explains that every couple is giving birth to 2 children.
- For TFR to be 2.1, NRR (Net Reproduction Rate) must be equal to 1.
- NRR is equal to 1 when the contraceptive prevalence rate is $>60\%$.
- $NRR=1$ is the replacement level of fertility.
- A woman is going to be replaced with 1 daughter who is going to survive till reproductive age.

Q11. What percent of birth indicates a weak impact on family planning?

Ans: >5

Q12. The average number of children a woman would have if she were to pass through reproductive years bearing children at the same rate as women now in each group is known as?

- A. General fertility rate
- B. Total fertility rate
- C. Gross reproduction rate
- D. Net production rate

Q13. The following fertility rate gives the approximate magnitude of the complete fertility rate?

- A. Total fertility rate
- B. Total marital fertility rate
- C. General fertility rate
- D. General marital fertility rate

Q14. The number of live births for 1000 women in the reproductive age group in a year refers to the?

- A. Total fertility rate
- B. Gross reproduction rate
- C. Net production rate
- D. General fertility rate

Q15. The total live birth per woman of reproductive age is?

- A. General fertility rate
- B. Birth rate
- C. General marital fertility rate
- D. None

Q16. The gross reproduction rate is?

- A. Number of girls born to mothers in their reproductive age.
- B. Number of boys born to mother in her reproductive age.
- C. Number of total children born to the mother in her reproductive age.
- D. Number of live births per 1000 women.

Q17. True about the general fertility rate?

- A. Indicator of complete fertility rate
- B. Measure of fertility
- C. Not better than crude birth rate
- D. All the above

Q18. General fertility rate?

- A. Number of live births in the reproductive age group 15 to 44 years.
- B. Number of live births in unmarried women in the age group 15 to 44 years.
- C. Number of children a woman would have if she were to pass through reproductive years.
- D. Number of abortions usually per 1000 women of childbearing age.

Q19. What is the net reproduction rate?

- A. Number of children a newborn girl has in her life.
- B. Number of female children a newborn girl has in her life.
- C. Number of male children a newborn girl has in her life.
- D. Number of female children a newborn girl has in her life, taking into account the mortality.

Q20. To attain a two-child norm, the net reproductive rate to be obtained is?

- A. 0.5
- B. 1
- C. 1.5
- D. 2

Q21. NRR of 1 can be achieved only when the couple protection rate exceeds?

- A. 40%
- B. 50%
- C. 60%
- D. 70%

Other Related Indicators

00:49:25

- **Child-woman ratio:** The number of children 0-4 years of age per 1000 women of childbearing age (15-49 years).
- **Pregnancy rate:** Ratio of the number of pregnancies in a year to married women in the age group 15-49 years.

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- **Abortion rate:** Number of all types of abortions per 1000 women of childbearing age.
- **Abortion ratio:** Ratio of the number of abortions during a particular period to the number of live births during the same period.
- **Marriage rate:** Number of marriages in the year per 1000 mid-year population.
- **Child-woman ratio:** Number of children 0-4 years per 1000 women in 15-49 years.

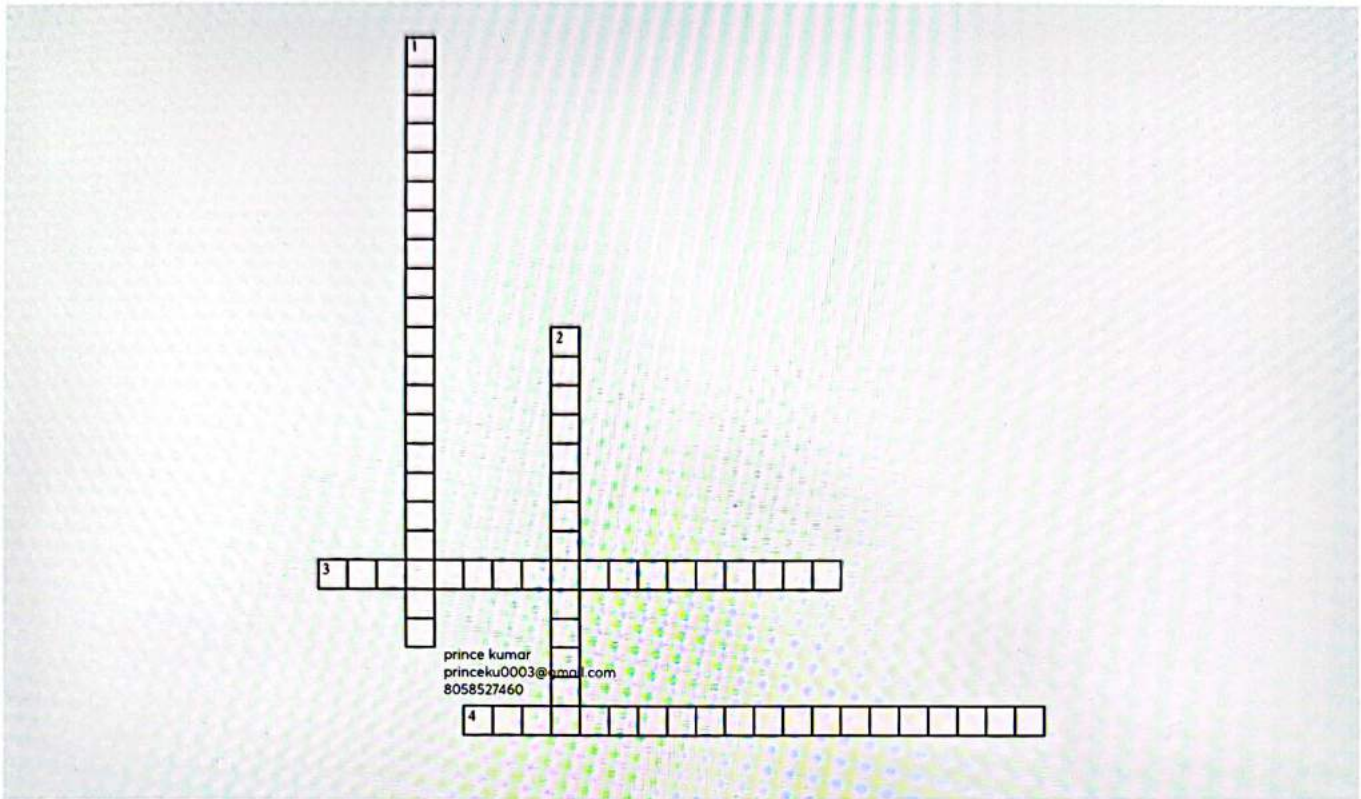
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CROSS WORD PUZZLES



Crossword Puzzle



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Across

- 3. TFR is computed by summing age-specific fertility rates for all ages.
- 4. GFR is the total number of live births in an area in a year per 1000 women in the reproductive age group (15-49 years) in a year.

Down

- 1. GRR is the average number of girls a woman will have throughout her reproductive age, considering the current age-specific fertility pattern and with no mortality.
- 2. CBR is the total number of live births in a year per 1000 estimated mid-year population.



Census

00:00:33

- Census in India is a **Union Matter**.
- Conducted by the Prime Minister's office under the **Ministry of Home Affairs** (disaster management is also under the Home Affairs)
- Data collection methods:
 1. **De Jure method** - not based on permanent residence (used in the census)
 2. **De Facto method**-based on permanent residence
- **Census act of 1948** forms the legal basis for the conduct of censuses in India
- It is conducted once every 10 years

- Differentiated population based on
 - Occupational categories
 - Industrial worker classification
- **"CENSUS STOP"** - it means the population count is declared on **1st march at 00:00 hours**
 - Next population census was to be declared on 1st March 2021, but due to covid, it got delayed
- Census provides data on
 - Age & Sex composition
 - Sex ratio
 - Population statistics
 - Literacy rate
 - Population density



NFHS (National Family Health Survey) -5

00:10:22



History

00:04:28

- The first census was taken in 1872 under **Lord Mayo**
- The First synchronized OFFICIAL census was conducted under **Lord Rippon in 1881**
- Since 1901, it has been taken every decade, it has been conducted
- **Census 2021** is the 16th census and 8th since the independence.
- Slogan: **OUR CENSUS, OUR FUTURE**
- The question on disability was canvassed in all the censuses since 1872 to 1931
- The question on disability was not canvassed in the censuses from 1941 to 1971
- In census 1981, information on 3 types of disability was collected
- The question was dropped in census 1991
- In census 2001, the question was again included and information on 5 types of disability was collected
- In **census 2011**, information on **eight types of disability** has been collected

- Responsibility of Ministry of Health and Family Welfare
- IIPS does actual work- **International Institute of Population Sciences**
 - Headquarters in **Mumbai**
- The **5th NFHS is the latest census** which has been successfully completed
 - 2019-2021 NFHS
 - Used **DE FACTO METHOD**
- Conducted every **5-6 years**
- NFHS provides reliable and comparable datasets on health, family welfare, and other emerging issues
- Four rounds of NFHS conducted in 1992-93, 1998-99, 2005-06 and 2015-16
- NFHS is a large-scale, multi-round survey conducted in a representative sample of households across India.

Census 2021

00:07:25

- It is a **digital census**.

Significance of NFHS

00:13:39

- The survey provides:
 - State and national information for India
 - Fertility, Infant and child mortality, the practice of Family planning, maternal and child health, reproductive health, nutrition, anemia, utilization and quality of health and family planning services.

Newer Things Included Under NFHS-5

00:14:23

- Blood pressure
- Blood Glucose
- Waist Hip Circumference
- Disability
- Access to Toilet Facilities
- Preschool Education
- Bathing Practices during Menses
- Death Registration
- Methods for abortion
- Reasons for abortion
- HIV testing
- Four questionnaires are used.
- Biomarkers and anthropometric measurements used
- Household related information
- Information on men and women

DLHS

00:15:44

- District Level Household Survey
- Same details that is collected by NFHS but it is provided at **district level**
- Every 5-6 years
- Only 4 rounds have been completed till date.
- Ad Hoc survey at regular intervals

Civil Registration System

00:16:29



- Flame going up- birth
- Flame going down- death
- Providing information on vital events
- **Birth and death registration**
 - Birth registered- within 21 days.
 - Death registered- within 21 days.
 - NRI- within 60 days of arrival.
- Also known as **Vital registration system**
- Under the office of **Registrar General India**
- **Central birth and death registration act-** came into force on 1st April 1970
- This uses the technique of **Lay reporting**: health workers are going into the field and collecting the data
- Civil registration system is **least reliable** health information collecting system in India
- It is the responsibility of healthcare facility or the hospital to register the child

Sample Registration System (SRS)

00:20:33

- **Most reliable and efficient** health information collection system in India
- Dual Registration/ Dual Recorder, biannual system
- It is reliable because it is collected by:
 - **Part-time enumerator** who can be any health personnel who can collect the information
 - And the data is then evaluated/verified by the **full-time enumerator**
- **It is conducted every 6 months**
- It provides us with annual estimates.
- SRS bulletin is **released every year**
- Provides all maternal and child health indicators
- **Information provided by SRS**
 - Crude birth rate
 - Crude death rate
 - Annual growth rate
 - Infant mortality rate
 - Maternal mortality rate
 - Neonatal mortality rate
 - Under 5 mortality rate

National Sample Survey Organization

00:25:05



- The NSS came into being in 1950 to collect information through sample surveys on a variety of socio-economic aspects
- The work-finalization of sampling design, schedule of enquiries, writing of instruction, training of field staff, processing of data and writing of reports
- It is the **largest organization** in India conducting a regular socio-economic survey.

MCQs

- Q. Which ministry is responsible for conducting census in India?
- A. Ministry of health and family welfare
 - B. Ministry of human resource and development
 - C. Ministry of education
 - D. **Ministry of Home Affairs**

Q. What is the method of data collection in the census?

- A. Dejure
- B. Defacto
- C. Both
- D. None

Q. Birth and death registration act come into force on 1st April?

- A. 1968
- B. 1969
- C. 1970
- D. 1971

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Q. Not true about the civil registration system in India?

- A. Dual record system
- B. Head of institution or officer in charge is responsible for registration
- C. Birth and death both are registered
- D. Cause of death is recorded

Q. NFHS is conducted by which institute?

- A. National Statistics sample survey
- B. Ministry of health and family welfare
- C. International Institute of population sciences
- D. Directorate general of health services

Q. National family health survey is done in how many years?

- A. 6 months
- B. 1 year
- C. 5 years
- D. 10 years

Q. In SRS, the investigator supervisor conducts an independent survey in how many years?

- A. 6 months
- B. 1-year
- C. 5 years
- D. 10 years

Q. Dual recording will provide data on?

- A. Population pyramid
- B. Literacy rate
- C. Sex ratio
- D. Crude death rate

Q. Births in India must be registered within?

- A. 7 days
- B. 14 days
- C. 21 days
- D. 1 month

Q. Which of the following is true about SRS?

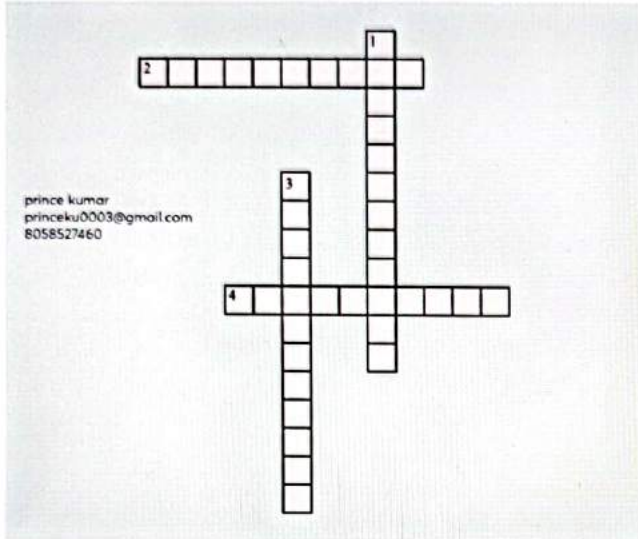
- A. It is the only dual record data collection system
- B. It has completed 4 rounds
- C. Once undertaken every 5-6 years
- D. It mandates birth, death, and marriage registration



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. International Institute of Population Sciences is headquartered in which city?
- 4. The First synchronized official census was conducted under whom in 1881

Down

- 1. The technique of data collection where health workers are going into the field and collecting the data
- 3. Data collection method not based on permanent residence (used in the census)



PREVIOUS YEAR QUESTIONS



Q. Low stationary growth is in which stage?
(FMGE June 2021)

- A. Stage 1
- B. Stage 2
- C. Stage 3
- D. Stage 4

Q. Number of live births of 1000 women in the reproductive age group in a year refers to? (FMGE June 2018)

- A. Gross reproduction rate
- B. Total fertility rate
- C. Net reproduction rate
- D. General fertility rate

Q. Mortality is taken into consideration in? (FMGE Dec 2020)

- A. Gross reproductive rate (GRR)
- B. Net reproduction rate (NRR)
- C. Total fertility rate (TFR)
- D. Completed family size

Q. To achieve a net reproduction rate (NRR) of 1, the couple protection rate should be at minimum of? (NEET 2018)

- A. 50%
- B. 60%
- C. 55%
- D. 75%

Q. The average number of children that are born to a woman over her reproductive life span refer to the?
(FMGE June 2021)

- A. Total fertility rate
- B. Net reproductive rate
- C. Gross reproductive rate
- D. General fertility rate

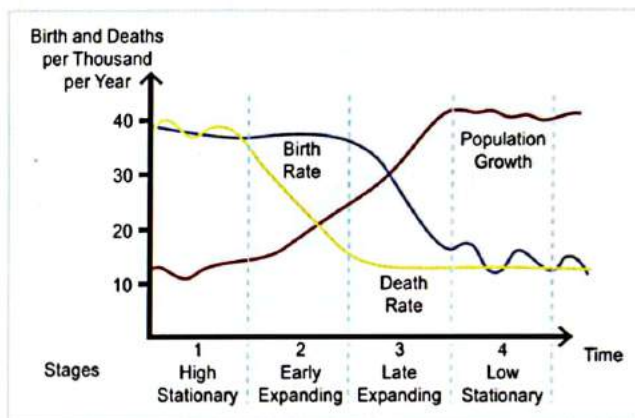
Q. Midyear population is taken on? (FMGE AUG 2020)

- A. September
- B. November
- C. April
- D. July

Q. In a European country, there are low births and high deaths reported. Which stage the of Demographic cycle will be present?
(FMGE June 2022)

- A. High stationary stage
- B. Late expanding stage
- C. Low stationary stage
- D. Declining stage

Q. See the Image given and identify? (FMGE June 2022)



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- A. Population cycle
- B. Demographic processes
- C. Registration of births
- D. Demographic transition

Q. If older people die, then the Dependency ratio will?
(FMGE June 2022)

- A. Increase
- B. Decrease
- C. Remains same
- D. None

31

FAMILY PLANNING DEFINITION CONCEPT

Family Planning 00:00:18

- The ability of individuals and couples to anticipate and attain their desired number of children and the spacing and timing of their birth.
- Voluntary approach

Planned Family 00:01:26

- Birth of first child delayed till mother is 20 years of age
- No childbirth beyond the age of 30 to 35 years
- Ideal gap of 2 years between marriage and birth of first child.
- Gap of 3 years between 2 successive pregnancies
- Limited family size

Eligible Couples 00:02:50

- Currently married couples wherein the wife is in the reproductive age group (15-49) years of age.
- Replaced the term target couple.
- **Eligible couple register** is maintained at the sub-centre.
 - Maintained by- ANM (multipurpose worker female)
- 15 to 18% of eligible couples in India.
- 20% of eligible couples are in the age group of 15 to 24 years.

Q. Eligible couples per 1000 population in India is-

- 50- 70
- 100- 120
- 150 - 180**
- 200 - 250

Target Couple 00:05:30

- The term is no longer in use.
- It meant married couples with two or more children who were in need of family planning services.

Couple Protection Rate vs Effective Couple Protection Rate 00:06:11

- Percentage of eligible couples protected against childbirth by one or other approved family planning methods.
- **Couple Protection Rate**=No. of couples using the contraceptive method / Total no. of eligible couples x 100
- Percentage of eligible couples effectively protected against childbirth by one or other approved family planning methods.
 - Condoms: male condoms are provided (Nirodh)
 - Mala-N
 - IUD
 - ANTARA: Injectable DMPA
 - Chaya: Non steroidal hormonal contraceptive
 - Sterilization

- Indicative of prevalence of the contraceptive practice in the community - Couple protection rate
- For population stabilization - TFR = 2
 - TFR is 2 when net reproduction rate (NRR) is 1.
 - TFR is 1 when Couple protection rate (CPR) is more than 60%
- Sterilization contributes to about > 60% of effectively protected couples.

Q. In a village with 180 eligible couples, the family planning data of contraceptive methods is:

- Sterilization: Vasectomy - 3 Tubectomy - 8
- IUD users- 10
- OCP- 10
- Condom users- 29

Note:

Effectivity of approved contraceptive methods:

- Condoms: 50%
- IUDs: 95%
- OCPs: 100%
- Sterilization: Vasectomy/Tubectomy: 100%

Couple Protection Rate = No. of couples using the contraceptive method / Total no. of eligible couples x 100

Effective couple protection rate

Sterilization: 11 - 100%

OCP: 10 - 100%

IUD: 45%

Effective: $45/100 \times 10 = 9.5$

Condom: $50/100 \times 29 = 14.5$

$CPR = (11+10+9.5+14.5)/180 \times 100 = 45/180 \times 100 = 25\%$

Effective couple protection rate: 25%

Q. Calculate Couple protection rate & effective CPR in the village.

- 60%
- 33%**
- 25%
- 10%

Unmet Need for Family Planning 00:14:57

- Women who are sexually active but not using any approved methods of family planning and they do not desire to have any more children or want to space their pregnancy.

- Reasons:
 - Fear of side effects
 - Infrequent sexual activity
 - Opposed by partner
 - Breastfeeding

Contraceptive Efficacy 00:17:55

- Number of unwanted pregnancies occurring in a specified period of exposure or use of contraceptives.
- Evaluated by:
 - Pearl index
 - Life Table Analysis

Pearl Index

- Most common technique
- **Pearl index = (No of accidental pregnancy/ total months of exposure) x 1200**
- 1200 is expressed in terms of per hundred women per year. (Number of months in 100 years)
- The numerator "total accidental pregnancy" includes all unwanted pregnancies irrespective of the outcome.
 - Live Birth
 - Abortion
 - Stillbirth
 - Still not terminated
- A minimum of 600 months of exposure is necessary for obtaining a valid "failure rate" value.

Disadvantages of Pearl Index 00:21:08

- PI assumes a constant failure rate over time.
- The most fertile couples will get pregnant at the beginning of the study and will no longer be counted in the denominator. Couples remaining later in the study are, on average, of lower fertility.
- PI also provides no information on factors other than accidental pregnancy, which may influence effective calculations, viz. dissatisfaction with the methods, trying to achieve pregnancy, medical side effects, and lost to follow up.

Q. A contraceptive "Z" is used by 100 couples for a continuous period of 2 years. During this period, 20 women become pregnant despite using the contraceptive "Z". What is the pearl index of "Z"?

- A. 0.1 per HWY
- B. 5 per HWY
- C. 10 per HWY
- D. 1000 per HWY

Life Table Analysis 00:23:08

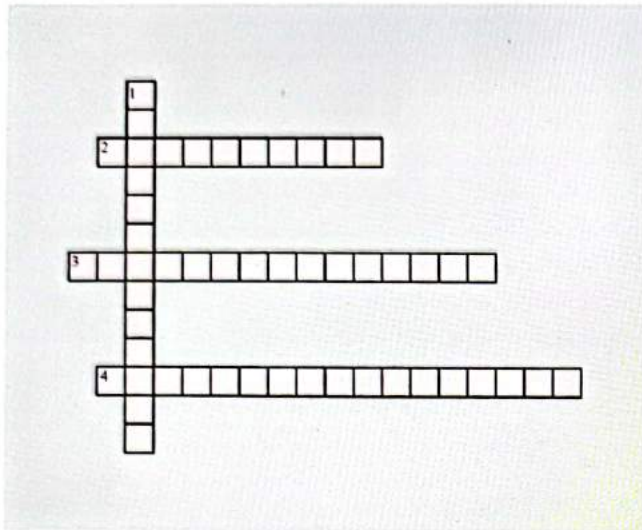
- It is a better method.
- Calculates cumulative failure rates over a specified time frame.
- They present failure rate as the number of pregnancies per 100 women years, standardized by yearly cut-off points (usually 1,3 or 5 years).
- Eg: life table rates for long-acting hormonal methods were reported as 0-0.8 as per 100 HWY at one year.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. No. of accidental pregnancy/ Total months of exposure x 1200
- 3. Currently married couples wherein the wife is in the reproductive age group (15-49) years of age
- 4. This calculates cumulative failure rates over a specified time frame

Down

- 1. What contributes to more than 60% of effectively protected couples?

32

CLASSIFICATION OF CONTRACEPTIVES AND BARRIER METHODS OF CONTRACEPTIVES

- **Family Planning**
 - Spacing and timing between the births.
 - Ability of couples to attain a number of children.
- **Contraceptives**
 - Intentional prevention of pregnancy.
 - By natural or artificial means.

- **Hormonal methods:**
 - Oral contraceptives pills (OCPs)
 - Nuva rings
 - Depot formulations
 - Patches
 - Sub dermal implants
- **Emergency contraceptives**
 - I-pill
 - Yuzpee method
 - IUCDs - up to 5 days of unprotected sex
- **Physiological methods**
 - Coitus interruptus
 - Rhythm method
 - Lactational amenorrhea
- **Surgical methods**
 - Tubectomy
 - Vasectomy

Methods of Contraception

00:01:32

- 2 methods:
 - Spacing methods
 - Terminal methods

01. Spacing Methods

00:02:23

- Spacing between two pregnancies (at least of 3 years)
- Temporary method.
- Includes:
 - Barrier methods:
 - Physical methods.
 - Chemical methods.
 - Both.
 - Intrauterine devices
 - Hormonal methods
 - Post conceptional methods

02. Terminal Methods

00:03:09

- No further births occur
- Permanent method
- Includes:
 - Male sterilization
 - Female sterilization

Classification of Contraceptives

00:04:00

- **Barriers:**
 - Physical barriers includes:
 - Condoms (male and female)
 - Vaginal Sponge
 - Diaphragm
 - Chemical barriers includes:
 - Spermicides: Foams, gels, creams, suppositories
- **Intrauterine devices:**
 - 1st generation includes:
 - Lippes loop
 - Grafenberg ring
 - 2nd generation includes:
 - Copper containing IUDs
 - 3rd generation includes:
 - Hormone containing IUDs

Important Information

- Conventional contraceptives-
 - Used at the time of sexual intercourse.
 - Ex: Condoms, spermicides.
- **Interceptive:** Used after the intercourse.

Male Condom

00:09:41



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- Barrier type (spacing method) of contraceptive.
- Made from **latex**.
- Freely available under the National Family Welfare Programme till the level of sub centers.
- Brand name: **NIRODH**, meaning prevention.
- Provided under a social marketing scheme.
- Should not be reused.
- Failure rate is 2-14/HWY
- 72 Condoms needed to be used for effective protection in a year.

Advantages of Male Condoms

- Safe
- Easy to use
- Inexpensive
- No side effects
- Easy disposable
- Protect from HIV and STDs

Disadvantages

- Interferes with sexual sensation
- Due to incorrect use - may slip off or tear during coitus.

Female Condom

00:12:52



- Identified by the presence of two rings.
 - Inner ring covers the cervix.
 - Outer ring lies outside vagina - interferes with sexual intercourse.
- Brand name: **FEMIDOM**
- Invented by **MD Hessel**
- Made of:
 - Polyurethane
 - Nitrile/latex.
- Barrier method
- Not provided under the National Family Welfare Programme.
- Provided freely under NACP (National AIDs Control Programme) - particularly for commercial sex workers.
- Male and female condoms should not be used together

Advantages of Female Condoms

- Provides a higher degree of protection against HIV and STDs compared to the male condoms
- Doesn't reduce male partner's stimulation.
- No Hormonal side effects.
- Can be used by women with latex sensitivity.

- Pre-lubricated and can be used with oil and water lubricants.
- Erection is not necessary to keep a condom in place.
- Can be reused.
- Doesn't affect future fertility.

Disadvantages of Female Condoms

- High cost
- Women should be motivated to use it.
- Noticeable during sex.
- Needs practice to insert and use.
- Can break or leak.
- 3 times more expensive than male condoms.
- Higher failure rate than male condoms.

MCQ

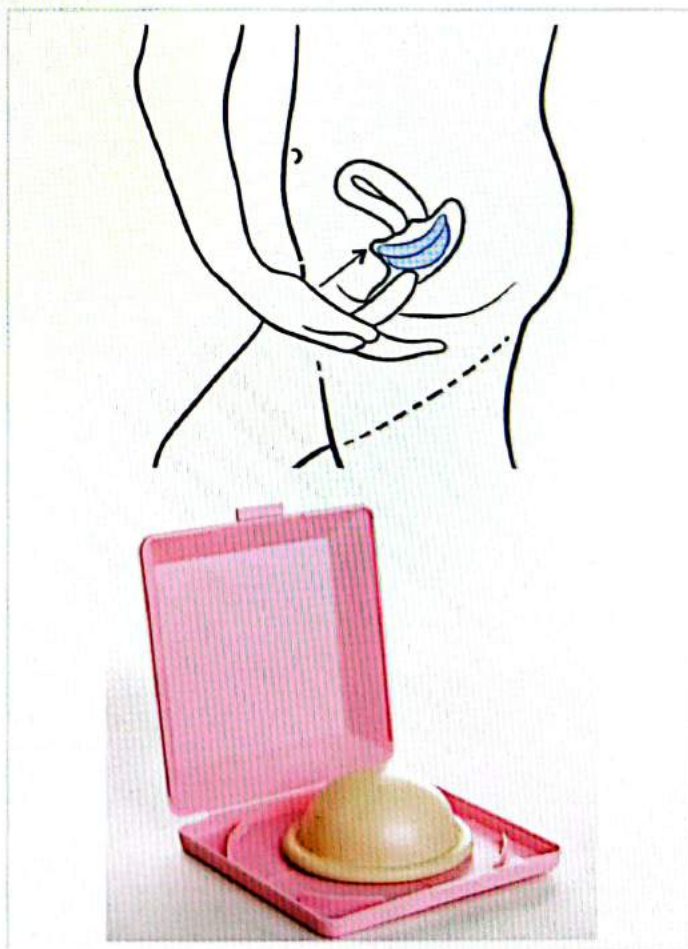
Q. All are true about female condoms except?

- Should be used with male condom
- Invented by Hessel
- Offers protection against STDs
- Reusable

Answer: (a) should be used with male condom

Diaphragm

00:18:10



- Inserted into vagina and pushed to place over the cervix.
- Also called **Dutch cap**.
- Physical Barrier.
- Shallow cup with diameter 5 to 10 cm.
- Made of synthetic rubber or plastic.
- **Technique of use:** Inserted into vagina and pushed gently to place over the cervix.
- Requires expertise.
- Must be ensured that diaphragm is of correct size.
- Should be fitted properly and not damaged.
- Failure rate: 6-12/HWY.
- Not recommended under the National Family Planning Welfare Programme.
- Variation of diaphragm includes:
 - Cervical cap
 - Vault cap
 - Vimule cap.

Advantages of Diaphragm

- Nil side effects and medical contraindication.
- Can be Reusable.

Disadvantages of Diaphragm

- Required motivation to use.
- Practice is required by the women to use.
- Privacy for practice, washing and storage of Diaphragm.
- Should be present in vagina up to 6 hours post ejaculation.
- If left for more than 24 hours leads to Toxic Shock Syndrome (TSS).
- Doesn't protect from HIV and STDs.

Vaginal Sponge

00:22:47



- Image indicates Vaginal sponge.
- V band like structure.
- Brand name: **TODAY**.
- Contains a chemical called **nonoxonyl-9**.
- Technique if Insertion:
 - Must be wet under water till thoroughly wet before insertion.
 - Inserted into vagina and then pushed gently to be placed over the cervix.
- Requires skill to use.

Advantages of Vaginal Sponge

- Free from ill side effects and contraindications.

Disadvantages of Vaginal Sponge

- No protection from HIV or STDs.
- May lead to Toxic Shock Syndrome if left beyond 24 hours.
- Has to be left for 6 hours post ejaculation.
- Increased risk of yeast infection and UTI.
- Higher failure rate than diaphragm.
 - Higher failure rate in parous women - 20 to 40/HWY.
 - Nulliparous women - 9 to 20 per HWY.
- Can be reused.
- Not recommended under the National Family Welfare Programme.

Spermicides

00:26:24

- Chemical barriers methods.
- Surface active agents - binds to sperms - inhibits oxygen uptake by sperms - kills the sperms.
- Available as:
 - Foams
 - Pastes
 - Jellies
 - Suppositories.
- High failure rate when used alone.
- Good to use with some other contraceptive method.
- Should be used before intercourse.
- Should be repeated before each sex act.
- May cause burning irritation.

MCQ

Q. Identify the image.



- Diaphragm
- Male condom
- Vaginal sponge
- Female condom

Ans: Vaginal sponge.



33

INTRA UTERINE DEVICES

Introduction

00.00.21

- Temporary method of contraception.
- Essential in spacing pregnancies.
- IUD is made of non-reactive, non-toxic and durable **polyethylene**.
- Consists of a small amount of **barium sulphate** to allow **X-ray observation**.
- Its lower end is attached to a tail made up of fine nylon.
- Importance of the tail of IUD:
 - Reassurance that IUD is in place.
 - Removal of IUD is done by pulling the thread.

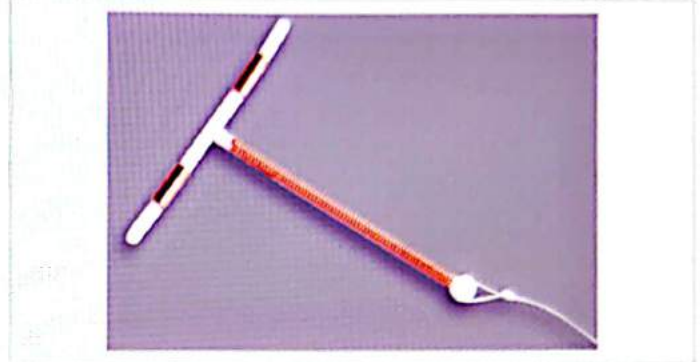
- Cellular/Biochemical changes in endometrium/uterine fluids.
- Impair viability of gamete.
- Reduce chances of fertilization, rather than implantation.

2nd generation IUDs

00:06.31

1. CuT 380 A

00:06.32



- Medicated.
- **Parts:**
 - Copper wire wound on horizontal and vertical stems.
 - Fine nylon thread.
- Surface area of copper wire wound around the stem = 380 mm²
- A depicts the size.
 - Size may be A, B, C or D.
 - D is the greatest size.
- Lifespan - Shelf life of 10 years.
- Failure rate - 0.3-0.5/100 women.
- Ball at the bottom of the stem reduces risk of perforation and cramp-like pain.

Types of IUDs

00.03.32

Classes	Components	Examples
1st generation	Inert IUDs.	<ul style="list-style-type: none"> • Lippes Loop • Grafenberg containing ring.
2nd generation	Copper-containing devices.	<ul style="list-style-type: none"> • CuT 380 A • Nova-T • Multiload
3rd generation	Hormone-containing devices.	<ul style="list-style-type: none"> • MIRENA (LNG-20). • Progestasert.

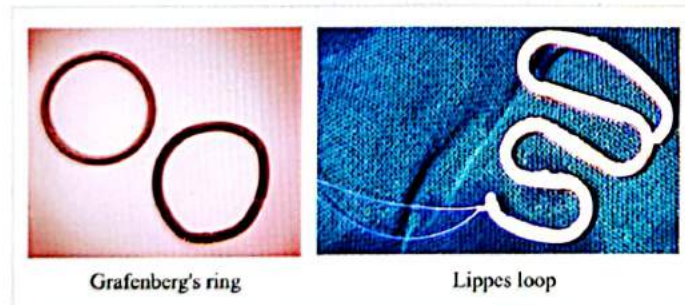
MCQs

Q: Which of the following is a 3rd generation IUCD?

- A. ML CuT 250.
- B. MIRENA.
- C. CuT 380 A.
- D. Copper T 200.

1st generation IUDs

00.05.22



- Non-medicated
- They have a high failure rate.

Mechanism of action

00.05.53

- Foreign body reaction.

2. Nova-T

00:08.17



- CuT 380 A with a **silver (Ag) core** attached to it.
- Shelf life - 5 years.

- Silver core increases the shelf life of copper by stabilizing it and decreasing its fragmentation.
- Curved horizontal stem and vertical stem.

3. Multiload

00:08.53



- U-shaped ring.
- Most commonly used IUD.
- CuT 375
 - Meaning 375mm of copper wire is wrapped around the stem.

Mechanism of copper in IUD

00:10.23

- Enhances foreign body reaction.
- Cellular response in endometrium.
- Affects enzymes in the uterus.
- Alter cervical mucus thus affecting sperm motility, capacitation and survival.

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Advantages of copper devices

00:11.33

- Lower expulsion rate.
- Lower incidence of side effects like bleeding and pain.
- Lower failure rate or increased contraceptive effectiveness.
- Easier to fit.
- Effective as post-coital contraceptives if inserted within 3-5 days of unprotected intercourse.
 - Best emergency contraception.



Important Information

- Copper T is freely available under the National Family Welfare Program.
 - CuT 200.
 - CuT 380A.
- CuT 380A is the most commonly used.

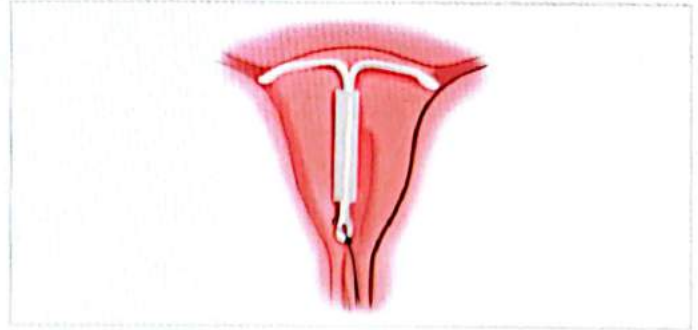
3rd generation IUDs

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- Hormone containing.

1. MIRENA

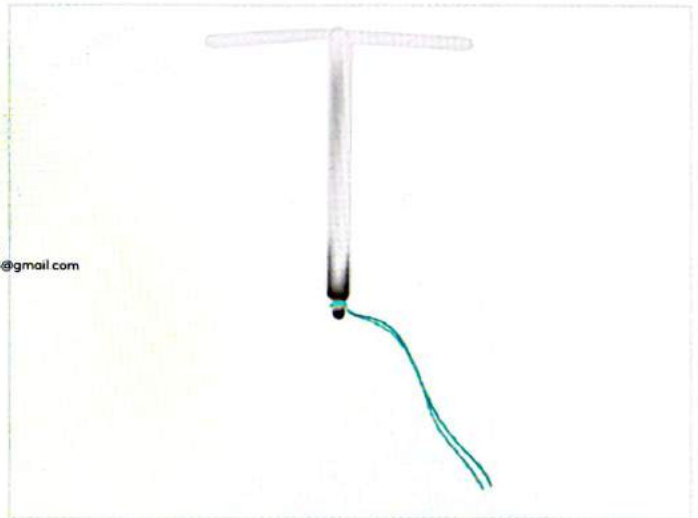
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- Contains 52mg levonorgestrel.
- Releases 20µg of levonorgestrel per day.
- Shelf life of up to 7 years.
 - Can be replaced every 5 years.
- Least failure rate of all IUDs i.e. 0.1-0.2/ HWY
- Not available under programme
- Expensive

2. Progestasert

00:18.36



- It carries progesterone in silican oil.
- Most widely used.
- Straight white T.
- Contains 38 mg of progesterone.
- Release 65µg of progesterone per day.
- Shelf life of 1 year.

Shelf life of common contraceptives

00:20.30

CuT 380 A	10 years.
Nova-T	5 years.
Progestasert	1 year.
LNG IUD	5-7 years.

MCQs

Q: CuT 380 has a life span of:

- A. 10 years.
- B. 5 years.
- C. 2 years.
- D. 7 years.



Important Information

- **IUD expulsion rate**
- Lowest -> Progestasert.
- Highest -> Lippes loop.
- **IUD removal rate**
- Lowest -> Progestasert.
- Highest -> MIRENA.
- **IUD pregnancy rate**
- Lowest -> MIRENA.
- Highest -> Lippes loop.

Ideal IUD candidate

00:22.08

- Has at least one child.
 - Not recommended in nulliparous women as cervical canal diameter is not wide for IUD insertion.
- No history of pelvic disease.
- Normal menstrual periods.
- Willing to check IUD tail.
- Access to follow-up and treatment of potential problems.
- Monogamous relationship.
 - Not preferred in women with multiple partners as they have increased risk of getting PID.

MCQs

Q: Characteristics of an ideal IUD candidate include all of the following except?

- A. Has borne at least 2 children.
- B. Is willing to check the IUD tail.
- C. **Has a history of ectopic pregnancy.**
- D. Has normal menstrual periods.

Side effects of IUD insertion

00:25.13

Bleeding

- The most common side effect.
- 2nd most common cause of removal.
- It is physiological bleeding that resolves on its own in 1-3 months.
- Administration of iron tablets (200mg, 3x daily).
- Persistent bleeding which does not improve on medication, then remove IUD.

Pain

- 2nd most common side effect.
- Most common cause of removal.
- Occurs due to disparity in size of IUD.

- Severe pain is suggestive of uterine perforation
- It disappears after 3 months.
- Analgesics and aspirin administration.

Pelvic inflammatory diseases (PID)

- Certain organisms reach the uterus, fallopian tube and ovaries from the lower genital tract via the thread.
- Organisms:
 - Gardnerella
 - Anaerobic Streptococci
 - Bacteroides.
- PID presents with pain and discharge.
- Higher risk in women with multiple sexual partners.
- Administration of broad spectrum antibiotics for 24-48 hours.
 - Antibiotics are stopped if there is no improvement.

Uterine perforation

- Rare i.e. 1:150 or 1:900 insertions.
- Causes:
 - If IUD is inserted immediately after delivery (within 48 hours to 6 weeks).
 - Technique of insertion- disparity
 - Design of IUD - 1st generation IUDs have higher risk of perforation.

Migration of IUD to peritoneal cavity

- Intestinal obstruction - Serious complication.
- May be asymptomatic.
 - Spotted when looking for missing IUD.
- Confirmatory diagnosis is X-ray imaging.

Pregnancy with IUD-in-situ

- 50% of cases report a spontaneous abortion.
- 25% of cases have successful outcomes.
- Least pregnancies are reported with MIRENA.

Management

- If a woman requests an induced abortion - Legal allowed.
- If a woman wants to continue pregnancy and threads are visible -
 - Pull the thread and continue pregnancy
 - Explain the risk of spontaneous abortion or congenital anomalies.
- If a woman wants to continue pregnancy and threads are not visible -
 - Uterus examination for any complications
 - Evacuation of uterus if any complication is identified.

Ectopic pregnancy with IUD-in-situ

- Women with IUDs are taught to recognize symptoms:
 - Lower abdominal pain.
 - Dark and scanty vaginal bleeding.
 - Amenorrhea.
- Women with high risk of ectopic pregnancy should not use IUDs.

Spontaneous expulsion

- 12-20% of cases.
- Usually occurs in the first few weeks following insertion or during menstruation.
- Higher risk of expulsion in:
 - Young women.
 - Nulliparous women.
 - Women who have had a postpartum insertion.
 - Inert (non-medicated IUDs).

Contraindications of IUDs

00:37.31

Absolute	Relative
<ul style="list-style-type: none"> • Pregnancy. • Recurrent PID. • Vaginal discharge of undiagnosed etiology. • Cancer of cervix, uterus or adnexa. • Previous ectopic pregnancy. 	<ul style="list-style-type: none"> • Anemia, Menorrhagia. • History of PID. • Purulent cervical discharge. • Distortion of uterine cavities e.g., congenital malformations, fibroids. • Unmotivated person.

Timing of insertion

00:40.07

- **Ideal time** - During menses or first 5 days of menstruation.
- **Most preferred timing**
 - Postpartum (immediate postpartum): post-placental.
- Late postpartum: within 48 hours of delivery up to 1 week.
- Postpartum reports more cases of spontaneous expulsion.
- Post-puerperal: within 6 weeks of delivery.
- Interval: within 6 months.
- Post-coital: Up to 3-5 days of unprotected intercourse.
- Post-abortion: After 1st trimester loss.
 - Not recommended after 2nd trimester abortion.
- Most receptive timing - Postpartum.

MCQs

Q: Select the correct statement signifying the ideal and most receptive time for IUD insertion?

- 6-8 weeks post-delivery, during menstruation.
- Post-placental, within 6 months of delivery.
- Within 5-10 days of beginning of menses, within 1 week of delivery and before discharge.**
- Any of the above.

Q: Mechanism of action of IUD is all of the following except:

- Foreign body reaction.
- Thickening of cervical mucus.
- Unfavorable endometrium for implantation.
- Thinning of the fallopian tube.**

Q: Mechanism of action of IUD is:

- Stop ovulation.
- Interferes with fertilization.**
- Prevention of implantation.
- Acts as a spermicide.



Topics

- Hormonal Contraceptive
- NUVARing
- Depot formulation
- Implants
- Patch
- Cent chroman tablets
- Oral contraceptive pills
- Management of missed pills
- Emergency contraception
- Male only pill

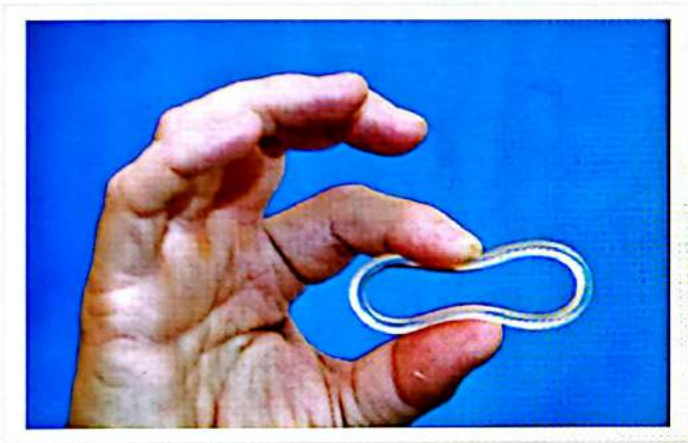
00.00:35

Depot formulation

00:05:26

NUVARing

00.02:05



- **Hormonal method.**
- Has both **Estrogen and progesterone.**
- It is a **ring** inserted inside the vagina.
- Inserted for three weeks and then taken out during the last 2 weeks when the woman expresses menstrual period.
- After fourth week, a new ring is inserted.

Benefits

- Once-a-month self-administered use offering convenience
- Ease of use
- **Privacy.**
- **Lower Estrogen exposure than with OCPs or patches (Estrogen is more commonly associated with cardiovascular effects)**
- Low incidence of estrogenic side effects such as nausea and breast tenderness
- Low incidence of irregular bleeding



- **Injectables:** means injecting hormones.
- **DMPA:** Depo-Provera Medroxy Progesterone acetate
- Dose - 150 mg IM for 3 months
- DMPA is now available under the name of **ANTARA** (a newer contraceptive that has now been introduced under National family welfare programs & is freely available till the level of sub-centre).

Advantages

- Highly effective
- Long-lasting and reversible
- Can be used during lactation because it has progesterone and no Estrogen.

Side effects

- Menstrual irregularities

NET-EN: Norethisterone Enanthate

00:09:52

- **Injectable hormone.**
- Also a depot formulation which **only has progesterone.**
- Dose: 200 mg IM, for 2 months
- Not available under National family welfare programs.

Advantages

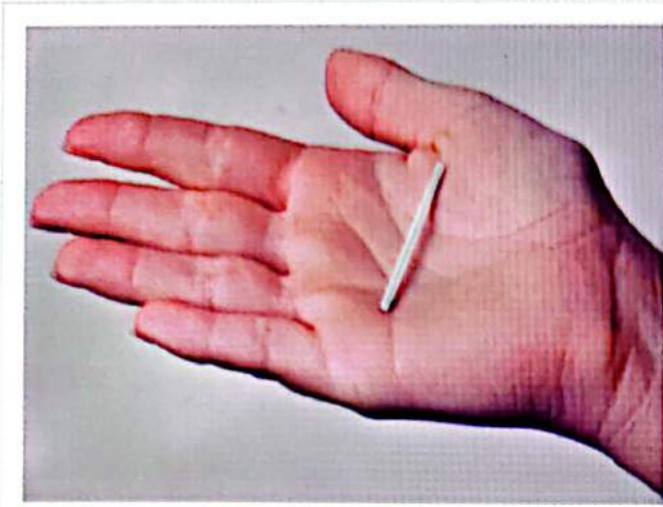
- Highly effective
- Long-lasting and reversible

Side effects

- Menstrual irregularities

Implants

00:11:09



- Implants have only progesterone.
- **Norplant:**
 - Subdermal implant contraceptive
 - 6 Silastic capsules containing 35 mg Levonorgestrel (LNG) each
- **Norplant R2:** 2 capsules containing 75 mg LNG each
- Capsules or rods are inserted beneath the skin of the forearm
- Prevent Ovulation
- Effectiveness: 5 years
- Implants are not available under National family welfare programs.

Disadvantages

- Irregularities of menstrual bleeding (MC)
- Surgical procedures required for insertion and removal

Patch

00:14:00



- **Hormonal Contraceptive**
- It has both progesterone and Estrogen
- **Transdermal**
- Have the same effectiveness as combined OCPs
- Inhibits ovulation

Composition

- Ethinyl estradiol (an estrogen) and norelgestromin (a progestin)
- 1 patch is applied for 7 days; 3 such patches are applied successively. No patch is applied in the 4th week (Menstrual period)



Important Information

- NUVA rings and Patches are similar to OCPs and contains estrogen and progesterone.
- Depot formulations are injectable hormones.
- DMPA is now promoted as Antara.
- NET-EN is also an injectable hormone.
- Implants only contain progesterone, just like DMPA or NET-EN.

Cent chroman: Saheli

00:17:34



- **Once a week pill**
- Available by the name of **CHAYA** under the national family welfare program (newly added)
- Freely available till the level of sub-centre.
- Synthetic: Nonsteroidal oral contraceptive
- Brand name: Saheli (now known as Chaya)
- Chemical: **Ormeloxifene**
- Mechanism of action: SERM (Selective Estrogen Receptor Modulator)
- Developed by **CDRI** (Central Drug Research Institute based in Lucknow)
- **Dosage and Frequency:** 1 tablet (30mg) twice a week for 3 months, then 1 tablet per week.

- Used for DUB (Dysfunctional Uterine Bleeding)
- Contraindication: PCOD



Important Information

- New contraceptives introduced under the National family welfare programme are freely available till the level of sub-centre.
 - Antara (Injectable DMPA)
 - Chaya (Cent chroman Tabs or Saheli)

Oral Contraceptive Pills (OCPs)

00:24:14



- In each strip, there are 21 tablets.
- 7 Iron tablets in the last row for last week (menstrual period).
- Mechanism of action- Inhibits ovulation

Types of OCPs

1. MALA-N



- Contains - Levonorgestrel 0.15 mg and ethinylestradiol 0.03 mg
- Not for sale, Free supply
- Combined OCP
- Freely available under the National Family Welfare program till the level of sub-centre.

2. MALA-D



- Promoted as a social marketing scheme to promote behavioural change
- Provided at minimal cost under the National Family Welfare Programme.
- Provided at Rs 3 per strip.
- Dose: Ethinylestradiol 0.03mg & Levonorgestrel 0.15 mg

3. Ultralow Dose OCP: Femilon



- Ultra-low dose.
- Ethinylestradiol IP is reduced to 0.02 mg.
- Levonorgestrel is present in the form of Desogestrel BP 0.15 mg.
- Not available under the National Family Welfare Programme.

4. Progesterone-only pill (mini pill or micro pill)

- Contains only progesterone given in small doses throughout the cycle
- Norethisterone and levonorgestrel are routinely used.
- Prescribed to older women for whom combined pills are contraindicated due to cardiovascular risks.

- It can be given during Lactation.



Important Information

- **Most preferable OCP during Lactation: Copper-T.**

Adverse effects of OCP

00:33:02

- Cardiovascular effects (due to estrogen contents)
 - MI
 - Cerebral thrombosis
 - Venous thrombosis.
 - Risk increases with age and smoking.
- Carcinogenesis
 - Increased risk of cervical cancer
- Metabolic effects
 - Due to progesterone
 - Elevated BP and altered serum lipid levels.
 - Can interfere with blood clotting, carbohydrate metabolism.
- Liver
 - Can precipitate Hepatocellular adenoma and gallbladder disease.
- Lactation
 - Cannot give combined pills as it interferes with the estrogen component.
- Ectopic pregnancy (most likely with POP - progesterone only pill)
- Other unwanted effects:
 - Breast tenderness
 - Weight gain (Rare due to reduced ethinylestradiol)
 - Headache
 - Migraine
 - Bleeding disturbances

Contraindications

00:37:01

- **Absolute:**
 - Cancer of the breast and genitals
 - Liver disease
 - Previous or present history of thromboembolism
 - Cardiac abnormalities
 - Congenital hyperlipidaemia
 - Undiagnosed Abnormal uterine bleeding
- **Relative:** (Special problems requiring medical surveillance)
 - Age over 40 years, or Smoking, and age over 35 years
 - Risk of cardiovascular effects increases with age and smoking.
 - Go for progesterone-only pills.
 - If she is a smoker, don't give combined pills if her age is over 35 years.
 - Mild hypertension
 - Chronic renal disease

- Epilepsy
- Migraine
- Nursing mothers in the first 6 months
- Diabetes Mellitus
- Gallbladder disease
- History of infrequent bleeding
- Amenorrhoea, etc

Non contraceptive benefits of OCPs

00:39:07

- Protects against benign breast disorders (Fibrocystic disease and Fibroadenoma)
 - Contraindicated in breast cancer.
- Ovarian cysts
- Iron deficiency anaemia
- Osteoporosis
- PID (Pelvic inflammatory disease)
 - In this case, the Intrauterine device was absolutely contraindicated.
 - Women with a history of PID can use OCPs.
- Ectopic pregnancy
 - The chance of this condition is more with progestogen-only pills (POP) and not with OCPs.
- Protects against Ovarian cancers.
- Protects against Endometrial cancer.
 - Non-contraceptive benefits will not be given in case of cervical cancer.
- Used in DUB (dysfunctional uterine bleeding), irregular menstrual cycles, dysmenorrhoea.

Recommended Actions after late or missed combined oral contraceptives

00:40:46

- For example, every day, a woman takes a pill at 10 pm. One day she forgets to take the pill and on day 2 she remembers in the afternoon at 2 pm that she forgot last night's pills.
 - She can take the missed pill as soon as she remembers. At night, she can take her regular pill.
 - This means she can take two pills a day.
 - If she misses more than equal to three pills, she needs to take a barrier method.
- **Missing 1-2 pills:**
 - Take one pill as soon as possible or take 2 pills at the scheduled time: no risk of pregnancy
- **Miss ≥ 3 pills in first or second week or started new pack 3 days late:**
 - Take one pill as soon as possible, and then continue with the scheduled pill.
 - Use the barrier method for the next 7 days
 - In case of unprotected sex in the last 72 hours, use an emergency contraceptive method

- Miss ≥ 3 pills in 3rd week (last week):
 - Take one pill as soon as possible and finish the rest of the hormonal pills.
 - The last 7 non-hormonal pills should be discarded, start a new day
 - use a barrier method for the next 7 days.
 - In case of unprotected sex in the last 7 days, use emergency contraception.
- Missed non-hormonal pills:
 - Discard missed non-hormonal pills, keep on taking hormonal pills, and start a new pack.
- In case of severe vomiting:
 - If you vomit within 2 hours of taking the pill, Take another pill.

Male Only Pill

00:47:38

Gossypol

- Natural phenol- yellow colour compound
- Anti-malaria, Anti-cancer, and has male sterilization property
- Derived from a Chinese cotton plant
- Adverse effects:
 - Permanent sterilization
 - Hypokalaemia

Emergency contraceptives

00:47:53

- Used in case of unprotected sexual intercourse.
- **iPill a single tablet of LNG or Levonorgestrel (1.5 mg)**
 - **Most preferred**
 - A single tablet of LNG - taken within 72 hours of unprotected sexual intercourse.



- The best emergency contraceptive is intra uterine copper-T or IUCD (Intrauterine contraceptive device).
 - Can be inserted up to 5 days of unprotected sexual intercourse
 - Not preferred by
 - An adolescent
 - Young people who have not had children (nulliparous)
 - Married couples who do not want children.

Other emergency contraceptives

00:51:48

1. Yuzpe method

- Combined OCP
- **Levonorgestrel 0.5mg + ethinylestradiol 0.1mg.**
- 2 pills within 72 hours of unprotected sexual intercourse and 2 exactly 12 hours later
- Before I-Pill, this was preferred.

2. Ullipristal

- A selective progesterone receptor modulator taken within 120 hours of unprotected sexual intercourse

3. Mifepristone 600 mg:

- More important for Medical Termination of Pregnancy (MTP)
- Can be used as an emergency contraceptive
- Single dose within 72 hours
- Not preferred.

4. IUCD

- Best and can be used for 5 days.
- Cannot be used in nulliparous women.

MCQs

Q. Non-contraceptive benefits of combined OCPS to a woman are all except?

- Protection against PID
- Protection against osteoporosis
- Protection against ovarian cancer
- Protection against cervical cancer

Ans. d) Protection against cervical cancer

Q. Best contraceptive for a newly married healthy couple?

- Barrier method
- IUCD
- Oral contraceptive pills
- Natural

Ans. c) Oral contraceptive pills

Q. In case women on OCP forget to take pills on 3 successive days, What should she do?

- Take 2 pills each for the remaining cycle
- Take 3 pills the next day, then continue with 1 pill per day
- Use barrier method for the rest of the cycle
- Continue with the next pill the next day onward.

Ans. c) Use barrier method for the rest of the cycle

Q. Minipill is a contraceptive of choice for?

- Elderly females
- Lactating females
- Obese women
- Menstruating women

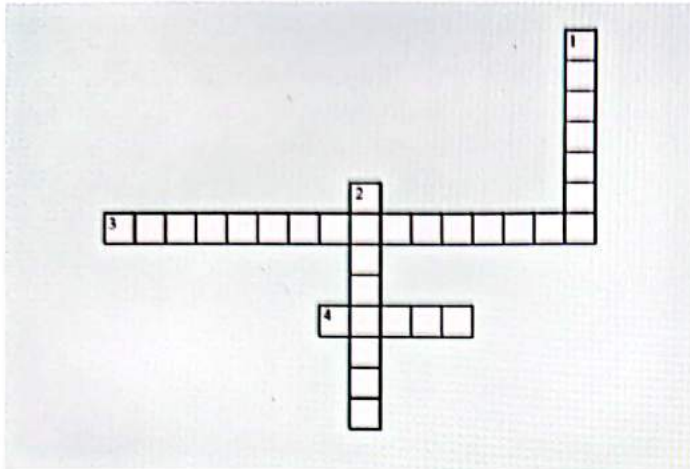
Ans. b) Lactating females



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. DMPA: Depo-Provera MedroxyProgesterone acetate
- 4. Contraceptive patch: It is a 'transdermal patch' applied to the skin that releases

Down

- 1. Oral contraceptive pills have both Estrogen and progesterone, and we take the pill orally.
- 2. Implants have only progesterone.

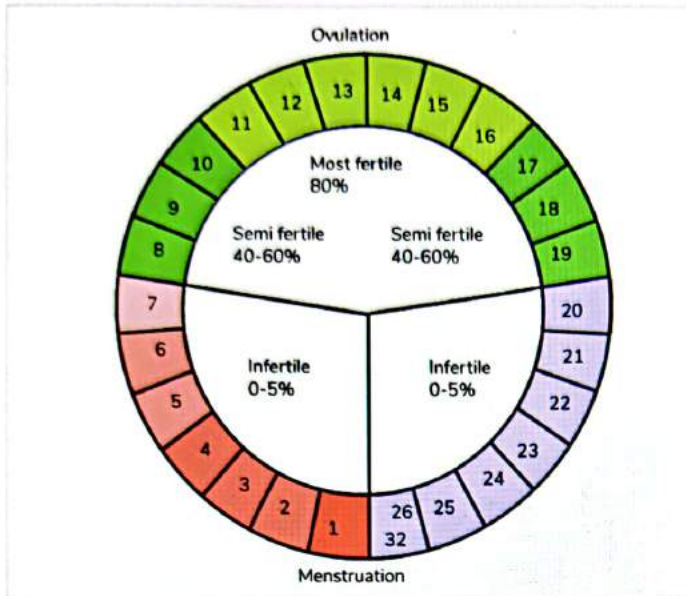
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35 PHYSIOLOGICAL METHODS OF CONTRACEPTION



Rhythm Method or Calendar Method

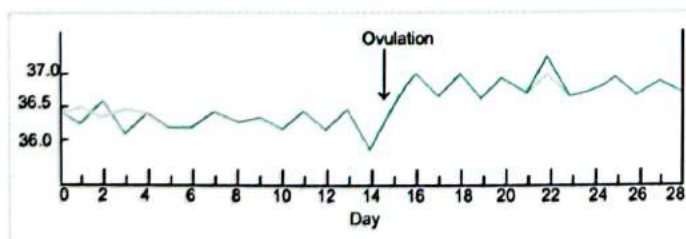
00:00:25



- Physiological method or natural method of contraception
- Track most fertile days and avoid sexual intercourse on those days
- Have a high failure rate.
- Days on which conception is likely to occur are calculated as follows
 - Shortest cycle minus 18 days gives the first day of the fertile period
 - The longest cycle minus 10 days gives the last day of the fertile period.
- Most fertile
 - 3-4 days before ovulation
 - Ova remains viable for 12-24 hours
- 11th to 17th day of the menstrual cycle intercourse should be avoided

Basal Body Temperature Method

00:03:00



- Used to find when a woman is ovulating
 - Retrospective method
- BBT rises at the time of ovulation
 - approx 0.3 to 0.5 degree during ovulation

- Sexual activity needs to be avoided for 4-5 days after the temperature elevates.
- Natural method of contraception

Ovulation Method/ Cervical Mucus Method/Billings Method

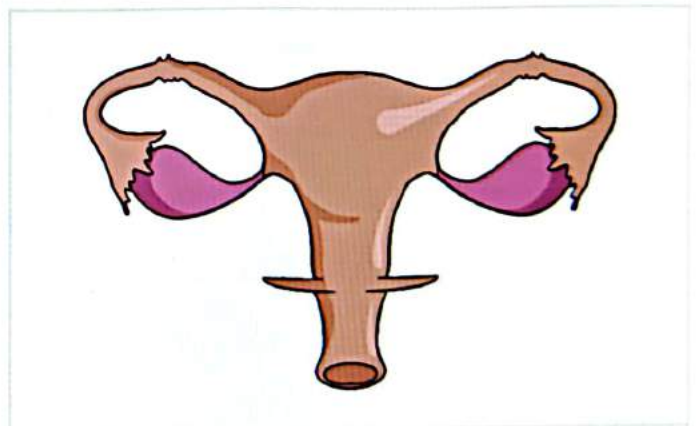
00:03:47

- After menstruation
 - The cervical mucus is opaque, thick, and sticky, and those are the dry days.
 - Women can have intercourse during this time.
- During Ovulation
 - Cervical mucus becomes slippery, lubricative, transparent and watery discharge.
 - Raw egg white appearance
 - Denotes peak of ovulation

Sterilization

00:04:57

- Permanent method of contraception
- Female sterilization (tubectomy) accounts for about 85% of and male sterilizations for 10-15% of all sterilizations in India.
- Male sterilization (vasectomy) is simpler, safer, and cheaper than female sterilization.
- Male sterilization is the most cost-effective form of family planning.
 - It has least failure rate
- Tubectomy is the most common method of sterilization in India.



Male Sterilization

00:06:22

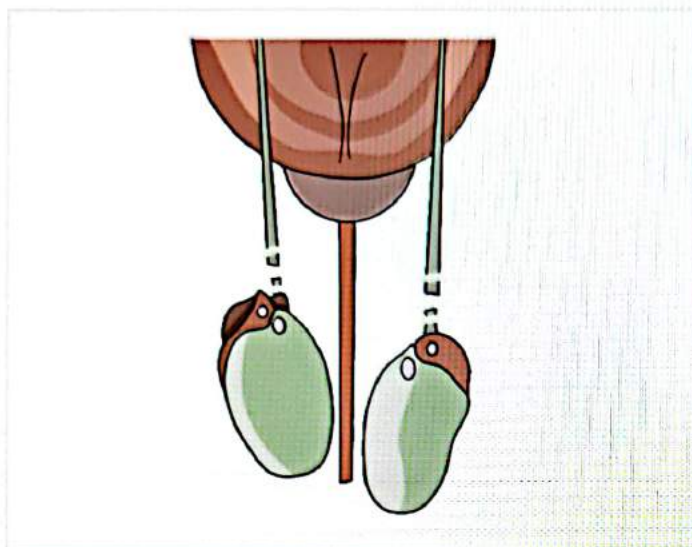
- Eligibility criteria of Male sterilization:
 - Married
 - <60 years of age
 - At least one child of more than 1 year of age
 - No past history of sterilization of self/ spouse
 - Sound mind

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- Approval is not needed from the partner for sterilization.
- For mentally-ill person
 - Certified mentally ill by Psychiatrist
 - A statement on the soundness of mind by the legal guardian/ spouse has to be provided
- Ways of vasectomy
 - Conventional vasectomy by a Trained MBBS doctor
 - No-scalpel vasectomy (NSV) by a trained MBBS doctor

Vasectomy

00:08:29



- A minimum of 1 cm of vas deferens is to be removed, and the ends are ligated.
- The most common cause of failure of vasectomy
 - Misidentification of vas deferens.
 - After vasectomy, for the man to be sterile, it takes up to 3 months, or the person has to be 30 ejaculations free.

Complications

00:10:07

- Failure rate
 - 0.15 per 100-person year
 - Least failure rate
- Operative complication
 - Pain
 - infection
- Sperm granules are formed
 - Appear after 10-14 days which eventually subsides.
- Autoimmune response
 - Antibodies to sperm may form, which are harmless and carry no clinical significance.
- There can be psychological effect
- Spontaneous recanalization
 - 0-6%
- Post-vasectomy, the couple should use a method of contraception (barrier method) for
 - Upto 3 months
 - Till the person is 30 ejaculations free
- The person should not lift any heavy weight after vasectomy.

Female Sterilization

00:12:41

- Married or ever married
- Age - 22-49 years
- At least one child of more than one years
- No permission is required of either husband or wife for sterilization.
- No past history of sterilization of self/ spouse
- Sound mind
- For mentally-ill person
 - Certified mentally ill by Psychiatrist
 - A statement on the soundness of mind by the legal guardian/spouse has to be provided
- Ways
 - Minilap by trained MBBS doctor
 - Laparoscopic sterilization by DGO (Diploma Gynaecologist), MD (Gyn-obs) or MS (Surgery)
 - Keep under observation for 24 hours

Timing of Sterilization

00:14:13

Procedure	Timing
Interval sterilization	Within 7 days of menstrual period (in the follicular phase of the menstrual cycle)
Postpartum sterilization	Between 24 hours to 7 days of delivery
Sterilization with MTP	Concurrently
Sterilization following spontaneous abortion	Performed if the client fulfills medical eligibility criteria

Hulka Clips

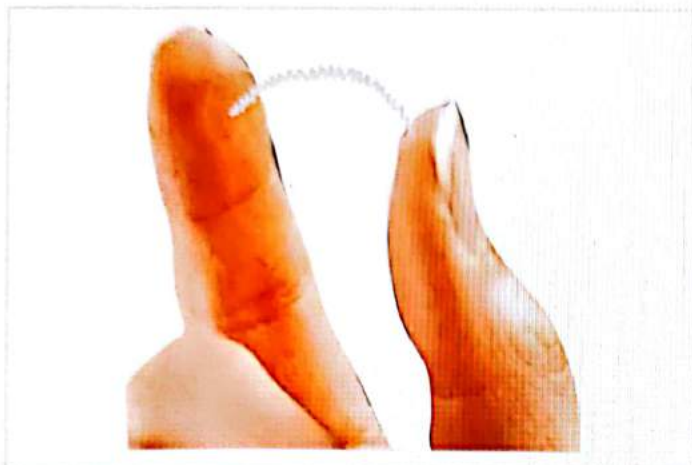
00:15:33



- Non-surgical method of sterilization
- Tubes are occluded by placing a spring clip (plastic or gold plated) across fallopian tube.
- Not used in India
- Person can have reaction with gold and plastic

Essure

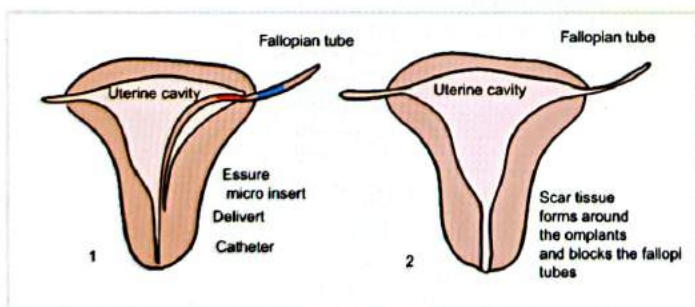
00:16:19



- Non-surgical method of sterilization
- Tubal insert
- A permanent sterilization procedure for women (USA)

Mechanism of action:

- Micro-inserts are placed into fallopian tubes by a catheter passed from the vagina through cervix and uterus
- Once in place, the device is designed to elicit tissue growth (scarring) in & around the micro- insert to form over a period of 3 months an occlusion/blockage in fallopian tubes.
- Tissue barrier formed prevents sperm from reaching an egg
- Occlusion confirmed by hysterosalpingogram
- No general anesthetic nor incision through the abdomen required
- Not done in india



Effectiveness

- 99.80% effective based on 4 years of follow-up

Disadvantages

- Do not prevent the transmission of STIS
- Ectopic pregnancy
- Expulsion
- Perforation of the uterus
- It is a permanent method

Failure Rate of Contraceptives

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00:17:45

Methods of contraception	Failure Rate (per 100-woman years of exposure)
Male Condom	5-14
Female condom	5-21
Diaphragm or dutch cap with spermicide	6-12
Today (vaginal sponge)	20-40(Parous women) and 9-20(Nullipara)
Lippes loop	3
CuT (copper T) 380 A	0.5-0.8
LNG 20 or Mirena (3rd generation IUD)	0.2
• Least failure rate	
Progestasert (3rd generation IUD)	1.3-1.6
OCP (Oral contraceptive pill)	0.1-0.5
DMPA (depo medroxyprogesterone acetate) or ANTRA	0.3
NET-EN	0.4
Norplant	1-6
Centchroman	1.8-2.8
• Available under 'Chhaya' program	
Rhythm or safe period method	24
• Natural method	
Coitus interruptus	18
• Natural method	
Sterilization	0.1-0.2 per 100 person years

Other New Contraceptives

00:19:12

1. Drospirenone
 - New progestin, available in India
 - Analogue of spironolactone (can increase potassium level)
 - Antioviulatory and antimineralocorticoid effect
 - Trade name in India: Yasmin and Tarana
2. Progesterone only pill
 - Ezy pill: 75mcg levonorgestrel
 - Organon, Cerazette: POP 75 mcg desogestrel

3. Injectables:

- Cyclofem
- Combined injectable: DMPA 25MG + ESTRADIOL CYPIONATE 5 MG

4. Mesigyna:

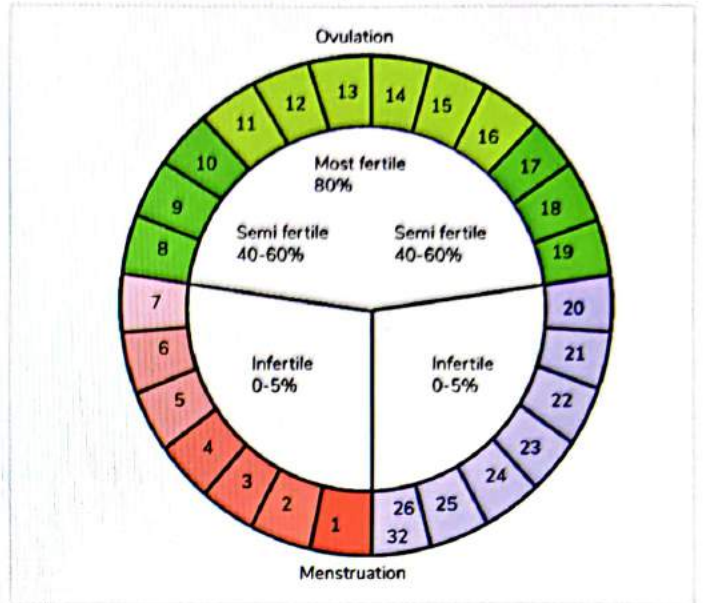
- NETEN 50 MG +ESTRADIOL VALERATE 5 MG

MCQs

Q. Postpartum sterilization as per GOI should be performed between?

- A. 12 hours to 7 days of delivery
- B. 24 hours to 7 days of delivery
- C. 48 hours to 7 days of delivery
- D. Within 7 days of delivery

Q. The diagram shown in the figure represents?



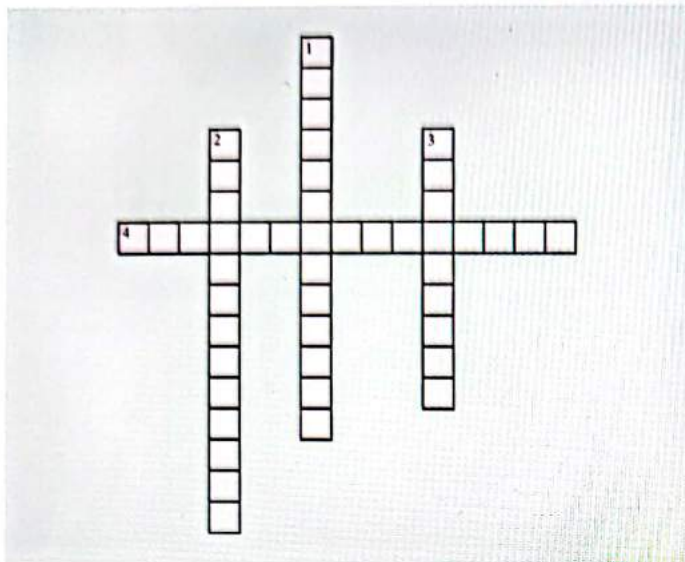
- A. Ideal tubectomy time estimation
- B. BBT method
- C. Cervical mucus method
- D. Rhythm method/ calendar method



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 4. Raw egg white appearance

Down

- 1. Permanent method of contraception
- 2. After menstruation
- 3. Minimum 1 cm of vas deferens is to be removed, and the ends are ligated.

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36

NATIONAL FAMILY PLANNING WELFARE PROGRAM



Introduction

00:00:35

- Launched in India 1951-52.
- In 1977- India was the first country to adopted voluntary approach.
 - Choice of couples to opt for it.
- Shift from clinical approach to extension of education approach

- Management of programs, funding, human resource and other functions
- District level- District health and family welfare
 - Implementation of family welfare programs
 - Administration and management of family welfare centers
 - Evaluation of program
 - Mass media and communication



Urban Family Welfare Centre

00:09:11

- Type I:
 - 10-25000 population
 - 2 paramedical staff
- Type II:
 - 25-50000 population
 - 2-4 paramedical staff
- Type III:
 - >50000 population
 - Includes 6 staff with a medical officer

Theme

00:04:10

- Theme of NFWP: India believes in two child themes.
 1. Son or Daughter: two will do
 2. Second child should be after 3 years
 3. Universal immunization
 4. Community needs assessment approach

Urban Health Posts

00:10:29

- Type A:
 - <5000 population
 - Paramedical staff
 - Attached to hospital
- Type B:
 - 5-10000 population
 - Paramedical staff
 - Attached to hospital

Targets

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00:06:07

- Couple Protection Rate should be more than 60 %. (Sensitive field indicator and outcome assessment tool)
- TFR- Total Fertility Rate has to be achieved 2.1 (sensitive indicator of family size and output of the program)
- NRR-Net Reproduction Rate to be achieved 1. (Indicates final impact of the program)
- Currently in India, according to NFHS- 5:
 - TFR= 2.0
 - CPR = 66.7%

- Type C:
 - 10-25000 population
 - Paramedical staff
 - Attached to hospital
- Type D:
 - 25-50000 population
 - Medical officer, para medical workers
 - Attached to hospital

Organizational Set Up

00:08:31

- Center level: Advisory council on population
 - Secretary: Additional and joint secretaries
 - Advisor (mass media and communication)
- State level (state health and family welfare bureau)

- Village level:
 - ASHA workers -1: 1000 population
 - Trained dai (TBA- Trained Birth Attendants)
 - Village Health guides -1: 1000 population

Strategies

00:12:05

Mission Parivar Vikash:

- Promote Family planning and decrease population explosion.



- New contraceptives (Antara & Chaya) were made available till the sub-centre level.
- **Nayi Pehel:**
 - o Family planning kit for newlyweds made available with ASHAs.
 - o Kits contain condom, OCPs, mirror, 2 towels, handkerchiefs in a jute bag and folic acid
- **Saas Bahu Sammelan:** encouraging young married women & their mothers-in-law to freely discuss matters related to family planning & reproductive health.
- **Saarthi:** Family planning mobile van offering information and services at the community's doorstep.

Newer Contraceptives: Introduced till sub-centre levels.

- ANTARA
- CHAYA
- EZYPILL
- Copper T
- PPIUCD insertion within 10 mins to 48 hours:
 - o IUCD used under NFWP are: Cu T 350A (shelf life- 10 yrs.)
- Nirodh (Male Condom)
- Mala N (OCP), Mala D

Social Marketing Scheme:

00:16:07

- Promote Behavior Change
- Home delivery of contraceptives
- Delivery charges by ASHA worker:
 - o Rs 1/-(3 condom pack)
 - o Rs 1/-(OCP Pack)
 - o Rs 2-(A pack of one tablet of emergency contraceptive pill)
 - o NISCHAY: Home testing UPT KIT



Incentives to ASHA workers for Ensuring spacing and limiting at birth.

- Rs 2000 - Delaying first childbirth by 2 years after marriage
- Rs 500 - Ensuring spacing of 3 years after birth of 1st child

Family Planning Insurance Scheme

00:18:43

- Introduced on 29 November 2005.
- It was introduced with oriental Insurance company to take care of cases of failure of sterilization or death resulting from sterilization.

Family Planning Insurance Scheme (Limit of Indemnity)

00:19:21

- Death at hospital/ within seven days of discharge- Rs. 2,00,000
- Death due to sterilization (8-30 day from the date of discharge)- Rs. 50,000
- Expenses for treatment of medical complications- Rs. 25000
- Failure of Sterilization- Rs. 30,000
- Doctors/ Facilities covered for litigations up to 4 cases per year Including defense cost-Rs. 2,00,000
- State government employees who undergo sterilization after two children- 2 increments
- After 3rd child- 1 increment
- Central government employees: One increment after sterilization no maternity leave after 3 children
- Special leave for sterilization (to both state & central government employees)
- Cash incentives (subject to state government policies and changes with time) for acceptors of sterilization services.
- Conventional tubectomy: When, women accepts it-
 - o High focus state/UT (all women)- Rs 1400 one-time payment (Acceptor)/200 ASHA.
 - o Non high focus state/UT-BPL + SC/ST women: RS 600 one-time payment acceptor/ 150 rs. for ASHA.
 - o Non-BPL+Non-SC/ST women: Rs 250 one-time payment
- Laparoscopic tubectomy- INR 145 one time payment
- Vasectomy: Rs 2000(acceptor- man)/ Rs 300(ASHA) (high focus state)
- Rs 1100 (for man) one time payment (high focus and non focus states / UT)/ Rs 200(ASHA)

- Motivator: Rs 150 for tubectomy and INR 200 for vasectomy
- IUD receptors: Rs 75
- Bimaru Coju / EAG states: Here family planning services are poor.
 - Bihar
 - MP, Maharashtra
 - Assam
 - Rajasthan
 - UP
 - Chhattisgarh
 - Odisha
 - Jharkhand
 - Uttarakhand

To promote family planning services

00:24:38

- Fixed day static approach
- District hospital: twice weekly
- Sub district hospital: weekly
- CHC: Fortnightly
- PHC: Monthly
- Promote tubectomy and vasectomy in health care facility

Gather Approach

00:25:43

- Contraceptive counselling.
- Used in family clinics

Method

- Greet the client in a friendly and respectful manner
- Ask the client about FP/RH needs
- Tell the client about different methods/services
- Help the client to make her own decision about which method/service to use
- Explain to the client how to use the method/service she has chosen
- Return visit and follow-ups of client scheduled

Contraceptive Availability

00:27:30

- CHC: Laparoscopic tubectomies
- PHC: Vasectomy, minilap procedures
- Sub Centre: IUD (Multi Purpose worker- Female or ANM), Injectables
- Village level (ASHA): OCPs, Condoms

National Population Policy

00:28:13

- It was adopted by the Government of India on 15th Feb 2000.

Objectives

Immediate objective:

- To address the unmet needs for contraception
- To provide integrated service delivery for basic reproductive and child health care

Medium term objective:

- To bring the TPR to replacement level by 2010

Long term objective:

- Achieve a stable population by 2045

Jansankhya Sthirata Kosh

00:29:05



- It is a Population stabilization fund to achieve family planning, control population growth.
- Combination of government and civil society
- Working to promote innovations
- Promote initiatives which leverage the strength of different economic and social sectors to reach out needy population groups

Strategies

00:30:09

Prerna

- Initiative for population control
- Provides reward for specific parenthood
- Girl's marriage after 19 years - Rs 5000
- First birth after 21 years –
 - Rs 7000- girl
 - Rs 5000- boy
- >3 years gap between first and second child with sterilization of 1 parent after the 2nd child (reward of Rs 7000/ if it's a girl child & Rs 5000/ if it's a boy)

JFK'S Santushti Strategy

00:31:21

- An opportunity for private sector O&G / empanelled general surgeons, to perform sterilization operations in private nursing homes, after receiving an advance of Rs 15,000/-
- Rs. 1,50,000 given for 100 cases. Rs 500 per case extra given if 30 cases at a time are done

Evaluation of Family Planning Services

00:32:19

- Evaluation of family planning services
- Evaluation of need: based on family planning indices, maternal mortality ratios
- Evaluation of plans: for scope of implementation of policies
- Evaluation of performance- in terms of:
 - Services: health care, sterilization, contraceptives, follow ups, mobile services

- Response: like enrollments in the program
- Cost analysis and administrative components
- Evaluation of effects: change in knowledge, attitudes and behavior of population
- Evaluation of impact:
 - Family size
 - Desired no of children
 - Age of mother at birth of first and last child
 - Birth interval
 - Birth order
 - Number of abortions
 - Change in annual growth rate, birth rates of larger areas

FP 2020

00:33:15

- Increasing financial commitment on family planning whereby India commits an allocation of 2 billion USD from 2012 to 2020
- Ensuring access to family planning services to 48 million (4.8 crore) additional women by 2020 (40% of the total FP2020 goal)
- Sustaining the coverage of 100 million (10 crore) women currently using contraceptives

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MCQ's

Q. Identify the logo?



- A. RMNCH+A
- B. Child rights
- C. Family Planning**
- D. National Health Mission

Q. Which one of the following is the main target of family welfare programs?

- A. Couples in the fertile age**
- B. Children below 12 years
- C. Women after fertile age
- D. Male after fertile age

Q. Which one of the following is the activity of family welfare programme

- A. Malnutrition programme
- B. child marriage
- C. IUD programme**
- D. One child one nation policy

Q. Which country first initiated the family planning programme?

- A. Brazil
- B. Pakistan
- C. India**
- D. France

Q. Family planning services were voluntary in India from?

- A. 1956
- B. 1977**
- C. 1992
- D. 1997

Q. Are all statements true under the national family welfare program except?

- A. Cafeteria approach
- B. Basket approach
- C. Family planning services were made compulsory for all**
- D. Family planning services were being provided free of cost by the government

Q. Mission Parivar Vikash is an initiative directed to?

- A. Promote antenatal care
- B. Promote family planning**
- C. Promote breastfeeding
- D. Promote safe sexual practice

Q. What is the name of the initiative currently adopted under the family planning program for contraceptive counseling?

- A. Spike approach
- B. Cafeteria approach
- C. Basket approach
- D. Gather approach**

Q. Theme of the national family welfare programme?

- A. Son or daughter one will do
- B. Son or daughter two will do**
- C. Son will do
- D. Daughter will do

Q. Who is the key health functionary for ensuring spacing at birth?

- A. ANM
- B. LHV
- C. ASHA**
- D. Trained birth attendant

Q. NISCHAY is a

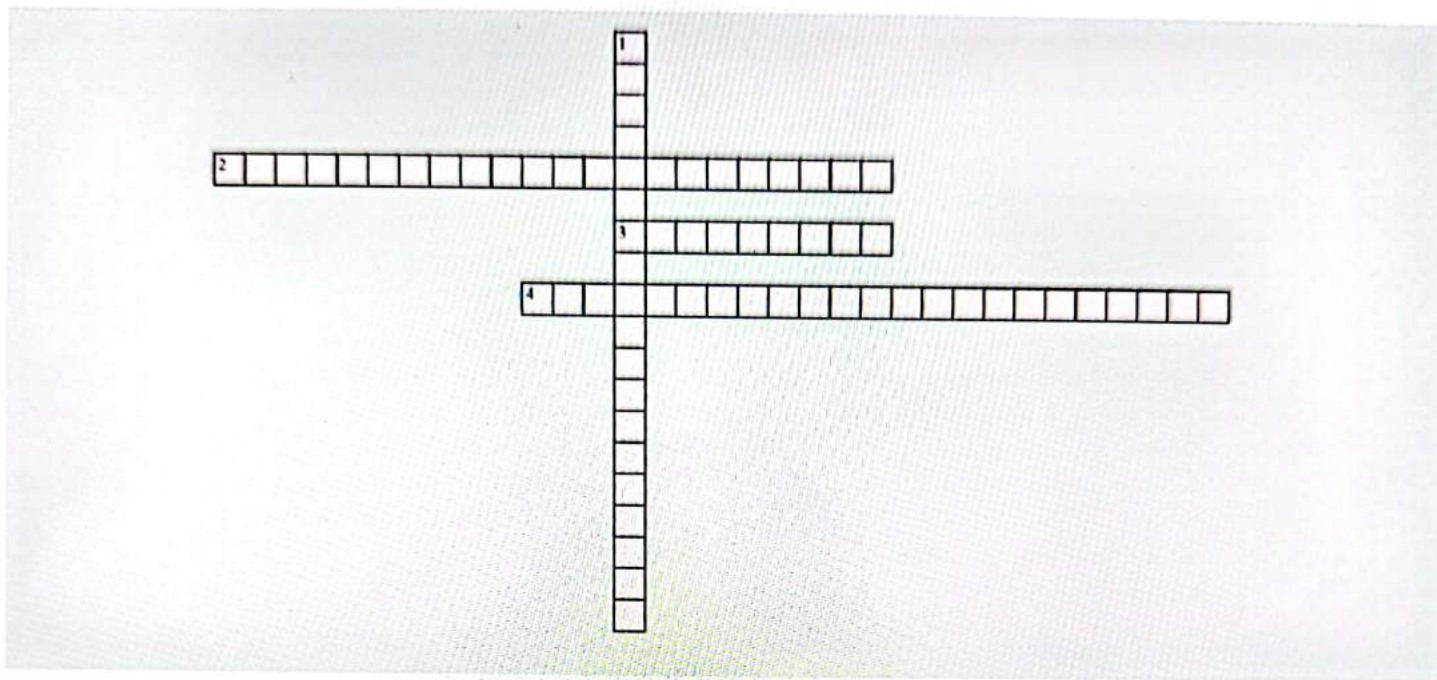
- A. Pregnancy test kit**
- B. STD test kit
- C. Kit for rapid malaria diagnosis
- D. Spot test for HIV



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Combination of government and civil society
- 3. Family planning kit for newlyweds made available with ASHAs.
- 4. Contraceptive Availability

Down

- 1. Promote Family planning and decrease population explosion.

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PREVIOUS YEAR QUESTIONS



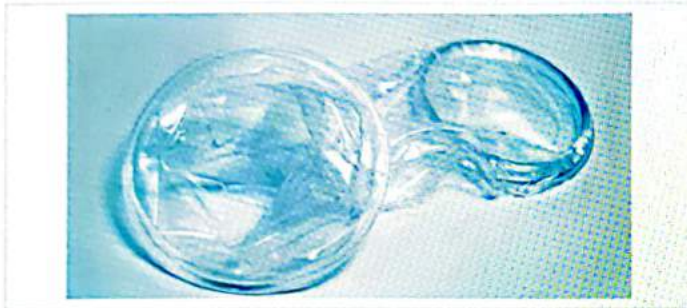
Q. Spermicide used in contraceptives is? (FMGE Dec 2019)

- A. Gossypol
- B. Non-oxynol 9**
- C. Centchroman
- D. Clomiphene

Q. Target couple is? (FMGE Dec 2019)

- A. Currently married couple where the wife is of reproductive age (15-49 years of age)
- B. Couple that is eligible for practicing family planning**
- C. Couple using contraception
- D. Couple with 3 children

Q. Identify the contraceptive method shown in the photograph below? (NEET 2020)



- A. Male condom
- B. Diaphragm
- C. Vaginal sponge
- D. Female condom**

Q. Absolute contraindication of IUCD? (FMGE Dec 2019)

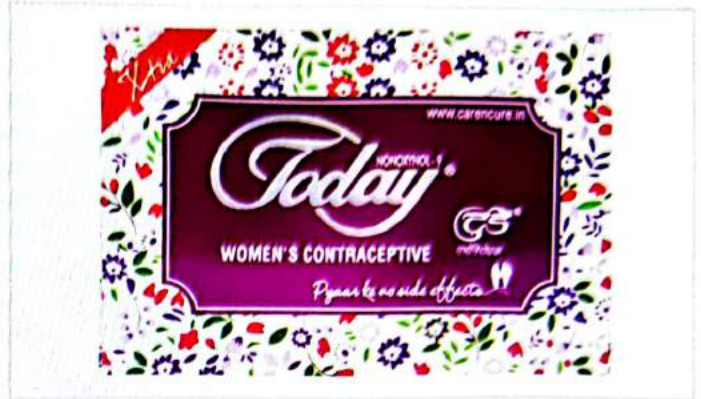
- A. Anemia
- B. DVT
- C. Acute PID**
- D. Endometriosis

Q. A lactating woman came to OPD 6 weeks after delivery, for check-a up and to get advice for the contraception. Which of the following is not advised? (FMGE Dec 2020)

- A. Combined OCP**
- B. Norplant
- C. IUCD
- D. Mini pill

Q. Substance chemical used in given contraceptive?

(FMGE June 2022)



- A. Ethinyl estradiol
- B. Levonorgestrel
- C. Progestin
- D. Nonoxynol 9**

Q. Women who recently delivered baby comes to the clinic for contraception plan for the next 3 years. Best contraceptive in this case? (FMGE June 2022)

- A. OCP
- B. CuT**
- C. Male condom
- D. POP

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PREVENTIVE OBSTETRICS, MATERNAL HEALTH INDICATORS

Obstetric Care 00:00:31

- Care given when women is pregnant

Essential Obs Care 00:00:49

- Early registration of pregnancy (12-16 weeks)
- 3 ANC receipts
 - Either 1 of it should be from a medical officer
- Safe delivery (Home or Institutional)
- 3 PNC receipts

Emergency Obs Care 00:02:00

- 2 types:
 - Basic
 - Comprehensive

Basic Emergency Obs care	Comprehensive Emergency Obs care
Needs skilled health professional	
Must know to give parenteral antibiotics, oxytocin and anticonvulsants	Must have Basic Emergency Obs care
Knows manual removal of placenta	Emergency C section, Blood transfusion and anesthetic services
Assisted vaginal delivery CHC, 24 hour PHC	

Important Information

- FRU: First Referral Unit
- Any CHC can act as FRU if it has 3 critical determinants:
 - Facility for Emergency C section
 - Facility for care of Newborn
 - Facility for Blood transfusion

Antenatal Care 00:06:48

- Care provided during antenatal period

ANC Visits 00:07:07

According to WHO

- 8 ANC visits recommended
- Minimum ANC visits are 8**
- Minimum ANC visits is known as **Antenatal care contact**.
- Symbolizes a stronger bond between health worker and pregnant female.

- Schedule of visits:
 - 1st Trimester: 1 visit
 - 2nd Trimester: 2 visits
 - 3rd Trimester: 3 visits
- It recommend pregnant women to have their first contact in first 12 weeks gestation, with subsequent contacts taking place at 20, 26, 30, 34, 36, 38 and 40 weeks gestation.

Govt. of India 00:09:50

- Minimum ANC visits are 4**
 - 1st visit - <12 weeks
 - 2nd visit - 14-16 weeks
 - 3rd visit - 28-32 weeks
 - 4th visit - 30 weeks-term

Recommended or ideal number of visits

- At Least 13 or 14
 - Up to 7 months: Once every month
 - 8th month: Twice every month
 - 9th month: Once every week

Supplementation in Pregnancy 00:12:44

- Folic acid tab 400mg daily in 1st trimester
- Iron folic acid tablet daily from 2nd trimester onwards (**Under Anemia Mukh Bharat**)
- For anemic women, iron folic acid tab twice daily
- Cut off for anemia in pregnancy
 - Hemoglobin less than 11g/dl
 - Female HG < 12/dl
 - Male HG < 13/dl
- Hb 7-9g/dl- 2 tablets of iron folic acid
- Hb <7g/dl- injectables are given.

Nutritional Recommendation for Mother 00:14:21

- Calorie requirement according to NIN (National Institute of Nutrition)
 - Pregnancy:** +350 kcal/day
 - Lactation**
 - 0-6 months: +600 kcal/day
 - 7-12 months: +520 kcal/day

- Ideally in**
 - 1st trimester- No additional calories required.
 - 2nd trimester- 350 kcal/day
 - 3rd trimester- 450 kcal/day
- Female**
 - Sedentary:** 1660-1700 kcal
 - Moderate:** 2100 kcal
 - Heavy worker:** 2700 Kcal
 - +350 means we add to sedentary (1660)

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- Element requirement that increases during pregnancy
 - Fe
 - Folic acid
- Nutrients requirement that increases during pregnancy and lactation
 - Ca
 - Vitamin A
 - Iodine

Weight Gain in Pregnancy

00:19:33

- Avg weight gain: 9-11 kg
- NIN recommend: 10 kg (lower socioeconomic status: 6 kg)
- 1st trimester: No weight gain
- 2nd trimester: 2kg per month weight gain
 - If its 3kg per month- twins, big baby or diabetes in mother

Vaccination Protocol in Pregnancy

22:21:00

- TD vaccine (replaced for TT- TT is no longer given)
- If women
 - Primi
 - Multi - With last childbirth more than 3 years ago
- 2 does of TD vaccine must be given
- 2 doses of TD
 - 1st dose- As soon as pregnancy confirmed or possible in pregnancy
 - 2nd dose - 28 days later
- If she is a multi but last child birth is less than 3 years ago
 - A booster dose of TD vaccine
 - Given- 7th month of pregnancy

Lab Investigations in Pregnancy / Antenatal Period

00:24:24

At Sub-centre

- Pregnancy detection test
 - UPT testing kit provided from ASHA workers is Nischay
- Hb examination
- Urine test for presence of albumin and sugar
- Rapid Malaria test

At PHC/CHC/FRU

- Blood groups & Rh status
- VDRL/RPR
- HIV testing
- Rapid Malaria test (if unavailable at Sub centre)
- Blood sugar testing
- HbsAg for Hepatitis B infection



Important Information

- Triple test: HIV testing, HbsAg, VDRL

High Risk Pregnancies

00:26:20

- Elderly primi (age 30 years and more)
- Short stature primi (height 140 cm and less)
- Malpresentation (breech, transverse lie)
- APH
- Threatened abortion
- Preeclampsia and eclampsia
- Anemia
- Twins
- Hydramnios
- Previous stillbirths or Intrauterine death
- Manual removal of placenta
- Elderly grand multipara
- Prolonged pregnancy-14 days after expected date of delivery
- History of previous cesarean or instrumental delivery
- Pregnancy with other disease, kidney, diabetes, TB, liver disease
- History of 3 or more spontaneous abortions
- History of infertility

Danger Signs in Pregnancy

00:28:36

- Any bleeding per vaginam during pregnancy or heavy vaginal bleeding > 500ml during delivery or postpartum
- Severe headache with blurred vision
- Convulsion or loss of consciousness
- Labor lasting for more than 12 hours
- Preterm labor
- Premature rupture of membranes
- Severe abdominal pain
- Failure to deliver placenta within 30mins
- Medical conditions like diabetes, heart disease and asthma

Specific Health Problems During Antenatal Period

00:29:50

1. Anemia

- Hemoglobin < 11g/dl
- Anemia mukt bharat program
 - To a pregnant women: 600mg Fe and 500 microgram folic acid
 - Daily
 - Given during pregnancy and lactation
 - Deworming done around 2nd trimester with Albendazole.

2. Other nutritional deficiencies: Vitamin A and D

3. Asymptomatic bacteriuria

- Midstream urine culture to diagnose

4. Gestational diabetes mellitus

- Test advised to 24-26 weeks
- Sometimes offered in 12 weeks
- Give 75g of anhydrous glucose given to mother

- Then sugar level measured
 - If blood sugar is more than > 140 mg/dl, then suffers from GDM (2 occasions when done in 12 weeks)
 - Female is pt in **medical nutrition therapy**
 - After 2 weeks if blood sugar is
 - <120 mg/dl - No need to worry
 - >120mg/dl - **Insulin is given**
- 5. Syphilis**
- Seen after 6 months
 - If women develop primary or secondary syphilis it passes to baby
 - Preventable
 - **10 daily injection of procaine penicillin given**
- 6. Tetanus**
- 7. German Measles/Rubella:** Birth defects uncommon after 20 weeks of gestation.
- 8. Rh status:** Hemolytic disease takes the form of hydrops fetalis, icterus gravis neonatorum and congenital hemolytic anemia.
- 9. HIV infection:** Through placenta, during delivery, breast feeding
- Mother to child transmission in India contributes **5% of total cases**
 - Efficiency or risk is 25% - 30%
- 10. Hepatitis Infection:** Most infections occur at birth, Both HbsAg and HBeAg are positive

Expected no. of Pregnancies

00:37:52

- Q.** The birth rate is 20/1000 mp. As a medical officer we should perform audits of a sub center. How many pregnancies should be registered with the ANM?
- Population in plain area is 5000
 - For 5000 the birth rate is 100.
- $$5000 \times \frac{20}{100} = 1000$$
- We consider 10% of pregnancy wastage factor
 - Expected number of pregnancy is **100+10% of pregnancy wastage 100**
 - $100+10=110$
 - At any point of time: 50% of pregnancies should be registered.
 - $\frac{110}{2} = 55$

Maternal Health Initiatives

00:41:48

- JSY - Janani Suraksha Yojana
- JSSK - Janani Shishu Suraksha Karyakram
- Pradhan Mantri Matritva Surakshit Abhiyan
- SUMAN

Intranatal Care

00:42:43

- Assistance during delivery: Institutional delivery or safe delivery at home by skilled birth attendant
- To train health workers - **Dakshatha training**
- We ensure Disposable Delivery Kits (DDK)
- **5 cleans** in conduct of delivery important in prevention of neonatal tetanus:
 - Clean water
 - Clean surface for delivery
 - Clean cut
 - Clean tie
 - Clean cord
 - No application
- 7 clean- 5 clean + clean water and clean towel for hand wiping
- **Initiative:** **Lakshay** providing quality and satisfaction

Postnatal Care

00:44:24

- Care provided after delivery
- **GOI:** Minimum postnatal visits
 - In case of home delivery (ANM) **4 minimum**
→ Day 1,3,7 and 42
 - Institutional delivery **3 minimum**
→ Day 3, 7 and 42

Home Based Newborn Care

00:46:20

- Additional home visits made by ASHA worker.
- **Home delivery**
 - Day 1, 3, 7, 14, 21, 25, 42
 - Total- **7 visits**
- **Institutional delivery**
 - Day 3, 7, 14, 21, 25, 42
 - Total- **6 visits**

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SUMAN

00:48:03

- Surakshit Matritva Ashwasan
- Women under **6 months post delivery**

Indicator

00:48:32


- Maternal mortality indicator
- **Maternal mortality ratio**

$$\frac{\text{No. of maternal deaths during, antenatal period, during delivery and up to 42 days post delivery}}{\text{Life birth}} \times 100000$$
 - Numerator not a part of denominator
- **Maternal mortality rate**



No. of maternal deaths during antenatal delivery and up to 42 days post delivery
 $\frac{\text{Women in reproductive age group. 15 - 49 yrs}}{\times 100000}$

- **Maternal death:** Excludes accidental/incidental causes.
 - Example: Slipped and falling, electric shock
- **Current value of MM ratio:** 97/100000 LB
- **Source-** SRS (Sample registration system)
- **Most common direct cause:** Hemorrhage (PPH)
- **Most common indirect cause:** Anemia



Important Information

- Most sensitive indicator of delivery services under health care in India
- Direct cause of maternal mortality: PPH
- Indirect cause maternal mortality: Anemia

Obstetric Hemorrhage	38%
Puerperal sepsis	11%
Unsafe abortion	8%
Hypertensive disorders	5%
Obstructed labor	5%
Others (Ectopic pregnancies, embolism, due to interventions)	8%

Approaches to Measure Maternal Mortality 00:55:20

- **Verbal Autopsy:**
 - Done for measuring maternal mortality
 - Technique in which forms are filled regarding causes of maternal mortality in the field.

MCQs

- Q. Minimum no of antenatal care contacts (Antenatal visits) required during pregnancy is?**
- A. 3
 - B. 4
 - C. 8
 - D. 11
 - E. 13

Q. Registration of pregnancy within 12 weeks is a prime responsibility of?

- A. Anganwadi worker
- B. Asha
- C. ANM
- D. MPW

Q. Recommended ideal number of antenatal visits are

- A. 4-5
- B. 6-7
- C. 11-12
- D. 13-14

Q. Essential Obs care does not include

- A. Three postnatal checkups
- B. MTP facilities
- C. Safe delivery at home or institution
- D. Early registration of pregnancy

Q. Which out of the following is a critical determinant of FRU

- A. Essential lab service
- B. Safe abortion services
- C. Newborn care
- D. **Emergency care of sick newborn**

Q. All of the following are considered as high risk pregnancy except?

- A. Elderly primi (30 years and over)
- B. **Short statured primi (150 cm and below)**
- C. History of previous cesarean or instrumental delivery
- D. Prolonged pregnancy (14 days after expected date of delivery)

Q. Maternal mortality ratio is calculated by?

- A. Maternal deaths/100
- B. Maternal deaths/ live births
- C. **Maternal deaths/ 100000 live births**
- D. Maternal deaths/100000 population

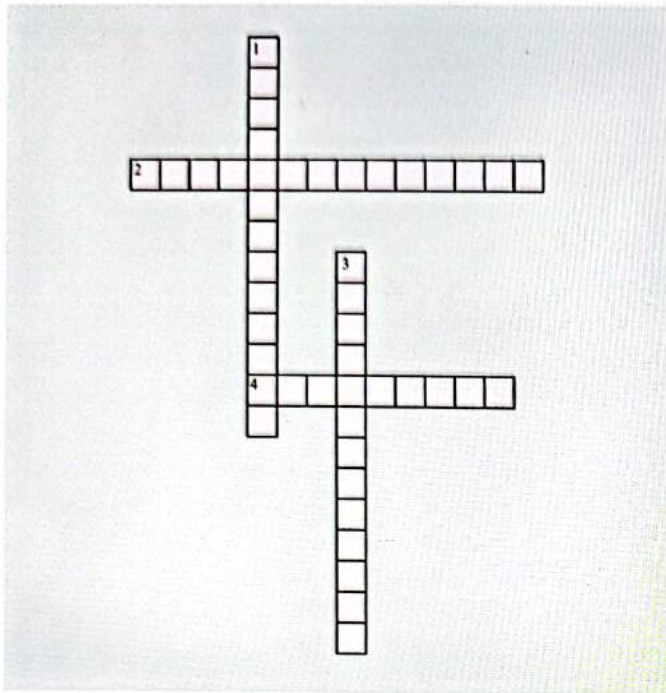
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. To train health workers - Dakshatha training
- 4. Sample registration system

Down

- 1. Done for measuring maternal mortality
- 3. Excludes accidental/incidental causes



PREVENTIVE PEDIATRICS CHILD HEALTH INDICATORS



Topics	00:00:10	LNMR = death of a neonate from 8th day till 28th day per 1000 live births (Death of child (neonate) 8-28 days of life / live births) ×1000 Post neonatal mortality rate PMMR= death from 29th day till 1 year of life per 1000 live births (Death of child (neonate) 29th day-1 year of life / live births) ×1000
<ul style="list-style-type: none">Preventive PediatricsChild Health IndicatorsStillbirth RatePerinatal Mortality RateNeonatal Mortality RateInfant Mortality RateUnder 5 Mortality RateChild Death RateChild Survival IndexLow Birth Weight		
Preventive Pediatrics	00:00:33	Causes of neonatal mortality
<ul style="list-style-type: none">Similar to preventive obstetrics and gynecologyCare to children right from life inside womb to 5 years		00:05:59 <ul style="list-style-type: none">Most common cause of neonatal mortality is Low birth weight or prematurity (According to SRS 2023 cause of death report)<ul style="list-style-type: none">75% of total neonatal deaths occur within first week of life in the first 48 hours.Neonatal PneumoniaSepsisCongenital anomaliesDiarrheaInjuriesOther non-communicable diseases
Indicators - child health indicators	00:01:09	Danger signs
<ul style="list-style-type: none">Neonatal Mortality RateEarly Neonatal Mortality RatePost Neonatal Mortality RateInfant Mortality RateUnder 5 Mortality Rate - Child Mortality RateStillbirth RatePerinatal Mortality RateChild Death Rate		00:07:40 <ul style="list-style-type: none">Refusal to feedLethargicCold to touchDifficult or rapid breathingConvulsionsPersistent vomitingJaundice at birthBlue color of extremities
Neonatal mortality rate	00:02:28	Infant mortality rate
<ul style="list-style-type: none">Neonate- birth to first 28 days of lifeNeonatal mortality rate		00:07:59
NMR= Death of child (neonate) 0-28 days of life per 1000 live births (Death of child (neonate) 0-28 days of life / live births) ×1000		IMR = Death of an infant 0 - 1 year per 1000 live births (Death of child (infant) 0-1 year of life / live births) ×1000
<ul style="list-style-type: none">Usually denominator - live birthsMultiplier - 1000		<ul style="list-style-type: none">Death within first year of lifeMost important cause of Infant Mortality Rate is Low birth weight or prematurity. (According to Cause of Death Report SRS 2023)Most important indicator of<ul style="list-style-type: none">Health status of a community
Early neonatal mortality rate <ul style="list-style-type: none">Early neonate - 0-7 days		
ENMR = death of neonate 0-7 days of life per 1000 live births (Death of child (neonate) 0-7 days of life / live births) ×1000		
Late neonatal mortality rate <ul style="list-style-type: none">Late neonate - 8 - 28 days		

- Level of living of people
- Effectiveness of MCH services
- **Current IMR = 28 / 1000** (given by SRS - sample registration system)
- Most infant death - 1st month of life
- Of these 54.6% die during first week of birth
- Risk of death greater in first 24-48 hours of life

At risk infants

00:10:20

- Birth weight < 2.5 kg
- Twins
- Birth order 5 or more
- Infant in artificial feeding
- II- and III-degree malnutrition (weight < 70 % of expected weight)
- Failure to gain weight in 3 successive months - failure to thrive
- Children with PEM
- Diarrhea
- Babies of working mother and single parent



Important Information

- Average birth weight of Indian babies - 2.8 kg
- At risk pregnancy - spontaneous abortion 3 or more

Under 5 mortality rate

00:11:46

Child mortality rate / U5MR = death of a child 0-5 years of age per 1000 live births

(Death of child (neonate) 0-5 years of life / live births) \times 1000

- Most important cause of U5MR: Low birth weight or prematurity (According to Cause of Death report, SRS 2023)
- Considered by UNICEF as **single best indicator of overall social-economic development and well-being of entire society.**

Causes

- Prematurity
- Preterm
- Birth asphyxia / Hypoxia
- Pneumonia
- Sepsis
- Congenital anomalies
- Diarrhea
- Injuries
- Measles
- Meningitis
- Tetanus
- AIDS

Stillbirth rate

00:14:00

Death of a fetus weighing at least 1000 grams equivalent to 28 weeks of gestation per 1000 total births

(Death of fetus weighing atleast 1000grams equivalent to 28 weeks of gestation / total births) \times 1000

- Period of viability - 22 weeks - WHO
- In India - period of viability - 28 weeks

Perinatal mortality rate

00:15:06

PMR = late fetal death (28 weeks of gestation or more) and early neonatal death (0-7 days) per 1000 live births

- **28 weeks** of gestation or
- Weight of the fetus should be at least **1 kg** or
- Length of fetus at least **35 cm**
- **PMR** - best indicator for combined obstetrics and pediatrics care
 - As it takes into consideration both
 - Beyond 28 weeks of gestation
 - Within first 7 days of life
- Cause - birth asphyxia

Points to remember-

1. Low birth weight or premature mortality

- Most common cause of neonatal mortality
- Most common cause of infant mortality
- Most common cause of under 5 mortality

2. Best indicator of

- Health status of a community - IMR
- Health status and socio-economic status of a community - under 5 mortality
- Combined obstetrics and pediatrics care - perinatal mortality rate
- Health care delivery services in a population - maternal mortality ratio

3. Formulas -

- Multiplier - 1 lac - maternal mortality rate and maternal mortality ratio
- NMR, ENMR, PNMR, IMR, U5MR -
 - Multiplier - 1000
 - Denominator - live births
- Stillbirth - denominator - total births
- Child death rate
 - Death rate - denominator - mid - year population

Child death rate

00:19:17

Death of a child 1-4 years per 1000 mid year population of 1-4 years

(Death of child 1-4 years of life / midyear population) \times 1000

- Most refined indicator of social situation in a country
- **Second year is the period when the young child has the highest risk of dying.**
 - Most common cause of child death rate - diarrhea

Developing countries	Developed countries
Diarrhoeal diseases	Accidents
Respiratory infections	Congenital anomalies
Malnutrition	Malignant neoplasms
Infectious diseases (measles, whooping cough)	Influenza
Other febrile diseases	Pneumonia
Accidents and injuries	

Child survival index

00:22:27

$$\text{Child survival index} = (1000 - \text{under 5 mortality rate}) / 10$$

$$(1000 - \text{Under 5 mortality rate} / 10)$$

- Proportion of children who survive up to 5 years

Low birth weight (LBW)

00:22:43

- Birth weight **below 2.5 kg**
- Average weight of Indian babies - 2.8 kg
- Birth weight doubles by 5 months
- It triples by 1 year.
- Quadruples by 2 years
- It can be divided into:
 1. **Moderately low birth weight** - 1500 g to 2499 g
 2. **Very low birth weight** - 1000g - 1500 g
 3. **Extremely low birth weight** - below 1000 g
- IMR is 20 times higher in LBW babies
- Single most important factor influencing child survival

Preterm

00:24:45

- Less than 37 weeks
- Term - 37 weeks to 42 weeks
- Post term - beyond 42 weeks
- It can be divided into:
 1. **Extremely preterm** - <28 weeks
 2. **Very preterm** - 28 to <32 weeks
 3. **Moderate to late preterm** - 32 to 37 weeks

Small for date babies (SDF)

00:25:09

- Babies weigh **less than 10th percentile for gestational age**
- Show retarded intrauterine fetal growth
- SDF babies may be born term or preterm
- Have high risk of death - PEM and infections
- **Survival is better for preterm babies than SDF babies**

- Prognosis is not good for SDF babies
- Risk factors
 - Maternal
 - Placental
 - Fetal

MCQs

Q. Perinatal mortality rate includes

- a. Death within first week of life
- b. Abortions stillbirths, death within first week of life
- c. Death from 28 weeks within first week of life
- d. Death within first one month of life

Ans: c) Death from 28 weeks within first week of life
(Perinatal mortality rate = Late fetal death + early neonatal death)

Q. Stillbirth rate is

- a. Death of a fetus weighing 1000 gm or more in one year per 1000 total births
- b. Death of a fetus weighing 1000 gm or more in one year per 1000 live births
- c. Death of a fetus weighing 1000 gm or more in one year per 1000 Stillbirths
- d. None of the above

Ans: a) Death of a fetus weighing 1000 gm or more in one year per 1000 total births

Q. All are criteria for identifying at risk infants except?

- a. Birth weight less than 2.8 kg
- b. Birth order 5 or more
- c. PEM, diarrhea
- d. Working mother

Ans: a) Birth weight less than 2.8 kg

Q. Mean birth weight of Indian babies

- a. 2.5kg
- b. 2.8kg
- c. 3.1 kg
- d. 3.5 kg

Ans: b) 2.8kg

Q. Low birth weight is defined as

- a. Birth weight <2.5 kg
- b. Birth weight < 10th percentile
- c. Gestational age <34 weeks
- d. Gestational age < 38 weeks

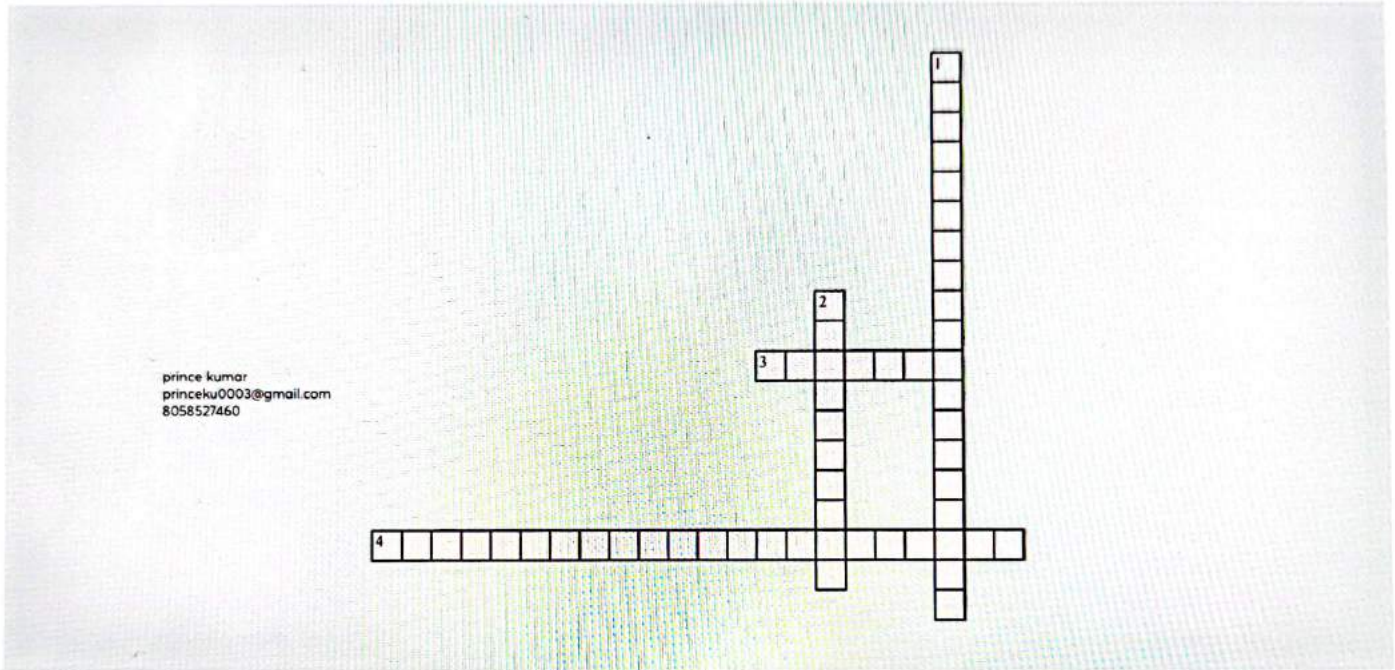
Ans: a) Birth weight <2.5 kg



CROSS WORD PUZZLES



Crossword Puzzle



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Across

- 3. Most important cause of neonatal mortality
- 4. Best indicator for combined obstetrics and pediatrics care

Down

- 1. Death of an infant 0 - 1 year per 1000 live births is called
- 2. Most common cause of child death rate



39

GROWTH AND DEVELOPMENT, SCHOOL HEALTH SERVICES



Cause of Neonatal Mortality

00:00:14

- According to causes of death survey (2017-19), released by SRS - Prematurity and low birth weight are the most common causes of neonatal mortality
- **Prematurity and low birth weight - 48.1%**
- Birth asphyxia and birth trauma - 12.9%
- Neonatal pneumonia - 12%
- Sepsis - 5.4%
- Congenital Anomalies - 4%
- Diarrhea - 3.1%
- Injuries - 0.9%
- Other non-communicable disease - 7.1%
- All other causes - 1.4%

Causes of Infant Mortality

00:01:20

- According to causes of that survey released by SRS 2023 - prematurity and low birth weight are the most common causes of infant mortality
- About 71.7% of Infant death occur within the first month of life
- **From this 71.7%, 54.6% die during first week of birth**
- Risk of death greatest during first 24 to 48 hours after birth
- Low birth weight - 57%
- ARI - 17%
- Diarrhea - 4%
- Congenital anomalies - 5%
- Cord infection - 2%
- Birth trauma - 3%
- Others - 18%

Causes of Under 5 Mortality

00:02:01

- **Prematurity - 43.1%**
- Preterm - 27.9%
- Intrapartum related complications including birth asphyxia - 18.9%
- Pneumonia - 14.6%
- Diarrhea - 9.5%
- Congenital anomalies - 9%
- Sepsis - 8%
- Injury - 3.6%
- Measles - 2.2%
- Meningitis - 1.7%
- Tetanus - 0.5%
- AIDS - 0.4%



Important Information

- Most common cause of neonatal mortality - **Premature birth rate**
- Most common cause of infant mortality - **Premature birth rate**
- Most common cause of under 5 mortality - **Premature birth rate**
- Best indicator of health status of a community - **IMR health status**
- Best indicator of health status and socio economic status of a community - **Under 5 mortality rate**
- Best indicator of combined pediatrics and ohs care - **Perinatal mortality rate**
- Best indicator for Healthcare delivery services in a population - **Maternal mortality rate**

Causes of Death in 1-4 Years Age Group

00:02:38

Developing Countries	Developed Countries
<ul style="list-style-type: none"> • Diarrheal diseases • Respiratory infections • Malnutrition • Infectious diseases (measles, whooping cough) • Other febrile diseases • Accidents and injuries 	<ul style="list-style-type: none"> • Accidents • Congenital anomalies • Malignant neoplasms • Influenza • Pneumonia

Parameters for Growth and Development

00:02:56

Weight/Age

- Most Commonly used
- Weight reflects acute changes.
- Average weight of an Indian baby - **2.8 kgs**

Birth weight

- By 5 months - x2 times
- By 1 year - x3 times
- By 2 years - x4 times

Repeated measurements

- Monthly - up to 1 year
- Every 2 months - up to 2 years
- Every 3 months - up to 5 years



Important Information

Baby should gain at least 500 gm/ month for the 1st 3 months, or else considered malnourished

- Calculated only till 5 years
- Later BMI is used.

Height

00:05:11

- **At birth:** 50 cms (length of a baby)
- ↑ 25 cms by 1st year
- ↑ 12 cms by 2nd year
- ↑ 9 cms by 3rd year
- ↑ 7 cms by 4th year
- ↑ 6 cms by 5th year
- More stable indicator



Important Information

- Height x2 times by 4 years

Markers for Malnutrition

00:06:08

- **Acute malnutrition**
 - Low weight for height
 - Measure of emaciation/ wasting
- **Chronic malnutrition**
 - Low height for age
 - Measure of stunting
- **Acute on chronic malnutrition**
 - Low weight for age
 - Measure for underweight
- **Weight for age**
 - General marker
 - Most sensitive marker

Classifications to Assess Malnutrition Status

00:07:34

- <80% of expected weight for age - Low

Gomez Classification

Weight for Age (%)	Malnutrition
91-100	Normal
76-90	1st degree
61-75	2nd degree
<60	3rd degree

Waterlow's Classification

Weight for Height	Height for Age	Nutritional Status
≥ 80%	≥ 90%	Normal
< 80%	≥ 90%	Wasted
≥ 80%	< 90%	Stunted
< 80%	< 90%	Wasted and Stunted

Welcome Trust Classification

Weight for Age (Boston) (% of expected)	Oedema	Clinical Type of PM
60-80	+	Kwashiorkor
60-80	-	Underweight
<60	-	Marasmus
<60	+	Marasmic Kwashiorkor

Salter's Scale

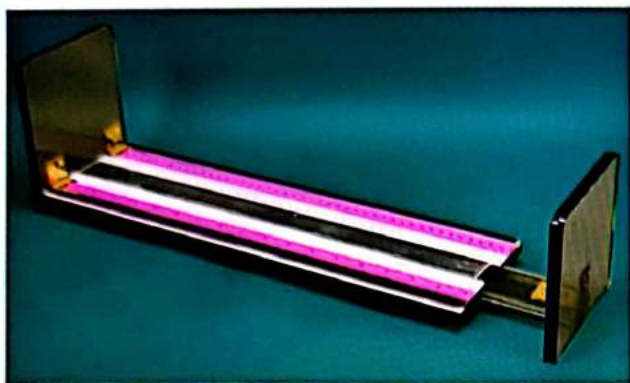
00:09:01



- Used to measure weight of a child in the field.
- Weight showed in 100 gms graduation.

Infantometer

00:09:37



- Used to measure length of the baby till 2 years.

Stadiometer

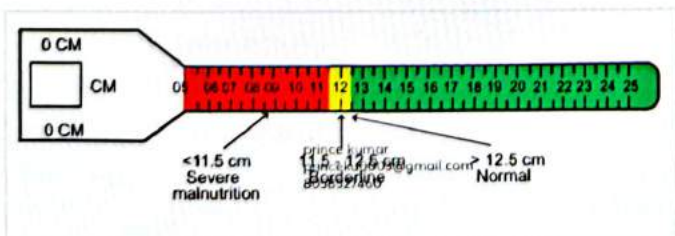
00:09:55



- Used to measure height after 2 years.

Shakir's Tape

00:10:21



- Assessment of malnutrition status
- **Red:** <11.5 cm (SAM - WHO)
- **Yellow:** 11.5-12.5 cm (under nourished)
- **Green:** >12.5 cm (Normal)
- Mid upper arm circumference is measured

Important Information

- Mid upper arm circumference (MUAC) is a sensitive indicator for assessment of malnutrition status.
- Triceps is the first muscle to lose or gain weight along with child's growth.
- MUAC is age independent.
- **Used:** 6 months - 5 years
- Checks girth of mid upper arm (mid-way between acromion and olecranon)
- Used by health workers

SAM Child - Severe Acute Malnourished Child

00:12:40

- MUAC <11.5 cm
- Visible severe wasting
- Low weight for height <3SD
- Bilateral pitting pedal edema
- SAM children are to be admitted to NRC (Nutritional Rehabilitation Center)

Growth Charts

00:13:44

- Assessment of malnutrition status
- Devised by **David Morley**
- Up to 5 years: **Weight for age**
- Superimposed with acute chronic malnutrition.

Important Information

- WHO growth charts/ Road to health growth chart/ Boston health chart/ field growth chart
- Based on Multicentric growth reference study

WHO Growth Chart

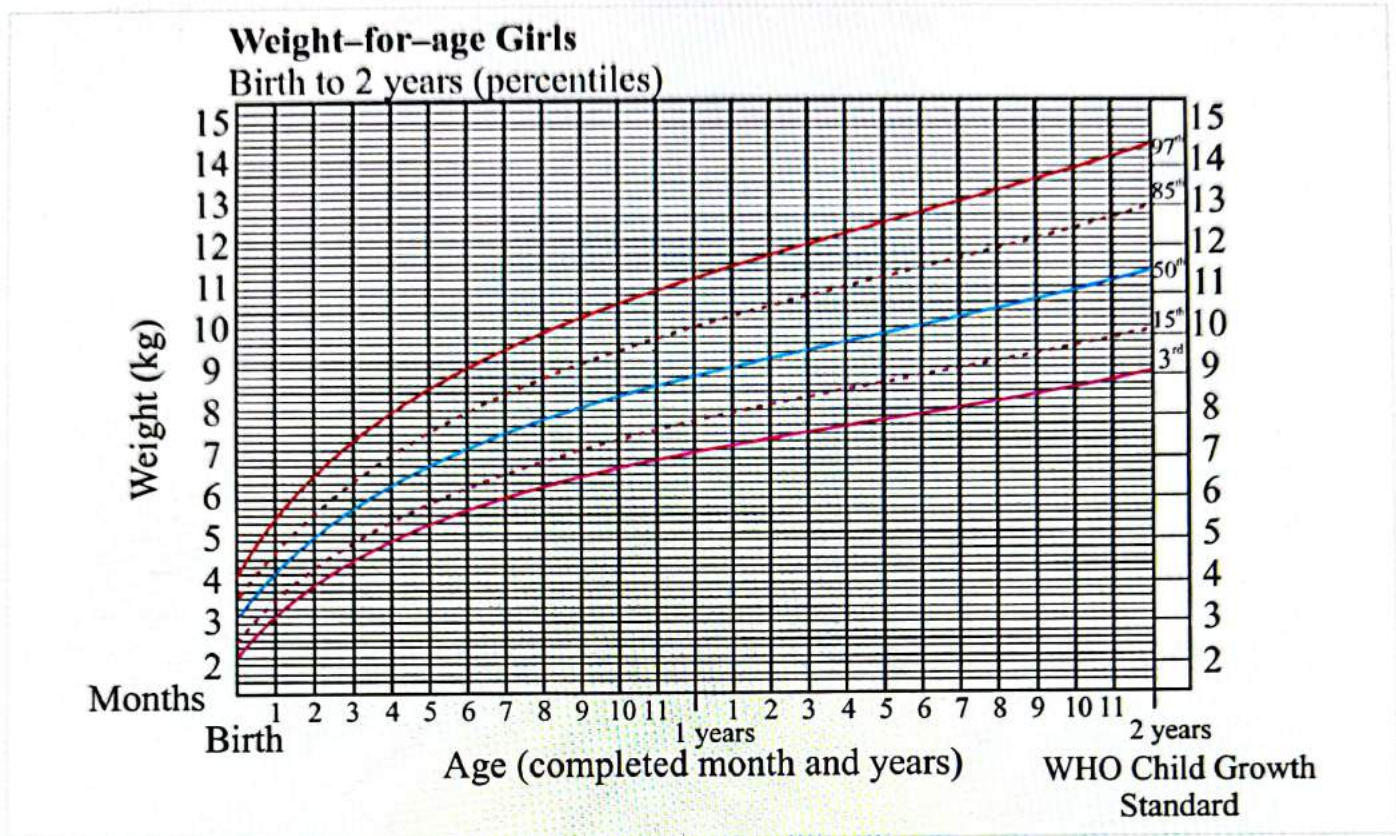
00:14:51

- **Has 2 lines**
- Weight is on y-axis
- Age is on x-axis
- Upper reference (**50th percentile for boys**)
- Lower reference (**3rd percentile for girls**)
- **Between the two references - Road to health**
- **Below lower reference - Malnutrition**

ICDS Growth Chart

00:17:19

- **Adopted from WHO chart**
- Based on Multicentric growth reference study (**MGRS**)
- MGRS included exclusively breastfeed babies and excluded factors like maternal alcohol, smoking.
- **Girls - Pink color chart**
- **Boys - Blue color chart**



- Has 3 lines
- Weight is on y-axis
- Age is on x-axis
- Upper reference (0)
- Lower reference (-2 standard deviation)
- Last one (-3 standard deviation)
- 0 to -2 SD
 - Road to health
 - Green color
- Advice: Take care of danger signs
- -2 to -3 SD
 - Mild to moderate malnutrition
 - Yellow color
 - Advice: Supplement with diet and breastfeeding
- Below -3 SD
 - Severe malnutrition
 - Red color
 - Refer to a CHC level or above.

Uses of Growth Chart

00:23:28

- Growth monitoring
- Diagnostic tool to identify high risk children.
- Planning and policy making
- Educational tool: Educate other and actively involve mother in growth monitoring of child
- Tool for action: Helps health worker to choose the required intervention and makes referral easier

NRC (Nutritional Rehabilitation Centre)

00:23:44

- Facility based units providing medical and nutritional care to SAM children under 5 years of age with medical conditions

Admission Criteria for NRC

- MUAC: <11.5 CM with or without any grade of edema
- Wait for height <-3SD
- Bilateral edema with
 - Loss of appetite
 - Hypothermia
 - Fever
 - Persistent vomiting
 - Hypoglycemia
 - Severe dehydration
 - Pneumonia
 - Anemia
 - Weak
 - Unconscious



Important Information

- First sign of growth failure is flattening of the curve.
- Direction of growth chart is more important than position of charts



Services Provided 00:24:30

- Treatment of medical complications
- 24 hour care and monitoring of child
- Therapeutic feeding
- Demonstration on preparation of energy dense food using local available food
- Counseling on appropriate feed and hygiene
- Sensory stimulation and emotional care
- Follow up of discharge patients

SAM Management (Therapeutic Feeding) 00:25:05

- **Stabilization Phase: 1-2 days**
 - **Starter Diet (F-75):** Nutritional & electrolyte balance
 - **75 kcal, protein: 0.9 gms/100ml**
 - **F-75 (per 100m):** 300ml Cow's milk or Toned milk 100 gm sugar + 25 gm vegetable oil + water
- **Transition Phase: 2-3 days**
 - **Catch up Diet (F-100):** When there is beginning of return of appetite & loss of edema
 - **100kcal, protein: 2.9 gms/ 100 ml**
 - **F-100 (per 1000 ml):** 900 ml Cow's milk or toned milk + 75 gm sugar + 20gm vegetable oil + water
- **Rehabilitation Phase**
 - Initiated when there is major loss of edema & reasonable appetite >90% of feed given
 - **Home based nutritious diet given.**

Micronutrient Supplementation 00:26:28

Age	Vit-A Dose
<6 months	50,000 IU
6-12 months (wt <8kg)	1,00,000 IU
>12 months (wt >8kg)	2,00,000 IU

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- **Other vitamins:** B12, C, D, E
- **Folic acid:** 5mg on day 1, then 1mg/day
- **Elemental zinc:** 2 mg/kg/day
- **Copper:** 0.3mg/kg/day
- **Iron:** 3mg/kg/day (preferable in between meals)

Discharge Criteria for NRC 00:27:31

- Edema has resolved.
- > 150% weight gain
- Child is eating adequate amount of food
- All medical conditions treated

Follow Up 00:27:43

- NRC visits & Home visits by ASHA/AWW
- **Weekly for 1 month in rehabilitation phase**

Breast Feeding 00:28:32

- Breastfeeding is initiated as soon as possible after birth
- Exclusive Breast feeding should be done for 6 months
- **Continued up to 2 years**
- Maximum amount of breast milk is released up to 5-6 months
- **Energy:** 65 kcal per 100 ml
- **Protein:** 0.9 to 1.1 gms per 100 ml

Composition of Colostrum 00:29:42

- EFA exclusively present is DHA required for brain development and myelination.
- Amino-acid present for brain development is **Taurine**.
- Vitamin most deficient in breast milk is Vit-D, Vit-K

Cow's Milk vs Human Milk 00:30:11

- Cow's milk is higher in protein-energy contents and fat contents
- Human milk has higher lactose, iron, water, and calcium-phosphate ratio, and it has better casein: whey ratio of 40:60

Cow vs Buffalo vs Human Milk 00:30:38

Components	Cow (100 ml)	Buffalo (100 ml)	Human (100 ml)
Protein (g)	3.2	6.5	1.1
Fat (g)	4.1	4.3	3.4
Lactose (g)	4.4	5.1	7.4
Calcium (mg)	120	210	28
Energy (kcal)	67	117	65



Important Information

- Human milk contains more cysteine essential for premature and less methionine than cow milk.
- Breast milk contains protective anti infective factors eg IgG, lysozyme
- Levels of polyunsaturated fatty acids especially linoleic acid and alpha linolenic acid are higher in human milk than in cow milk
- Less calcium in human milk but better absorbed than cow milk
- Breast milk contains more lactose than other milks. Lactose helps lactobacillus bifidus to grow
- Lactose maintains low electrolyte concentration

- Human milk contains more vitamin A and vitamin C than cow's milk coefficient of uptake of iron in breast milk is as high as 7
- No iron supplement is necessary for baby reared on breast milk
- Human milk contains copper, selenium, cobalt
- Contains less sodium than cow's milk and does not put unnecessary strain on infant kidney
- Calcium/ phosphorus ratio is high so uptake of calcium is better than cow's milk

Types of Milk

00:33:25

- **Foremilk**
 - Low in milk, fat
 - High in lactose, protein, vitamins, minerals and water
- **Hind milk** is rich in fat and supplies more energy
- **Preterm milk** is rich in protein, minerals, immunoglobulins, and lactoferrin than mature milk

Types of Feeding

00:33:51

- **Exclusive feeding:** 6 months
- **Complementary feeding:** Started from 6th month onwards only
- **Predominantly breastfeeding:** Mostly breastfeeding + sometimes water, juice, sweetened water
- **High partial:** > 80% of infant feed is breast milk
- **Medium partial:** only 20-80% infant feed is breast milk
- **Low partial:** <20% of infant feed is breast milk
- **Token feeding:** Breastfeeding from either or both breasts for less than 15 minutes per day
- **Not advisable**
 - **Pre lacteal food:** Any fluid or food given before colostrum.
 - **Post lacteal food:** Fluid or food given after breastfeeding has started (within 3 days of birth)

Kangaroo Mother Care – KMC

00:35:14



- **Skin to skin positioning**
- Example of appropriate technology
- **Duration**
 - **Short:** 4 hours daily
 - **Extended:** 5-8 hours daily
 - **Long:** 9 hours daily
 - **Continuous:** >12 hours daily

School Health Services

00:35:58

- **History**
 - Bhoire committee launched the concept of School health checkup
 - Improvised by Renuka Roy committee (**once every 4 years**)
- **Current - Once every 6 months**

Health Problems of School Child

00:37:11

- Malnutrition
- Infectious diseases
- Intestinal parasites
- Diseases of skin eye and ear
- Dental caries (**Most common**)

Health Appraisal

00:37:32

- Periodic medical examination
 - Secondary level of prevention
 - Done for every six months
- School personnel checkup
 - Regular intervals
- Daily morning inspection of child
 - Nails
 - Rash
 - Cold
 - Cough

Remedial Measures and Follow Up

00:38:02

- **Rural area:** Special clinics to be setup at PHC.
- **Urban area:** Special clinics to be setup at selected schools or dispensaries (with 5000 children)

Prevention of Communicable Diseases

- Immunization is also done

Healthful School Environment

00:38:40

- **Location:** Away from noisy places
- **Site:** High land
 - 10 acres - Higher elementary school
 - 5 acres - Primary school with additional 1 acre per 100 students
- **Classroom**
 - **1 class room:** Only 40 students
 - **Per capita space:** >10 sq.ft

- Single desks - Minus type
- Door and windows - >25% of floor area
- 1 urinal for 60 students
- 1 latrine for 100 students
- Lighting should come from the left side (as most of us are right handed)

Nutritional Services

00:39:39

- **Mid-day meal**
 - Pradhan Mantri Poshan Shakti (Now)
 - 1/3rd calorie
 - 1/2 protein
 - Only to prevent dropouts
 - Under Ministry of Education
 - Also includes Balvatikas and Class 1 to 8 students
- **Applied nutrition programme**
 - Under UNICEF
 - Provides, implements, seeds, manure, and water supply equipments to develop school gardens

First Aid and Emergency Care

00:40:48

- Teachers are need to be trained
- Training programmes to be conducted

Mental Health

00:40:50

- **Common issues**
 - Juvenile delinquency (child who committed a crime)
 - Boys - <16 year
 - Girls - <18 years
 - Maladjustment
 - Drug addiction

Dental Health

00:41:25

- **Common issues**
 - Dental caries
 - Periodontal diseases
- Check up to be done once in a year

Eye Health Service

00:41:36

- School vision screening program
- 1 teacher for 150 students
- ~~Cutoff is 6/9~~
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- If <6/9, posted to PHC
- PHC has a paramedical ophthalmic assistant (Vision centers)
- Secondary level of prevention

Initiative Promoting School Health

00:42:40

- **Health screening**
 - Rashtriya Bal Swasthya Karyakram
- **Anemia Mukh Bharat**
 - Providing iron and folic acid supplements
 - Under WIPS

- Blue tabs are given to adolescents (60 mg Fe and 500 mg folic acid)
- **5-9 year children:** Elemental iron and folic acid
- Deworming is done at schools **10th of Aug and 10th of Feb**
- **Menstrual hygiene management**
 - Sanitary pads are provided to girls
 - Usually in rural areas

School Health Administration

00:43:51

- **PHC - Responsible in their jurisdiction**
- There should be a medical officer present to cover 5000-6000 children per year
- **At village levels, school health committees can be set up**

MCQs

Q. An Anganwadi teacher takes measurements for weight and height for a child. Height for age in the child is less than - 2SD. It signifies?

- Chronic malnutrition
- Acute infection
- Acute malnutrition
- No malnutrition

Q. The upper most line of the WHO growth chart is equivalent to?

- 80% of boys
- 50% of girls
- 50th percentile for boys**
- 3rd percentile for girls

Q. Type of growth chart used by Anganwadi workers for growth monitoring?

- NACHS
- IAP
- MGRS**
- CDC

Q. Mean birth weight of Indian babies?

- 2.5kg
- 2.8kg**
- 3.1kg
- 3.5kg

Q. As per WHO low birth weight is defined as?

- Birth weight <2.5 kg**
- Birth weight <10th percentile
- Gestational age <34 weeks
- Gestational age <38 weeks

- Q. Term 'small for date babies' is defined as?
- A. Weight <5th percentile of gestational age
 - B. Weight <10th percentile of gestational age**
 - C. Weight <15th percentile of gestational age
 - D. Weight <50th percentile of gestational age
 - E. Weight <75th percentile of gestational age

- Q. Birth weight of a baby doubles by what age?
- A. 5 months**
 - B. 12 months
 - C. 18 months
 - D. 24 months
- Q. Length of a newborn doubles by which year?
- A. 6 months
 - B. 1 year
 - C. 2 years
 - D. 3 years
 - E. 4 years**

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PREVIOUS YEAR QUESTIONS



Q. In marasmus, mid-arm muscle circumference is less than?
(FMGE Dec 2019)

- A. 15
- B. 17.
- C. 19
- D. 21

Q. Chronic malnutrition in a child is best evaluated by?
(FMGE Dec 2019)

- A. Weight for height
- B. Weight for age
- C. Height for age
- D. Ponderal index

Q. In a school scenario, school health guidelines include?
(FMGE Aug 2020)

- A. Minimum area 5 sq. ft per student
- B. Minus type desk
- C. Can allot 60 students per classroom
- D. Light coming from the front of classroom

Q. A child presents with normal height, but the weight was lesser than expected for that height. He will be classified as a case of?
(FMGE June 2022)

- A. Underweight
- B. Wasting
- C. Stunting
- D. Kwashiorkor

40

MACRONUTRIENTS AND MICRONUTRIENTS (MINERALS)

Nutrients

Macronutrients:

- Proximate principle of our diet.
- Proteins: provide 10-15% of the total energy intake
- Fats: provide 15-30% of the total energy intake
- Carbohydrates: provide 50-80% of the total energy intake
- A balanced diet should offer around 60-70% of total calories from carbohydrates, 10-12% from proteins and 20-25% of total calories from fat.

Micronutrients:

- Required in small amounts from a fraction of milligrams to several grams.
- They are further divided into vitamins and minerals.
- Micronutrients consist of vitamins and minerals.
- Major minerals
 - Sodium
 - Potassium
 - Calcium
 - Phosphorus
 - Magnesium
- Trace elements
 - Iron
 - Iodine
 - Zinc

Energy-providing food products:

- Carbohydrates:
 - Provide 4 kcal/gram of carbohydrates.
- Proteins:
 - Provide 4 kcal/gram of proteins
- Fats:
 - Provide 9 kcal/gram of fats.
- Fibre:
 - Provide 2 kcal/gram of Fibre
- Alcohol:
 - Provide 7 kcal/gram of Alcohol

Important Definition

Balanced diet

- A diet that contains all nutrients both macro and micronutrients in required quantities to prevent any excess or deficiency.
 - Protein - 10-15%
 - Fats - 15-30%
 - Carbohydrates - 50-80%

Food Item	Man (sedentary)	Female (sedentary)
Cereals	460 gm/day	410 gm/day
Pulses	40 gm	40 gm
Leafy vegetables	40 gm	100 gm
Other vegetables	60 gm	40 gm
Roots and tubers	50 ml	50 gm
Milk	150 ml	100 gm
Oil & fat	40 gm	20 gm
Sugar & jaggery	30 gm	20 gm

Prudent Diet



- A temporary diet that adheres to dietary goals, i.e, fat and cholesterol-controlled diet.
- Principle preventive strategy in coronary heart disease recommended by WHO
 - Reduction of fat intake to <20-30% of total energy intake.
 - Consumption of saturated fats <7% of total energy intake
 - Reduction in dietary cholesterol < 200 mg/day
 - Increase in complex carbohydrate consumption
 - Reduction of salt intake to <5 gm per day (in India average < 15 gm/day)
 - Avoidance of alcohol consumption
 - Cholesterol: HDL Ratio < 3.5

Staple diet

- diet consumed by the majority of the population and culturally acceptable.
- Rice, corn (maize), and wheat make up two-thirds of this.
- Other food staples include millet and sorghum; tubers such as potatoes, cassava, yams, and taro; and animal products such as meat, fish, and dairy.
- Food staples traditionally depend on what plants are native to a region.

Proteins

- Complex organic nitrogenous compounds
- Proteins differ from carbohydrates and fats in that they contain nitrogen which amounts to 16%.
- Proteins constitute about 20% of total body weight in an adult.

Essential amino acids

- Proteins are made up of essential amino acids.
- Essential Amino Acids: Cannot be synthesized in the body in the required amount, so must be obtained from the diet (that is why it is essential)
- Nine essential amino acids: Mnemonic - **PVTTIMHLL**
 - Leucine -L
 - Isoleucine -I
 - Lysine -L
 - Methionine -M
 - Phenylalanine -P
 - Threonine -T
 - Valine -V
 - Tryptophan -T
 - Histidine -H

Non-essential amino acids

- Non-essential amino acids: Synthesized in the body.
- There are six non-essential amino acid
 - Arginine
 - Asparaginic acid
 - Serine
 - Glutamic acid
 - Proline
 - Glycine

Conditionally essential amino acids (expected MCQ)

- Conditionally Essential Amino Acids
 - Non-essential amino acids may turn essential if their precursors are limited in the body
 - Tyrosine (derived from phenylalanine) and cysteine (derived from methionine) are CEAA
- Other CEAA Include:
 - Arginine
 - Glutamine
 - Taurine
 - Glycine

Semi-essential amino acids

- Semi-essential amino acids - requirements increase during vulnerable periods like
 - Pregnancy
 - Adolescent
- Semi-essential amino acids:
 - Arginine
 - Histidine.

Supplementary action of proteins

- **Lysine most deficient amino acid**
- In India, the most common staple food is rice and pulses together, because they both supplement each other.

Food Item	Limiting amino acid
Cereals - TL	Threonine & lysine
Pulses - MC	Methionine & Cystine
Maize - TL	Tryptophan & lysine

Sources

- Animal sources: milk, meat, eggs, cheese, fish
- **Biologically complete proteins** (animal source) contain all essential amino acids in adequate amounts.
- Egg proteins reference proteins
- Vegetable sources: Pulses, cereals, nuts.
- Poor in EAA.
- India: cereals and pulses main sources of dietary protein cheap, easily available, and consumed in bulk.

Proteins (quantity of protein)

- Quantity Of Protein:
- **Protein-energy ratio** = (energy from protein in food product/total energy from food product) x 100
- PER > 2.5 assigned to proteins that are efficient in promoting growth (animal protein)
- PER-0.5-2.5 assigned to proteins that are efficient in supporting life but not growth (vegetable protein)
- Maximum Protein energy ratio = Fish
- **Protein Efficiency Ratio** = weight gain(g)/Unit of protein intake(g) x 100
- Laboratory indicator

Quality Of Protein

- Quality Of Protein
- **DIAAS**: Digestible Indispensable Amino Acid Score
- Represents ideal digestibility coefficient of a food product
- **DIASS%** = $\frac{\text{Digestible dietary indispensable amino acid mg in 1g of dietary protein}}{\text{Same dietary indispensable amino acid mg in 1g of reference protein}} \times 100$
- Reference protein - egg because it has maximum net protein utilization and contains all the essential amino acids.
- Currently accepted best to measure protein quality (important)
- Digestibility coefficient
 - Amount of amino acid absorbed from food/ amount of protein ingested.
 - It is an indicator of the external protein quality of the food product.
 - amino acid absorbed/Protein

- Biological Value
 - Amount of nitrogen retained for body mass/amount of amino acid absorbed from food
 - It is an indicator of the internal quality of protein
 - Nitrogen retained / amino acid
- Net Protein Utilization
 - NPU Digestibility coefficient x Biological value/100
 - Or NPU Nitrogen retained/Protein ingested x 100

In calculating protein quality, **1 gm of protein is equivalent to 6.25gm nitrogen (MCQ)**
- Key points
 - NPU of Indian diet: 50-80
 - 1 gm of protein is equivalent to 6.25 grams of nitrogen.

EGG

- Called a reference protein (contains all essential amino acids): NPU is maximum. - 96
- Mnemonic - **rule of 6 - the average weight of egg - 60 grams.**
 - It provides us with 60-70 kcal
 - 6-gram fat
 - 6 grams of protein.
- Egg: 6 Gm Fat
- 6 Gm Protein
- 30 Mg Calcium
- 1.5 Mg Iron
- 70 Kcal Energy
- 250 Mg Cholesterol
- Amino acid score: the amount of amino acid in a food product/amount of same amino acid in reference protein egg.

Fats

- Rich sources of energy.
- Include **simple lipids (triglycerides)**, compound lipids (**phospholipids**), derived lipids(cholesterol).
- The fats may further be classified as saturated or unsaturated fats
- Saturated fats (not good for health)
 - Lauric acid, palmitic acid, stearic acid
- Unsaturated fatty acids
 - Primarily vegetable source of fat Monounsaturated (oleic acid)
 - Polyunsaturated fatty acid omega 3 and omega 6

Alpha-Linolenic acid - Omega 3	Linoleic acid - Omega 6
EPA	Arachidonic acid
Fish	EGG
Flax seed	Safflower oil

- **Most essential fatty acid - linoleic acid.**
- Saturated fatty acids mostly in animal fats exception coconut oil and palm oil

- Polyunsaturated fatty acids source is vegetable oils exception fish oil

Source of Fats

Linoleic acid, Arachidonic acid	Safflower oil
Linolenic acid	Flaxseed oil, soybean oil
Eicosa pentatonic acid	Fish oil

Key points

	PUFA
Safflower oil	75
Sunflower oil	62
Soybean oil	53
Groundnut oil	32
Palm oil	11
Coconut oil	2
Butter	2

Visible Fats vs Invisible Fats

- Visible fats separated from natural sources eg. Ghee from milk
- Invisible fats are not visible to the naked eye and are present in almost every article of food e.g. cereals, pulses.

Partially hydrogenated vegetable oils

- eg. Vanaspati ghee
- Use quality maintained in hot humid climate, easy storage.
- Fortified with Vitamin A 2500 IU/100 GM
- Vitamin D-175 IU/100 GM

Carbohydrates

- It makes up 50-70% of the total diet.
- Provides 4 kcal/gram.
- Carbohydrates are essential for oxidation of fats and synthesis of certain non essential amino acids.
- Important sources of carbohydrate:
 - Starch= roots, tubers, cereals
 - Sugars comprise:
 - Monosaccharides: glucose, fructose, galactose
 - Disaccharides: sucrose, lactose, maltose
 - Cellulose: indigestible component of carbohydrates which contributes to dietary fibers
 - Carbohydrate reserve (glycogen) of a human adult is 500 gm.

Glycemic Index

- GI of a food is defined as area under two-hour blood glucose response curve (AUC) following ingestion of a fixed

proportion of test carbohydrate (usually 50gm) as a proportion (% of the standard either glucose or white bread)

- Rate of change of blood glucose per unit of food consumed.
- We should have low glycemic index foods.

Classification	GI Index range	Examples
Low GI	55 or less	most fruits and vegetables (except potatoes, watermelon, sweet corn), whole grains, pasta foods, beans, lentils, oats, quinoa, guava
Medium GI	56-69	Sucrose, basmati rice, brown rice, dairy products
High GI	70 and above	corn flakes, baked potato, some white rice varieties (e.g. jasmine), white bread, candy bar, syrupy foods

Key Points

Fibre

- 2kcal/g
- Should be the major bulk of the diet
- Shorten the transit time of the food and increases the bulk of the food
- Reduces postprandial blood sugars, LDL, Cholesterol
- Reduces the chance of CAD, diverticulitis, irritable bowel syndrome and colon cancer
- Indian diet provides 50-100 gms of fiber per day
- **Daily intake of 40 gms of fibre is desirable**

Q. Limiting amino acids in wheat are?

- A. Methionine and lysine
- B. Lysine and threonine**
- C. Threonine and methionine
- D. Arginine and lysing

Q. Not true about content composition of an Egg?

- A. 6 grams protein
- B. 6 grams fat
- C. 1.5 mg iron
- D. 150 mg Cholesterol**

Q. Most essential fatty acid is?

- A. Linoleic acid**
- B. Linolenic acid
- C. Arachidonic acid
- D. Eicosa pentatonic acid

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Q. The highest content of saturated fatty acid is in?

- A. Palm oil
- B. Safflower oil
- C. Coconut oil**
- D. Margarine

Q. A form of undernutrition that occurs when intake and absorption of vitamins and minerals are to sustain good health and development is called as?

- A. Global Hunger Index
- B. Micronutrient deficiency
- C. Malnutrition
- D. Severe acute malnutrition
- E. Hidden hunger**

Micronutrients - minerals

Micronutrient: Classification

- Iron
- Iodine
- Fluorine
- Zinc
- Copper
- Chromium
- Selenium
- Molybdenum
- Antioxidants

Minerals

- Major Minerals (PYQ): Calcium, Phosphorous, Sodium, Potassium, Magnesium
- Trace Elements: Required in Quantities Less Than A Few Milligrams/Day
 - Eg Iron, Iodine, Fluorine, Zinc, Copper, Cobalt, Chromium, Manganese, Molybdenum, Selenium, Silicon, Nickel, Tin
- Trace Contaminants with No Known Function: Lead, Mercury, Barium, Boron, Aluminum

Iron

- Human body contains 3-4 gm iron
 - 60-70 percent in blood in the form of hemoglobin (Hb) iron circulating form
- 1-1.5 gm - storage iron

Sources

- Haeme source is obtained from **animals** (meat, liver, poultry, and fish)
 - Bioavailability 15-30%
- Non-haeme source:
 - Obtained from **Green leafy vegetables** (spinach, mint, coriander, cereals, jaggery, dried fruits)

- Bioavailability: poor due to the presence of phytates, oxalates, carbonates, phosphates, and dietary fibers, which interfere with iron absorption.

Q. What are the things that interfere with iron absorption?

Ans. Phytates, oxalates, carbonates, phosphates, milk, eggs, tea, and dietary fibers

- Milk, eggs, tea interfere with iron absorption
 - **Phosphates** in egg yolk, **tannin in tea**, **oxalates** in vegetables interfere with iron absorption (MCQ)
- Promoters of iron absorption: **ascorbic acid** and vitamin C-rich foods
 - Eg. Amla, guava, citrus fruits etc.
- Note:
 - One should never have iron with egg, tea, and milk.
- Human milk has less iron content <0.2 mg/dl
 - The bioavailability is 60-70 percent
 - Therefore, a child who is 0-6 months should not be put on additional iron supplements.
- The richest source of iron is jaggery.
- Dried pumpkin and pistachio seed contains a lot of iron



Diagnosis of Anemia

- Cut off for anemia
 - Adult male - 13 gm/dl (minimum Hb content)
 - Adult females (non-pregnant) - 12 gm/dl (minimum Hb content)
 - Adult females (pregnant) - 11 gm/dl (minimum Hb content)
 - Children, 6 months to 6 years - 11 gm/dl (minimum Hb content)
 - Children, 6 months to 14 years - 12 gm/dl (minimum Hb content)
- Early anemia: Hb level 10-11 gm/dl
- Marked anemia: Hb level < 10 gm/dl

Evaluation:

- Hemoglobin concentration:
 - Epidemiological indicator
 - Used for **Epidemiological survey of anemia**
 - It is an Insensitive index of nutrient depletion

- Serum iron concentration:
 - A **better index of nutrient depletion**
 - Normal range: 0.8-1.8mg/l
 - **Values < 0.5mg/l indicate iron deficiency**
 - Preferred for index of nutrient depletion
- Serum Ferritin
 - **Most sensitive tool** for evaluating iron status
 - Most useful Indicator of iron status in a population where the prevalence of iron deficiency is not high
 - Values <10mcg/L: absence of stored iron Serum transferrin saturation: >16%, normal value is 30%

Iodine

- Required for synthesis of thyroid hormones
- Needed for growth and development of body

Sources:

00:41:25

- Richest source
 - **Seaweeds**
- Cod liver oil
- Milk, meat, vegetables, onions, potatoes
- Other sources:
 - Potatoes, Onions, Cranberries
- About 90% of iodine comes from food eaten, and the rest from drinking water (about 1-50 micrograms/L)



- Goitrogens:
 - Lead to the development of goitre by interfering with iodine utilization by thyroid glands
- The Brassica group of vegetables contains goitrogens
- Eg. - cabbage, cauliflower

Deficiency of iodine

Disease-associated with iodine deficiency are

- Goitre
- Hypothyroidism
- Subnormal intelligence
- Delayed motor milestones
- Mental deficiency
- Hearing defects
- Speech defects

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- Strabismus
- Nystagmus
- Endemic cretinism
- IUD (intrauterine death)

Indicators of Iodine Deficiency

- Urinary iodine excretion:
 - Most **important surveillance or epidemiological indicators**
 - Preferred for surveillance
- Neonatal hypothyroidism
 - **Sensitive indicator of environmental iodine deficiency**
 - Preferred for environmental iodine deficiency checks
- Goiter prevalence is checked
- Cretinism prevalence is checked
- T3/T4/TSh Level:
 - Serum T4 level is a more sensitive indicator of thyroid insufficiency than T3 level.

Fluorine

- Most abundant element in nature
- Source
 - Drinking water - 0.5-0.8 mg/L
- Food
 - Sea fish
 - Cheese
 - Tea

Double-Edged Sword

- It is other name for fluorine
- Reason
 - Deficiency leads to dental caries
 - Excess leads to Fluorosis.



mottling of the teeth

- Indicates mottling of upper incisors of teeth
 - Happens when the fluoride content in water is more than 1.5 mg/l of drinking water.



Dental caries

- Here there is a Deficiency of fluorine in the water
- Excess of fluorine other presentations
 - Skeletal Fluorosis
 - When the level of fluorine in water is 3-6 mg/L of drinking water
 - Crippling fluorosis: Genu Valgum (Knock Knee).
 - The level of fluorine in water is more than 10 mg/L of drinking water

00:44:28
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- Excess of fluorine is removed from water by the **Nalgonda technique** developed by NEERI Institute (National Environmental and Engineering Research Institute) (Head Quarter: Nagpur)
 - Defluoridation of water
 - LAB (Lime, Alum, and Bleaching powder are added)

Zinc

- It is an Immunomodulator required for
 - synthesis of insulin by the pancreas
- It is an Antioxidant
- Its deficiency leads to
 - Growth failure
 - Sexual infantilism in adolescents
 - Loss of taste
 - Delayed wound healing.
- Maternal zinc deficiency leads to
 - Spontaneous abortion
 - Congenital malformations like anencephaly
- Milk, meat, and fish are sources

MCQs

Q. Acrodermatitis enteropathica is?



- A. Inherited disorder of excessive excretion of zinc from body
- B. Inherited disorder of impaired uptake of zinc from body**
- C. Inherited disorder of excessive excretion of copper from body
- D. Inherited disorder of impaired uptake of copper from body a child suffering from Acrodermatitis enteropathica

Explanation:

- Inflammatory rash around
 - Nose
 - Mouth
 - Anus

Copper

- Hypocupremia
 - Neutropenia
- Loss of copper leads to Wilson's disease
- PEM, Infants fed for long periods on cows milk (can suffer from copper deficiency)
- Hypercupremia:
 - Leukemia
 - Hodgkin's disease
 - Severe anemia
 - Hemochromatosis
 - MI
- Hyperthyroid

Chromium

- Carbohydrate metabolism
- Insulin disturbances, diabetes mellitus

Selenium

- **Deficiency in PEM**
- Selenium administration to children with kwashiorkor led to weight increase

Molybdenum

- Deficiency can cause
 - Mouth and esophageal cancers
- Excess absorption can lead to bony deformities

Antioxidants

- Vitamin E, C BETA-CAROTENE. Selenium
- Others:
 - Plant phenols
 - Flavonoids,

Enzymes

- Superoxide dismutase
- Catalase
- Superoxides mutase

Nutritional Deficiencies

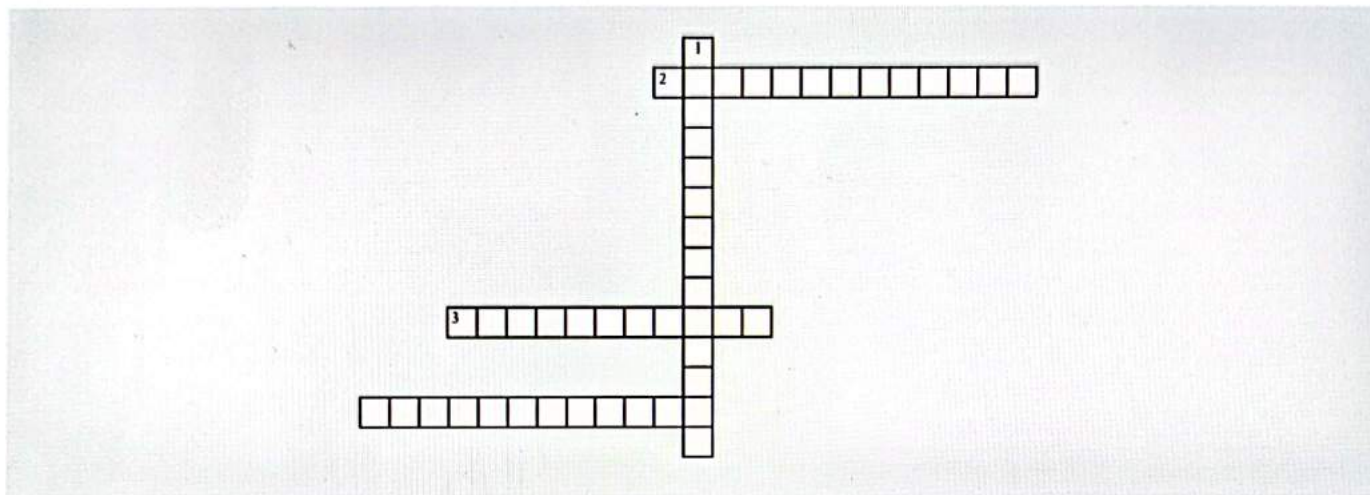
- Nutritional deficiencies:
 - Subacute combined degeneration of the spinal cord due to Vitamin B12 deficiency
- Acrodermatitis Enteropathica due to Zinc deficiency
- Seizures in infants due to Vitamin B6 deficiency
- Neural tube defect due to Vitamin B9(FOLICACID)
- Vitamin B1 deficiency causes Beri beri
- **Wernicke's Korsakoff Psychosis due to thiamine deficiency**
- Chromium deficiency causes impaired glucose tolerance
- **Riboflavin deficiency causes Vitamin B2**
- **Cretinosis**
- Angular stomatitis
- Atrophic glossitis



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. They provide 4 kcal/gram of carbohydrates.
- 3. A temporary diet that adheres to dietary goals.
- 4. A diet that contains all nutrients both macro and micronutrients

Down

- 1. Proximate Principles form the main bulk of the food.

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41

MICRONUTRIENTS: VITAMINS

Micronutrients

00:00:10

- Includes vitamins and minerals
- Required in small amounts from a fraction of a milligram to several grams.

Water Soluble Vitamins

- Water soluble vitamins:
 - Vitamin B and C
 - Excreted in urine therefore need to be taken daily
- Fat Soluble Vitamins
 - Vitamin A, D, E and K

Vitamin A

00:01:02

- Present in plants: Beta-carotene
- Animals: Retinol
- Beta carotene converted to Retinol (in intestine)-absorbed and stored in liver

Sources of Vitamin A

- Richest animal source: Halibut fish (also richest source of Vitamin D)
- Animal source: Meat, liver, fish, egg yolk, cheese, butter, ghee
- Cheapest source of vitamin A: Green leafy vegetables like spinach
- Fruits like: yellow fruits like papaya, mango
- Fortified foods: Vanaspati (ghee rich in Vitamin A & D), Milk

Vitamin A Deficiency

- Xerophthalmia:
 - Refers to all ocular manifestations of Vitamin A Deficiency
- M/c age group: 1-3 Years.

WHO classification of Xerophthalmia

- Primary Signs:
 - Reversible:
 - X1A- Conjunctival Xerosis
 - X1B- Bitot's Spot
 - X2- Corneal Xerosis
 - X3A- Corneal Ulcer involving < 1/3rd of cornea
 - Irreversible:
 - X3B- corneal Ulcer > 1/3rd of cornea. Also, known as Keratomalacia
- Secondary Signs:
 - XN- Night Blindness
 - XS- Scar
 - XF- Fundal changes

00:05:26



Dry eyes (lustreless eyes)

Bitot's spot

- Dry eye which means lustreless eyes.
- Bitot's Spot occurring on temporal side of Bulbar Conjunctiva

Key Point

- Most common presenting symptom: Night Blindness
- Most common presenting manifestation: Night Blindness
- First symptom in vitamin A deficiency: Night Blindness
- Most common indicator for Vitamin A deficiency. Bitot's Spot
- First clinical sign in vitamin A deficiency: Conjunctival Xerosis
- Most specific presentation: Bitot's Spot
- Reversible till which stage: X3A
- Irreversible stage: X3B

Prevalence Criteria for Determining Xerophthalmia as Public Health Problem

- From 6 month to 6 years

Criteria	Prevalence Criteria
Night Blindness	>1%
Bitot's Spot	>0.5%
Corneal Xerosis / Corneal ulceration / Keratomalacia	>0.01%
Corneal Ulcer / Scar	>0.5%
Serum Retinol < 10 mcg/dl	>5%

Prevention: Vitamin A Prophylaxis Program

- It is an example of Primary Prevention (specific Protection)

00:09:05



- It is a bottle of vitamin A (100ml).
- We have to keep it away from sunlight at room temperature.
- There is a spoon to administer Vitamin A.

Preventive Dose

- It is given with Measles Vaccine at 9 completed months → 1 ml or 1 lac IU along with Measles / Rubella vaccine.
- Then, thereafter every 6 months till 5 years of age, it is given 2 ml or 2 lac IU
- Total dose given → 9 doses
- Total amount → 17 Lac IU

Treatment

- All early stages of xerophthalmia can be reversed by administration of a massive dose of 200000 IU or 110 mg of retinol palmitate orally on two successive days.
- Administer 2 lakh IU orally on 2 successive days
- IM dose = 1/2 of oral dose

	<6 months	6 months-1 year	> 1 year
Day 0	50000 IU	1 lac IU	2 Lac IU
Day 1	50000 IU	1 Lac IU	2 Lac IU
Day 2	50000 IU	1 lac IU	2 Lac IU

Diagram

00:13:44



- There is a white colored spoon which is used to give Vitamin A because it has an inner marking of 1ml & outer marking of 2ml.

- We can never use a spoon of 5 ml or 15 ml because it will lead to Toxicity.
- Toxicity: Anorexia, Nausea, vomiting, sleep disorders, skin desquamation, enlarged liver, papillary edema
- In case there is a center where the spoon isn't available, we can use the cap of the vitamin A bottle which also has markings.

Vitamin B1 (Thiamine)

00:14:45

- Vitamin B1: Required for Carbohydrate & Lipid metabolism
- In thiamine deficiency accumulation of pyruvic acid and lactic acids in tissues and body fluids
- Cereals (rice and wheat) are main source of diet in Indian people
- Thiamine is lost during milling, washing, and cooking of rice
- Thiamine in fruits and vegetables lost during prolonged storage.
- Parboiled rice (rice soaked in hot/warm water and then boiled in same water)

Vitamin B1 Deficiency Disorder

- Deficiency of Vitamin B1 leads to: Beri Beri & Wernicke's Korsakoff Psychosis
- Beri beri 3 forms:
 - Dry BERI BERI: CNS Manifestations
 - Wet beriberi: CVD Manifestations
 - Infantile beriberi: 2-4 months (fed by thiamine deficient mother and shows signs of peripheral neuropathy)
- Ophthalmoplegia, ataxia, mental retardation is also seen among Chronic alcoholics and those who fast leading to Wernicke's Korsakoff Psychosis
- Seen in AP (Andhra Pradesh)

Vitamin B2 (Riboflavin)

00:17:50

- Vitamin B aka (Riboflavin)
- Acts as a coenzyme in various oxidation reduction reaction
- Cereals and pulses are poor source but because of the bulk in which they are consumed fulfills all requirements
- Richest source: Milk, egg, green leafy vegetables

Ariboflavinosis Triad (Vitamin B2 Deficiency)

00:18:26



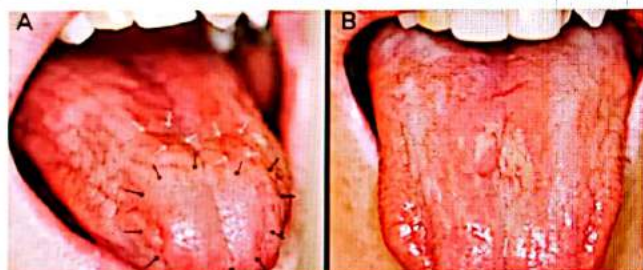


- As in the first image, Magenta red Tongue is seen in vitamin B2 Deficiency. Also known as Geographical Tongue.
- As in the second image, it also presents with cheilosis.
- As in third image, it also presents Angular Stomatitis

Key Points

- Beefy Red Tongue: Vitamin B12 Deficiency
- Strawberry or raspberry tongue: Seen in Scarlet fever/ Kawasaki disease

00:19:32



- This is beefy tongue Seen in vitamin b12 Deficiency.



- This is strawberry tongue Seen in Scarlet fever.
- **Multiple Deficiency Syndrome:**

Occurs in association with Deficiency of other B complex vitamins such as pyridoxine. It is shown by Vitamin B2 which exists with other B complex Deficiency.

Vitamin B3 Deficiency (niacin)

- Essential for metabolism of carbohydrate, fat and protein
- EAA Tryptophan serves as a precursor(makes it unique).
 - 60 mg of Tryptophan converts to 1 g of Niacin
- As water soluble vitamin not excreted in urine but metabolized
- **RDA: 6mg/1000 kcal**

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- **SOURCES:** Meat, fish, groundnuts, legumes, liver, kidney
- **MILK** is a poor source of niacin but its proteins are rich in tryptophan which is converted into niacin.

Vitamin B3 Deficiency Disorders

- **Pellagra:**
 - Deficiency of Niacin
 - Associated with Diarrhea, Dementia, Delirium, Depression, Dermatitis, Death

00:22:41



- This is Casals Necklace
- There is bilateral Dermatitis
- There are hyperpigmented patches over sun exposed areas
- Prevention: Mixed diet containing milk and near essential for prevention and treatment
- Avoidance of total Dependence on maize and sorghum is important preventive measure
- Among maize, jowar, sorghum eaters, Niacin deficiency is seen because due to excess leucine the conversion of Tryptophan to niacin is prevented.

Vitamin B5 (Pantothenic Acid)

00:24:40

- Biosynthesis of Corticosteroid
- Deficiency leads to Burning sole / Feet Syndrome

Vitamin B6 (Pyridoxine)

00:25:10

- Essential for Gluconeogenesis & Synthesis of neurotransmitters
- Source: Milk, Meat, eggs, fish, cereals, vegetables
- Deficiency leads to:
 - Microcytic anemia
 - Peripheral neuropathy
 - Seizures in infants
 - Patient on Isoniazid provided with supplement 10 mg/day
 - Adults: 2mg/day
 - Pregnancy & lactation: 2.5mg/day

Vitamin B9 (Folate)

00:26:04

- Synthesis of nucleic acids
- Source: Meat, dairy products, eggs, milk, fruits & Vegetables

- Vitamin B9 deficiency seen in pregnancy and lactation (During pregnancy, according to Anemia mukt Bharat, we give Prophylaxis iron folic acid supplementation to women which is 60 mg & 500 mg folic acid- daily & starts after first trimester and ends after 6 months of Lactation).
 - Megaloblastic anemia
 - Glossitis
 - Cheilosis
 - GI disturbances such as diarrhea, Flatulence, distension
- According to NIN, iron and folic acid requirements increase during pregnancy.
- **Severe folate deficiency can cause infertility or even sterility**

Vitamin B12

- Complex organ metallic compound with cobalt atom.
- Vitamin B12: Cyanocobalamin (preparation therapeutically used which is cheap)
- Predominantly available from animal sources
- **Deficiency seen among vegetarians (not found in foods of vegetable origin)**
- Deficiency leads to:
 - Megaloblastic anemia (Corporates with folate in synthesis of DNA so deficiency of either leads to megaloblastic anemia)
 - Pernicious anemia
 - Peripheral neuropathy
 - **SACD (demyelinating neurological lesions of spinal cord). SACD means Subacute combined degeneration of Spinal Cord.**

Vitamin C (Ascorbic Acid)

- It is the most Heat Sensitive.
- an, monkey and guinea pig require vitamin C in their Diets.
- **Functions:**
 - Antioxidant, tissue oxidation
 - **Formation of collagen which accounts for 25% of total body protein**
 - (Supporting matrix for blood vessels, connective tissues, bones and cartilage)
 - **Reduces ferric iron to ferrous iron facilitates absorption of iron from vegetable foods**
- Sources of Vitamin C: Fresh Fruits and Dietary Vegetables



- This is an image of Amla or Gooseberry which is the richest source of Vitamin C

- Guava is another rich source
- Potato is the cheapest source
- Deficiency: Scurvy which was discovered by James Lind.
- It leads to collagen synthesis which is a supporting matrix, so if this is deficient, it causes:
 - Swollen and bleeding gums
 - Subcutaneous bruising
 - Bleeding into skins and joints
 - Delayed wound healing
 - Anemia
 - Weakness



- This is an image of teeth and jaw.
- There is scurvy presenting with swollen gums.
- RDA: 40mg/ day for adults
- Intake of Vitamin C associated with reduced incidence of Gastric Cancer
- Required amount - 20mg/day
- Recommended intake-40 mg/day

Vitamin D

- Nutritionally important and present in two forms:
 - Calciferol (Vitamin D2) derived from plant source
 - Cholecalciferol (Vitamin D3): Derived from animal source and exposure to UV rays(naturally occurring form)
- Vitamin D is also called kidney hormone.
- Richest source: Halibut Fish
- **Why is it called Kidney Hormone?**
 - Vitamin D by itself is metabolically inactive unless it undergoes endogenous transformation into several active metabolites first in liver and later in kidney.
 - Can be synthesized in the body in adequate amounts by simple exposure to **sunlight** even for 5 minutes per day.
- Sources: Liver, Egg yolk, Butter and Cheese





- Image of Halibut fish which is the richest source of Vitamin D
- This white color fish is Cod Fish which is also rich in Vitamin D.
- Deficiency:
 - Rickets (6 months - 2 years)- Rickets has a Genu Varum or Bow legs presentation.
 - Reduced calcification of growing bones
 - Growth failure, bone deformity, muscular hypotonia, tetany, convulsions(hypocalcemia)
 - Elevated levels of alkaline phosphatase in serum



Image of Bow legs or Genu Varum.

- Other manifestations:
 - Bony deformities
 - Curved legs
 - Deformed pelvis
 - Pigeons chest
 - Harrison's sulcus
 - Rickety rosary
 - Kyphoscoliosis
 - Osteoporosis
 - Osteomalacia



Image of Genu valgum presentation.

- This is knock Knee Syndrome.
- This is seen in Fluorosis, when there is excess of fluoride in drinking water

- When fluoride was 3-6 mg / L, it was leading to Skeletal changes.
- Here in this presentation of Crippling Fluorosis, the amount of fluorine is >10 mg/L.



Important Information

- Dalda (Vanaspati Ghee) is fortified with 2500 IU of Vitamin A and 175 IU of Vitamin D.

Vitamin K

- Occurs in two forms:
 - K1 in green vegetables
 - K2 Synthesized by intestinal bacteria
- In deficiency of Vitamin K the prothrombin content of blood is decreased & clotting time is increased
- Newborn infants are deficient in Vitamin K due to minimal stores of prothrombin at birth and lack of intestinal flora
- All infants after birth must receive a single IM dose of Vitamin K preparation (0.1-0.2mg of menadione sodium bisulfite or 0.5 gm of vitamin K1 by prophylaxis)

Vitamin E (Tocopherol)

- Source: vegetable oil, sunflower seed, egg yolk, butter
- Deficiency leads to external Ophthalmoplegia or Infertility



- This is an image of golden rice which is rich in Vitamin A.
- 500 IU of Vitamin A and 175 IU of Vitamin D is present in 100 ml of Dalda (Vanaspati Ghee).

MCQ

Q. Vanaspati Ghee contains?



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- A. Vitamin A
- B. Vitamin A & D
- C. prince kumar Vitamin A & B
- D. Vitamin A, B & D

Q. Prevalence surveys of vitamin A Deficiency is done among?

- A. Children 1-3 years
- B. Children 6 months - 6 years
- C. Adolescents 11-14 years
- D. Pregnant women 15-24 years

Q. Xerophthalmia is a problem in a community if the Prevalence of Bitot's Spot is more than?

- A. 1%
- B. 0.5%
- C. 5.0%
- D. 25%

Q. White polished rice causes deficiency of

- A. Thiamine
- B. Tryptophan
- C. Riboflavin
- D. Protein

Q. Thiamine content is highest in?

- A. Milled rice
- B. Whole wheat
- C. Gingelly seeds
- D. Ground nut

Q. Magenta red Tongue is seen in Deficiency of?

- A. B12
- B. Riboflavin
- C. Scarlet fever
- D. All of the above

Q. Disease characterized by 3Ds occurs due to Deficiency of?

- A. Vitamin A
- B. Folic Acid
- C. Vitamin C
- D. Niacin

Q. A farmer is having complaints of skin rash which increases on sun exposure.

There is also redness of the tongue. Maize is his staple diet.

Which of the following

vitamin deficiency can cause these types of features?

- A. Pyridoxine
- B. Thiamine
- C. Niacin
- D. Cyanocobalamin



Q. Pellagra in maize eating population due to:

- A. Niacin in bound form
- B. Deficiency of tryptophan
- C. Excess of leucine
- D. High consumption of milk and milk products

Q. A 45-year-old man presents with the following skin changes.

What relevant history will you take to diagnose this condition?



- A. Diarrhea, Dementia
- B. Diarrhea, memory impairment
- C. Diarrhea, arthritis
- D. Diarrhea, disability

Q. Subacute combined degeneration of cord is due to Deficiency of?

- A. Vitamin B 1
- B. Vitamin B6
- C. Folic acid
- D. Vitamin B 12

Q. All are seen in vitamin C Deficiency except?

- A. Swollen bleeding gums
- B. Delayed wound healing
- C. Anemia
- D. Infertility

Q. Richest source of Vitamin D is?

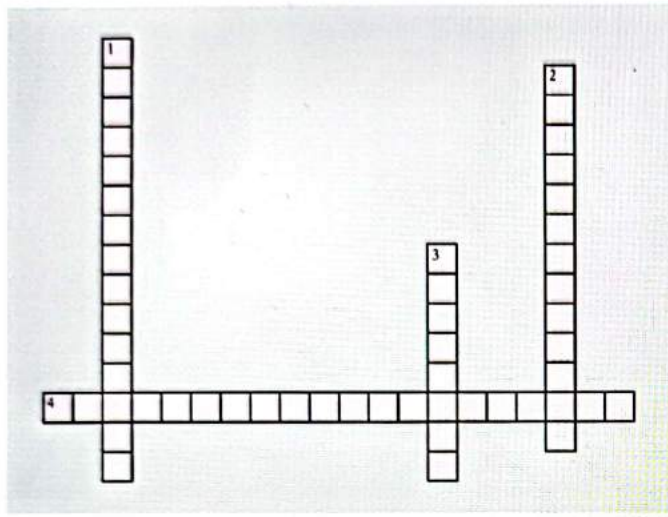
- A. Sunlight
- B. Shark liver oil
- C. Cod liver oil
- D. Halibut fish liver oil



CROSS WORD PUZZLES



Crossword Puzzle



Across

4. Vitamin B and C

Down

1. Includes vitamins and minerals

2. Vitamin A Deficiency

3. Animals: Retinol

42

FOOD ADULTERATION AND FOOD FORTIFICATION

Definitions

00:00:46

Food Adulteration

- Any substance added to the food product which decreases the nutritive value and harms the body.

Food Additives

- This is a substance added to the food product and it does not alter the nutritive value but it increases the shelf life or consumption.
- Example:** Preservatives.

Food Fortification

- This is a substance added to a product that helps to increase the nutritive value and was not present in the food prior.

Food Enrichment

- This is a substance added to a food product to increase the nutritive value and it was present in lower quantities initially.

Food Adulterants (Food, Toxin, Clinical Features)

00:04:07

- Lathyrism (in humans – NeuroLathyrism)
- Epidemic dropsy
- Endemic ascites
- Aflatoxicosis
- Ergotism

Lathyrism

00:05:09

- An example of food adulteration



(Khesari Dal or Lathyrus Sativus)

- Food:** Khesari dal or *Lathyrus sativus*
- Toxin present is **Beta oxalyl amino alanine (BOAA)**
- Khesari dal also called as Teora dal or Lak dal.
- Resembles like Arhar dal (sambar dal)
- This crop has been banned.

NeuroLathyrism

- Caused due to the consumption of 30% khesari dal in 2-6 months.
- Age groups of 15 to 45 years
- Clinical features: **Spastic paralysis of lower limb.**
- Stages of Spastic Paralysis of Lower Limb**
 - Latent stage
 - One stick stage
 - Two stick stage



Interventions of NeuroLathyrism

- VITC prophylaxis-500 to 1000 mg in a week
- Toxin removal by steeping and parboiling.
- Health education
- Banning the crop
- Genetic approach

States Reporting the Crop

- UP, MP, Bihar, Orissa, Gujarat
- Maharashtra and west Bengal

Source of NeuroLathyrism

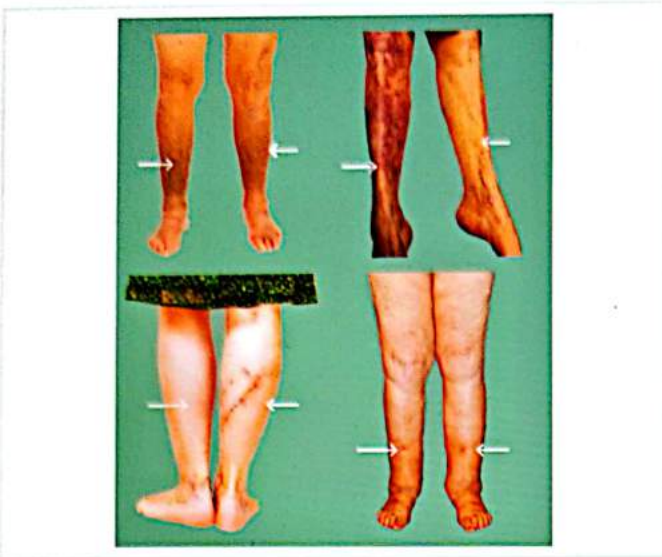
- Contamination of Arhar dal with Khesari dal.
- This is grown illegally.

Osteolathyrism

- The other type which is **not present in humans.**

Epidemic Dropsy

00:12:29



- An example of food adulteration.
- Caused due to contamination of mustard oil with Argemone oil.
- A toxin called Sanguinarine is present in Argemone oil.
- In mustard fields, a weed called Argemone Mexicana is found from which Argemone oil is produced.
- Argemone oil is derived from its flower.
- Due to the preparation of Argemone oil instead of Mustard oil, epidemic dropsy is caused.

Clinical Features

- Sudden bilateral non inflammatory pitting Edema
- Diarrhoea
- Dyspnoea
- Cardiac defects
- Glaucoma, thereby leads to death.



Argemone Mexicana flower

Q. Most sensitive test to detect Argemone oil contamination?
Ans. Nitric acid paper chromatography test

Endemic Ascites

00:15:41



Millet seeds and Crotalaria

- Millet seeds get contaminated with Crotalaria or Jhunjhunja weeds.
 - Toxin present is pyrrolizidine.
 - Clinical feature: Hepatotoxicity

Aflatoxicosis (Storage Fungus)

00:17:15

- Fungus present is Aspergillus Flavus or Aspergillus parasiticus.
- Caused due to groundnuts, maize, jowar gets infested with storage fungus.
- Toxin present is Aflatoxin.
- Clinical features: liver cirrhosis and hepatocellular carcinoma

Ergotism (Field Fungus)

00:18:54

- Claviceps fusiformis: field fungus
- Caused due to the adulteration of bajra, wheat, sorghum, rye with Claviceps fusiformis.
- Prevention: It is prevented by hand picking, air floatation and floating the grain with 20% salt water.

Refer Table 42.1

MCQs

Q. Epidemic dropsy is caused by which toxin?

- A. BOAA
- B. Sanguinarine
- C. Alkaloid
- D. Ergot

Q. A person after consuming an allegedly adulterated food developed bilateral swelling of legs, diarrhoea, glaucoma, cardiac failure. The toxin most likely to cause the symptoms.

- A. Aflatoxin
- B. Pyrrolizidine
- C. Sanguinarine
- D. BOAA

Q. Argemone oil contamination of mustard oil can be tested by

- Phosphorus test
- Nitric acid test**
- Coliform test
- Methylene blue test

Q. The toxin in pulse Lathyrus sativus can be removed by following method

- Milling
- Steeping**
- Nalgonda technique
- Polishing

Q. Ergot infested grains can be easily removed by

- Floating in 20% salt water**
- Steeping method
- Parboiling method
- Nalgonda technique

Food Fortification Vs Food Enrichment

00:24:19

Food Fortification	Food Enrichment
<ul style="list-style-type: none"> A product which increases its nutritive value and is not present initially is added. 	<ul style="list-style-type: none"> Addition of a nutritive product, present initially in small quantities and lost during processing.
<p>Example</p> <ul style="list-style-type: none"> Double fortified salt Twin fortified salt 	<p>Example</p> <ul style="list-style-type: none"> White flower- Vitamin B is lost during processing and added back.

Protein Energy Malnutrition

00:28:49

- It is a nutritional deficiency disorder.
- Caused due to inadequate intake of food both in quality and quantity.
- Infections like diarrhoea, respiratory infections, measles, worms, etc. require extra calories.
- These infections cause decreased absorption and utilisation.
- It is a Vicious Circle as both acts synergistically.

Ecological Factors of Malnutrition

00:30:22

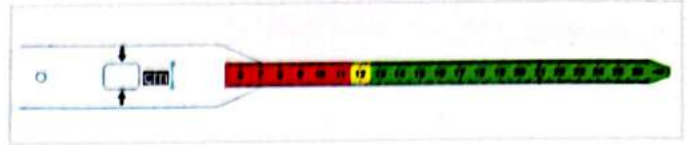
Includes

- Food balance sheet:** regarding food consumption
- Socioeconomic factors:** No. of children, Occupation, Family income, etc
- Cultural pattern:** In certain communities some food is not allowed during a particular time.
- Health care services:** PHC services, feeding programmes, immunisation programmes, etc.

- Conditioning factors:** Infections like fungal or bacterial which can precipitate malnutrition.

Shakir's Tape

00:31:54



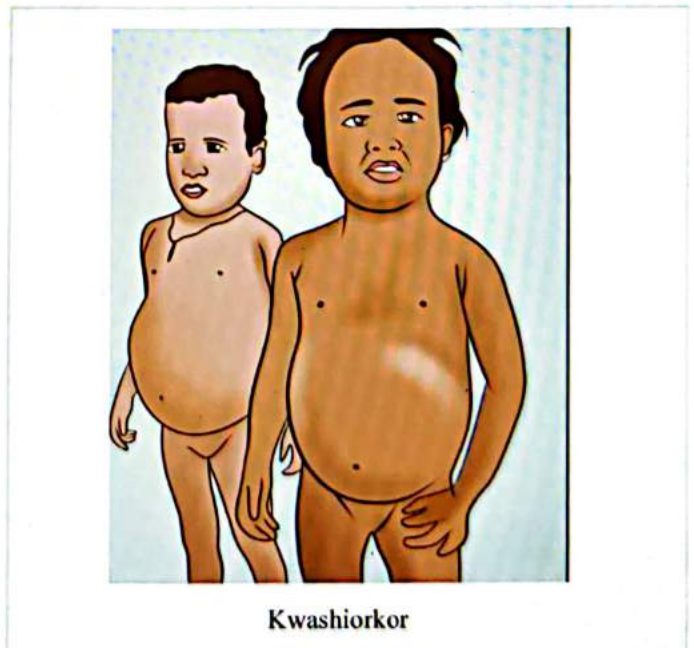
- Assess malnutrition state in the field using Shakir's tape
- It is used at field level.
- We measure Mid-arm Circumference using this tape.
- It has 3 zones- Red, Yellow and Green.

MUAC (cm)	Inference
>13.5cm	Normal
12.5 to 13.5cm	Borderline
<12.5	Undernutrition

Severe Acute Malnutrition

00:32:39

- Manifestation of Protein Energy Malnutrition
- Weight/height is below -3 Standard Deviation and/ or Mid upper arm circumference (MUAC) <11.5cm or 115mm.
- And/or presence of bilateral Edema.
- MUAC is observed in children from 6 months to 59 months.
- According to WHO, any one of the above conditions is enough to detect SAM child.



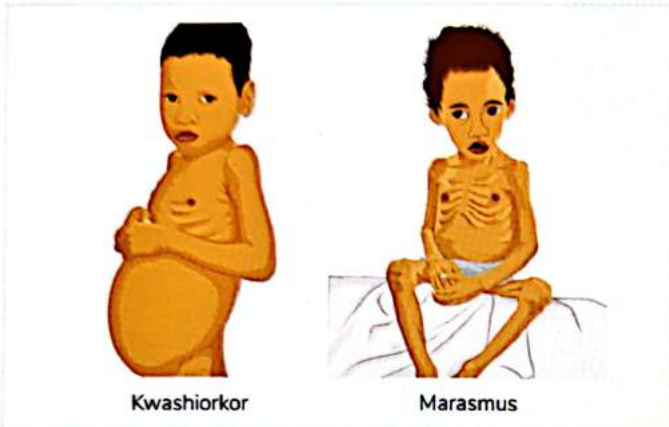
- Marasmus is more common.
- Kwashiorkor is more severe.

Marasmus includes

- Weight loss
- Wasting of muscle
- Loss of subcutaneous fat
- Wise old man appearance

Kwashiorkor includes

- Moon face appearance



Kwashiorkor Vs Marasmus

00:36:05

MCQs

Q. Conditioning factor for malnutrition which is a manmade disease

- A. Infectious disease
- B. Socio economic factors
- C. Child rearing habits
- D. Food habits

Q. Which of the following is included in detecting a child with severe acute malnutrition?

- Weight for age score is less than minus three SD
- Bilateral pitting Edema
- Weight for height score is less than minus three SD
- Mild upper arm circumference of less than 12 cm

Select the correct answer using the code given below:

- A. 1 and 3 only
- B. 2 and 3 only
- C. 3 and 4 only
- D. 1,2,3 and 4

Q. Which form of SAM is more common?

- A. Marasmus
- B. Kwashiorkor
- C. Mixed syndrome
- D. All are equally common.

Kwashiorkor	Marasmus
Children with protein deficiency only	Children with both protein and calorie deficiency
Age: 6 months to 3 years	Age: from infants to less than one year
Presence of subcutaneous fat	No subcutaneous fat
Edema is present	Edema is absent
Presence of enlarged fatty liver	No fatty liver
Ribs are not prominent	Ribs are prominent
Lethargic	Alert and irritable
Mild or no muscle wasting	Severe muscle wasting
Poor appetite	Voracious feeder
Requires adequate proteins	Requires adequate fats, proteins and carbohydrates
More hair changes	Less hair changes
Flaty paint like skin	Wrinkled, dry face
Moon appearance	Wise old man appearance

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Table 42.1

Food Adulteration	Food	Toxin
NeuroLathyrism	<ul style="list-style-type: none"> • Khesari dal or lathyrus sativus • Contamination of Arhar dal with khesari dal 	<ul style="list-style-type: none"> • BOAA
Epidemic Dropsy	<ul style="list-style-type: none"> • Contamination of Mustard oil with Argemone oil 	<ul style="list-style-type: none"> • Sanguinarine
Endemic Ascites	<ul style="list-style-type: none"> • Contamination of millet seeds with Crotalaria or jhunjhunja seeds 	<ul style="list-style-type: none"> • Pyrrolizidine
Aflatoxicosis	<ul style="list-style-type: none"> • Groundnut, maize, jowar infested with Aspergillus flavus or parasiticus 	<ul style="list-style-type: none"> • Aflatoxin
Ergotism	<ul style="list-style-type: none"> • Rye, bajra, wheat with Claviceps fusiformis 	<ul style="list-style-type: none"> • Field fungus

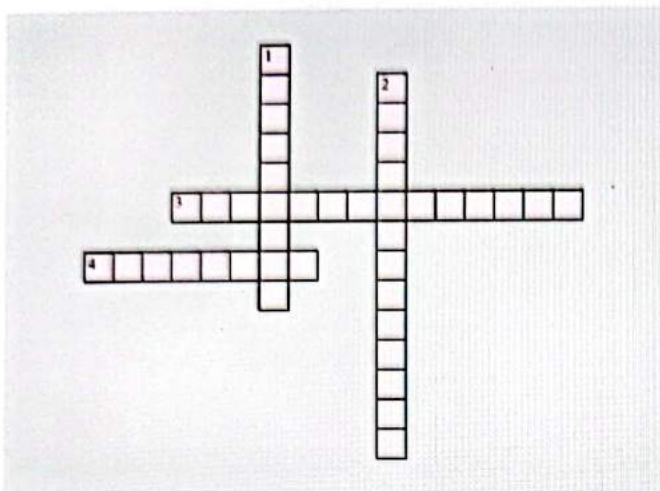
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Caused due to the consumption of 30% kesari dal in 2-6 months.
- 4. Caused due to the adulteration of bajra, wheat, sorghum, rye with *Claviceps fusiformis*

Down

- 1. Toxin present is Beta oxalyl amino alanine (BOAA)
- 2. Fungus present is *Aspergillus Flavus* or *Aspergillus parasiticus*.

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43

NUTRITION HEALTH PROGRAMMES AND FOOD LOGOS



Topics

1. Integrated Child Development Services Scheme
2. Pradhan Mantri Poshan Shakti Nirman
3. PM Poshan Shakti (Mid-Day Meal)
4. Poshan Abhiyaan
5. Anemia Mukh Bharat
6. National Iodine Deficiency Disorder Control Program
7. Food logos

00:00:20

Organization - Anganwadi Centre

00:05:54

- Anganwadi means courtyard in Hindi.
- Government runs the ICDS program in an "Anganwadi Centre (AWC)"
- AWC is a courtyard established to deliver the programs under the ICDS.
- **Capacity of One AWC**
 - Plain areas: 400-800 population
 - Hilly areas: 300-800 population
- **Capacity of Mini-AWC:** 150-300 population.
- AWC can be set up on demand in areas with 40 children under 6 years without an AWC.
- **Anganwadi worker (AWW)** is the most important Health personnel in an AWC.
 - AWW is a Grass Root level worker in an AWC
 - Works at field level
 - Education: 10th pass
 - Duration of training: 4 months
 - Work
 - Plain areas: 400-800 population
 - Hilly areas: 300-800 population
- **Mukhya sevika**
 - Supervises the work of AWW's.
 - One Mukhya sevika can supervise the work of 25 AWW's.
- **CDPO (Child/Community Development Project Officer)** supervises the overall functioning of ICDS.
 - 1 CDPO can supervise 1 **Block** (1,00,000 population)
 - 1 CDPO can supervise 4 **Mukhya sevikas**.
 - 1 CDPO can supervise 100 **AWW'S**.

ICDS: Integrated Child Development Services Scheme

00:00:44



- Launch Date: 2nd October 1975
- Ministry: Women & Child Development
- Aiming for overall child growth and development

Beneficiaries of ICDS

00:03:10

- Children (0-6 years)
- Pregnant women
- Lactating women
- Adolescent girls
- Reproductive age women (15-45 years)

Benefits/ Services Under ICDS

00:04:25

- Supplemental Nutrition
- Immunization
- Non-formal preschool education
- Health checkups
- Referral services
- Nutritional and health education
- Adolescent health, vocational training, food and health program.

Nutrition Norms

00:13:32

- ICDS provides Supplementary nutrition to the beneficiaries.

S. No	Category	Revised (Per beneficiary per day)	
		Calories (Kcal)	Protein (g)
1	Children (6-72 months)	500	12-15
2	Severely Malnourished	800	20-25
3	Pregnant women and Nursing Mothers	600	18-20

MCQs

Q. ICDS was launched in?

- A. 1955
- B. 1968
- C. 1975
- D. 2005

Q. The diet given to a pregnant lady under ICDS is?

- A. 600 kcal+20g proteins/day
- B. 250 kcal+12g proteins/day
- C. 300 kcal+15g proteins/day
- D. 350 kcal+15g proteins/day

Q. In an ICDS scheme, one Anganwadi center should cover a population of?

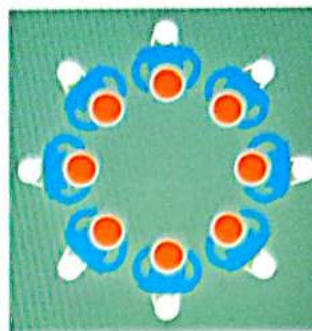
- A. 1000-1500
- B. 2000-25000
- C. 400-800
- D. 100-200

Q. What does 'S' stand for in ICDS?

Ans. Services

PM Poshan Shakti

00:19:01



- Earlier known as the "Mid-Day Meal" scheme.
- Initially, it was launched by the "Ministry of Human Resource and Development (MHRD)."
- Now it is currently under the "Ministry of Education."
- Main initiative – to prevent dropouts from school.
- Meals were provided at government schools.
- Targeted mainly in slums.
- Update
 - Balvatikas (Preschool children) are added.
 - Class I-VIII (Primary & Upper Primary)

Food Norms Under PM Poshan Shakti

FOOD NORMS UNDER MID-DAY MEAL	
(PER CHILD PER DAY IN GRAMS)	
For Primary Classes	For Upper Primary Classes
Foodgrains 100gms	Foodgrains 150gms
Pulses 20gms	Pulses 30gms
Vegetables 50gms	Vegetables 75gms
Oil and fats 5gms	Oil and fats 7.5gms

Refer Table 43.1

MCQ's

Q. What should the meal provided daily in the PM poshan shakti (Earlier Mid-day meals) program supply?

- A. One-third of the energy requirement and half of the protein requirement
- B. Half of the energy requirement and one-third of the protein requirement
- C. Half of the energy requirement and half of the protein requirement

Kishori Shakti Yojana

00:15:42



- It is an initiative for adolescent girls (11-18 years) enrolled under ICDS.
- Present in certain states only.
- All the benefits are provided to the girls respectively under ICDS.

Pradhan Mantri Poshan Shakti Nirman - (Update)

00:17:56

This scheme is divided into two parts

- PM Poshan Shakti (Earlier Mid-Day meal)
- Poshan Abhiyan

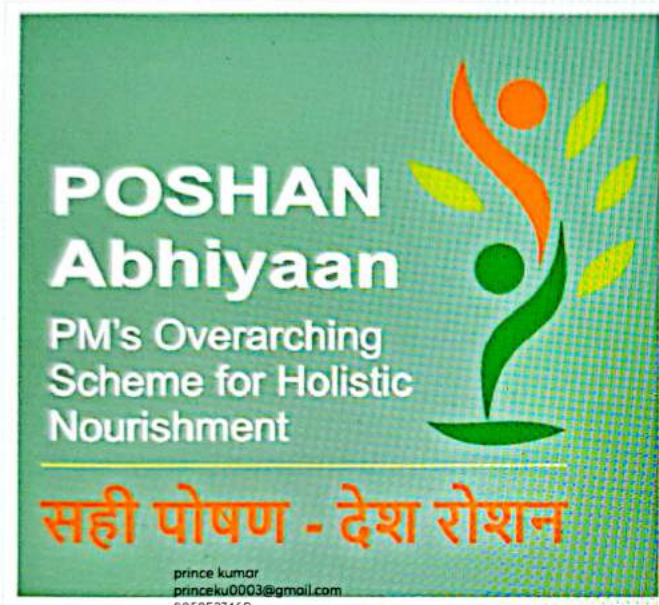
D. One-third of the energy requirement and One-third of the protein requirement

Q. PM poshan shakti (Earlier Mid-day meals) program comes under?

- A. Ministry of health and family welfare
- B. Ministry of education
- C. Ministry of social welfare
- D. Ministry of Human resource development

Poshan Abhiyaan

00:26:07



- POSHAN is abbreviated as “PM's Overarching Scheme for Holistic Nourishment.”
- Other name: “National Nutrition mission.”
- Ministry: “Ministry of Women & Child Development.”
- Launched in 2018.
- GOI wants to reduce the prevalence of
 - Low birth weight (<2.5 kg) by 2% point every year.
 - Stunting (Height/Age: Chronic malnutrition) by 2% yearly.
 - Underweight (Weight/Age: Acute on chronic malnutrition) by 2% every year.
 - Anemia by 3% point every year.

Anemia Mukh Bharat

00:30:39



- It follows a 6x6x6 strategy.

Important Information

- 5x5 strategy is followed by RMNCH+A.

- Ministry: Ministry of Health and Family Welfare (MOHFW)
- Prophylactic Iron and Folic acid supplementation are provided to 6 beneficiaries.
- Level of prevention: Primary prevention (Specific protection).
- 6 Beneficiaries
 - 6–59-month child (0–6-month child gets Iron from breastfeeding)
 - 5-9 years old
 - 10-19 years old adolescent boy
 - 10-19 years old adolescent girl
 - Reproductive age women (20–45 years)
 - Pregnant and Lactating women

Prophylactic Iron & Folic Acid Supplementation

Refer Table 43.2

Important Information

- Blue color Iron tabs (Iron ki neeli goli) are also supplied to WIFS (Weekly Iron Folic Acid Supplementation).

MCQ's

Q. Is Deworming done in this initiative?

Ans: Yes, Deworming is done for both children and pregnant women.

- In pregnant women: Full tab of Albendazole (400 mg HS) is given in their 2nd trimester.
- In children <2 years: Half a tab of Albendazole (200 mg HS) is given.
- In children >2 years: Full tab of Albendazole (400 mg HS) is given.

Important Information

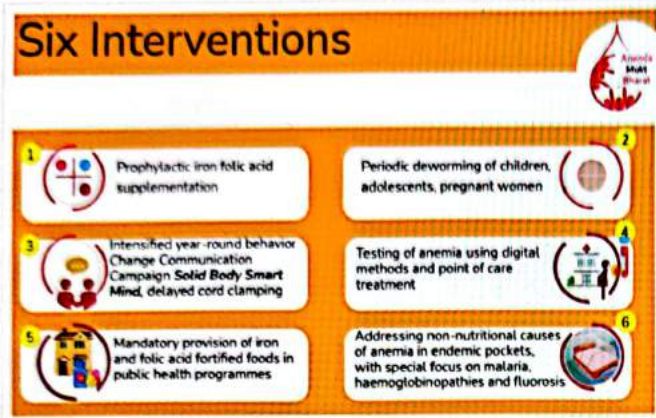
- Anemia is also tackled under Anemia Mukh Bharat.
- Emaciation or wasting- low weight/height is indicator of acute malnutrition.



Important Information

- National Deworming Days are celebrated on 10th February & 10th August.

The 6 Interventions



- Prophylactic iron-folic acid supplementation.
- Periodic deworming of children, adolescents, and pregnant women.
- Intensified year-round behavior Change Communication Campaign **Solid Body Smart Mind**, delayed cord clamping (Promoting awareness on Anemia).
- Testing anemia using digital methods and point-of-care treatment.
- Mandatory provision of iron and folic acid-fortified foods in public health programs.
- Addressing non-nutritional causes of anemia in endemic pockets, focusing on malaria, hemoglobinopathies, and fluorosis.

National Iodine Deficiency Disorder Control Program

00:42:06

Objectives of program

- Surveys to assess the magnitude of iodine deficiency disorders.
- Supply of iodized salt in place of common salt.
- Resurvey after every 5 years to assess the extent of iodine deficiency disorders and the impact of iodized salt.
- Laboratory monitoring of iodized salt and urinary iodine excretion.
- Health education and publicity.

Iodine content

- At Manufacturing level: Less than 30 parts per million on a dry weight basis.

- At the Distribution level: Less than 15 parts per million on a dry weight basis.

IDD (Iodine Deficiency Disorder) Monitoring

- Most sensitive indicator to environmental iodine deficiency is "Neonatal Hypothyroidism" followed by "Urinary Iodine excretion."

Programmatic Goal

- <5% prevalence of IDD in 10-14 years of age.
- <10% of the incidence of IDD

Indicators in IDD Control Program

- Impact indicator: **Urinary Iodine excretion**
- Chronic/Long-term impact indicator: **Goiter rate**
- Epidemiological indicator/principal impact indicator/important indicator/sustainability indicator: **Urinary iodine levels**
- Process indicator: **Iodine levels in the salt** (at packaging and household level)

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Iodized products available

- Iodized oil** (Intramuscular injection of iodized oil, mostly poppy seed oil, protects for 4 years with 1ml average dose).
- NIN** (National Institute of Nutrition) developed the process to produce iodized oil in safflower or saffola oil.
- Iodized oil oral**: Iodized oil or Sodium iodate tablets.
- The **Smiling Sun symbol** is used for Iodized salt.



Important Information

- Double fortified salt/Twin salt** has 1 mg of Iron and 40 mcg of Iodine per gram.

MCQ's

Q. Iodized salt in Iodine deficiency control program is.

- Primordial prevention
- Primary prevention**
- Secondary prevention
- Tertiary prevention



Important Information

- Production (30ppm) and distribution (15 ppm) levels
- Environmental indicator: Neonatal Hypothyroidism
- Impact indicator: Urinary Iodine excretion
- Double fortified salt

Food Logos

00:48:46

FSSAI



- Fruit Product/Process Order.
- Regulates the quality of tinned fruit juices and tinned fruit cans.

AGMARK

00:52:26



- Marketing of Agricultural products

Organic Product

00:52:47



MCQs

- Q.** Food standards and safety authority of India comes under?
- Ministry of Agriculture
 - Ministry of health and family welfare
 - Ministry of Consumer Affairs
 - Ministry of Rural development
- Q.** Food standards in India are based on the standards set by?
- PFA standards
 - AGMARK standards
 - Codex Alimentarius
 - Bureau of Indian standards

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BIS

00:50:10



- **Bureau of Indian Standards**
- **Ministry:** Ministry of Consumer affairs
- PFA (Prevention of Food Adulteration) provides the Minimum quality of food products.
- BIS provides **quality above the minimum** standards of food products.

FPO

00:51:56



Table 43.1

DIET	Primary	Upper Primary
Carbohydrates	450 kcal	700 kcal
Proteins	12g	20g
Food grains	100g	150g
Pulses	20g	30g
Vegetables	50g	75g
Oil and Fats	5g	7.5g

Table 43.2

Population	Iron	Folic Acid	Schedule
6-59 month	20 mg Elemental Iron	100 mcg Folic acid	Bi-weekly (Syrup)
5-9 years	45 mg Elemental Iron	400 mcg Folic acid	Weekly (Pink tabs)
10-19 years	60 mg Elemental Iron	500 mcg Folic acid	Weekly (Blue tabs)
Reproductive age women	60 mg Elemental Iron	500 mcg Folic acid	Weekly (Red tabs)
Pregnant and Lactating women	60 mg Elemental Iron	500 mcg Folic acid	Daily (Red tabs)

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44 RECOMMENDED DIETARY ALLOWANCE

- Average dietary nutrient intake level that is sufficient to meet the nutrient requirement of nearly all healthy individuals.
- Recommended Dietary Intakes meet the needs of 97.5% of the population
- RDA= Actual daily requirement + extra amount
 - **Exception** one nutrient where RDA= Actual daily requirement - It is energy (can get deposited in the body leading to overweight and obesity)

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Lactation	0-6 Months	No change from previous guidelines recommend by NIN • National institute of nutrition ○ Headquarter - Hyderabad
	<ul style="list-style-type: none"> • +600 kcal/day to women's energy requirements 7-12 Months • +520 kcal/day to women's energy requirements 	

Reference Man & Reference Woman 00:01:41

- To calculate the ideal amount of energy and protein that is required by a person, we tend to take reference which is called Reference Man & Reference Woman.

- If it is an **elderly male** (> 65 years) the calorie requirement is 1700 kilo calories/ day
- If it is an **elderly Female** (> 65 years) the calorie requirement is 1500 kilo calories/ day

New Guidelines		
Indian Reference	Man	Women
Age	19-39	19-39
Weight	65 kg	55 kg
BMI	18.5 - 22.9 kg/m ² (Asian classification)	
Height	177cm	162 cm
BMI	20.74 kg/m ²	20.95 kg/m ²

Protein Requirement

- 0.83 gm/kg/ day

Visible Fat Intake 00:09:21

	Male Fats (g/ day)	Females Fats (g/ day)
Sedentary	25	20
Moderate	30	25
Heavy	40	30

Activity Level 00:03:40

- 8 hours of sleep (for both man and women)
- 8 hours of moderate work
- 4-6 hours of sitting/moving
- 2 hours of walking/recreation

Vitamins And Minerals Requirement NIN 2020 Update 00:09:55

Refer Table 44.1

Energy Requirements 00:04:18

New Energy Guidelines		
	Adult Man (kilocalories/ day)	Adult Woman (kilocalories/ day)
Sedentary	2110	1660
Moderate	2710	2130
Heavy	3470	2720
Additional Requirements		
Pregnancy	+350 kcal/day (women energy requirements)	

- Abbreviation
 - TM - Trimester
 - IU - international unit
- Nutrients requirements increase
 - During pregnancy
 - During lactation
- The requirement of vitamin D remains constant throughout
- Iodine increases
 - in pregnancy- 250
 - Lactation- 280
- Nutrients whose requirements have increased during **lactation**:
 - Calcium increases to 1200 mg/day
 - Vitamin A increases to 950 IU/day
 - Iodine increases to 280 mcg/day

- Nutrients whose requirements have increased during pregnancy:
 - Iron increases to 40 mg/day
 - Folic acid increases to 570 mcg/day
- The iron folic acid tablets given in Anemia Mukht Bharat to a pregnant woman the quantity of each is
 - 60 mg elemental iron
 - 500 microgram folic acid

- A. 2350 kcal, 1700 kcal
- B. 3470 kcal, 1500 kcal
- C. 2710 kcal, 1700 kcal
- D. 2110 kcal, 1500 kcal**
- E. 1690 kcal, 1500 kcal

- Q. Which of the following is the correct calorie requirement in 12-week pregnant female?
- A. 400 in 1st trimester
 - B. 300 in all trimesters
 - C. 400 in 3rd trimester**
 - D. 300 in 1st trimester

Note:

- 1st trimester: Calorie requirement not required to increase
 - 1st trimester: 0 kcal/day
- 2nd trimester: 350 kcal/day increase
- 3rd trimester: 450 kcal/day increase
- Energy requirement in pregnancy: **35-40 kcal/kg/day**
 - Carbs: 50%
 - Proteins: 30%
 - Fats: 20%
- NIN: + 350 kcal/kg/day throughout pregnancy

Energy And Protein Requirements for An Infant 00:14:26

	0-6 months	6-12 months
Energy requirement	92 kcal/kg/day	80 kcal/kg/day
Moderate	1.16 grams/kg/day	1.69 gms/kg/day

Q. Rahul 35 years has brought his mother who is 70 years old to his family doctor for a health check-up. The family doctor is advising Rahul and his mother on adequate nutritional requirements. Rahul tells the doctor weight is 65kg, is a teacher, and that his mother stays at home. According to the latest NIN RDA guidelines, how many calories should Rahul and his mother take?

Table 44.1

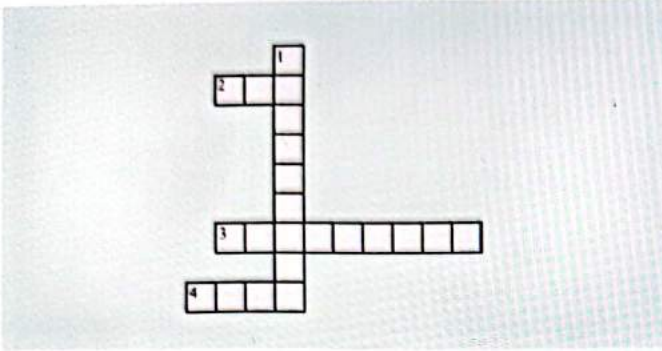
	Wright (kg)	Protein (gm/day)	Carbohydrate (gm/day)	Vit A (IU/day)	Vit D (IU/day)	Iron (mg/day)	Calcium (mg/day)	Iodine (mcg/day)	Folate (mcg/day)
Males	65	54	130	1000	600	19	1000	150	300
Females	55	45.7	130	840	600	29	1000	150	220
Pregnancy	55+10	+9.5 (2TM) + 22 (3TM)	175	900	600	40	1000	250	570
Lactation		+16.9 (0-6 m) + 13.2 (6-12m)	200	950	600	23	1200	280	330



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Actually daily requirement + extra amount
- 3. Abbreviation TM
- 4. Requirements have increased during pregnancy

Down

- 1. Calcium increases to 1200 mg/day

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PREVIOUS YEAR QUESTIONS



- Q. Highest thermic effect is seen in? (INICET NOV 2020)
 A. Carbohydrate diet
B. Protein diet
 C. Fat diet
 D. Vitamin diet
- Q. Vitamin which increases Iron absorption is? (FMGE Jun 2021)
 A. Vitamin A
 B. Vitamin B1
C. Vitamin C
 D. Vitamin B12
- Q. Recommended daily iodine intake for a 3-5 year child? (FMGE Dec 2018)
 A. 90 mcg
 B. 120 mcg
 C. 150 mcg
 D. 250 mcg
- Q. Keshan's disease is due to deficiency of? (FMGE Dec 2019)
 A. Selenium
 B. Zinc
 C. Copper
 D. Iron
- Q. Which of the following is included in the concurrent list by the government of India? (NEET 2019)
 A. Landmine injuries
 B. Medical emergencies
C. Adulteration of food prevention
 D. Road traffic accidents
- Q. A factory worker had a history of frequent exposure to groundnuts. Subsequently, he develops hepatocellular carcinoma. Most likely exposure associated is? (FMGE Aug 2020)
 A. Ergot toxin
B. Aflatoxin
 C. Sanguinarine
 D. Pyrrolizidine alkaloids
- Q. Nowadays, which is the most common pasteurization method? (FMGE Jun 2019)
 A. Holder (VAT) method
 B. Ultra-high temperature method
C. High temperature and short time method
 D. Low temperature and longtime method
- Q. Patients from different age groups from a village in West Bengal came to the clinic with illness. On examination, it is noted that all of them had edema. In history, it was found that they were consuming mustard seeds from the same local shop. Which is the best probable diagnosis? (FMGE Jun 2022)
 A. Lathyrism
B. Epidemic dropsy
 C. Endemic ascites
 D. Aflatoxicosis
- Q. If Arhar dal is found to be contaminated with Khesari dal, which of the following will not be done? (FMGE June 2022)
 A. Ban the Crop
B. Give DEC
 C. Give Vitamin C prophylaxis
 D. Remove toxin
- Q. A patient is presented with a Neurological deficit and history of Chronic alcohol intake. It is due to the deficiency of? (FMGE June 2022)
 A. Riboflavin
 B. Niacin
C. Thiamine
 D. Pyridoxine
- Q. Vitamin deficiency in the given image is? (FMGE June 2022)



- A. Folate
 B. Riboflavin
C. Niacin
 D. Vitamin B12

Q. A patient presents with typically dry-appearing triangular patches of conjunctiva with a layer of foam on the surface, usually located temporal to the cornea. This is?

(FMGE June 2022)

- A. Thiamine deficiency
- B. Conjunctival xerosis**
- C. Niacin deficiency
- D. Ascorbic acid deficiency

Q. A couple goes to hospital and told Doctor that they are prone to have Anencephaly in their baby. Then they asked Doctor how to prevent it. Most likely response by Doctor?

(FMGE June 2022)

- A. Give folic acid antenatally**
- B. Give TT antenatally
- C. Give vitamin A antenatally
- D. USG



45

SOCIOLOGY

Social Science

00:00:47

- Social science is the **scientific examination of human behavior**.

Components of Social science

00:01:07

1. Health Economics

- Economics deals with human relationships in the specific context of production, distribution, consumption, and ownership of scarce resources, goods, and services.
- The assets, goods, and services which we own influence human behavior.

2. Political science

- Study of the system of laws and institutions which constitute the government of whole societies.
- For example: Nobody can smoke in public.

3. Sociology: Study of Human relationships and Human behavior.**4. Psychology**

- It includes things like beliefs, opinions and attitude.
- It is the study of the effect of the social environment on individual psychology.
- How surroundings affect behavior, and attitude is Psychology.
- It is concerned with how and why perceptions, thoughts, opinions, attitudes, and behavior vary in different societies and groups.

5. Social Anthropology

- Study of the physical, social, and cultural history of man.
- It is the cultural evolution of man. It defines how evolution affects human behavior.
 - Sociology, Psychology, and Anthropology directly influence human behavior and have a direct relationship with human behavior.
 - Health Economics and Political science indirectly influence human behavior.

Sociology & Concepts in Sociology

00:06:30

- Sociology is the study of human relationships and Human Behavior.

Definitions related to sociology

00:07:03

- Society:** Society is a group of individuals who have **organized themselves** and lead a particular pattern/ way of life.
- Importance of Society:** Controls and regulates the behavior of individuals by enforcing laws and customs.
- It doesn't allow people to do as they wish all the time.

- Community:** A community is a group of people who have organized themselves and lead a certain way of life surrounded by or living in a **defined geographical boundary** and sharing common values and interests.
Community = Society + Geographical boundaries

- Social Structure:** It is a pattern of **interrelationships between members of society**. It shows how we behave with one another. The social structure comprises of
 - Major institutions
 - Groups
 - Power structure
 - Status hierarchy

**Important Information**

- Dynamics of social change: Factors that determine changes in social structure are
 - Birth Rate
 - Death Rate
 - Income Level
 - Migration from rural to urban

d. Socialization

- It is the process by which individuals adopt the cultures, customs, traditions, beliefs, and habits of a society and become a part of the society.
- When we are born, we don't know which society we are part of.
- We gradually, through a process, acquire all that which are the cultures and customs of society and become a part of society.
- **Examples:** Children going to school, Internship training programs for doctors.
 - Internship training is done because, during an internship, we are **learning the process** of how to behave in that atmosphere.

- Socialism:** Socialism is the **public ownership** of property and resources. It employs the use of public resources.

• Capitalism

- Capitalism means the use of private resources.
- It implies private ownership of means of production and aims at a maximum private profit at the expense of the **working class** (the working class will do the work, but **private owners will take profits**).

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Important Information

- When a private company owns everything, all revenue will be shared by owners only. But if the government or the public owns important things, the revenue will be shared equally.

f. Social Pathology

- Study of **social causes** leading to the occurrence of a disease.
- Social Pathology can be **studied** by social surveys.
- Examples of social causes leading to the occurrence of disease:
 - Peer pressure
 - Stress
 - Poverty
 - Industrialization
 - Migration
 - Smoking
 - Drinking,
 - Illiteracy
 - Criticism
 - Child labor
 - Prostitution
 - Gender Bias
 - Drug abuse
 - Suicide
 - Juvenile delinquency

g. Social Control Mechanisms: This helps to **govern the behavior** of individuals in a society.

- **Formal ways of governing the behavior of a person.**
 - Example: Laws and enactments of parliament, rules, and regulations
- **Informal ways of governing the behavior of a person**
 - Example: The government of India incentivizes those who undergo sterilization operations.

h. Customs: **Established pattern** of human behavior.

• Folkways

- Less stringent customs
- It does not arise out of fear.
- A person is not penalized for it.
- Something whose origin is unplanned and obscure.
- Example: You didn't greet your parents' friends who came to your house even after seeing them.

• Mores

- More stringent customs
- Arises out of fear.
- If we don't follow, we will be punished or penalized.
- Something which involves moral standards.
- Example: Purdah System (It has to be strictly followed in certain cultures and Societies)

- i. Culture:** **Learned pattern** of Behavior of individuals in a society. We have to learn the culture of a society.
- j. Acculturation:** It is **cultural contact** or the exchange of culture.
 - Examples of Culture contact can occur through
 - Marriage
 - Trade & Commerce
 - Conquest
 - Education
 - Industrialization
 - Propagation of religion.
- k. Internalization:** **Adopting someone's good behavior** and making it a part of your own. Example: If your friend is honest, you also try to be honest.
- l. Social Defense:** In social defense, the government is trying to **control social factors** which can lead to the **occurrence of a disease.**
 - It covers a range of preventive, therapeutic, and rehabilitative services to protect the society from antisocial, criminal, or deviant conduct of man.
 - It involves
 - Prevention and control of Juvenile delinquency via children's acts.
 - Eradication of beggary.
 - Social and moral hygiene programs.
 - Elimination of prostitution via suppression of immoral traffic in the women and girls act.
 - Control of alcoholism, drug addiction, gambling, and suicides.

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Important Information

- The National institute of social defense is under the **Department of social welfare.**

MCQs

00:29:17

Q. Sociology is

- A. Study of human relationships
- B. Study of human behavior
- C. Both
- D. None

Q. An organized group of people with social relationships:

- A. Community
- B. Association
- C. **Society**
- D. Family

Q. Social Pathology is:

- A. Change in disease pattern due to change in lifestyle

- B. Study of social problems which cause disease in the population
- C. Conflicts arising from new opportunities in transition societies
- D. Study of human relationships and behavior

Q. Acculturation is:

- A. Triage
- B. Cultural change due to socialization
- C. Attitude
- D. Belief

Q. Pattern of interrelationships between persons in a society is known as

- A. Socialism
- B. Socialization
- C. Social structure
- D. Medical sociology

Q. Learned behavior which is socially acquired is known as

- A. Customs
- B. Acculturation
- C. Standard of living
- D. Culture

- Can also be as superstitions.
- Example: You see your mother's belief in the superstition that it brings you bad luck if a black cat crosses the road, and you believe it.

Attitude

00:40:42

- Attitude is the **acquired characteristics** of an individual.
- It is **objective** in nature, and it is independent of subject perception.
- It is centered **around our beliefs**.
- **More or less permanent way of behaving.**
- Organization of beliefs around an object, subject, or concept which predisposes our actions.
- One to respond in some desired manner.
- Doesn't depend on what you think.

Some Other Definitions

1. **Habit:** An **accustomed way** of doing things is called Habit.
2. **Emotions:** Emotions are the **feelings experienced** by a person. The **most common emotion** experienced by a person is **Fear**
3. **Learning:** Any relatively **permanent change in behavior** that occurs as a result of practice or experience.
 - **Cognitive Learning** (Knowledge-based)
 - **Affective Learning** (action-based or attitude-based)
 - Example: If you have a patient who is HIV positive and he is requesting you to not tell this to his wife. You have to convince the patient.
 - **Psychomotor Learning** (skill development)
 - Example: A child is taught hand-washing technique, An intern is taught knee reflex demonstration, etc.



Important Information

- The standard of Living of a country Depends on the following:
- Level of national income
- The total amount of goods and services a country can produce
- Size of population
- Level of education
- General price level
- Distribution of national economy

The most important determinant of the standard of living is **Gross National Income**



Important Information

- In Sociology, the unit of study is **group**.
- In Psychology, the unit of study is **individuals**.

Psychology

00:37:43

- In Psychology, we try to study **Opinions, beliefs, and attitudes**.

Opinions

00:38:30

- It is something that is **temporary and subjective** in nature.
- Our opinions can change according to our surroundings.
- Subjective means, it depends on what the individual thinks.

Beliefs

00:39:48

- It is something that is **permanent and subjective** in nature.
- It is something that we acquire from our parents.

Social Organisation

00:48:48

- Family
- Religion and Castes

Temporary Social Groups

- **Crowd; No leader.** People gathered out of **curiosity**.
- Example: To witness an accident

- **Mob:** Has a Leader and it is emotionally agitated.
- **Herd:** Has a leader, but people are following him without asking any questions. They have no emotional agitation.
 - Example: Tourist Guide

Permanent Social Groups

- Like Cities, Towns, villages, and Bands.
- **Band:** A most elementary community of a few families living together. Groups have organized themselves and follow a pattern of life.
 - Example: Gypsies in India.
- **Village:** Small collection of people permanently settled with cultural values.
- **Town:** Permanent large, dense, urban settlements.
- **City:** Heterogeneous population > 100000
- **State:** Social group based on a defined geographical boundary, usually with a common culture, language, and code of conduct.
- Government Groups

MCQ

Q. Which out of the following is not a temporary social group?

- A. Mob
- B. Crowd
- C. **Band**
- D. Herd

Theories of Sociology

00:53:21

Marxist Theory

- Putting profit ahead of health
- Example: Tobacco consumption is not banned completely as it leads to loss of revenue

Parsonian Theory

- Social factors leading to the occurrence of disease.
- Social constraints like poverty, migration, and industrialization.
- Example: TB due to poverty leads to overcrowding.

Feminist Theory

- The roles of females in society are enforced by men.
- Certain things are supposed to be done by men and women.
- When this balance is disrupted, it leads to some form of disease.

Foucauldian Theory

- The population is segregated into groups, which makes it easier to control
- The disease is labeled to segregate the population to make it easier to control.

McKeown's theory of TB

- Reduction in TB has occurred due to changes in socio-environmental conditions.
- It has not been reduced due to diagnosis or treatment facilities but due to social conditions.

MCQs

Q. A condom vending machine at the railway is an example of:

- A. Socialization
- B. Appropriate technology
- C. Community participation
- D. **Social marketing**

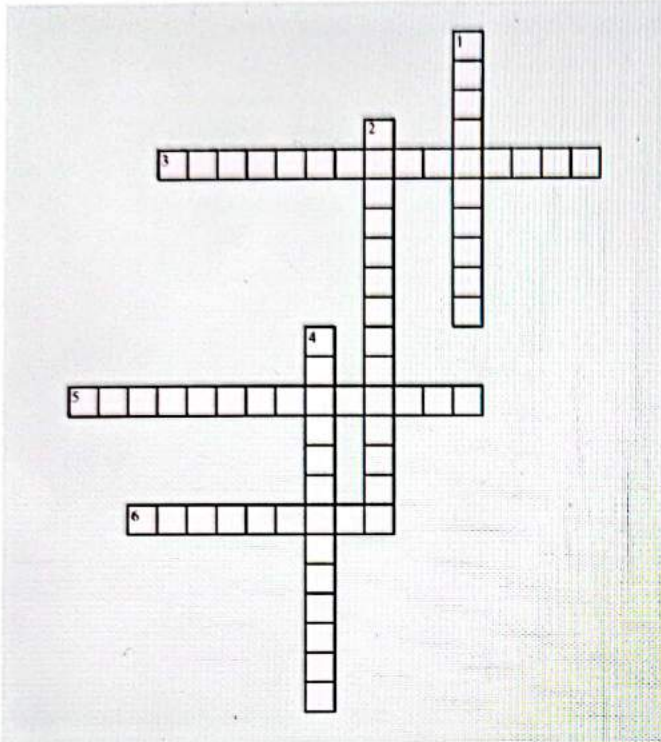
- **Social marketing:** It is way of promoting desired behavior change where we are not expecting any profit.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Social factors leading to the occurrence of disease.
- 5. The roles of females in society are enforced by men.
- 6. Study of Human relationships and Human behavior.

Down

- 1. It is the study of the effect of the social environment on individual psychology.
- 2. Putting profit ahead of health
- 4. Study of the physical, social, and cultural history of man. It is the cultural evolution of man.

46

FAMILY AND SOCIOECONOMIC SCALES



Definition 00:00:32

Family 00:00:34

- A group of individuals related by blood(biologically) or by law (marriage or adoption).
- Living together and eating from a common kitchen.
- They can be:
 - **Family of origin** - A family where you are born
 - **Family of procreation** - A family that we set up after marriage.
- **Difference between family and household**
 - Family is biologically (blood) or legally related.
 - Household - **no blood relations. Only eating from a common kitchen.** E.g., hostlers eating in a mess (common kitchen).
 - Househelp at home is a part of the household.
- **Head of the family-**
 - The major decision-maker of the family
 - Takes all important decisions related to marriage, property, etc.
 - Not necessary that the head of the family is the most aged, most educated, or most earning person.
 - They can be male or female.
- Family can function:
 - as a biological unit (shares common gene)
 - as a social unit (shares common physical and social environment)
 - As cultural unit (part of a society, so represents the culture of society. By attitude or behavior of individuals' family)
 - And also as epidemiological unit (family having a common disease or any common disorder)

Family Cycle 00:06:43

- It is the cycle that shows the various phases of a family.
- Phases of family:
 1. **Formation** - marriage to the birth of the 1st child
 2. **Extension** - birth of the 1st child to birth of the last child
 3. **Complete extension** - the birth of the last child to 1st child leaving home
 4. **Contraction** - The 1st child leaving home to the last child leaving home
 5. **Complete contraction** - the last child leaving home to the 1st spouse dying
 6. **Dissolution** - Death of the 1st spouse to the death of the survivor

Types of Family 00:11:03

- Nuclear family/ elementary family
- Extended family
- Joint family
- 3 generation family
- Broken family
- Problem family
- Communal family
- Dysfunctional family
- New family

1. **Nuclear family**
 - Also known as the **elementary family.**
 - Involves newly married couples with their dependent children.
2. **New family**
 - It is a nuclear family only.
 - But it has **less than 10 years duration.**
3. **Extended family**
 - Have grandparents, brothers, sisters, uncles, aunties, etc.
 - It can be present as a 3 generation family or as a joint family.
4. **Joint family**
 - A family with two or more **married couples, where the males of the family are related by blood, and the females are either the wives, daughters, or widows.**
 - **Common kitchen.**
 - There should be a **common purse-** all expenditures are made from that
 - Usually senior-most member becomes the head of the family.
5. **Three-generation family**
 - It is a type of joint family where a member of three generations is living or staying together.
 - E.g. Grandparents - parents - children
6. **Broken family**
 - It is a family where either of the parent has died, or the couple is divorced/separated.
7. **Problem family**
 - It is a family that lags behind the rest of the community.
 - Parents cannot fulfill the family's social and physical requirements.

8. Communal family

- It is a family with a division of labor.
- Division of labor means roles and responsibilities of family members are divided like a community.

9. Dysfunctional family

- It is a family where conflict, misbehavior, and abuse are common for the individuals, and the rest of the family members are okay with it.

MCQ

Q. Arrange the following stages of the family cycle in chronological order.

- Formation, extension, complete extension, dissolution, contraction, complete contraction.
- Formation, contraction, complete contraction, extension, complete extension, dissolution.
- Formation, extension, contraction, complete extension, complete contraction, dissolution.
- Formation, extension, complete extension, contraction, complete contraction, dissolution.

Ans.

- d. Formation, extension, complete extension, contraction, complete contraction, dissolution

Socio-Economic status scales

00:25:50

- It belongs to a type of **ordinal scale** of measurement.

1. Urban Areas

- **Modified kuppuswamy scale**
- Kul Shrestha scale
- Srivastava scale
- Jalota scale, Gaurs

2. Rural SES scale

- Udai Pareek scale
- **Modified B.G Prasad scale**
- Radhukar
- Shirpurkar

3. Student's scale

- Bharadwaj scale

4. Non- Indian SES scales

- Hollingshead (occupation-based) scale
- Henderson scale

Modified Kuppuswamy scale

00:27:14

- Used to assess the socio-economic status of individuals living in urban areas.
- The Kuppuswamy scale is called the Modified Kuppuswamy scale because earlier, we used to consider per capita income

(total income of the family/ total family members), but now we consider total family income.

- The family income gets revised based on the consumer price index.
- The income scale has been recalculated using **all India's average consumer price index** for Industrial workers for the year 2021.
- Urban definition: 75% of the male working population is involved in the non-agricultural sector
- A population of more than 5000
- **Three-component of the Modified kuppuswamy scale -**
 - Education of the head of the family
 - Occupation of the head of the family
 - Total family income
- **Scoring-**
 - Education - 1-7
 - Occupation - 1-10.
 - Total family income - 1-12
- The Modified Kuppuswamy scale ranges from **3 to 29**
- The **lowest score** on the Modified Kuppuswamy scale is **3**
- The **highest score** on the Modified Kuppuswamy scale is **29**

Updated monthly family income in rupees (2021)	Score
>= 123322	12
61, 663 - 123,321	10
46129 - 61662	6
30881-46128	4
18497 - 30830	3
6175 -18496	2
<6174	1

- The data gets revised every year

Socioeconomic status

- The socio-economic status scale is divided in the following manner
 - Its range is from **3 to 29**

Total score	Socioeconomic status
26-29	Upper-class <ul style="list-style-type: none"> • Range of the upper class
16-25	Upper middle
11-15	Lower middle
5-10	Upper lower
Below 5	Lower <ul style="list-style-type: none"> • Range of lower class

Udai Pareek Scale

00:33:55

- This scale is independent of income
- Meant for rural area
- Based on 9 parameters -

 1. Caste
 2. Occupation
 3. Education
 4. Land
 5. Social participation
 6. Family members
 7. House
 8. Farm power
 9. Material possession

BG Prasad Scale

00:34:28

- Based on per capita income.
- Per capita income - total income/ number of family members

Below Poverty Line

00:35:40

Criteria for Below Poverty Line

1. According to Tendulkar committee

	Rural areas	Urban areas
Per capita calorie intake	<2400 kcal per day	<2100 kcal per day
Per capita Income	<27/- INR per day	<33/-INR per day

2. According to Rangarajan committee

- Per capita income less than 32- INR per day in the rural area
- less than 47- INR per day in the urban area.

3. As per World Bank

- If the per capita income is less than 2.15 US \$ per day, this is an extreme poverty level.

MCQ

Q. Family, which lags behind the rest of the community, is known as?

- a. Communal family
- b. Elementary family
- c. Problem family
- d. Broken family

Ans - c. Problem family

Q. Nuclear family consists of?

- a. Husband, wife, and son
- b. Husband, wife, and dependent children
- c. Husband and wife only
- d. Father, mother husband, and wife

Ans. - b. Husband, wife, and dependent children.

Q. A family where all its members play a part in its management is known as a?

- a. Elementary family
- b. New family
- c. 3-generation family
- d. Communal family

Ans. d. Communal family (there is a division of labor)

Q. The following is true about the term 'new families.'

- a. It is a variant of 3 generation family
- b. It is applied to all nuclear families of less than 10 years duration
- c. It is a variant of joint family
- d. It is applied to all nuclear families of less than 2 years duration

Ans - b. It is applied to all nuclear families of less than 10 years duration.

Q. Movements in socioeconomic levels in society are known as?

- a. Social equality
- b. Socioeconomic upliftment
- c. Social mobility
- d. Scarce resources

Ans - c. Social mobility

Q. Socioeconomic status in urban areas is indicated by which of the following?

- a. Kuppuswamy scale
- b. Sullivan index
- c. Human development index
- d. Physical quality of life index

Ans - a. Kuppuswamy scale.

Q. Scales used for assessing the socio-economic status of the population are the following except?

- a. Modified Udai Pareek scale
- b. Modified Kuppuswamy scale
- c. Likert scale
- d. BG prasad scale

Ans. c. Likert scale.

Q. Income generated within a country is known as?

- a. Gross domestic product (GDP)
- b. Net national product (NNP)
- c. Net domestic product (NDP)
- d. Purchasing power parity (PPP)

Ans. a. Gross domestic product(GDP) (The topic is to be taken up in health economics).

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Q. Upper-class score in Kuppuswamy socioeconomic status scale is?

- a. 5-10
- b. 11-15
- c. 16-25
- d. 26-29

Ans. d. 26-29.

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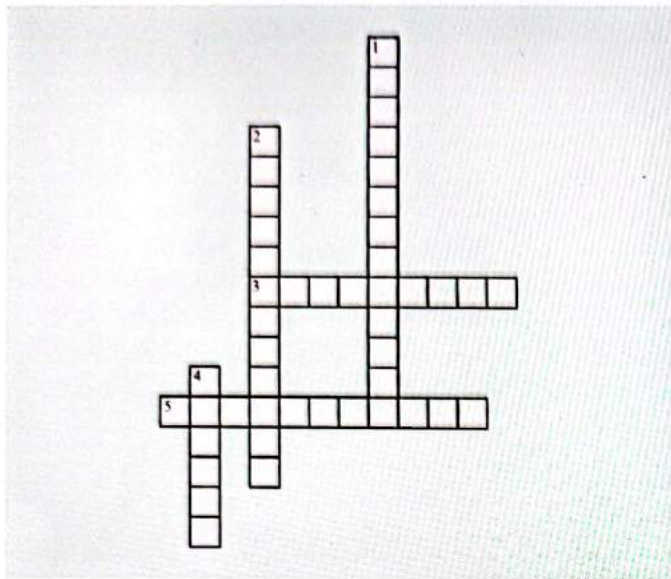


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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. It is a nuclear family only.
- 5. It is the cycle that shows the various phases of a family.

Down

- 1. Also known as the elementary family.
- 2. It is a family where either the parents have died, or the couple is divorced/separated.
- 4. A group of individuals related by blood(biologically) or by law(marriage or adoption).

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HEALTH ECONOMICS DOCTOR PATIENT RELATIONSHIP
RIGHT OF AN INDIVIDUALS SOCIAL SECURITY



Health Economics 00:00:28

- Providing, Delivering, and Financing health care of a country.

Gross National Income (GNI) Or Gross National Product (GNP)

- Gross income generated from within the country + **Net Income received from abroad.**
- Indicator of objective component of concept of wellbeing.
- Independent of subject's perception.

Gross Domestic Product (GDP)

- Gross income generated from **within the country**

Net National Product (NNP)

- $NNP = GNP - \text{Capital consumed}$

Net Domestic Product (NDP)

- $NDP = GDP - \text{Value of depreciation on fixed assets}$

Purchasing Power Parity (PPP)

- Number of units of a country's currency required to buy the same amount of goods and services in domestic market, as **\$1.00 would buy in USA.**
- Component of HDI (Human Development Index)

Rights of an Individual 00:03:26

- Right to equality
- Right to freedom of speech and expression
- Right against exploitation
- Right to freedom of practice and propagation of religion
- Right of minorities to consult their culture
- Right to property
- Right to constitutional remedies offer enforcement of fundamental rights

Doctor Patient Relationship 00:03:52

- How doctors behave with patients

Forms of Doctor Patient Relationship

- **Paternalistic** - Doctor is dominant.
- **Consumeristic** - Patient is dominant (patients are consumers here)
- **Defaulter** - Both the doctor and the patient are not dominant (showing minimal interest)
- **Mutualistic** - Combined approach (both comes to a proper agreement) and is best type of doctor patient relationship.

3 Levels of Communications 00:06:19

- Communication on emotional plane
- Communication on cultural plane
- Communication on intellectual plane

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00:06:53

Social Problems Faced

- **Prostitution**
 - One of the major problems.
 - The **Immoral Traffic Prevention Act 1986** covers prostitution.
- **Delinquency**
 - Criminal or bad behavior among young people.
 - Committed an offense like theft, murder, burglary, sexual offense.
 - **Children Act 1960** covers delinquency.
- **Dowry system**
 - Covered under **Dowry Prohibition Act 1986**
 - Gives minimum punishment for taking or abetting to take dowry to 5 years imprisonment and a fine of rupees 15,000.
- **Drug addiction**
 - **Narcotic Drugs and Psychotropic Substances Act 1985** cover this
- **Others**
 - Alcohol abuse
 - Unmarried mothers

Handicapped 00:08:34

- 7 main categories
 1. The blind
 2. Hearing disability
 3. The orthopedically handicapped
 4. Multiple disabilities
 5. Mentally retarded
 6. Mental illness
 7. Speech disability

Social Security 00:08:48

- A social **insurance program** providing social protection or protection against socially recognized conditions like
 - Poverty
 - Old age
 - Disabilities
 - Unemployment and others.
- Examples
 - Old age - Pension
 - Factory workers - Protected by Factories Act and ESI Act


Approaches to Social Security System

00:09:36

- 2 approaches
 - a) Social assistance
 - b) Social insurance

Social assistance	Social insurance
<ul style="list-style-type: none"> • Noncontributory benefit extended to vulnerable groups. • Provides relief to individuals at critical times without having received any contributions from them. • Ex: Reliefs during calamities. 	<ul style="list-style-type: none"> • Contributory benefit extended to individuals as a matter of right. • Ex: ESI Act (Employees give contribution of 0.75% of daily wages)

- Family pension schemes
- Social security for general public
- Insurance schemes
 - LIC
 - PPF

 **Important Information**

- First Social Security Act - Germany 1881 for industrial workers (PYQ)
- Bismarck introduced the system of social insurance in Germany in 1883, it became a model for other European countries to introduce similar social security systems.
- **Sweden** is the only country where the entire population is under social security schemes

Social Security Measures for Industrial Workers

00:11:06

- Workmen's Compensation Act 1923
- The Factories Act 1948
- Employees' State Insurance Act 1948
- Central Maternity Benefit Act 1961
- The Family Pension Scheme 1971

Social Security Measures for Civil Servants

00:11:21

- Pension
- Gratuity
- Provident fund

Social Safety Net

00:12:31

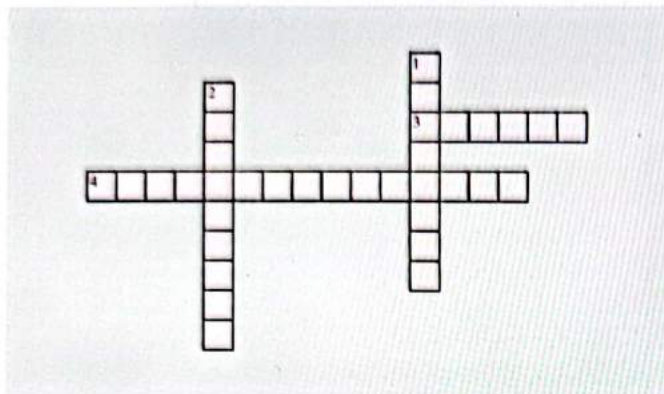
- A collection of services provided by the state such as,
 - Welfare
 - Unemployment benefit
 - Universal Healthcare
 - Homeless shelters
 - Minimum wage
 - Subsidized services like public transport (sometimes)
- This prevents individuals from falling into poverty beyond a certain level.
- **Ex:** Atal Bimit Vyakti Kalyan Yojana- 91/- relief under unemployment.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. In which country does the entire population live under social security schemes?
- 4. Contributory benefit extended to individuals as a matter of right

Down

- 1. Who introduced the system of social insurance in Germany in 1883?
- 2. A form of doctor patient relationship where both the doctor and the patient are not dominant (showing minimal interest)

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PREVIOUS YEAR QUESTIONS



Q. Role of social factors in Disease causation is studied under?
(FMGE June 2022)

- A. Sociology
- B. Social structure
- C. **Social pathology**
- D. Social medicine

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48

WATER : INTRODUCTION



Water Requirements

00:01:53

- Basic physiological requirement of drinking water is **2L per head per day**
- Daily supply per capita is adequate to meet the needs of all urban domestic purposes

Q1. A daily water supply considered adequate to meet the needs of all Domestic Urban Purposes is

- 10L per capita
- 20L per capita
- 40-60L per capita
- 150-200L per capita

Answer: 150-200L per capita

Q2. The daily supply per capita per is adequate to meet the needs of all Rural domestic purposes is

Answer: 40-60L

Q3. Purest water in Nature

- River water
- Rainwater
- Deep well
- Impounding reservoirs

Answer: Rainwater

Sources of Water

00:04:15

- Rain
- Surface water
 - Impounding reservoirs
 - Rivers and streams
 - Ponds and lakes
- Ground water
 - Shallow well
 - Deep well
 - Spring

Safe Yield of a Source

00:04:59

- Defined as yield that is adequate for **95% of the year**
- Wells are sufficient.
- Safe yield of source should be **sufficient to serve population** expected at the end of design period which is like 10 to 50 years in future

To Remember

- Rainwater is the purest water.
- Rainwater is very soft with traces of 0.0005% solids

Ground Water

00:06:35

- Cheapest and the most practical means of providing water to small communities.
- Groundwater is superior to surface water as it provides an effective filtering medium.
- There is less chance of contamination.
- Advantages
 - Free from pathogenic organisms
 - **Requires no treatment.**
 - Supply is sufficient during dry seasons.
 - Less subject to contamination than surface water
- Disadvantages
 - High mineral content. Examples: salts and calcium, magnesium which makes water hard.
 - Pumping is required to lift.

Sources of Ground Water

00:09:45

- Wells
 - Shallow well
 - Deep well
- Springs

Shallow well	Deep well
Taps water from above first impervious layer	Taps water from underneath the first impervious layer
Moderately hard water	Very hard water
More likely to get contaminated	Not liable for contamination yielding purer water
Yield limited quantities of water	Yield sufficient quantities of water providing source of constant supply
Usually dries up during summer	Usually does not dry even during summer
Easy to construct	Difficult to construct
Cheaper to construct	Expensive to construct

Key Points

- Deep wells provide the safest water and are most satisfactory source of water supply
- Shallow wells are most commonly used in India
- **Artesian wells** are a type of deep wells in which water rises above the level of ground water as it is held under pressure between 2 impervious strata.
- Artesian wells are not common in India

Types of Wells

00:14:19

- Based on the method of construction
 - Dug wells.
 - Tube wells

- Dug wells** are two types.

- o **Unlined katcha wells**
- o **Masonry Pucca well:** Step well is a type of pucca well

Step well

00:14:36

- Source of Guinea worm disease.
- Banned.
- Type of dug well.

Tube wells

00:16:18

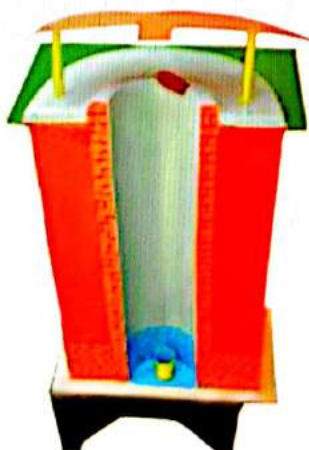
- Shallow tube wells or driven wells are largest supply of water for the rural community



- Area within **15m** of a well should be free from pollution with liquids and solid wastes.
- On average tube wells last for **5-10 years**
- Chandigarh** derives its entire water supply from tube wells

Sanitary Well

00:18:19



- Properly and suitably constructed.
- Well protected from contamination**

- Following points should be considered while constructing a sanitary well
 - o Located within **60m** (not more than 100m because water can get contaminated while transporting) from human dwelling.
 - o Located at least **15m (50 ft)** on site of likely contamination (like a drain)

Q6. The construction of step wells were banned and a more sanitary approach in the form of sanitary wells were constructed. Which of the following sentences are false with the reference of sanitary wells

- Location of sanitary well >10m from source of contamination
 - Lining >20ft depth and 2-3 ft above ground level
 - Lining >3m depth
 - Parapet wall >70-75 cm above ground
 - A concrete cement cover and a pump to withdraw water
- A. All
B. a,c,d,e
C. a,d
D. a,c

Answer: a,c

Explanation

- Located >100m radial distance > 15m (50 ft) on site of contamination
- Lining is >6m and 20 ft deep, 60-90cm above ground level
- Parapet wall 70-75 cm above round
- Platform >1m (3ft) in all directions

Disinfection of Wells

00:23:44

- Requires mass scale of disinfection during epidemics like cholera and gastroenteritis.
- Most effective and cheap method of disinfecting a well is using **bleaching powder**.

To Remember

2.5g of good quality bleaching powder would be required to disinfect 100 L of water.

Steps

- Estimate volume water in well.
- Formula is $3.12 \times d^2 \times h$ (d= diameter h= height)
- Estimate the quantity of bleaching powder required using Horrocks apparatus.

Criteria of Identification of Problem Habitation

00:27:51

- Drinking water source point is not within **1.6 km** in plains or **100m** in hill areas.
- Water available at depth of >**15m**

Q. Under the water supply program, which of the following statement is false

- a. At Least 1 hand pump (safe water spot) for 250 population
- b. At Least 40 L per capita water supply per day in rural areas
- c. At least 140 L in urban areas with sewage
- d. It is a problem village if there is no safe water within 1km.

Answer: It is a problem village if there is no safe water within 1km

To Remember

At Least 1 hand pump (safe water spot) for 250 population

Public Health Classification of Water and Diseases

00:30:50

Divided into

- o Water borne diseases
- o Water washed diseases
- o Water based diseases
- o Water related/ breeding diseases

Water Borne Diseases

00:31:16

- Drinking contaminated water
 - o Diarrhea
 - o Typhoid
 - o Cholera
 - o Hepatitis A and E
 - o Gastrointestinal infections
 - o Polio

Water Washed Diseases (Water Scarcity Diseases)

00:32:20

- Inadequate amount of water to maintain personal hygiene.
 - o Infective trachoma
 - o Conjunctivitis
 - o Scabies
 - o Bacillary Amoebic dysentery
 - o Worm infestations

Water Based Disease

00:34:00

- Due to intermediate host in water
 - o Schistosomiasis (snails)
 - o Cyclopes: Guinea worm disease/ dracunculiasis)

Water Related/ Breeding Diseases

00:35:21

- Vectors require water for breeding (Mosquito borne)
 - o Anopheles (malaria) needs clean water.
 - o Culex needs dirty water for Japanese encephalitis.
 - o Aedes, dengue, chikungunya in artificial water collection sources

Q. Scabies, an infection of the skin caused by sarcoptes scabiei, is an example of ?

- a. Water borne diseases
- b. Water washed diseases
- c. Water based diseases
- d. Water related/ breeding diseases

Answer: Water washed diseases

Water Quality: Criteria and Standards

00:37:39

- Water quality can be assessed on the following criteria(guidelines):
 - o Acceptability aspects
 - o Microbiological aspects
 - o Chemical aspects
 - o Radiological aspects

Acceptability Standards

00:38:29

- **Physical Properties**
 - o **Turbidity:** Up to 5 NTU (Nephelometric turbidity unit)
 - o **Color:** Up to 15 TCU (true color unit) or 5 Hazen unit
 - o Taste and odor: Tasteless, odorless
- **Chemical Properties**
 - o **Chlorides:** Standards which is prescribed for chloride prescribed is 200 mg/L maximum prescribed level is 600 mg/L
 - o **Excess NaCl causes CVDs (cardiovascular diseases).**
 - o **Hardness:** Recommended between 100-300 mg/L is acceptable.
 - o Softening of water is recommended is at 150 mg/L
 - o **pH:** 6.5-8.5
→ Chlorines acts best at pH 7.
 - o **Hydrogen sulfide:** Taste and odor threshold should be at 0.05-0.1 mg/L
 - o **Iron:** Reddish brown color occurs when ferrous iron in groundwater oxidized to ferric iron. Iron level is up to 0.3 mg/L
 - o **Total dissolved solids:** <600 mg/L is good. Prescribed permissible level TDS can go up to 1000 mg/L

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Microbiological Aspects

00:43:01

Q. Most reliable evidence for fecal contamination in water is provided by

- a. Coliform bacteria
- b. Cl.Perfringens
- c. Faecalis
- d. Cl.Welchii

Answer: Coliform bacteria

- Most reliable evidence for fecal contamination-Coliform bacteria.
- Evidence for recent contamination - Fecal streptococci
- Remote contamination - Clostridium perfringens

Q. Reasons for choosing coliform indicators for fecal pollution rather than water borne pathogens?

- Constant presence in great abundance in human intestine; foreign to portable waters
- Easily detectable to culture methods
- Longer survival periods
- Greater resistance to forces natural purification

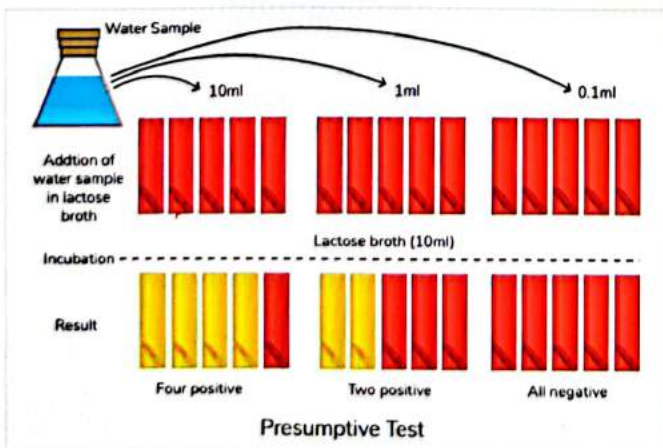
Answer: All of the above

Explanation: Constant presence in great abundance in the human intestine; foreign to portable waters (0 coliforms per 100mL of water)

Presumptive Coliform Test

00:48:06

- Yields the probable no. of coliform bacilli per 100 mL of water (Using Mc Crady's Table)
 - Screening test for presence of E Coli
 - METHODS:
- Multiple tube method**
 - Used for detection and estimation of coliform in water samples. For estimation of coliform, lactose containing broth medium is used.
 - Commonly used medium is Mc-Conkey broth
 - Indicator: Bromocresol purple
 - An inverted Durham's tube is placed Color of media turns into yellow and on collecting gas in Durham's tube, bacteria are assumed to be coliform.
 - Number of positive test tubes are counted and referred to the standard chart of MPN of coliform organisms in 100 mL of water samples.
 - Result is known as presumptive coliform count, the presumption being each tube showing fermentation contains coliform organisms.



- Interpretation of results of disinfected water

No coliforms in 100 cc of water	Excellent water
1-3 coliforms in 100 cc of water	Satisfactory water
4-10 coliforms in 100 cc of water	Suspicious water
> than 10 coliforms in 100 cc of water	Unsatisfactory water

2. Membrane filtration Technique

00:52:48

- Measured volume of water is filtered through a membrane made from cellulose ester.
- Bacteria present in water is retained on surface of membrane
- By inoculating membrane face upwards on suitable media, and at appropriate temperature colonies counted
- **Media:** Endo agar count colonies. (Green sheen or pink mucoid with dark centers)

Important Points

- 20 hours results: Membrane filtration technique
- Result obtains in 72-96 hours multiple tube method

Q. All of the following about purification are true except

- Clostridium pores indicate remote contamination of water
- Coliforms may be detected by multiple tube and Indole production
- Sodium thiosulphate is added to neutralize certain contaminants
- Coliforms must not be detected in 1000mL of sample of drinking water

Answer: Coliforms must not be detected in 1000mL of sample drinking water.

Explanation

- It should be 100mL of sample drinking water.
- This is known as portable water.
- IN 100 mL of drinking water, E coli or thermotolerant coliform bacteria shouldnt be detected.
- In case of large supplies, E coli or thermotolerant coliform bacteria shouldnt be present in 95% of samples taken through any 12 month period or not more than 5% of samples should have coliform bacteria.

To Remember

- Confirmatory test for E coli is EIC.
 - o E - Eijkman test,
 - o I - Indole production
 - o C - Citrate utilization

Chemical Criteria

00:56:36

Constituent	Recommended Maximum Limit (mg/L)
Arsenic	0.01
Lead	0.01
Cadmium	0.003
Chromium	0.05
Cyanide	0.07
Fluoride	0.5-0.8
Mercury	0.006
Nitrate	< 50
Nitrite	<3
Selenium	0.01

- **Most undesirable metal in water is lead**
- **Nitrate** - Remote contamination
- **Nitrite** - Recent contamination
- If both are present the amount should be ≤ 1 mg/L (expected mcq)

Radiological Aspects

00:59:26

- Gross alpha activity 10 Bq/L
- Gross beta activity Bq/L

Q. Proposed guideline values for radioactivity in drinking water,

- Gross alpha activity 0.5 Bq/L and gross beta activity 0.1 Bq/L
- Gross alpha activity 0.1 Bq/L and gross beta activity 0.1 Bq/L
- Gross alpha activity 0.1 Bq/L and gross beta activity 10.0 Bq/L
- Gross alpha activity 10 Bq/L and gross beta activity Bq/L

Answer: Gross alpha activity 0.5 Bq/L and gross beta activity 0.1 Bq/L

Key Guideline Aspects of WHO Recommended Drinking Water Quality Summary

01:01:11

- **Turbidity:** 5 NTU
- **Color:** 15 TCU
- **Chloride:** 600 mg/L
- **TDS:** 1000 mg/L
- **Hardness:** 100-300 mg/L
- **Coliform:** 0 coliform per 100 mL of water
- **Lead:** 0.01 mg/L
- **Fluoride:** 0.5-0.8 mg/L

- **Nitrate:** < 50 mg/L
- **Nitrite:** <3 mg/L

Q. Nitrates in excess of may cause infantile methemoglobinemia

- 15 mg/L
- 25 mg/L
- 35 mg/L
- 45 mg/L

Answer: 45 mg/L.

Q. Most undesirable metal

- Iron
- Copper
- Zinc
- Lead

Answer: Lead

Q. In a remote area of the country a gastroenteritis epidemic broke out. A shallow well was suspected to be the cause. The doctor of PHC had no other facility to check the quality of water except physical examination of water. Which of the following is a physical parameter that would indicate water pollution?

- Biological oxygen demand
- NO₂
- Chemical oxygen demand
- Turbidity

Answer: Turbidity

Hardness of Water

01:02:50

- Hardness of water is defined as **soap destroying power of water**
- Temporary hardness is because Ca and Mg salts of bicarbonates
- Calcium and magnesium salts Chlorides, Nitrates, Sulfates
- Hardness of water is expressed in terms of Milliequivalents per liter (meq/L) of CaCO₃

1 meq/L hardness = 50 mg CaCO₃ (50 ppm) per liter of water

Soft water	<1 (<50 mg/l)
Moderately Hard water	1-2 (50-150 mg/l)
Hard water	3-6 (150-300 mg/l)
Very hard water	>6 (>300 mg/l)

How to Remove Hardness

- **Methods to remove temporary hardness**
 - Boiling
 - Addition of lime
 - Addition of sodium carbonate
 - Permutit process
- **Methods to remove permanent hardness**
 - Adding sodium carbonate
 - Base exchange process

01:05:10

Q. Temporary hardness of water is primarily due to the presence of?

- a. Calcium and Magnesium sulfates
- b. Calcium and Magnesium chloride
- c. Calcium and Magnesium bicarbonates
- d. Calcium and Magnesium nitrates

Answer: Calcium and Magnesium bicarbonates

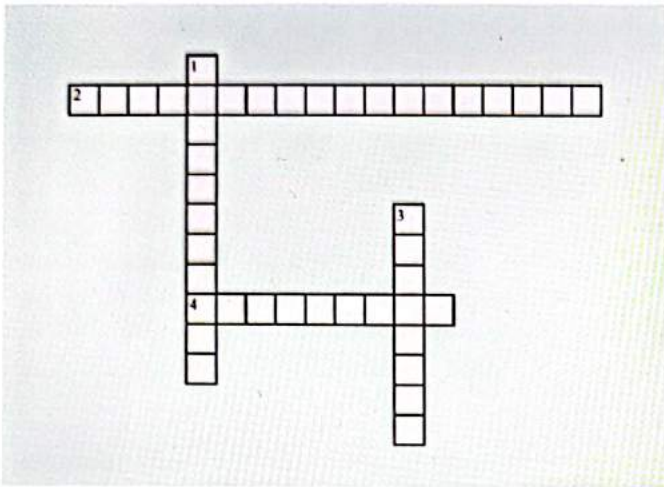
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Drinking contaminated water
- 4. Shallow tube wells or driven wells are largest supply of water for the rural community

Down

- 1. Cheapest and the most practical means of providing water to small communities
- 3. Guinea worm disease/ dracunculiasis)

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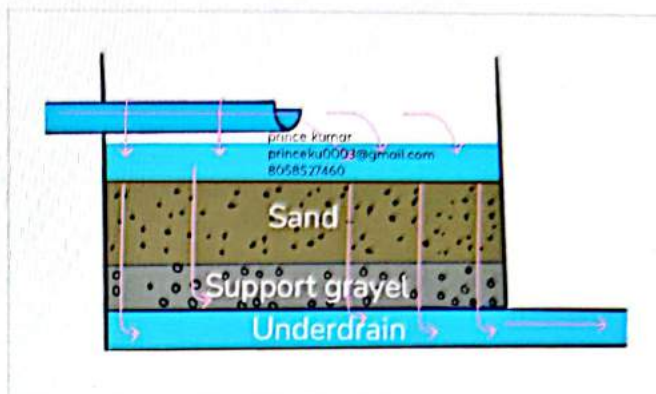
49 PURIFICATION OF WATER



Topics

00:00:10

- Purification of water on a large scale
- Difference between Rapid & Slow Sand filter
- Other types of filters
- Purification of water on a small scale
- Chlorination
- Horrocks apparatus
- Residual / Free Chlorine
- Chloroscope
- Test for chlorination of water (Ortho toluidine test vs Ortho toluidine arsenite test)



Purification of water on a large scale

00:01:04

- There are different steps of purification of water on a large scale.
- It means how water is provided in large cities and towns.
- It is achieved through filters which are of two types: **Rapid Sand Filter and Slow Sand Filter.**

- Suppose the images as A & B. There is a sand bed in both the filters. But above the sandbed, in image A there is a layer named **Schmutzdecke**, while in image B, there is no layer on top of sandbed. So, image A is a slow sand filter (biological filter) but image B is a Rapid Sand Filter (mechanical filter). The **schmutzdecke layer is the vital or Zoogleal or biological layer.** This layer is responsible for the functioning of the Slow Sand filter.

Steps of Water Purification

00:01:58

Step 1: Storage of water

- Physical
- Chemical
- Biological

Step 2: Filtration of water

- Slow sand (biological) filters
- Rapid sand (mechanical) filters

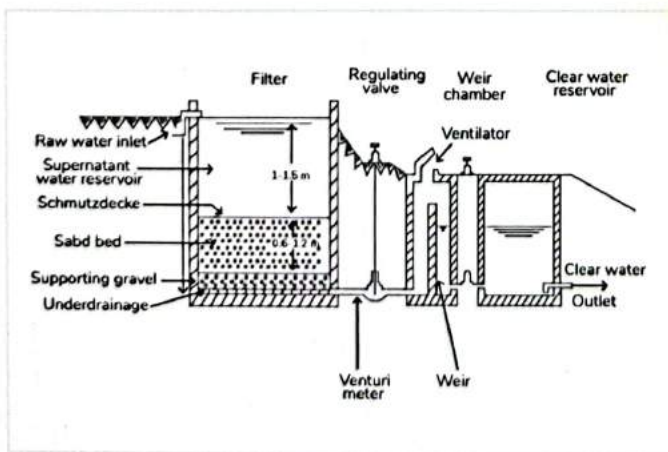
Step 3: Disinfection of water

- Chlorination
- Ozonation
- Ultraviolet irradiation

Slow Sand Filter

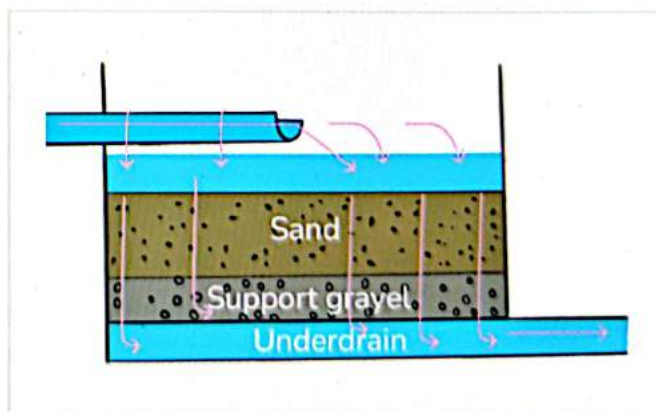
00:05:27

- Heart of the Filter: **Schmutzdecke layer**
 - 2-3cms layer
 - Vital / biological/ Zoogleal layer which is responsible for purifying water.
 - It removes organic matter, holds back bacteria, and **oxidizes ammoniacal nitrogen into nitrates.**
 - In simple words, it disinfects water.
 - It is not present in the Rapid Sand filter.
 - There is nothing above the sand bed which means there is a mechanical operation in the Rapid Sand filter.



Rapid Sand Filter

00:06:41



- Also known as mechanical filters
- There is no vital layer, so mechanical operation is used.
- It is functioning by utilizing the concept of gravity and pressure.
- These are of two types:
 - Paterson's Gravity Type: Water gets filtered through a sand bed under its weight.
 - Candy's Pressure Type: Water is passed through the bed under pressure which is higher than atmospheric pressure.

Difference between Rapid & Slow Sand filter 00:08:26

	Rapid Sand Filter (Preferred as it is Rapid/Fast)	Slow Sand Filter (Obsolete nowadays or used in smaller towns)
Space	Occupies less space	Occupies more space
Rate of Filtration	Fast rate	Slow rate
Effective size of sand	0.4-0.7 mm	0.2-0.3 mm
Preliminary treatment	Both	Both
Washing	Frequent washing, the technique is easy known as Backwashing	Technique used is to scrape the sand bed
Operation	It needs skilled operations	Skill is not required
Removal of turbidity	Good	Fair
Removal of bacteria	Can remove up to 99%	Can remove up to 99.9%
Ideal for	Large cities	Smaller towns
Removal of color	Good	Good
Preliminary Storage	Not required	Required

Q. Which filter is preferred? Why?

Ans. Rapid Sand Filter is preferred. It is preferred because

- Occupies less space.
- Rate of Filtration is fast.
- No storage is required.
- Easy to clean by the technique of Backwashing.

MCQ's

Q. The effective size of sand filtered by Rapid Sand filter:

- A. 0.2 mm
- B. 0.5 mm
- C. 0.8 mm
- D. 0.1 mm

Q. Features of the slow sand filter with respect to fast filter:

- A. Occupies less space
- B. Highly skilled operations
- C. Poor bacterial quality
- D. Take more time for purification
- E. Size of sand is smaller

- a. All are true
- b. A, C, D, and E are true
- c. B, D, and E are true
- d. D, E are true
- e. A, B, and E are true

Q. All are true for the Rapid Sand filter except

- A. No preliminary Storage of raw water is needed.
- B. Operation requires a skilled person.
- C. Frequent washing is not required.
- D. Can be Gravity type or Pressure type.

Purification of water on a small scale 00:18:53

If we are in a rural area or small-scale place then water can be purified by various means which include

1. Boiling 00:19:43

- Boiling is the **best method for purification** of water.
- It kills everything but boiling is **not preferred** as a mode of purification of water because
 - It is costly.
 - It consumes a lot of gas.
 - It has no residual activity. It means once we boil water after 4-6 hours we will need to boil it again.
 - Water will not remain disinfected.
 - Retreatment of boiling is required every 4-6 hours.

2. Chlorination 00:21:56

- **Second best method** for purification.
- It is second because it does not kill everything like it **cannot kill all spores, ova.**
- In case we need to **kill the polio virus**, the dose of chlorine will have to be **increased**. However, this will alter the taste and smell of water.
- If we need to **kill cyclops**, again dose needs to be **increased** which will affect the water.
- Chlorine has a very important property which is **Residual Activity**. This means water once chlorinated doesn't have to be re-treated again.
- This residual activity is also known as **Free chlorine**.

What happens when chlorine is added to water? 00:25:00

- When chlorine is added to water (also known as Combined Chlorine), it will form **HOCl (hypochlorous acid) + HCl (Hydrogen chloride)**.
- **HCl gets neutralized** by the alkalinity of water.

- HOCl remains, and it further dissociates into H^+ and OCl^- (Hypochlorite ion).
- Disinfecting property of chlorine is due to HOCl (Hypochlorous acid) and OCl^- (Hypochlorite ion).
- 90% of disinfecting properties are due to Hypochlorous acid and 10% is due to Hypochlorite ions.
- Major disinfecting property of chlorine is due to Hypochlorous acid.
- The amount of chlorine required to disinfect water is known as Chlorine demand.
- The instrument used to estimate chlorine is known as Horrocks Apparatus.

Which form of chlorine is most common?

- Chlorine is most commonly used as bleaching powder.
- 100g of bleaching powder releases 33 grams of chlorine.



Important Information

- Chlorine also oxidizes Iron, Manganese, and Hydrogen sulfide- Controls algae, slime organisms, and AIDS coagulation.

Chlorine Demand of Water

00:32:02

- The amount of chlorine required or demanded to destroy bacteria and to oxidize all the organic matter and ammoniacal substances present in water.
- Estimation of chlorine demand of water (or the dose of Bleaching water required for disinfecting of water) is done by the Horrocks apparatus.

Horrocks apparatus

00:33:14



- Horrocks apparatus estimates the chlorine demand of water.
- It contains 1 Black cup and 6 white cups.
- We use an indicator here which is starch iodide. The color changes to blue during the procedure of estimation.
- All 6 cups are of the same size and shape.
- There are markings made on six white cups at increasing levels.
- In the Black cup, we have to prepare the solution.
- Whatever water we need to disinfect we put it in the Black cup and add the indicator.
- Then we fill the water at an increasing level in six white cups.
- Then we will add 2 drops of solution to each white cup.
- There would be 1 one white cup that will change color.
- Out of 6 white cups, in addition to the solution, it will change its color to blue.
- As soon as one cup changes color, the other will also change.
- (nx2) gms of bleaching powder will disinfect 455 liters of water. (n is the first cup which will show color change).

MCQ's

Q. How many grams of bleaching powder is used to disinfect 3000L of water where the 4th cup is the first cup to show color change in apparatus?

- A. 40 gms
- B. 53 gms
- C. 64 gms
- D. 100 gms

Formula

= (nx2) gms of bleaching powder = disinfect 455 liters of water
 455 liters = $4 \times 2 = 8$ gms of bleaching powder
 1 liter = $8/455$
 3000 litres = $8/455 \times 3000 = 53$ gms

Methods of Chlorination

00:42:05

1. Chlorine gas (1st choice)
 2. Chloramine
 3. Perchloron
- Most commonly used form of chlorination is bleaching powder

Free or Residual Chlorine

00:42:40

- Breakpoint chlorination is the point at which the chlorine demand of water is met.
- After breakpoint chlorination has been achieved, additional chlorine is added to the water in the form of free or residual chlorine which will keep the water disinfected.
- To know that we have achieved the level of level of free or residual chlorine, an apparatus is used which is a chloroscope, and certain tests known as OT & OTA tests.



Chloroscope

- Instrument used to estimate the free or residual chlorine.
- Total amount (or dose) of chlorine added to water = combined chlorine + Free/Residual Chlorine.
- Combined chlorine is estimated by Horrocks apparatus and free/residual chlorine is estimated by Chloroscope or tests known as OT or OTA test.

Test for chlorination of water

00:47:22

- Ortho Toluidine (OT) Test or OTA test (Ortho toluidine arsenite test).
- If we are using this test, again there would be a color change.
- The color change which we notice in the first 10-15 sec.
- In addition to OT reagent or OTA reagent, there is a color change to Yellow. The color change in the first 10-15 seconds is free chlorine.
- OTA tests can detect both free and combined chlorines separately.
- OT tests can also detect free chlorine separately. It can detect combined chlorine but not separately.
- For calculating: (Total chlorine - Free Chlorine)

Q. Which test is better?

Ans. The OTA test is better than the OT test as it detects Free/residual and combined chlorine separately. Also, it is not affected by interfering substances such as nitrates, iron, and manganese.

Levels of residual chlorine required

00:52:11

- Drinking water: more than 0.5 mg/L for a contact period of 1 hour.
- Swimming pool sanitation: more than 1 mg/L and contact period will be 1 hour.
- To kill poliovirus or cyclops: more than 2 mg/L for a contact period of 1 hour.
- Post-disaster phase: more than equal to 0.7 mg/L for a contact period of 1 hour.

MCQ's

Q. The color produced in the Orthotolidine test after 5 minutes is due to the action of

- Dissolved solids
- Free chlorine
- Combined Chlorine
- Free and combined chlorine

Q. All the following statements are true about breakpoint Chlorination except

- Free chlorine is released into the water after the breakpoint.
- Chlorine Demand is the amount of chlorine needed to kill bacteria, oxidize organic matter and neutralize the ammonia.
- 1 ppm free Chlorine should be present in water after the breakpoint has reached
- A contact period of 1 hour is necessary.

High Yield points

00:55:58

- Disinfecting action of chlorine is mainly due to: HOCl
- Disinfecting property of Chlorine due to: HOCl + OCl-
- Minimum concentration of free Chlorine is 0.5 mg/L for an hour.
- Total dose of chlorine: Chlorine demand + Residual Chlorine of 0.5 mg/L
- Breakpoint chlorination: the point at which Chlorine demand has been met.
- Most commonly used form of chlorine is Bleaching Powder (100 gms of bleaching powder releases 33 grams of chlorine)
- Stabilized Bleach: Bleaching Powder mixed with excess lime; it retains its strength.
- Chlorine acts best at pH 7.
- Chlorine Demand estimated by Horrocks apparatus (color change is blue)
- Free/residual chlorine estimated by Chloroscope/OT/OTA test.
- 10-15 sec yellow color is due to Free chlorine.

3. Oxidization

00:59:24

- OZONE: Powerful oxidizing and strong virucidal agent
- Dose for potable water treatment varies from 0.2 - 1.5 mg/L.
- UV radiation
- Don't have residual activity.

4. Chemical Disinfection

00:59:54

- Bleaching powder: 33% of chlorine
- Chlorine Solution: If 4 kg of bleaching powder with 25% available chlorine is mixed with 20 liters of water, it will give a 6% solution of chlorine.
- High test Hypochlorite: Perchloron is a calcium compound that contains 60-70% available chlorine.
- Chlorine tablet: A single tablet of 0.5 mm is sufficient to disinfect 20 liters of water.
- Iodine is used for emergency disinfection of water. 2 drops of 2% ethanol solution of iodine will suffice for one liter of clear water, contact time of 20-20 min.
- Iodine tablets are available as Nesfield's and Bursoline's tablets.
- Potassium permanganate is no longer recommended.



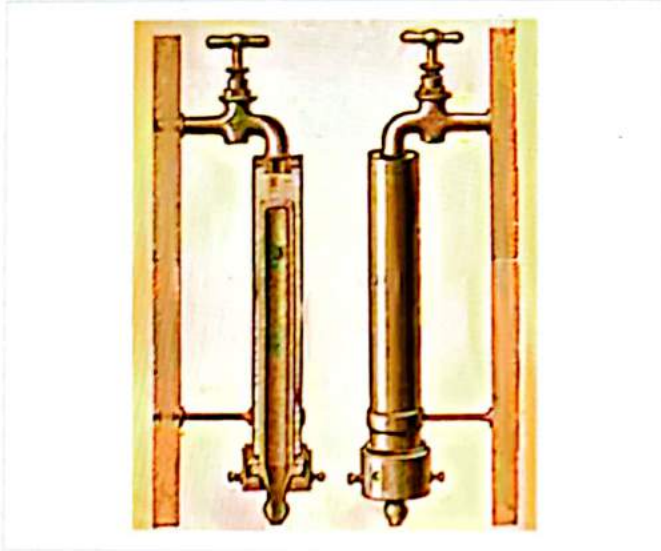
PREVIOUS YEAR QUESTIONS



Q. Identify the following image?

Ans. chamberland filter

- It is made of Porcelain.



Q. Identify the following image?

Ans. Katadyn Filter

- It is portable.
- It is coated with silver ions.
- The Bacteria is killed by the Oligodynamic option of silver ions.



Q. Identify the following image?

Ans. Berkefeld filter

- It is still used in houses.
- The filter is made of material known as Kiesel guhr or also known as infusorial earth.

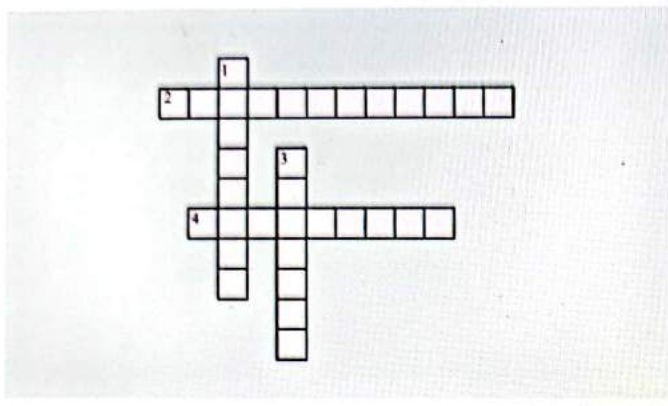




CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. If we need to kill cyclops, again dose needs to be increased which will affect the water.
- 4. Water gets filtered through a sand bed under its weight.

Down

- 1. Vital / biological/ zooglear layer which is responsible for purifying water.
- 3. It has no residual activity. It means once we boil water after 4-6 hours we will need to boil it again.

50

AIR POLLUTION



Topics Covered 00:00:19

- Air pollution
- Indicators of air pollution
- Air quality index
- Prevention and control of air pollution
- Air comfort
- Instruments to measure air quality.
- Ventilation
- Global warming

Air Pollution 00:01:29

- Major problems these days.

Primary Air Pollutants 00:01:48

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- Pollutants which are directly released into the air.
- **Example:** Sulphur dioxide, Carbon monoxide, Nitrogen dioxide, Particulate matter, hydrocarbons, chlorofluorocarbons (CFC's), etc.
- Metals like lead, cadmium, copper

Secondary Air Pollutants 00:03:25

- These are formed by a combination of primary air pollutants.
- **Example:** Ground level ozone, Peroxyacetyl nitrate, particulate matter formed by combinations.

Indicators of Air Pollution 00:05:21

1. **Sulphur Dioxide:** Most important indicator of air pollution
2. **Smoke or soiling index:** Specific amount of filtered air is filtered through a filter paper and the stain is measured by photoelectric metre.
3. **Grit and dust measurement:** It checks the dust, grit deposits and small particulate matter present in the air.
4. **Coefficient of haze:** Measures smoke and other aerosols in air.
5. **Air Pollution Index:** A combined index which takes multiple air pollutants with upper limits into consideration.

High Yield Points

- Best indicator of air pollution: **Sulphur dioxide**
- Recommended level of SO₂ in 24 hours exposure is: **<20 mcg/m³**
- Most common and widely distributed air pollutant: **Carbon monoxide**
- Best biological indicator of air pollution: **Lichens**

MCQs

- Q. All are indicators of air pollution except?
- A. Soiling index
 - B. **McArdles index**
 - C. Suspended particle count
 - D. SO₂ concentration

Explanation

- McArdle's index is an indicator to measure air comfort.
 - Also measures predictable sweat rate in 4 hours.
- Q. Establishment of green belts between industrial and residential action is a technique to prevent air pollution. This is an example of?
- A. Containment
 - B. Replacement
 - C. **Dilution**
 - D. Legislation

Explanation

- Containment means it doesn't let bad air escape out.
- Replacement means replace all the bad air
- Legislation means the laws which prohibits the factories and industries to release bad air out.

Air Quality Index 00:11:10

- An indicator of air pollution
- It is given by the **Central Pollution Control Board (CPCB)**.
- Components of Air Quality Index (AQI)
 - Sulphur dioxide, Nitrogen dioxide, Carbon monoxide
 - Particulate matter 2.5 and 10
 - Measures Ozone level
 - Measures Lead, Ammonia, Chlorofluorocarbons, Hydrogen sulphides, etc.

Central Pollution Control Board's Air Quality Standards 00:13:22

Central Pollution Control Board's Air Quality Standards	
0-50	Good
51-100	Satisfactory
101-200	Moderate
201-300	Poor
301-400	LeadVery Poor
401-500	Severe

Must Remember: There is no very severe category in AQI.

Explanation

- The first two colours are dark green and light green which means traffic is moving.
- Yellow and orange describe getting ready to move.
- Red describes stopping which means it is bad.
- The colours can be remembered using traffic signals.

Q. What is the AQI value of 461, is it

- A. Poor
- B. Very poor
- C. Severe
- D. Very severe

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- It ranges from 0 to 100.
- **Severe heat strain:** 40 to 60
- **Very severe heat strain:** 70 to 90
- **Upper limit of heat tolerance:** 100

Source of Indoor Air Pollution

00:16:04

Fuel consumption	Carbon monoxide, Polyaromatic hydrocarbons, Nitrogen oxides
Tobacco consumption	Carbon monoxide, Polyaromatic hydrocarbons
Coal combustion	Sulphur oxides, arsenic, and fluorine
Furnishings, construction materials, cooking	Aldehydes
Remodelling and destruction of construction materials	Asbestos
Remodelling/demolition of painted surfaces, leaded fuels, smelting	Lead
Building and construction materials	Radon
Adhesives, solvents, aerosol sprays, resin products	Organic vapours like benzene, toluene
Incineration, coal burning, petroleum burning	Hydrocarbons

3. Effective Temperature

- It measures heat stress index.
- It includes air temperature, air humidity, and air flow.

4. Corrected effective temperature

- A better indicator of air comfort than effective temperature.
- It includes 4 components:
 - Air temperature, air humidity, air velocity, Mean radiant heat.
 - **Globe thermometer** is an instrument used to measure this.

5. Predictable 4 hours sweat rate

- Air comfort is measured using **McArdle's index**.
- It tells about predictable 4 hours sweat rate
- **P4SR** classifies thermal comfort levels as:
 - Comfort zone: 1 to 3 litres
 - Just tolerable: 3 to 4.5 litres
 - Intolerable: >4.5 litres

Prevention and Control of Air Pollution

00:17:23

- Contaminant
- Replacement
- Dilution
- Legislation
- International action

Comfort Zone

00:24:31

- The range of corrected effective temperature in which the individual or worker in an industry feels comfortable.
- It considers temperature, humidity, cooling power of air, velocity of air, mean radiant heat.
- **Corrected Effective Temperature:** 25 to 27°C
- **Relative humidity:** 30 to 65%
- **Dry Kata:** 6 and above
- **Wet Kata:** 20 and above
- **Predicted 4 hours sweat rate:** 1 to 3 litres.

Air Comfort

00:17:32

It has lot of indicators

1. Cooling Power of air

- It determines the capacity of the atmosphere to dissipate the metabolite heat generated by humans.
- It includes 3 components- **Air temperature, Air humidity and Air velocity.**
- It is measured by a **Kata thermometer.**

Instruments to Measure Air Quality

00:27:10

- Kata Thermometer
- Globe thermometer

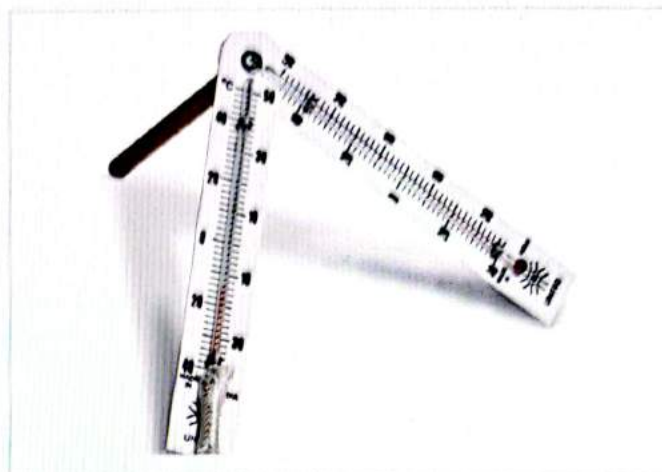
Kata thermometer

00:28:28

- A red coloured narrow and thin bulb
- It is used to measure low air velocity and cooling power of air.
- More reserved for low air velocity measurement.
- The cooling power of air is an indicator of air comfort. Not very reliable estimates are provided of cooling power of air by Kata thermometer.
- In the Kata thermometer, **dry Kata reading** is more than 6 and **wet Kata reading** is more than 20 - indicates thermal comfort.
- It is used to record air velocity.



2. Sling psychrometer



Globe thermometer

00:30:33

- Thick and wide bulb is present.
- It is used to measure corrected effective temperature or radiant heat.

3. Dry and wet bulb hygrometer



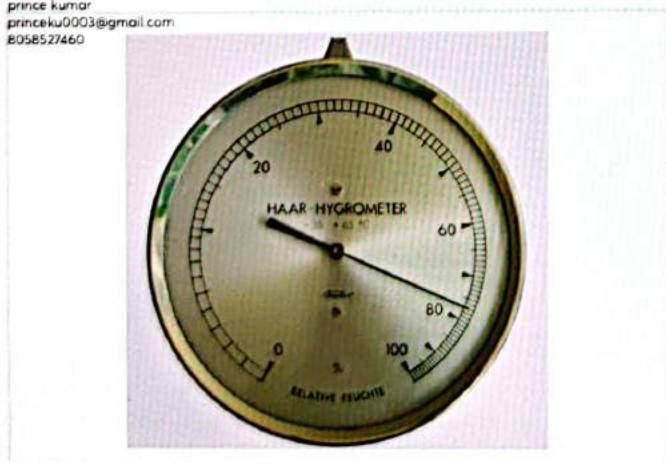
Instruments to Measure Air Humidity

00:31:12

- Air humidity is the moisture content of air.
- It can be measured by

1. Hygrometer

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4. Assman psychrometer



Some Other Instruments

00:32:39

Robinson cup Anemometer



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Campbell stock sunshine recorder



- It measures amount of sunlight absorbed with 24 hours

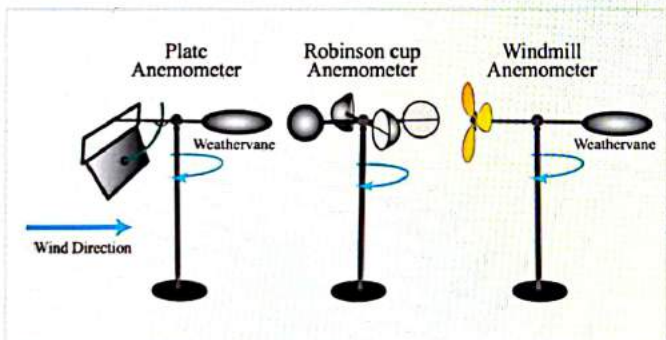
Stevenson screen



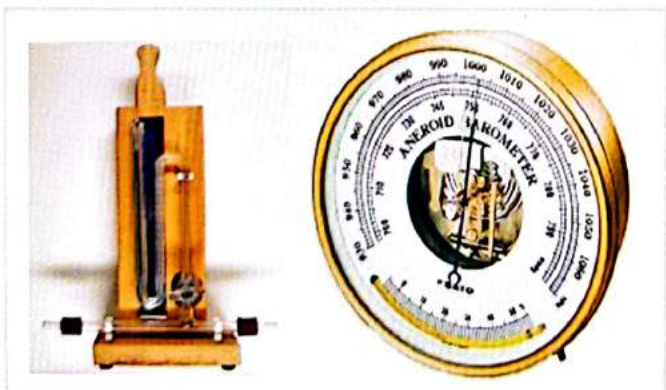
- It measures air temperature

Robinson cup Anemometer

- It measures air velocity in the early days.
- Types of Anemometer
 - a. Plate Anemometer
 - b. Robinson cup Anemometer
 - c. Windmill Anemometer



Barometer



- It is an instrument to measure atmospheric pressure
- In this, Aneroid Barometer and Mercury Barometer are present.

MCQs

Q. Psychrometer is used to measure?

- A. Air humidity
- B. Air velocity
- C. Room temperature
- D. Radiant heat

Q. Is Global warming true?

- A. CO2 is a major greenhouse gas
- B. Stratosphere ozone layer is harmful
- C. CFC increases stratosphere ozone layer
- D. Kyoto protocol called for 20% reduction in greenhouse emissions

Explanation

- Temperature of earth is raising due to greenhouse gases
- Few important greenhouse gases are water vapour, carbon dioxide, nitrous oxide, methane, ground level ozone

- The Stratosphere ozone layer cuts down the harmful radiations released from the sun.
- Chlorofluorocarbons decrease the stratosphere layer
- Kyoto protocol is one of the initiatives to control global warming
- The Kyoto protocol called for 90% reduction in greenhouse gas emissions.
- Water vapour is a major greenhouse gas than CO₂
- The Kyoto protocol was launched for climate protection.
- The Paris agreement is used to control greenhouse gas emission.

Ventilation

00:38:30

Ventilation is 2 types

- Natural ventilation
- Mechanical ventilation

Natural ventilation

- Wind (perflation and aspiration) occurs
- Diffusion
- Movement of air

Mechanical ventilation

- Exhaust ventilation: using exhaust fans
- Plenum ventilation: by centrifugal fans
- Balanced ventilation
- Air conditioning

MCQs

Q. All of the following are types of mechanical ventilation except?

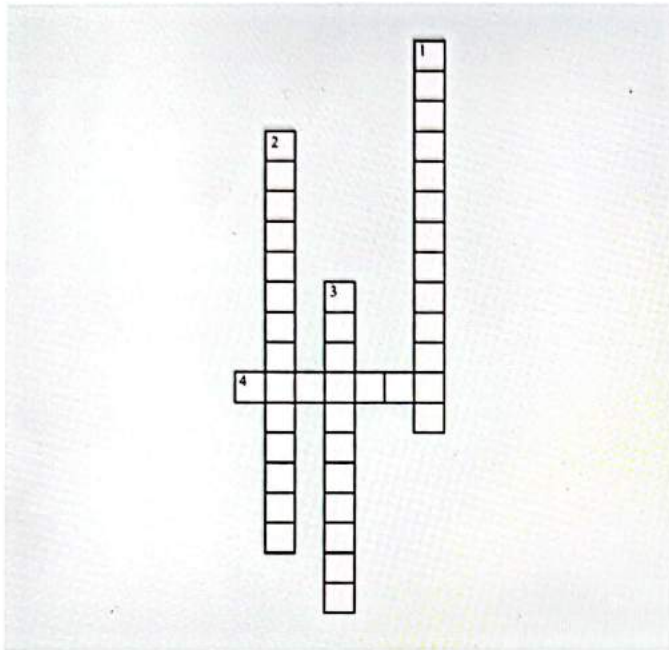
- A. Perflation and aspiration
- B. Exhaust ventilation
- C. Plenum ventilation
- D. Air conditioning



CROSS WORD PUZZLES



Crossword Puzzle



Across

4. Best biological indicator of air pollution

Down

- 1. All are indicators of air pollution except
- 2. Most important indicator of air pollution
- 3. It can be measured by Hygrometer, Sling psychrometer, Dry and wet bulb hygrometer and Assmann psychrometer.

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51 WASTE DISPOSAL



Topics

00:00:44

The following topics will be covered:

- REFUSE.
- Methods of Refuse disposal.
- Sanitation Barrier.
- Sewage (definition).
- Strength of sewage.
- Methods of sewage disposal.
- Modern sewage treatment plants.
- Other methods of sewage disposal.
- Septic tank.
- Sulabh sauchalaya.
- Environment related programs.

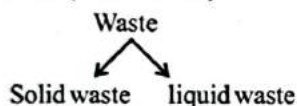
- These are the operations where compaction and covering are achieved once or twice a week.

The trench method:

- Trench method is the most common.
- In this method, we dig the ground and the solid waste is buried in it. The solid waste is then covered with the mud.
- Trench is dug where level ground is available.
- A 2-3-meter-deep trench is dug, which is 4-12 meters wide.
- For a population of 10,000, a two-meter-deep trench is dug up, and one-acre land is required.

Refuse (solid waste)

00:01:11



Domestic refuse

- Garbage: process food waste from kitchen.
- Rubbish: paper, tissue, metal, cloths
- Ash: smoke generated
- There are two types of waste: Solid waste and liquid waste.
- REFUSE is solid waste.
- Domestic refuse can be further classified as follows:
 - Garbage: It is processed food waste from the kitchen.
 - Rubbish: Tissue, cloth, piece of paper, metal, etc.
 - Ash: It is the smoke generated.



Ramp method:

- Suited for moderately sloping terrain

Area method:

- Land depressions, disused quarries and clay pits are filled with refuse
- Disadvantage: it requires supplemental earth from outside source

Important Information

- REFUSE is solid waste.
- Domestic refuse is important concerning REFUSE.

Technique in controlled tipping (Trench method):

00:12:44

- Whenever the solid waste is buried, physical, bacteriological and chemical changes occur in the buried refuse.
- The temperature rises to 60 degrees C after 7 days of burial of refuse killing all pathogens. This is followed by the decomposition process.
- Complete decomposition of organic matter into an innocuous mass (made up of soil) occurs within 4-6 months. This end product is used as manure in farming.
- This further cools down in 2-3 weeks.

Methods Of Refuse Disposal

00:03:36

- **Dumping.**
 - Dumping is the most unsatisfactory method of refuse disposal as it is a social nuisance.
- **Controlled tipping or sanitary landfill.**
 - Controlled tipping is the most satisfactory method of refuse disposal.
 - Controlled tipping or sanitary landfill is achieved by three methods:
- **Modified sanitary landfill:**

Incineration

00:15:18

- Incineration is a high-temperature dry oxidation process.
- It's not preferred in India as manure is not generated.

- Incineration is done when a suitable land is not available for solid waste disposal.

Compositing 00:17:00

- Compositing is an integrated method of refuse and night soil disposal.
- Compositing is achieved by two methods (CBI):
 - Bangalore method: It is based on an anaerobic hot fomentation process.
 - Indore method: aerobic process.
- Compositing is not a preferred method for a population more than 1,00,000.



Important Information

- The pneumonic "CBI" can help in remembering two methods of compositing i.e., the Bangalore method and the Indore method.
- The "an" in the spelling of "Bangalore" can be used to remember that the Bangalore method is an aerobic hot fomentation process.

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- The human excreta of a sick person or a carrier of the disease is the main focus of infection.
- Disease agent is transmitted from human excreta a sick person to the host via 6F's:
 - Fluids (water, milk)
 - Food
 - Fruits and vegetables
 - Flies
 - Fomites
 - Fingers
- To prevent disease transmission to the community the disease cycle can be broken at vulnerable points
- Contamination of physical environment can be prevented by construction of a sanitation barrier
- Most important step is to segregate the feces and arrange for its proper disposal
- Sanitary barrier most effectively can be provided by a sanitary latrine and a disposal pit
- The feces generated can reach the new host through 5 "F" i.e.
 - fluids
 - fingers
 - flies
 - fields
 - food.

Manure Pits 00:18:52

- Manure pits are used for solid waste disposal in rural areas.
- Two manure pits are dug on the back of the houses.
- Garbage is put in the pit daily and covered with the material.
- It usually takes 6 months to convert into manure.

Burial method: 00:19:34

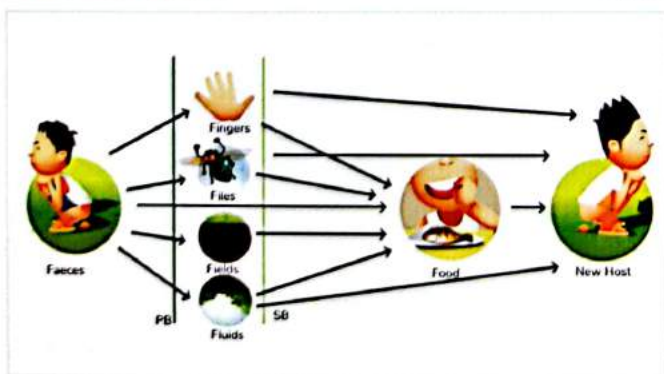
- Burial method is a technique used in camping.
- In this technique, a trench of 2-meter depth and 1.5-meter width is dug.
- For a population of around 200 people, a bigger trench of 1 meter in depth is dug.
- This will get filled in at least one week.



Important Information

- The burial method is a technique used in camping.

Sanitation Barrier 00:21:42



- A barrier is required to prevent the contamination from reaching the new host.
- The human excreta of a sick person or a carrier of the disease causes infection.
- The causative agent is transmitted from the human excreta of a sick person to a new host by "6Fs":
 - Fluids (milk, water),
 - food,
 - flies,
 - fruits and vegetables,
 - fomites
 - fingers.
- Disease transmission to the community can be prevented by breaking the disease cycle at vulnerable points.
- Construction of sanitation barriers can help in preventing the contamination of the physical environment.
- Segregation of the feces and its arrangement for proper disposal is the most important step.
- Sanitary barriers can be provided most effectively by a sanitary latrine and a disposal pit.

Sewage (Definition) 00:23:53

- Sewage is a liquid waste with excreta.
- Composition of sewage: It is made up of
 - 99.9% water
 - 0.1% solid.

- **Strength of sewage:** It is expressed in three terms:
 - Biological oxygen demand (BOD).
 - Chemical oxygen demand (COD).
 - Suspended solids.

Key Points

00:26:52

- The first sewers were laid in 1867 in Calcutta.
- Sewer systems are designed to serve one generation i.e., approximately 30 years.

Strength of Sewage

Biological Oxygen Demand

00:27:08

- Biological Oxygen Demand (BOD) is defined as the amount of oxygen absorbed by a sample of sewage during a specific period (usually 5 days) at a specified temperature of 20 degree C for aerobic destruction or use of organic matter by living organisms.
- BOD is the most important test that is done on sewage.
- The normal range of BOD is 100-300 mg/L.
- Strong sewage has a BOD of more than 300 mg/L.
- Weak sewage has a BOD of less than 100 mg/L.

Chemical Oxygen Demand

00:29:28

- Chemical Oxygen Demand (COD) is defined as the measure of oxygen equivalent to that portion of organic matter in a sample which is susceptible to oxidation by a strong chemical oxidizer.
- COD estimation is best estimated by potassium dichromate.

Suspended solids

00:30:01

- The normal range of suspended solids is 100-500 mg/L.
- Strong sewage has more than 500 mg/L of suspended solids.
- Weak sewage has less than 100 mg/L of suspended solids.

Key Points

00:30:39

- Most important test done on sewage: BOD
- Most practical method for determining organic load when waste contains toxic substances: COD
- Most efficient method to reduce organic matter in sewage: Aerobic process.
- Highly concentrated sewage with plenty of solids: Aerobic process.
- One gram of sewage contains the following:
 - 1000 million E. coli.
 - 0 to 100 million fecal streptococci.
 - 1 to 10 million spores of Cl. Perfringens.
- Average adult excretes 100 gm of feces.
- BOD is the most important test done on sewage.
- COD is the most practical method for the determination of organic load for waste containing toxic substances.

- Aerobic process is the most efficient method for reducing organic matter in sewage.
- Anaerobic process is used for highly concentrated sewage which has plenty of solids.

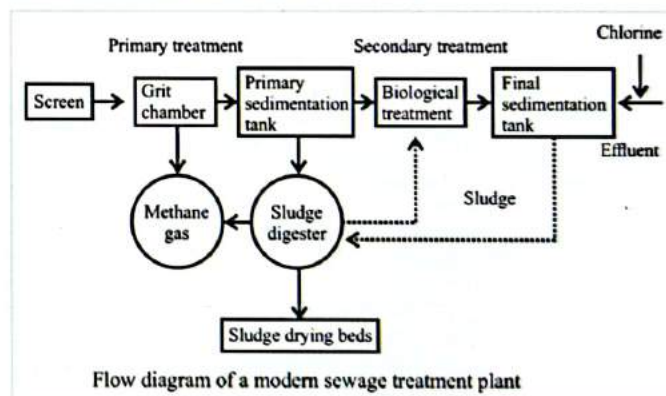
Methods Of Sewage Disposal

00:32:39

- Sewage treatment plants are used for sewage disposal.
- **The primary treatment** in a sewage treatment plant is achieved by
 - screening
 - Grit chamber
 - Plain sedimentation.
- **Secondary treatment** can be achieved through
 - Trickling filters
 - Activated sludge process.(preferred)
- **Other methods** include the following:
 - Sea outfall.
 - River outfall.
 - Land treatment.
 - Sewage farming.
 - Oxidation ponds.
 - Oxidation ditches.

Modern Sewage Treatment Plants

00:35:28



- Stage 1 is **primary treatment**: In this stage, solids are separated from sewage and subjected to **aerobic digestion**. This stage involves the following:
 - Screening: In this, large objects like rags, wood, and garbage are removed by metal screens of vertical or inclined steel bars 5 cm apart.
 - Grit chamber: After the screening chamber, sewage flows through the Grit or Detritus chamber.
 - It is a long chamber 10-20 meters in length.
 - The sewage flows through it at a constant velocity of 1 foot/second with a detention period of 30 seconds to 1 minute.
 - Heavier solids like sand and gravel settle down and organic matter passes through.

- Primary sedimentation tank: It is a large tank which has a capacity of 1/4 to 1/3 dry weather flow.
 - The most common design is rectangular. The sewage flows slowly at 1-2 feet per minute.
 - The sewage retention period is 6-8 hours.

Important Information

- Dry weather flow is the amount of sewage which is flowing in the sewage pipeline during a 24 hour period.

Secondary Treatment

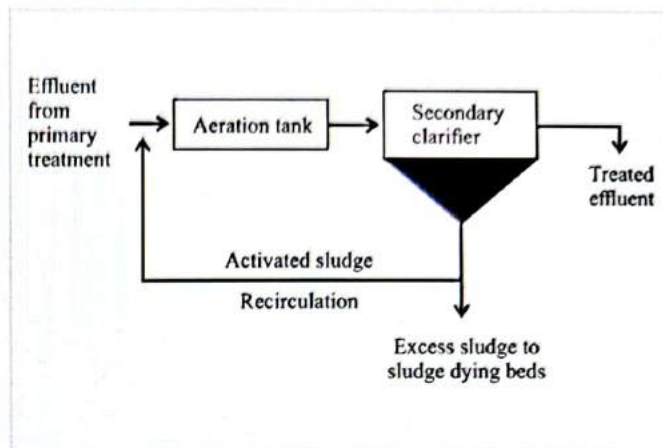
00:38:30

- In this stage, the effluent from the primary sedimentation tank is subjected to **aerobic oxidation**. This involves the following stage:
 - **Trickling filter:** It is a percolating filter which has a fixed bed of rocks, gravel, coke, and slag of 1-2 meters in depth and 2-30 meters in diameter. The sewage or other wastewater flows downward and forms a layer of microbial slime, called a biofilm, to grow and cover the bed of media. This layer is a zooglear layer. Here, the treatment of sewage occurs by bio-filtration process. The dead matter is sloughed off, breaks away and washes down the filter. The material is flocculent and light green and is called humus. The disadvantage of the trickling filter is that it occupies a very large space.



- **Activated sludge process:** It is an aerobic oxidation process used as a secondary treatment. It is a modern method of sewage treatment.
 - Aeration tanks are the heart of the activated sludge process.
 - The retention period in the aeration chamber is 6-8 hours.

Activated Sludge Process Flow Diagram



Key Points

00:42:20

- Activated sludge process is preferred over the trickling filter method because it occupies less space. However, it requires skill, whereas the trickling filter process does not require a skill.

Stage 3 Of Modern Sewage Treatment

00:43:26

- The effluent collected from secondary treatment is directed into another secondary sedimentation tank. It is detained there for 2-3 hours and undergoes desludging periodically.

Sewage Treatment Summary

00:43:51

- Primary treatment involves screening, a grit chamber (30 seconds to 1 minute), a plain sedimentation tank. The process is anaerobic digestion.
- Secondary treatment involves either the trickling filter or the activated sludge process. The process involves aerobic oxidation. The activated sludge process is an easier method as it requires less process and involves an aeration tank.
- Sedimentation tank is stage three of sewage treatment.

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Key Points

00:45:27

- Activated sludge process is the most common suspended growth process used for municipal wastewater treatment.

Other Methods of Sewage Disposal

00:45:58

- Sea outfall.
- River outfall.
- Land treatment (sewage farming): One acre of land is required to treat the sewage of 100-300 people.
- Oxidation ponds: They are also known as waste stabilization ponds, sewage lagoons, or redox ponds. In this, the natural method of photosynthesis is used for sewage treatment.

Other Methods of Sewage Disposal



- Oxidation ditches and aerated lagoons: These use mechanical rotors for aeration.

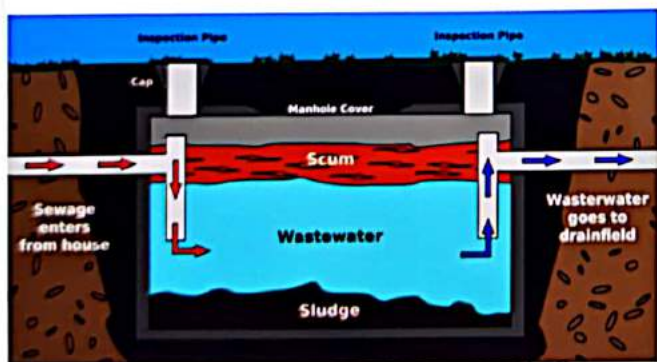
Important Information

- In land treatment (sewage farming), one acre of land is required to treat the sewage of 100-300 people.

Key Points 00:46:55

- Oxidation pond is used for purifying sewage for small communities.
- The following is the required for waste treatment for a population of 5000-20000:
 - One acre of land for oxidation ditch.
 - 22 acres of land for an oxidation pond.
 - 2.5 acres of land for aerated lagoons.

Septic Tank 00:47:15



- Septic tanks are used in smaller communities with no access to the sewage treatment plant.
- The sewage enters inside the tank from the house.
- Inside the septic tank, anaerobic digestion takes place.
- Outside the septic tank, aerobic oxidation takes place.
- Up to 500 gallons of sewage is admitted into the tank that is retained for 24 hours.
- The solid sludge settles down and the greasy material rises.

- The contents of the tank are cleaned once every year by a process called sludging.
- The sludge should be disposed of by trenching.

Important Information

- Septic tanks are used in smaller communities with no access to the sewage treatment plant.
- Inside the septic tank, anaerobic digestion takes place.
- Outside the septic tank, aerobic oxidation takes place.

Sulabh Sauchalaya 00:50:51

- It is a low-cost pour flush, water-seal type of latrine, which was developed by a Patna-based firm.
- It consists of a pan and a water-seal trap.
- It is connected to a 3 feet square and deep pit.
- The excreta undergoes bacterial decomposition and is converted into manure.
- Sulabh shauchalaya charges 5 rupees per user.

Environment Sanitation Programs 00:51:42

- Kayakalp: Its aim is sanitation and cleanliness in public hospitals.
- Swachh Bharat: Its aim is cleanliness, sanitation, and solid waste management in the country.
- Nirmal gram: Its aim is cleanliness and sanitation with a safe water supply in villages.

Kayakalp 00:52:23



- Kayakalp is for environmental sanitation.
- In this, health facilities are being awarded based on the following:
 - Hospital hygiene.
 - Sanitation.
 - Hospital upkeep.
 - Infection control practices.
 - Support.

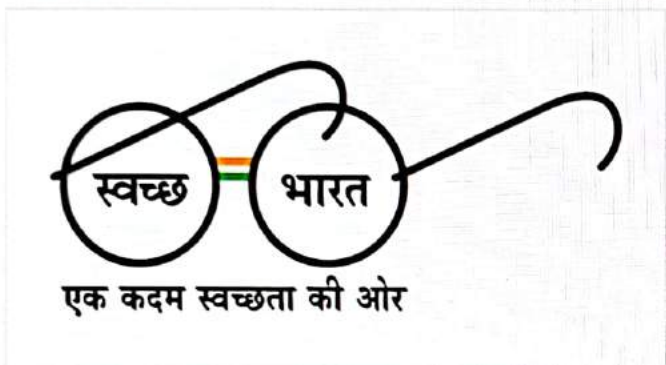
- The best district hospital gets Rs.50 lakh and the second best gets Rs.20 lakh.
- For CHC and sub-district hospitals, the best hospital gets Rs.15 lakh and the second best gets Rs.10 lakh.
- For PHC, the best will get Rs.2 lakh.
- PCHs can contest for the Kayakalp award.

Important Information

- PCHs can contest for the Kayakalp award.

Swachh Bharat

00:54:59



- Swachh Bharat was started in 2014 for solid waste disposal.
- The aim was the construction of toilets.

Nirmal Gram

00:55:18



- Villages can avail of benefits under this program for maintaining cleanliness.

MCQs

Q. True statements about sewage are?

00:55:35

- It does not contain human excreta.
- Its strength is measured by biological oxygen demand.
- BOD is more than 100 mg/L in strong sewage.
- It is composed of 90% water.
- Dry weather flow is measured for 24 hours.

- All are true.
- A, D, and E are true.
- A, B, C, and D are true.
- C and D are true.
- B and E are true.

Answer: B and E are true.

Q. All are methods of sewage disposal except?

00:56:17

- River outfall.
- Land treatment.
- Oxidation pond.
- Bangalore method (composting).

Answer: Bangalore method (composting).

Q. Trickling filter used in?

00:56:37

- Primary treatment of sewage.
- Secondary treatment of sewage.
- Sewage effluent treatment.
- Sewage farming treatment.

Answer: Secondary treatment of sewage.

Summary

00:56:58

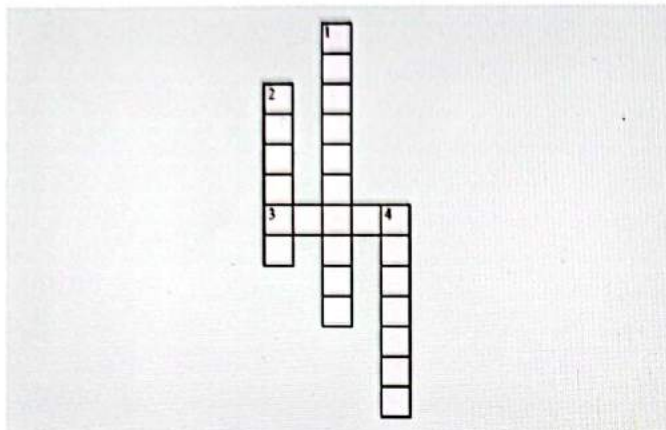
- Controlled tripping or sanitary landfills (trench method) is the best method of solid waste disposal.
- Manure pits are used in rural areas.
- Burial is used in camps.
- Incineration is not preferred since no manure is generated.
- Sewage composition is 99.9% water and 01. % solid.
- Strength of sewage: BOD (most commonly used), COD and suspended solids.
- Sewage treatment plant: Primary treatment includes screening, a Grit chamber, and a plain sedimentation tank. Here anaerobic digestion occurs. Secondary treatment of sewage is done either by trickling filter (Zoogleal layer) or activated sludge (preferred due to lesser space). Other methods include oxidation ponds.
- **Kayakalp** is for environmental sanitation. PCHs are part of it.



CROSS WORD PUZZLES



Crossword Puzzle 1



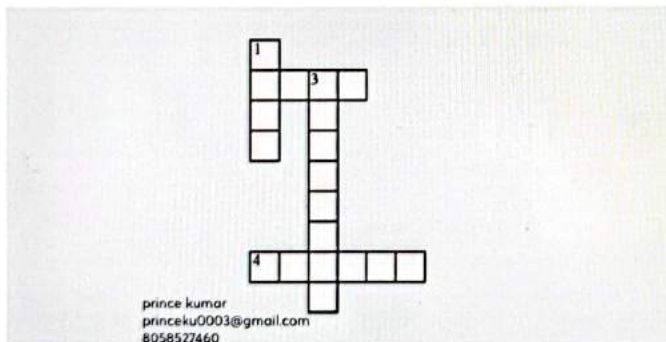
Across

3. _____ waste can arise from factories, houses, streets, etc.

Down

- 1. _____ is solid waste.
- 2. _____ is the diagnostic test of serous otitis media.
- 4. _____ is the most unsatisfactory method of refuse disposal as it is a social nuisance.

Crossword Puzzle 2



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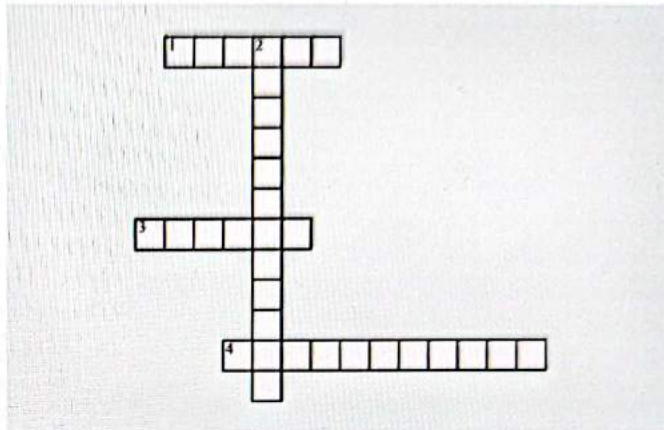
Across

- 2. _____ method is used wherever there is sloping ground.
- 4. _____ method is the most important method of controlled tipping.

Down

- 1. _____ method is used wherever there is diffused land.
- 3. _____ sanitary landfill are the operations where compaction and covering are achieved once or twice a week.

Crossword Puzzle 3



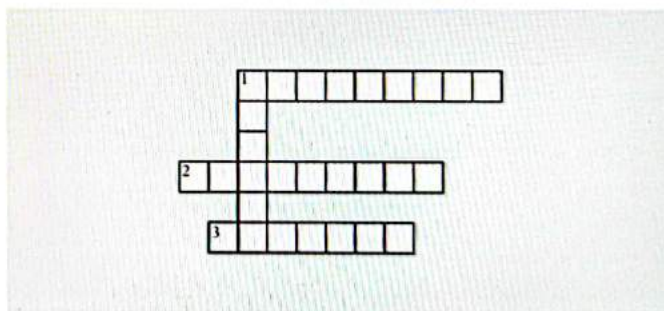
Across

- 1. _____ method is a technique used in camping.
- 3. _____ pits are used for solid waste disposal in rural areas.
- 4. _____ is an integrated method of refuse and night soil disposal.

Down

- 2. _____ involves burning waste. Thus, it is not preferred in India as we do not get manure.

Crossword Puzzle 4



Across

- 1. _____ treatment can be achieved through trickling filters and the activated sludge process. The activated sludge process is the preferred method.
- 2. _____ process is used for highly concentrated sewage which has plenty of solids.
- 3. _____ process is the most efficient method for reducing organic matter in sewage.

Down

- 1. _____ is a liquid waste with excreta.



Noise

00:00:36

- Loudness: Measured in Decibels.
- Key Points
 - Normal conversation - 60 to 65 dB.
 - Whispering - 20 to 30 dB.
 - Heavy street traffic - 60 to 80 dB.
 - Boiler factories - 120 dB.
 - Jet take off - 150 dB.

High Yield Points

- Tolerable daily exposure to noise without substantial damage to hearing - 85 dB.
- Noise threshold for pain - 140 dB.
- Auditory fatigue - 90 dB.
- Rupture of tympanic membrane if the noise is above - 160 dB.
- Permanent deafness – repeated or continuous exposure to noise around 100 dB.

Instruments Used in Studies on Noise

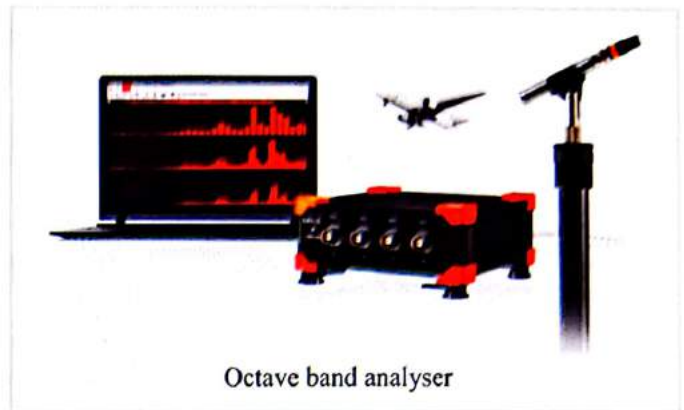
00:03:06

- To measure intensity of sound in dB
 - Sound level meter is used.
 - Hand held instrument with a microphone.



Hand held microphone

- To measure sound in octave bands
 - Octave band analyzer is used.
 - Plot is obtained.
 - Reflects sound spectrum ranging from low pitched to high pitched frequencies.



Octave band analyser

- For hearing ability: Audiometer is used.



Audiometer

Noise Dosimeter

- Special sound level meter.
- Intended particularly to measure the noise exposure of a person - over a period of time
- Ex: 8 hours of occupational exposure



Noise dosimeter

Light

00:06:48

- For satisfactory vision an illumination of **15-to-20 foot candles** is adequate.
- Measurement of light

Measurement	Description	Units
Luminous intensity	Power of light source	Candela
Luminous flux	Flow of light	Lumen
Illumination	Amount of light reaching the surface	Lux
Brightness or illuminance	Amount of light re-emitted from the surface	Lambert
Daylight measure		Daylight factor

Natural Illumination

00:12:45

- Daylight illumination is measured by **Daylight factor**.
- Daylight factor in **living rooms - 8%**.
- Daylight factor in **kitchen - 10%**

Housing Standards

00:13:34

- **Site**
 - Higher levels from surroundings.
 - Subsoil water should be present below 10 feet.
- **Set back:** Open space around the house.
 - Rural areas: 2/3rd
 - Urban areas: 1/3rd
- **Built up area:** Area where house is built.
 - Rural areas: 1/3rd
 - Urban areas: 2/3rd
- **Floor area:**
 - 1 person - 70 to 90 sq ft.
 - 2 persons - 100 to 110 sq ft.
- **Roof:** 10 ft
- **Wall:** 9-inch brick wall, plastered.
- **Windows**
 - Living room - 2 windows.
 - One opening directly to an open space.
- **Height of window:** 3 ft
 - Should cover 1/5th of total floor area.
 - Doors and windows combined should cover 2/5th of floor area.
- **Cubic space**
 - Air space - 500 c-ft per capita
 - preferably - 1000 c-ft per capita.
- **Living rooms**
 - Minimum 2.
 - One can be closed for security.
- **Lightning**
 - Daylight factor should be more than 1% over half of the floor area.
- **Ventilation**
 - Doors and windows should be diagonally opposite.
- **Cattle shed**
 - Should be at least 25 ft away from the house.



Important Information

Imagine you are on one end of study table and have a candle on the other end



The candle is power of light source - Luminous intensity- measured in candela



Light flows in air - Luminous flux- measured in lumen



The light falls on the surface – Illumination- measured with Lux



Some amount of light is re-emitted – Brightness- measured in Lambert

- Amount of light required for
 - Casual reading: 100 Lux.
 - Office work: 400 Lux.
 - Fine work/ needle work: 1000 to 2000 Lux.

MCQ's

- Q.** Luminous flux is measured in?
- Lux
 - Candela
 - Lumen**
 - Lambert

Overcrowding

00:20:24

- Present according to **3 criteria**
 - Person per room criteria.
 - Floor space per person criteria.
 - Sex separation criteria.

Refer Table 52.1

MCQs

Q. Mark the most appropriate statements concerning housing standards

- A. Set back in rural areas is 1/3rd
- B. Roof >= 10 feet**
- C. Daylight factor > 5% over half the floor area
- D. Windows area 1/5th of floor area and doors + windows combined 2/5th of floor area**
- E. Cattle shed should be 25 feet away from the living house and open on all sides.**

Q. As per WHO recommended standards for floor space a space of 90 to 100 sq ft can accommodate?

- A. 1 adult
- B. 2 adults
- C. 1 adult, 1 child of 8 years, 1 child of 2 years
- D. 1 adult, 1 child of 6 years and one 6 months old infant**

Explanation

- A 6 months infant is not counted.
- So, 1 adult needs 70 to 90% and 6 years child needs 25 to 30%
- Total of 90 to 100%.

Standards of Ventilation

00:26:49

- **Cubic space**
 - Fresh air supply - 3000 cu. ft. per hour per person.
 - Space of 1000 - 12000 cu. ft. per person is adequate.
- **Air change**
 - 2 to 3 changes per hour in living rooms.
 - 4 to 6 changes per hour in work rooms and assemblies.
 - Should not be changed more than 6 times per hour - leads to drought.
- **Floor space**
 - Min 70-90 sq ft per person.

Radiation

- Natural sources
- Cosmic rays
- Terrestrial radiations
- Internal radiation
- Man-made sources
- Skin dose to a patient from single X ray film - 0.02 to 0.3 Rad.
- Radioactive fallout: C14, I131, Cs137, Sr90.
- Maximum permissible dose of radiation exposure for human beings is 5 Rad per person per year.
- Radiation exposure in Chernobyl tragedy - Cs, Sr.
- Thickness of lead apron to prevent exposure - > 0.5mm
- State receiving highest solar radiation - Rajasthan.
- State utilizing maximum solar radiation - Gujarat.
- Total Natural radiation received by humans is 0.9 Rad per person per year.

Table 52.1

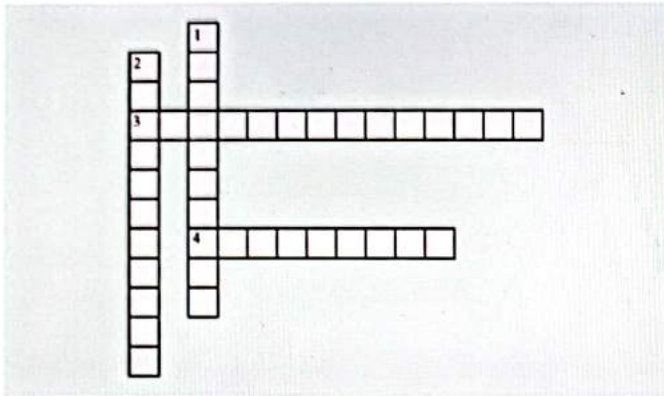
Person per room criteria	Floor space per person	Sex separation criteria
<ul style="list-style-type: none">• 1 room > 2 persons• 2 rooms > 3 persons• 3 rooms > 5 persons	<p>Required space</p> <ul style="list-style-type: none">• 1 person - 70 to 90 sq ft.• 2 persons - 100 to 110 sq ft. <p>Space less than the mentioned causes overcrowding.</p> <ul style="list-style-type: none">• Children up to 1 year are not counted.• Children from 1 to 10 years - counted as half.	<ul style="list-style-type: none">• 2 persons above 9 years of age of different sex are obliged to sleep in one room except husband and wife.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Special sound level meter.
- 4. Should not be changed more than 6 times per hour - leads to drought.

Down

- 1. Space of 1000 - 12000 cu. ft. per person is adequate.
- 2. Doors and windows should be diagonally opposite.

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53 ENTOMOLOGY

- Study of **Insects** 00:00:16
- 3 classes:
- 1. **Insecta**-Mosquitoes, flies, louse, flea
- 2. **Arachnida**-Ticks and mites
- 3. **Crustaceans**-Cyclops

	Insecta	Arachnida	Crustacea
Parts	Head, thorax, abdomen	Cephalothorax (fused head and thorax) and abdomen	Cephalothorax (fused head and thorax) and abdomen
Wings	Present	Absent	Absent
Legs	3 pairs	4pairs	5 pairs
Habitat	Land	Land	Water
Examples	Mosquitoes, flies, louse, flea	Ticks and mites <small>prince kumar princeku0003@gmail.com 8058527460</small>	Cyclops

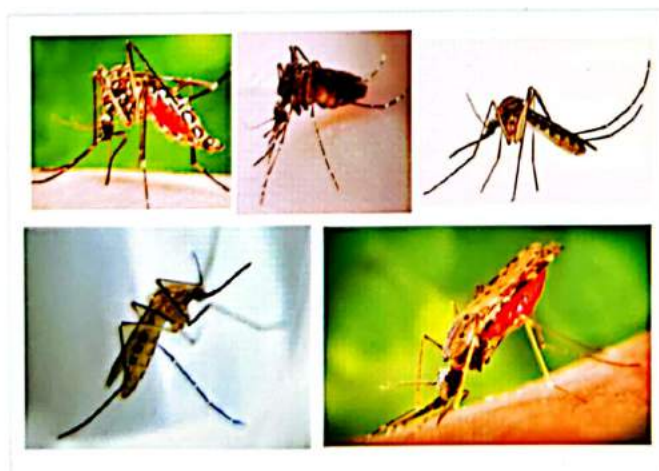
MCQ

Q. Mosquitoes belong to which class?

Ans: Insecta

Insecta

- 1. **Mosquitoes** 00:02:59
- Two families are present: **Anophelini & Culicini**. 00:03:00
- Family Anophelini: **Anopheles**
- Family Culicini: **Aedes, Culex and Mansonia**



Approach to identify Mosquito:

- Look at the way the adult mosquito sits. 00:04:14

Inclined resting to the skin surface, with head down	Hunchback position	Squatting position	
Spotted wings	White stripes on black body	No White stripes on black body, small body, longer legs	Big body, white spots on legs
Anopheles	Aedes (Tiger)	Culex	Mansonia



Adult mosquito

Important Information

- Inclined to the skin surface, with head down, spotted wings: **Anopheles**.
- Anopheles has an inclination of **45 degrees** with surface.
- Hunchback position, white stripes on the entire black body: **Aedes (Tiger)**.
- Hunchback position, small body, longer legs, no white stripes on black body: **Culex**.
- Squatting position, big body, white spots on legs: **Mansonia**.
- Mansonia is seen in water bodies with aquatic plants: **Pistia and Water hyacinth (water lily)**.

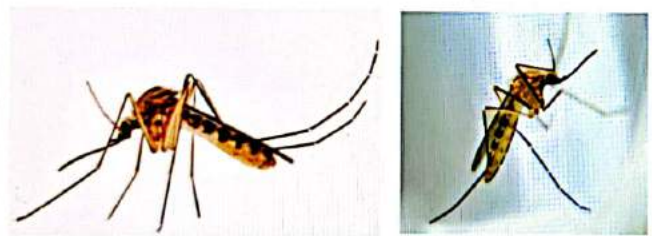


Anopheles (inclined with spotted wings)



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Aedes (hunchback position with white stripes on black body)



Culex (hunchback position with no stripes on body)



Mansonia (squatting position with large body and legs)

Breeding places of mosquitoes

00:10:55

- Anopheles: Clean, stagnant water
- Culex: Dirty, polluted water
- Aedes: Artificially collected water
- Mansonia: Large water bodies with aquatic plantations

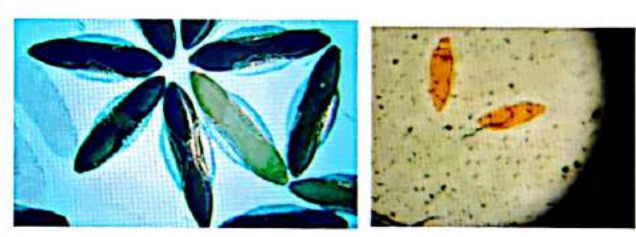


Aquatic plants
(on left- Pistia, on right- Water hyacinth)

Eggs of mosquitoes:

00:11:53

- a. Anopheles
 - o Known as **Sophisticated mosquito**.
 - o It lays eggs **singly in clean stagnant waters**.
 - o Eggs: **Boat shaped with lateral floats**.

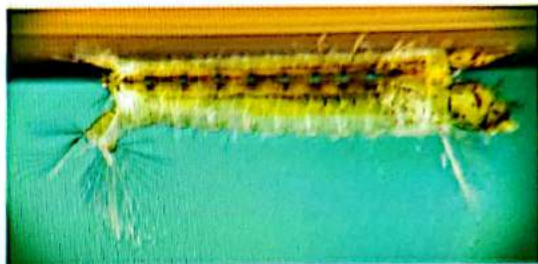
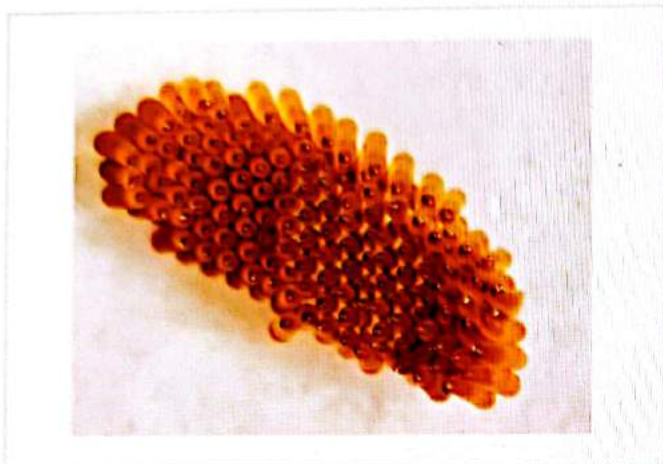


- b. Aedes
 - o Known as **Man-made mosquito**.
 - o It is found in **artificial waters** (AC's, coconut shells, buckets)
 - o Eggs: **Singly, Cigar shaped**



c. Culex

- o Known as Nuisance mosquito.
- o It lays eggs in dirty waters.
- o Eggs: Clusters or Rafts (100-250 eggs in one cluster).



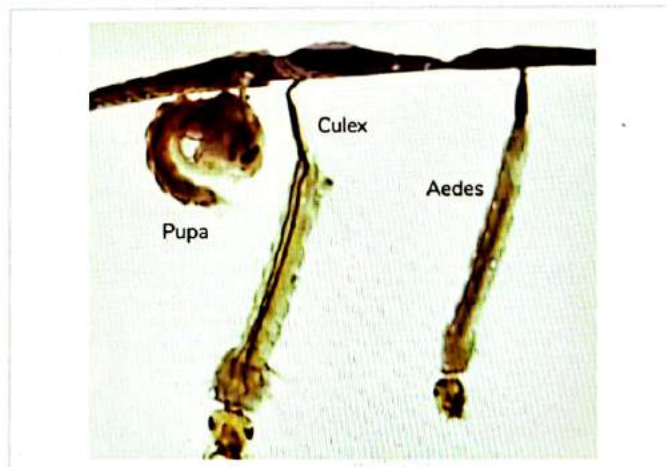
d. Mansonia

- o Lays under aquatic plants.
- o Eggs: Star shaped, laid in clusters.



b. Culex:

- o longer siphon tubes.
- o Breathe below the water surface.
- o Rest at an angle to the water surface.



Points to remember: (Eggs of Mosquito)

- Culex: Clusters or Rafts (100-250 eggs in one cluster).
- Anopheles: singly in clean waters, boat shaped with lateral floats.
- Mansonia: star shaped, laid in clusters, under aquatic plants.
- Aedes: Cigar shaped, single.

c. Aedes:

- o shorter siphon tubes.
- o Breathe below the water surface.
- o Rest at an angle to the water surface.

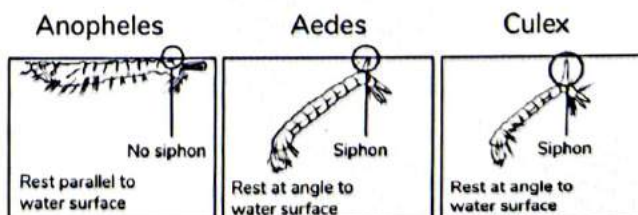
Larvae of Mosquito

00:17:59

a. Anopheles:

- o Near the surface,
- o Rest parallel to the water surface.
- o No breathing tube (siphon tube) present.

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Diseases transmitted by mosquitoes: 00:20:04

Anopheles	Malaria
Culex	Japanese encephalitis, Filariasis, West Nile fever
Aedes	Dengue, Chikungunya, Rift valley fever, Zika virus
Mansonia	Brugian filariasis

Important Information
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- **An. culicifacies:** Rural and peri urban areas.
- **An. stephensi:** Urban and industrial areas
- **An. fluviatilis:** Hilly areas, forests, forest fringes (East India)
- **An. minimus:** Foothills (Northeastern India)
- **An. epiroticus:** Andaman and nicobar islands

2. Sand Fly 00:30:45

- **Wings:** Lanceolate shaped, hairy
- **Legs:** Long
- **It does not fly, it hops (50-70 meters).**
- **Habitat:** Cool damp places (moist soil, stone walls, rubbish heaps, burrows)
- **Biting habits:** Nocturnal.
- **Only females suck blood.**
- **Adults live about 2 weeks.**
- **Take 2-3 blood meals during a lifespan.**



Public health importance 00:31:32

- Sandflies are the vectors of many diseases of public health importance.

Diseases Transmitted	
Species	Diseases carried
Phlebotomus argentipes	Kala Azar (leishmaniasis)
Phlebotomus papatasi	Sandfly fever, Oriental sore
Phlebotomus sergenti	Oriental sore
Sergentomyia punjabensis	Sandfly fever

Sandfly control measures 00:32:23

- Cracks and crevices to be plastered.
- **Insecticide of choice under NVBDCP:**
 - Malathion
 - Synthetic pyrethroids (No resistance)
- Sulfur fumigation or formalin cresol or DDT spray to kill adult fly (5% DDT in kerosine oil)

MCQs

- Q. Which of the following is not spread by Aedes mosquitoes?
- Dengue fever
 - Chikungunya
 - Japanese encephalitis**
 - Yellow fever

Comparative analysis of mosquitoes 00:22:25

Refer Table 53.1

Key points

- Buzzing sound while flying: **Culex.**
- Fast moving mosquitoes, difficult to catch: **Aedes.**
- Lifespan of mosquitoes: **14 days**, males short lived.
- It takes **7-10 days** to complete a life cycle.
- Relative humidity **60%** and temperature **20-30 degrees** optimum for mosquitoes.

Mosquito control measures: 00:29:41

Integrated vector management:

- Anti larval measure:**
 - Environmental ECP
 - Source reduction
 - Chemical control: Screen, Temephos (Abate)
 - Biological control: Fishes and Anti larval bacilli
- Anti adult measure**
 - DDT
 - Malathion
 - Pyrethroids
- Personal protection measures**
 - Mosquito repellants
 - Mosquito screens
 - Mosquito nets

Q. Urban malaria is transmitted by?

- a. *An. culicifacies*
- b. *An. stephensi*
- c. *An. sondaicus*
- d. *An. minimus*

Q. Is the flying range of *Aedes aegypti* is?

- a. 100 meters
- b. 200 meters
- c. 300 meters
- d. 400 meters

Q. Cigar shaped eggs are seen in?

- a. *Aedes*
- b. *Culex*
- c. *Anopheles*
- d. *Mansonia*

Q. Not a feature of *Anopheles* is?

- a. Spotted wing
- b. Siphon tube in larvae
- c. Boat shaped eggs
- d. Rest at an angle inclined to skin surface

Q. *Culex* mosquito is associated with transmission of which diseases in India?

- a. Malaria
- b. Brugian filariasis
- c. Dengue
- d. Japanese encephalitis

Q. The distance from airport or seaport which has to be kept free from *Aedes* mosquitoes?

- a. 400 m
- b. 500 m
- c. 1 km
- d. 100 m

Q. Vector for Kala Azar is?

- a. Flea
- b. Tsetse fly
- c. Sandfly
- d. Mosquito

3. Louse

00:33:40

- Dorso-ventrally flattened
- No wings
- Legs: 3 pairs
- Life cycle: Adult- Eggs- Larvae- Adult
- Life span of adult louse: 1-2 months
- Mode of transmission: Direct contact or fomites (inanimate objects)
- Control: Malathion



Public health importance

00:34:36

- Lice are the vectors of many diseases of public health importance.

Trench fever	<i>Rickettsia quintana</i>
Relapsing fever	<i>Borrelia recurrentis</i>
Epidemic typhus	<i>Rickettsia prowazekii</i>
Pediculosis	Head louse-scalp

4. Rat Flea

00:36:25

- Class: Insecta
- Bi-laterally compressed
- No wings
- Bristles over body, particularly on legs directed backwards.
- Habitats: Rat burrows, cracks & crevices of floors
- Mode of transmission: Bites
- Control:
 - DDT (10%)
 - Malathion (5%)
 - Cyano gas (Neurotoxic)
 - Diethyl toludamides
 - Benzyl benzoate



Public health importance

00:37:15

- Rat fleas are the vectors of many diseases of public health importance.
- Bubonic plague
- Endemic typhus/ Murine typhus
- Chiggerosis

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Hymenolepis diminuta

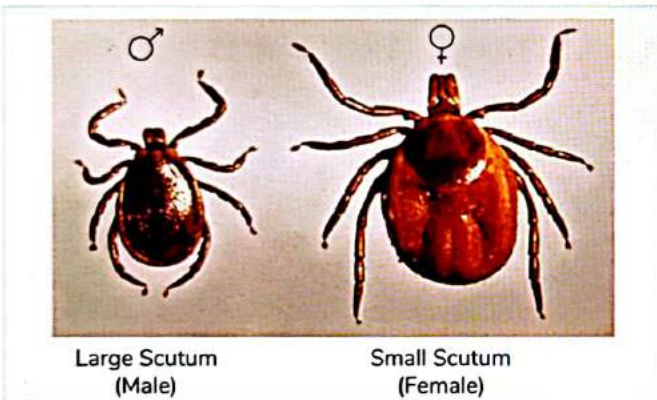
Arachnida

00:38:57

1. Ticks

00:38:58

- **Cephalothorax (fused head and thorax), abdomen**
- No wings
- Legs: 4 pairs
- Scutum - a chitinous covering over body
- The one with a chitinous covering over the body is known as Hard tick.
- Male: Large scutum, cover entire body
- Female: Small scutum, cover small part of body
- **Prevention and control:**
 - Appropriate clothing
 - Repellent (Benzyl benzoate)



Large Scutum (Male)

Small Scutum (Female)

MCQ

Q. Identify the following tick based on scutum.



Ans

- Left picture shows female tick as scutum is not covering entire body.
- Right picture shows soft tick as it has no scutum and its head is not visible.

Hard tick	Soft tick
Chitin on exoskeleton	No chitin
Head visible	Head not visible
Rapid life cycle, adult in 1-2 months	Adult in 9-10 months
Feeds all time	Nocturnal feeding
Will die once outside the body	Can starve for months

Public health importance

00:41:33

Ticks are the vectors of many diseases of public health importance.

a. Hard tick

- Tularemia
- Tick paralysis
- Indian tick typhus
- Colorado tick typhus
- 'Viral encephalitis
- Viral Haemorrhagic fever
- Lyme diseases
- Babesiosis
- RMSF
- KFD (very important)

b. Soft tick

- Q fever
- Relapsing fever



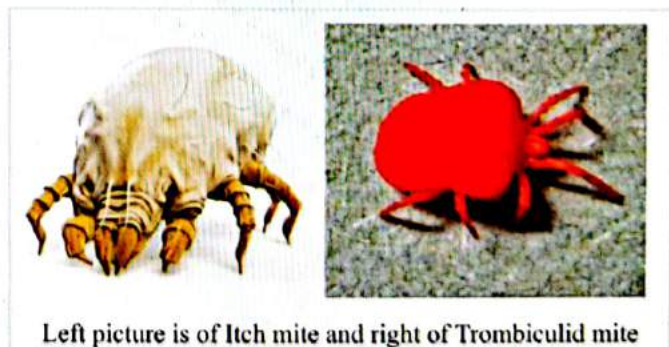
Important Information

- In humans Q. fever has no vector
- It is transmitted through inhalation of infected dust or contaminated milk and meat.
- Soft ticks transmits Q fever in animals

2. Mites

00:44:00

- **Cephalothorax (fused head and thorax), abdomen**
- Two types: Itch mites, Trombiculid mites



Left picture is of Itch mite and right of Trombiculid mite

a. Trombiculid mite

- o Berry bug or strawberry like
- o Infective and biting stage: Larvae
- o Larvae- strawberry like, 3 pairs of legs
- o Adults: 4 pairs of legs and are non-infective.
- o Shows transovarian (vertical) transmission.



b. Itch mite

00:48:03

- o *Sarcoptes scabiei*
- o Class: Arachnida
- o Spreads scabies.
- o It has nails with which it can make burrows under the skin.



Control of scabies-

00:48:19

- Treat all members of the household- **Blanket treatment** for scabies
- Benzyl benzoate (25%) is an effective sarcopticidal agent. Apply the whole body below the chin including soles of feet and allow it to dry. Application to be repeated after 12 hours and after further 12 hours bath is given with all clothes to be changed and washed in hot water.
- 2-3 times a week.
- HCH: 0.5-1% of gamma HCH (lindane) mixed in coconut oil, applied at an interval of 2-3 days.
- Other effective sarcoptic ideas are:
 - o Permethrin ointment: Single application
 - o Crotamiton ointment: Twice application
 - o Tetmosol (5%) solution: Thrice application'
 - o Sulfur (10%) ointment: Four time application

Public health importance

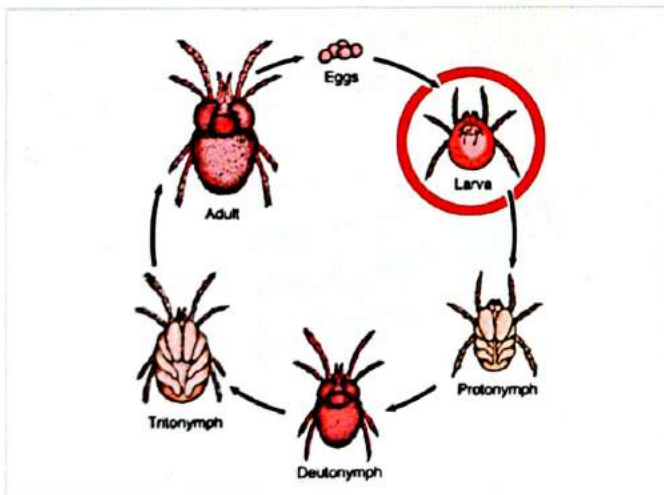
00:46:05

- Trombiculid mite, transmits (larvae form) Scrub typhus
- Agent: *Orientia tsutsugamushi*

Life cycle

00:46:57

- Larvae: 3 pairs of legs
- Adult-Eggs-Larva-Protonymph-Deutonymph-Tritonymph-Adult



Important Information

- Epidemic typhus: Louse
- Endemic typhus (Murine typhus): Rat flea
- Scrub typhus: Trombiculid mite (*Orientia tsutsugamushi*)

3. TSE-TSE fly

00:49:26

- Two wings are overlapping each other.
- Vector of African trypanosomiasis
- Agent: *Trypanosoma brucei*



4. Reduviid bug

00:50:11

- Also known as Triatomine bug
- Vector of **American trypanosomiasis** (Kissing/ Chagas disease)
- Agent: *Trypanosoma cruzi*



Public health Importance

- Typhoid
- Paratyphoid
- Cholera
- Diarrhea
- Dysentery
- GE (Gastro-intestinal)
- Helminthic infestation
- Polio
- Conjunctivitis
- Trachoma (Housefly around eyes)
- Anthrax
- Yaws

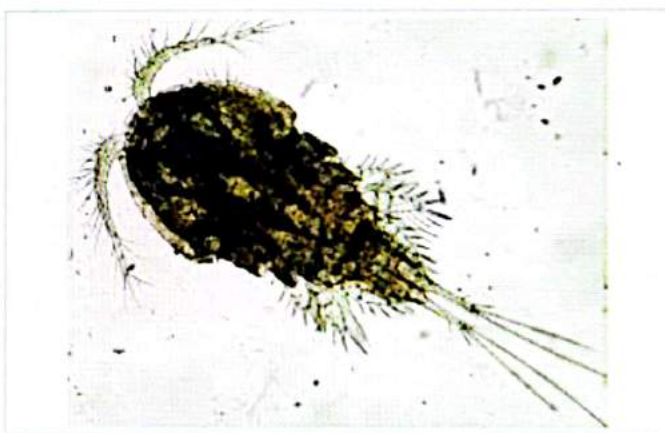
Crustaceans

00:52:30

Cyclops

00:52:31

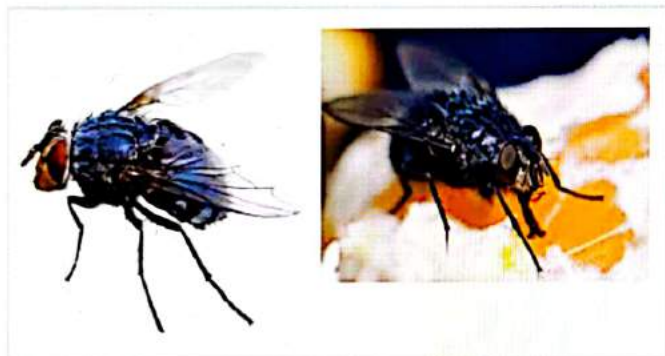
- Cyclops (Water flea)
- Class: Crustaceans
- Habitat: Collection of fresh water
- Life span: 3 months
- It is the intermittent host of guinea worm disease (eliminated).
- Mode of transmission: Drinking water containing infected cyclops.



5. Black fly

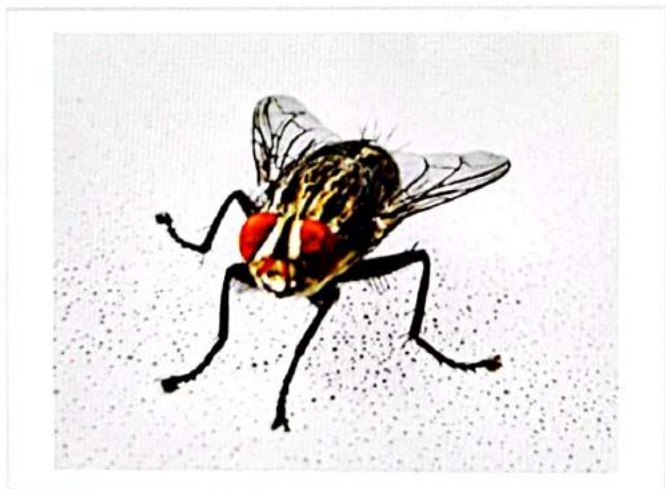
00:51:15

- Vector of **Onchocerciasis volvulus** (River blindness)



6. Housefly

00:51:41



MCQs

Q. All are spread through louse except?

- Trench fever
- Pediculosis
- Q fever
- Epidemic typhus

No vector is present for Q fever in humans.

Table 53.1

	Anopheles	Aedes	Culex	Mansonia
Breeding zone	Clean, stagnant water	Artificially collected water	Dirty, polluted water	Large water bodies under aquatic plants
Adult (Resting position)	Inclined at 45 degrees to skin, head is down, spotted wings	Hunchback, with white stripes	Hunchback, no white stripes on short body	Squatting position, large body and legs
Egg	Single, boat shape, lateral floats	Single, cigar shaped	Cluster	Cluster, star shaped
Larva	Parallel to water surface, no siphon tubes	Siphon tubes present, at an angle to water surface	Siphon tubes present, at an angle to water surface	Attached to roots of aquatic plants
Bite	Relatively less painful	Painful	Stinging and burning	Painless
Biting time	Morning & Evening (Dawn & Dusk)	Day time (2 hours after sunrise and 2 hours before sunset)	Nocturnal (Midnight)	Morning & Evening (Dawn & Dusk)
Flight range	2-3 kms	100-200 meters	11-13 km	2-3 km
Habitat	Exophilic (outside houses)	Endophilic (inside houses)	Exophilic (at daytime), Endophilic (at nighttime)	Exophilic
Diseases transmitted	Malaria	Dengue, Chikungunya, Rift valley fever, Zika virus, Yellow fever (not in India)	Japanese encephalitis, Filariasis, West Nile fever	Brugian filariasis



PREVIOUS YEAR QUESTIONS



Q. Which among the following is an active form of chlorination? (NEET 2018)

- A. Hypochlorite ion
- B. Hydrogen chloride
- C. Hypochlorous acid
- D. Chloride ion

Q. What is the recommended level of chlorine in a swimming pool? (NEET 2018)

- A. > 0.5 mg/L
- B. > 0.8 mg/L
- C. > 1 mg/L
- D. 5 mg/L

Q. Which of the following does not cause hardness of water? (NEET 2018)

- A. Calcium carbonate
- B. Calcium sulfate
- C. Calcium bicarbonate
- D. Magnesium

Q. Kyoto protocol 10 for?

(FMGE Dec 2019)

- A. To improve water sanitization
- B. To study food and nutrition
- C. To reduce green-house gas emission
- D. To do water chlorination

Q. Most important indicator of air pollution is? (NEET 2018)

- A. SO_2
- B. CO_2
- C. CO
- D. N_2O

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Q. Mode of disposal of sewage ground water is?

(FMGE June 2018)

- A. Activated sludge process
- B. Soakage Pond
- C. Oxidation Pond
- D. All of the above

1 INFECTION DISEASE EPIDEMIOLOGY

PART-I

Infectious Disease and Communicable Disease 00:00:40

- **Infectious disease:** Infectious in **origin**.
 - A clinically manifest disease of man or animal resulting from an infection.
- **Communicable disease:** Infectious in origin and can be **easily transmitted**.
 - Transmitted from man to man, animal to animal, environment to man or animal.
- **Contagious disease:** Transmitted through **contact**.

Important Point

- All infectious diseases are not necessarily communicable, ex rabies.
- All Communicable diseases are absolutely infectious.

Agent of Infection 00:04:07

- Agents could be bacteria, protozoa, viruses etc.
- These may have some properties.

Properties of Infectious agents

Infectivity: 00:04:59

- Ability of the agent to **invade, multiply and develop** in the host.
- Out of the total population the number of individuals infected.

Pathogenicity: 00:05:34

- Ability of the agent to **invade and multiply** in the host.
- Resulting in **development of a disease**.
- Presence of signs and symptoms.
- Out of the total infected the number of individuals that are diseased.

Virulence: 00:07:10

- Killing power or **severity** of a disease.
- Indicated by case fatality rate.
 - Out of total cases of disease the number of deaths happens due to the disease multiplied by 100.
 - It is a proportion.
- Independent of disease duration.
- Limited or no application in case of chronic illness.

Reservoir vs Source 00:09:45

- **Reservoir:** Natural habitat of infectious agents where they **multiply and develop**.
- **Source:** Any living or non living which harbors the Infectious agent and also transmits.
 - May or may not be the Reservoir.
 - Can be **passed or disseminated** through any person, animal, object or substance.

Important Points

- Host and Reservoir are the same for the disease - **Tetanus**.
- Reservoir and source are different - **Hookworm infestation**.

Disease	Reservoir	Source
Tuberculosis	Man	Sputum
HIV/AIDS	Man	Body secretions, fluids
Malaria	Man/mosquito	Infected blood
Rabies	Dog/other animals	Saliva
Measles	Man	Droplets
JE	Pig and birds	Infected mosquitoes
Cholera	Man	Unsafe water and food
Typhoid	Man (Case or carrier)	Unsafe water and food
Plague	Rodents	Infected flies
Hookworm	Man	Soil contaminated with infective larvae
Tetanus	Soil	Soil

Types of Host 00:13:57

1. Primary host:

- Sexual cycle of the infectious agent takes place.
- Also called the definitive host.
- **Ex:** Anopheles in case of malaria.

2. Secondary host:

- Asexual cycle of agent occurs.
- Also called intermediate host.
- **Ex:** Man in case of malaria.

3. Dead end host:

- No man-to-man transmission.
- **Ex:** Rabies, Japanese Encephalitis, tetanus, Bubonic plague.

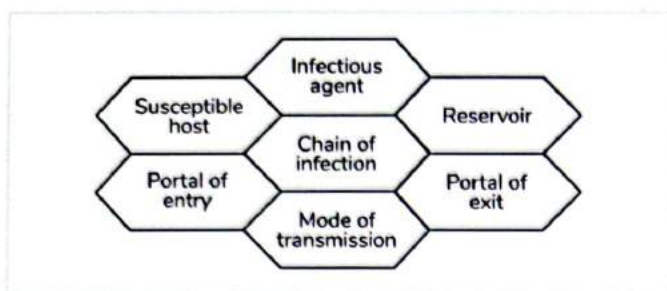
4. Obligate host:

- Only man is the host.
- **Ex:** Measles, typhoid.

	Primary Host	Secondary Host
Malaria	Mosquito	Man
Filaria	Man	Mosquito (culex)
Tapeworm	Man	Pig (T. Soilum) Cattle (T. Saginata)
Guinea worm	Man	Cyclops
Sleeping sickness	Man	TseTse fly
Hydatid disease	Dog	Sheep, cattleman

Chain of infection

00:17:35



• Chain of infection includes:

- Infectious agents
- Reservoir
- Portal of exit
- Mode of transmission
- Portal of entry
- Susceptible host

Mode of Transmission

00:17:49

- Agent → Source → Modes of transmission → Host
- 2 Modes of Transmission:
 1. Direct transmission
 2. Indirect transmission

Refer Table 1.1

Differences Between Droplet and Droplet Nuclei

00:20:29

Droplet	Droplet Nuclei
Direct mode of transmission.	Indirect mode of transmission.
Size: >5 microns.	Size: <5 microns.
• Heavier particles	• Lighter particles.
Under the influence of gravity fall to the ground.	Remain suspended in air.
Travel a distance <1 meter.	• Air borne.
	Travel a distance >1 meter.
	Diseases: Measles, chickenpox, TB, influenza, covid 19.

Diseases caused by droplet infection

- Contact-Scabies, dermatitis
- Soil - Tetanus.
- Inoculation - Dog bite, HIV by needle prick injury.
- **Vertical transmission**
 - 1st trimester - Rubella, chickenpox.
 - 2nd trimester - parvovirus
 - 3rd trimester - Toxoplasmosis, cytomegalovirus infection, hepatitis B, syphilis.
 - During delivery - HIV, Herpes.

Vector borne

00:27:56

- **Mechanical vector:**
 - Arthropods that physically carry the agent into the host.
 - Agent doesn't multiply or develop in the vectors.
 - Ex: footpad of housefly.
- **Biological vector:**
 - Arthropods in which the agent undergoes a necessary cycle of development in the vector.
 - Ex: Anopheles mosquito.

Types of Biological Transmission

00:29:32

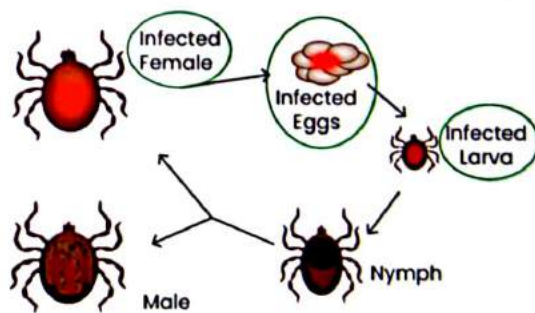
3 types:

1. **Propagative:**
 - Agent only multiplies in the vector.
 - Only **increases in number**.
 - Ex: Plague
2. **Cyclodevelopmental:**
 - Agent changes its shape when entering into the vector.
 - Ex: Filaria in culex.
3. **Cyclopropagative:**
 - Agent **multiplies and develops** (changes shape) in the vector.
 - Ex: Plasmodium in mosquitoes.

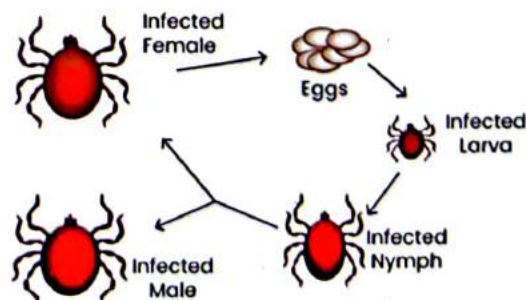
Transovarial transmission

00:32:26

- Vertical transmission.
- From mother to progeny.



Transovarial transmission



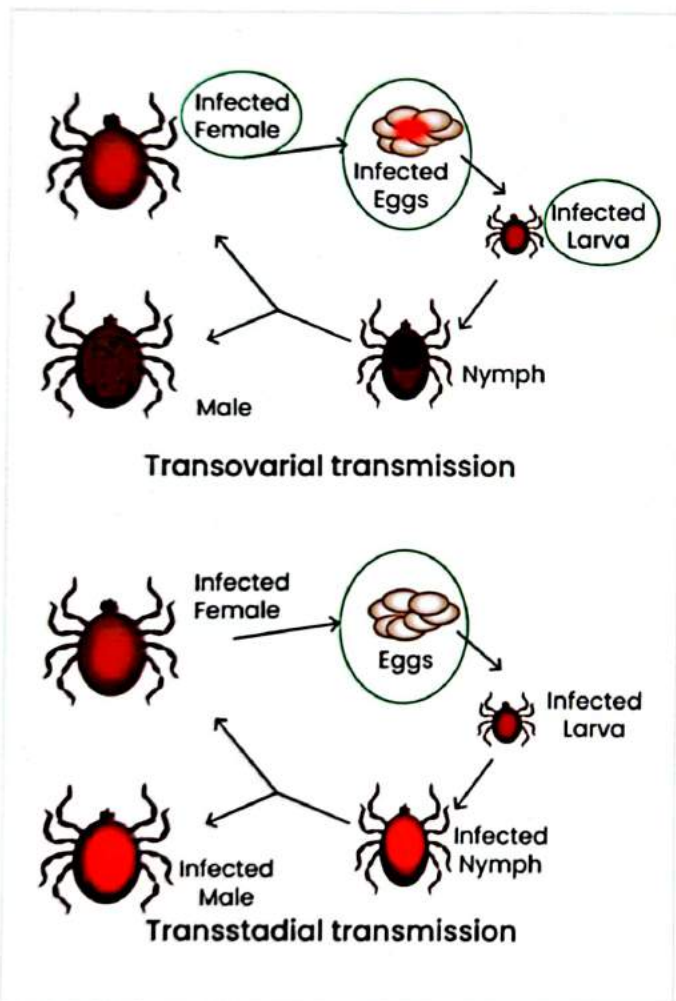
Transstadial transmission

- Infected tick → egg → larvae
- Ex: KFD, scrub typhus, Indian tick typhus, Q fever, RMSF.

Transstadial transmission

00:33:10

- Occurs when a pathogen remains with the vector from one life stage to the next.
- Horizontal transmission.
- Ex: Bacteria *Borrelia burgdorferi* (causative agent for lyme disease)
 - Infected tick vector as a larva.
 - Infection is maintained when it is a nymph.
 - Later develops as an adult.



Latent state:

- Agent is in **dormant stage**.
- No signs and symptoms.
- **Can't transmit** the disease.

• **Carrier:** Infected person or animal that **harbors** a specific infectious agent in the absence of clinical disease and serves as potential source of infection for others.

- Not in a dormant state.
- Transmits infection.
- No signs and symptoms.

Cases

00:36:41

- **Primary case:** **First case** introduced in a population.
- **Secondary case:** Cases which develop on **exposure to a primary case** within one incubation period of a disease.
- **Index case:** First case which comes to **notice of an investigator**.
 - Not necessarily a primary case.
- **Serial interval:** **Time interval** between primary and secondary case.
- **Incubation period:** Time interval between the **entry of an organism** and development of **signs and symptoms**.
- **Latent period:** Incubation period for **non-communicable diseases**.
- **Window period:** Time interval between entry of an organism and detected **positive on lab investigations**.
- **Median incubation period:** Time taken for **50% of cases** to occur.
- **Generation time:** Time interval between entry of organism and **maximum infectivity**.

Isolation vs Quarantine

00:41:19

Isolation	Quarantine
Done for cases	Done for healthy contacts
Done for a period of communicability or infectivity of a disease or till the person recovers.	<ul style="list-style-type: none"> • Done for maximum incubation period of the disease. • Known as absolute Quarantine.
Secondary level of prevention	Primary level of prevention.

Important Definitions

00:34:07

- **Case of a disease:**
 - Diseased person shows pathogenesis presenting **signs and symptoms**.
 - Also transmits the disease.
- **Subclinical case:**
 - Disease is present at **suboptimal level**.
 - No signs and symptoms present.
 - Can transmit the disease.

Types of Carriers

00:43:04

- Epidemiologically more dangerous than cases.
- **Contact carrier:** Develops from a **case**.
- **Paradoxical carrier:** Develops from **another carrier**.
- **Incubators carrier:** Spreading infection during **incubation period**.
- **Convalescent carrier:** Carriers which are **shedding organisms** during the **recovery phase**.

- **Chronic carrier:** Carriers **shedding** organisms for > 3 months.
- **Pseudo carrier:** Carriers of an **avirulent organism**.
- **Health carrier:**
 - Emerge from **subclinical cases**.
 - Victims of subclinical infection who have developed carrier state without suffering from overt disease.
 - But shedding the disease agent.
 - **Ex:** Polio, cholera, meningococcal meningitis, salmonellosis, diphtheria.

Chronic	Healthy	Convalescent	Incubatory
Malaria	Polio	Diphtheria	Diphtheria
Meningitis	Typhoid	Typhoid	Measles
Typhoid	Cholera	Cholera	Mumps
Dysentery	Diphtheria	Dysentery	Polio
Gonorrhoea	Meningitis	Pertussis	Pertussis
HBV			HBV
			Influenza
			COVID 19

Measurement of Disease Events

00:47:30

- **Proportionality mortality rate:** Out of the total deaths in a community in a year the total deaths due to a particular disease multiplied by 100.
 - Simple measure of burden of a disease.
- **Secondary attack rate:** Measure of communicability of a disease.

$$\frac{\text{(Number of secondary cases that developed following exposure to a primary case within one incubation period of the disease/ (Total Susceptible) X 100)}$$

- It is also a proportion.
- **Case fatality rate:** Out of total cases due to a disease the number of deaths or virulence due to the disease multiplied by 100.
 - It is also a proportion.
 - $CFR = 1 - \text{survival rate}$.
 - Importance for acute infection.

MCQs

Q. The population of 50 children is having ten children immunized against chicken pox. Five children developed chicken pox on 1st March 2017, another 28 children developed chicken pox within the next two weeks. What is SAR of chicken pox?

- a. 60%
- b. 70%
- c. 80%
- d. 90%

Explanation

- Total population = 50
- Immunized children = 10
- Susceptible = $50 - 10 = 40$
- Out of these 40, 5 children on 1st March developed the disease - primary case
- Other 28 becomes the secondary case
- Secondary attack rate = $\frac{\text{total number of secondary cases that developed following exposure to a primary case within 1 incubation period}}{\text{total number of susceptible cases}} \times 100$
 - $25 \div 40 - 5 \times 100 = 25 \div 35 \times 100$
 - 80%
- Always subtract primary cases from susceptible.

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Q. A village has a total of 100 under five children. The coverage with measles vaccine in these age groups is 60%. Following the occurrence of a measles case in a child after a visit outside, 26 children developed measles later. The secondary attack rate of measles is

- a. 16.6%
- b. 26%
- c. 65%
- d. 66.6%

Explanation

- Total children = 100
- Safe children = 60
- Susceptible children = $100 - 60 = 40$
- Primary case = 1
- Secondary cases = 26
- Therefore SAR = $26 \div 40 - 1 = 26 \div 39 = 66.6\%$.

Q. Disease transmitted through contact?

- a. Infectious disease
- b. Communicable disease
- c. **Contagious disease**
- d. Any of the above

Q. Which of the following statements about 'Reservoir' of an infection is not correct?

- a. Reservoir can transmit infection to a susceptible host
- b. **Reservoir and source of infection are synonymous**
- c. Non living thing can be reservoir
- d. Reservoir can be animal

Ans. Reservoir and source are synonymous

Q. All are direct modes of transmission except?

- a. Direct contact
- b. Contact with soil
- c. Transplacental transmission
- d. **Droplet nuclei**

Answer: Droplet nuclei - indirect mode of transmission

Q. Arthropods in which infectious Agent undergoes a necessary cycle of development in the vector is known as

- a. Mechanical vector
- b. **Biological vector**
- c. Any of the above
- d. None of the above

Q. Organism multiplying and developing the the host is called as

- a. **Cyclopropagative**
- b. Cyclodevelopmental
- c. Developmental
- d. Propagative

Q. Which of the statement about incubation period is incorrect

- a. It is the time interval between invasion by an infectious agent and appearance of the first sign or symptom
- b. During IP the infectious agent undergo multiplication in the host
- c. The factors such as infective dose of pathogens and portal of entry determines IP
- d. **Infectious diseases are not communicable during IP**

Q. The ability of an infectious agent to invade and multiply in host is called

- a. Pathogenicity
- b. **Infectivity**
- c. Virulence
- d. Communicability

Q. Denominator while calculating secondary attack rate includes

- a. All the people living in next 100 houses
- b. All the close contacts
- c. **All susceptible close contacts**
- d. All susceptible in the whole village

Q. The time taken for 50% of patients to develop the disease following exposure to the disease is known as

- a. Incubation period
- b. **Median incubation period**
- c. Generation time
- d. Secondary attack rate

Q. Out of 50 people suffering from cholera in a population of 5000, 10 died. However, total deaths are 50. What is the crude death rate?

- a. 1 per 1000
- b. 5 per 1000
- c. **10 per 1000**
- d. 20 per 100

Explanation

- $CDR = (\text{total deaths} / \text{total population}) \times 1000$
- $CDR = (50/5000) \times 1000 = 10/1000$
- $PMR \text{ Cholera} = (10/50) \times 100 = 20\%$
- $CFR = (10/50) \times 100 = 20\%$

Q. Incubation period should be

- a. Minimum incubation period
- b. Maximum incubation period
- c. **Period of communicability**
- d. Median incubation period

Q. Quarantine period should be

- a. Minimum incubation period
- b. **Maximum incubation period**
- c. Period of communicability
- d. Median incubation period

Q. Serial interval is

- a. **Time gap between primary and secondary case**
- b. Time gap between index and primary case
- c. Time taken for a person from receipt of infection to develop maximum infectivity
- d. The time taken from infection till a person infects another person

Q. Secondary attack rate is defined as?

- a. Number of total cases developing disease within maximum incubation period
- b. **Number of cases developing disease within incubation period following exposure to primary case**
- c. Number of cases developing disease after exposure to primary case in any period of time
- d. Number of cases developing after exposure to secondary cases

Q. Which indicator denotes the severity of a disease?

- a. Proportional mortality rate
- b. Cause specific death rate
- c. Case specific death rate
- d. **Case fatality rate**

Cause specific death rate: $(\text{Death due to disease} / \text{medical population}) \times 1000$

Q. Man is dead end for?

- a. Tetanus, measles
- b. Measles, yellow fever
- c. Tetanus, yellow fever
- d. Rabies, tetanus

Q. What is the measure of communicability of disease?

- a. Case fatality rate
- b. Secondary attack rate
- c. Both of the above
- d. None of the above

Table 1.1

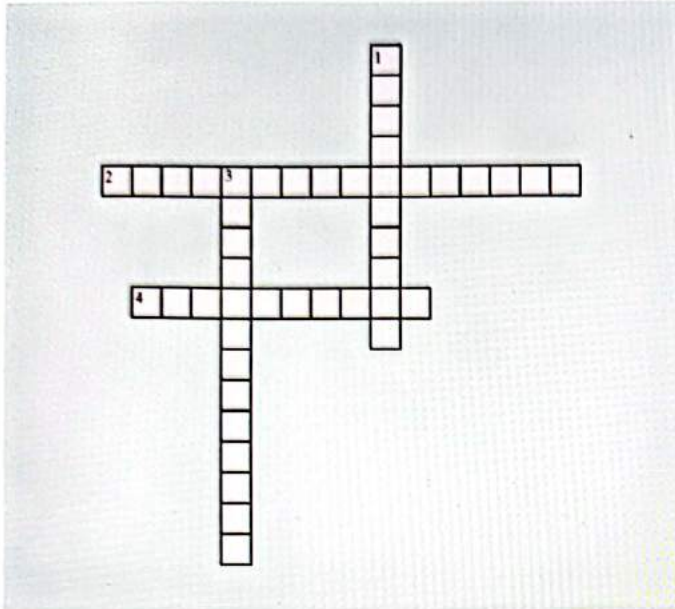
Direct Transmission	Indirect Transmission
<ul style="list-style-type: none"> • Direct contact • Ex: Scabies, dermatitis 	<ul style="list-style-type: none"> • Vehicle borne <ul style="list-style-type: none"> ○ Blood borne - HIV, hepatitis ○ Food borne - GI infections, typhoid cholera. ○ Water borne - GI infections, typhoid, cholera
<ul style="list-style-type: none"> • Droplet infection 	<ul style="list-style-type: none"> • Droplet nuclei <ul style="list-style-type: none"> ○ Air borne ○ Via dust ○ Diseases: Measles, chickenpox, TB, influenza, covid 19.
<ul style="list-style-type: none"> • Contact with soil • Ex: Tetanus 	<ul style="list-style-type: none"> • Vector borne <ul style="list-style-type: none"> ○ Mechanical vector ○ Biological vector - malaria
<ul style="list-style-type: none"> • Inoculation into skin or mucosa • Ex: Dog bite, HIV by needle prick injury. 	<ul style="list-style-type: none"> • Fomite borne: Non living thing or inanimate object. <ul style="list-style-type: none"> ○ Contaminated door handles, tables, chairs etc.
<ul style="list-style-type: none"> • Vertical transmission <ul style="list-style-type: none"> ○ From mother to baby. ○ Ex <ul style="list-style-type: none"> → 1st trimester - Rubella, chickenpox. → 2nd trimester - parvovirus → 3rd trimester - Toxoplasmosis, cytomegalovirus infection, hepatitis B, syphilis. → During delivery - HIV, Herpes. 	<ul style="list-style-type: none"> • Unclean hands and fingers



CROSS WORD PUZZLES



Crossword Puzzle

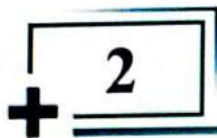


Across

- 2. Respiratory distress syndrome
- 4. Most common vector

Down

- 1. Emerging virus
- 3. Epidemic among animals ars of age / population between 15 to 64 years of age * 100



INFECTIOUS DISEASE EPIDEMIOLOGY

PART-II



Zoonoses

00:00:34

1. Diseases arising due to or related to animals
2. Example: Rabies, leptospirosis

Types of zoonoses

00:00:51

Based on origin or source

00:00:53

1. Zoonanthroponosis:
 - o Humans to animals
 - o E.g.- TB
2. Anthroponosis:
 - o Animals to humans
 - o E.g.- rabies
3. Amphixenosis:
 - o Animals to humans and vice versa
 - o Bidirectional.
 - o E.g. - staphylococcal or streptococcal infections

Based on transmission

00:02:43

1. Direct zoonoses: directly from bite
2. Cyclozoonoses: 2 or more animals involved
 - o E.g.- Taeniasis - T. solium & T.saginata
3. Metazoonotic: 2 or more animals or non-vertebrate host
 - o E.g.- KFD, tick-borne encephalitis
4. Saprozoonoses: animals or non-animals source
 - o E.g. - Mycosis, histoplasmosis

Based on source

00:03:16

1. Epizootic:
 - o Epidemic in animals
 - o E.g.- plague
2. Enzootic:
 - o Endemic levels in animals
 - o E.g.- staph infections or worm infestations
3. Epornitic:
 - o Diseases originating among birds having epidemic levels
 - o E.g.- psittacosis

Hospital-Acquired Infections

00:04:00

- Infections that arise as new infectious after 48 hours of admission
- MC organism: **staphylococcus**
- Most common mode of transmission: **unclean hands**
- Most common infectious disease: **nosocomial related urinary tract infection** due to retained catheters.

Iatrogenic

00:05:34

- Group of diseases which arise due to procedures in health facility
- Example:
 - o Procedural negligence
 - o Side effects
 - o Adverse reactions

Isolation vs Quarantine

00:05:50

Isolation	Quarantine
Cases	Healthy contact
For the period of communicability or transmissibility of a disease or till the person recovers	For the longest incubation period of the disease (Absolute quarantine)
Secondary level of prevention	Primary level of prevention

Modified quarantine:

- Partial limitations of movements
- Example: measles

Incubation Period for Diseases

00:08:05

Diseases	Incubation period
Influenza	18-72 hours
Measles	10-14 days
Chicken Pox	14-16 days
Rubella	2 to 3 weeks average 18 days
Mumps	2 to 4 weeks (14-18 days)
Diphtheria	2-6 days
Pertussis	7-14 days max upto 3 weeks
Bacillus Cereus	1-6 hrs
Most Upper Respiratory Diseases	2-5
Covid -19	3-21 days
Staphylococcal	1-8 hrs
Clostridium Perfringens	6-24 hrs
Salmonella	12-24 hrs
Botulinum	18-36 hrs
Cholera	1-2 days (3 days - 3 weeks)

Typhoid	10-14 days
Polio	7-14 days
Hepatitis A	15-50
Most diarrheal disease	1-5

Period of Isolation 00:09:30

Chicken Pox	Until all lesions are crusted, usually 6 days after the onset of rash
Measles	7 days after the onset of rash
German Measles	None, except the women in 1st trimester or sexually active, non-immune women in child bearing years not using contraception measures should not be exposed
Influenza	3 days after onset
Mumps	Until swelling subsides
Pertussis	4 weeks or until paroxysms cease
Diphtheria	Until 48 hrs of antibiotics or negative cultures after treatment
Tuberculosis	Until 3 weeks of effective chemotherapy
Cholera	3 days after tetracycline started
Shigellosis and salmonellosis	Until 3 negative stool cultures
Hepatitis A	3 weeks of onset
Covid 19	14 days

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Period of Communicability

00:10:17

Chicken Pox	1-2 days before to 4-5 days after the appearance of rash
Measles	4 days before to 5 days after the rash appearance
Rubella	7 days before symptoms to 7 days after appearance of rash
Mumps	4-6 days before symptoms to 7 days after
Influenza	1-2 days before to 1-2 days after the onset of symptoms
Diphtheria	14-28 days from disease onset
Tuberculosis	As long as not treated

MCQs

Q. Infection transmitted to man from vertebrate animals is known as?

- a. Exotic
- b. Anthrozoosis
- c. Zooanthroponosis
- d. Epizootic

Q. Disease imported in a country which was not otherwise present?

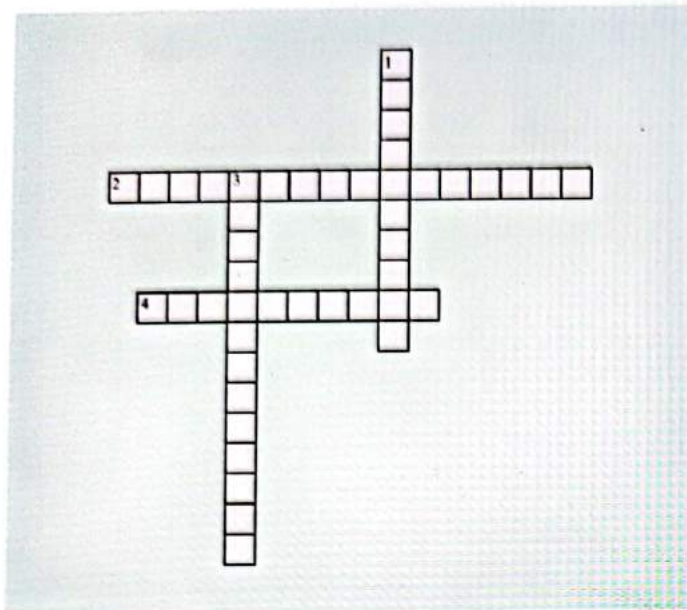
- a. Epornithic disease
- b. Zoonotic disease
- c. Exotic disease
- d. Epizootic disease



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Respiratory distress syndrome
- 4. Most common vector

Down

- 1. Emerging virus
- 3. Epidemic among animals
ars of age / population between 15
to 64 years of age * 100

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3

MEASLES AND RUBELLA

Measles 00:00:52

- Communicable disease that causes respiratory infection

Epidemiological Determinants 00:01:03

- Three types
 1. Agents
 2. Host factors
 3. Environmental factors

1. Agents 00:01:24

- **Single stranded negative sense RNA virus**
- **Family: Paramyxoviruses**
- **Source of infection**
 - Case of measles
 - No subclinical cases
 - No carriers
 - Animal reservoir is not present.
 - Only one serotype of the virus that is responsible for infection
- **Period of Communicability:**
 - 4-days before and 4-5 days after the appearance of rash
 - Secondary attack rate for measles: 80%
 - **Immunity:** One attack gives lifelong immunity


2. Host Factors 00:04:30

- Affects both developed and developing countries
- In developing countries
 - **Age group:** 6 months-3 years
- In developed countries
 - **Age group:** > 5 years old
- Equally susceptible for both males and females
- **Malnutrition** is a predisposing factor.

3. Environmental Factors 00:05:56

- Follows a seasonal distribution
- Most commonly seen in winter and early spring
- Measles follows a cyclical seasonal distribution.
- Epidemics in the unvaccinated population, it can be repeated for every 2-3 years
- Measles are **endemic** all over the world
- But it become epidemic when the proportion of susceptible children increases ≥ 40
- If measles is introduced in a virgin (completely unimmunized) community- >90% of children can get infected.
- **Mode of transmission:** Droplet and droplet nuclei
- **Size of the droplet:** < 5 micron
- Travels a distance of > 1 meter

- **Incubation period:** The period between the entry of organism and the first appearance of signs and symptoms is called Incubation period
 - 10-14 days (natural IP)
 - 10 days from exposure to fever
 - 14 days from exposure to appearance of rash
- **Post vaccination period:** 7-10 days (Antibody formation)
- Measles vaccination can be given to children in the post disaster phase within **3 days of exposure** because post vaccination in the incubation period is less than the natural incubation period.
- Measles does not follow the iceberg phenomenon.

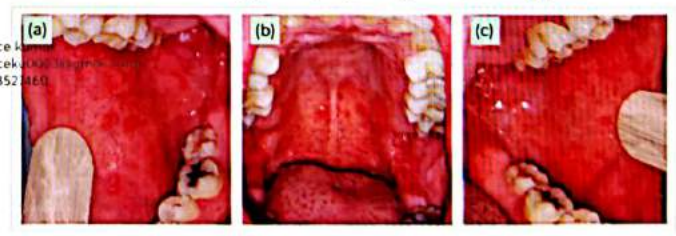
 **Important Information**

- Disease that are transmitted by droplet nuclei
 - Measles
 - Chicken pox
 - Influenza
 - TB
 - Covid 19

Refer Table 3.1

Clinical Presentations of Measles 00:14:47

1. **Prodromal phase:** It includes
 - Fever
 - Cough
 - Conjunctivitis
 - Coryza
 - **Koplik's spot (Specific)-**
 - 1 mm grayish white spots on reddish areola
 - It appears 24-48 hours before the rash is formed
 - As the rash appears, koplik spot will disappear

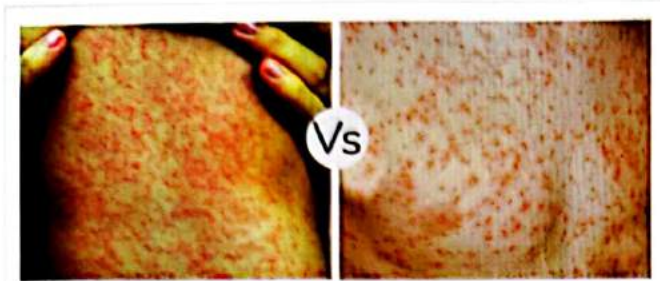


2. **Eruptive phase**
 - Rash is formed
 - Features of rash:
 - Maculopapular confluent rash (starts behind the ear)
 - It is retro auricular in origin.

- Fades in the same direction
- Rash appears after the koplik spot

Measles vs Rubella rash

00:17:50



Measles rash	Rubella rash
<ul style="list-style-type: none"> • Rash is maculopapular • Confluent rash 	<ul style="list-style-type: none"> • Rash is maculopapular • Discrete rash or non-confluent rash (25% of rubella will be presented without rash)

Diagnosis

00:18:36

- It is diagnosed clinically.
- Gold standard: PCR

Treatment

00:19:00

- No treatment.
- Symptomatic management only.

Complications

00:19:18

- Most common complication in young children is **otitis media**
- Measles and otitis media are covered under Integrated Management of Neonatal & Childhood Illnesses programme.
- Most common **fatal** complication: **Pneumonia**
- Most common cause of **death** in measles: **Pneumonia**
- If measles occur after 5 years in developed countries then diarrhea is the common complication
- **Rare complication of measles resulting in mortality: SSPE (subacute sclerosing panencephalitis)**
- After measles infection, there is a stage known as post measles stage
 - In this stage complications include
 - Weight loss
 - Fatigue
 - Diarrhea
- **Isolation period: 7 days from the onset of rash**

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Prevention

00:22:39

Refer Table 3.2

Key Points

Does the measles vaccine follow open vial policy?

- It doesn't follow open vial policy
- As it is a reconstituted vaccine, it should be used by 4 hours

Which vaccines follow open vial policy?

- **T series and liquid vaccines (PIO) follows open vial policy**
 - PCV
 - ICV
 - OPV

Immunoglobulins

00:26:24

- Measles may be prevented by administering immunoglobulin early in the incubation
- Dose: 0.25 ml per kg body weight
- Schedule: Within 3-4 days of exposure followed by measles vaccine after 8-12 weeks (post immunoglobulins)
- Susceptible contacts can be given measles vaccine- If the child is in 9-12 months: Measles vaccine is given within the three days of exposure.

Target Year for Measles Elimination

00:28:07

- It was for **2022, but it was extended.**
- By now, we are targeting to eliminate it as soon as possible.
- For that we have started a Measles rubella elimination campaign
 - **Catch Up- Measles rubella elimination campaign:**
 - All the children between 9 months-14 years of age are given with a dose of MR vaccine, irrespective of disease status or previous immunization status
 - These are the supplementary doses given along the routine dose
 - **Keep Up**
 - Keep up routine vaccination
 - Under the NIS, we are targeting to achieved 95% immunization
 - **Follow Up**
 - Subsequent nationwide vaccination campaigns
 - It is conducted every 2-4 years targeting usually all children born after the catch-up campaign.

WHO Measles Elimination Strategy

00:30:43

Catch Up • MR elimination campaign

Keep Up • 95% immunization coverage

Follow Up • Subsequent nationwide vaccination campaigns
• It is conducted every 2-4 years targeting usually all children born after the catch-up campaign

Diagnosis

00:46:54

1. Virus isolation
2. Hemagglutination inhibition test - **Mostly preferred**
3. ELISA test: Detection of IgG
 - o This IgG antibodies represent **previous or past infection**
 - o IgM means represent **recent infection**
4. Demonstration of rise in antibody titer between 2 serum samples taken 10 days apart or rubella specific IgM in single sample accurately confirms recent infection

- These spots are found in rubella
- Nonspecific

Prevention

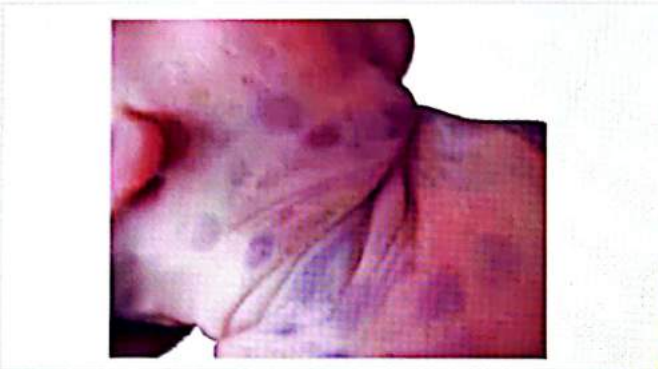
00:50:30

Rubella vaccine:

- **Strain:** RA 27/3
- **Type:** Live vaccine
- **Dose:** 0.5 ml
- **Route:** Subcutaneous route
- Recipients advised not to become pregnant over the next 1 month.
- Available in **combined vaccine with MMRV (measles, mumps, rubella, varicella), MR**

Blueberry Muffin Rash

00:48:00



- Seen in- **cytomegalovirus and rubella**
- Non infective causes of blueberry muffin rash are
 - o Congenital spherocytosis,
 - o Rhesus hemolytic disease
 - o ABO blood group incompatibility
 - o Anemia caused by twin-to-twin transfusion.

Rubella Vaccination Strategy

00:51:19

It is divided into three priorities:

1. 1st priority: Women of reproductive age group (non-pregnant women)
2. 2nd priority: Interrupt the transmission by vaccinating the children between 1-14 years of age
3. 3rd priority: Routine vaccination of children those who are < 1 year of age

MCQs

Q. Measles follow?

- A. Periodic trend
- B. Cyclical trend
- C. Secular trend
- D. All of the above

Q. True statements regarding measles are all except?

- A. Common in summer
- B. Incubation period is 10-14 days
- C. Infectivity decreases after appearance of rash
- D. Measles vaccine is live attenuated

Q. True statements regarding measles are all except?

- A. Koplik's spots appear as rash disappears
- B. It is prevented by both active and passive immunization
- C. Otitis media and meningitis are the most common complications
- D. TB is aggravated in post measles

Q. Koplik spots are seen in?

- A. Prodromal stage
- B. Incubation
- C. Eruptive
- D. Convalescent stage

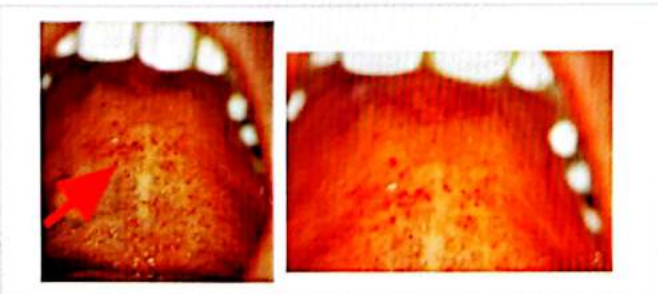
Blueberry Muffin Syndrome

00:49:18

- Blueberry muffin syndrome is a rare neonatal skin disorder characterized by
 - o Widespread non blanchable
 - o Maculo papular lesions of reddish-blue or magenta color
- It occurs due to persistent **dermal erythropoiesis** in patients with **congenital viral infections**.
- It goes away with time

Forchheimer Spot

00:49:44



- Discrete rose colored spot on soft palate that coalesce into red blush and extend over fauces

Q. Which of the following is the reservoir for measles?

- A. **Man**
- B. Soil
- C. Fomites
- D. Monkey

Q. Most serious complication of measles is?

- A. Koplik spots
- B. Parotitis
- C. **Meningoencephalitis**
- D. Nephritis

Q. Which of the following is the 'least common' complication of measles?

- A. Diarrhea
- B. Pneumonia
- C. Otitis media
- D. **SSPE**

Q. True about measles rash appearance?

- A. Along with koplik spot
- B. 1-2 days before koplik spot
- C. **1-2 days after koplik spot**
- D. Post measles stage

Q. Measles vaccination campaign between 9-14 months of age for elimination?

- A. Keep up
- B. Follow up
- C. Mop up
- D. **Catch up**

Q. A 1 year old unimmunized child presents to a primary health center with fever for 5 days. Mother also gives a history of rash starting behind ear-pinna a day before coming to OPD. On examination, the child has a runny nose and congested eyes. What is most probable diagnosis?

- A. Rubella
- B. Mumps
- C. **Measles**
- D. Chickenpox

Q. All are features of rubella except?

- A. Source of infection is a case
- B. **No subclinical case**
- C. No carrier for postnatally acquired rubella
- D. Infants with congenital rubella excrete virus

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Q. All of the following statements are true about congenital rubella except?

- A. It is diagnosed when the infant has IgM antibodies at birth
- B. It is diagnosed when IgG antibodies persist for more than 6 months
- C. Most common congenital defects are deafness, cardiac malformations and cataract.
- D. **Infections after 16 weeks of gestation result in major congenital defects**

Q. The most widely used diagnostic test for rubella is?

- A. ELISA
- B. RIA
- C. **Hal test**
- D. Virus isolation

Q. Recommended vaccination strategy for rubella is to vaccinate which age group on priority during rubella outbreak?

- A. **Women 15-49 years (non-pregnant)**
- B. Infants
- C. Women 15-39 years (pregnant)
- D. Adolescent girls 10-19 years

Table 3.1

Features	Description
Causative agent	Single stranded RNA paramyxoviruses (only one serotype)
Incubation period	10-14 days (natural)
Source of infection	Case of measles. <ul style="list-style-type: none"> No subclinical cases There are no carriers No animal reservoir Doesn't follow iceberg phenomenon
Mode of transmission	<ul style="list-style-type: none"> Droplet (direct) and droplet nuclei (indirect)
Period of communicability	<ul style="list-style-type: none"> 4-days before or 4-5 days after the appearance of rash
Rash	<ul style="list-style-type: none"> Maculo papular or maculopapular confluent (crowded) rash (retro auricular in origin)
Secondary attack rate of measles	<ul style="list-style-type: none"> 80%
Pathognomonic clinical feature of MC	<ul style="list-style-type: none"> Koplik's spot (buccal mucosa opposite to the lower second molar)
Complication of measles in young children	<ul style="list-style-type: none"> Otitis media Pneumonia (serious complication)
A rare complication of measles	<ul style="list-style-type: none"> SSPE: Subacute sclerosing panencephalitis (7-10 years after infection)

Table 3.2

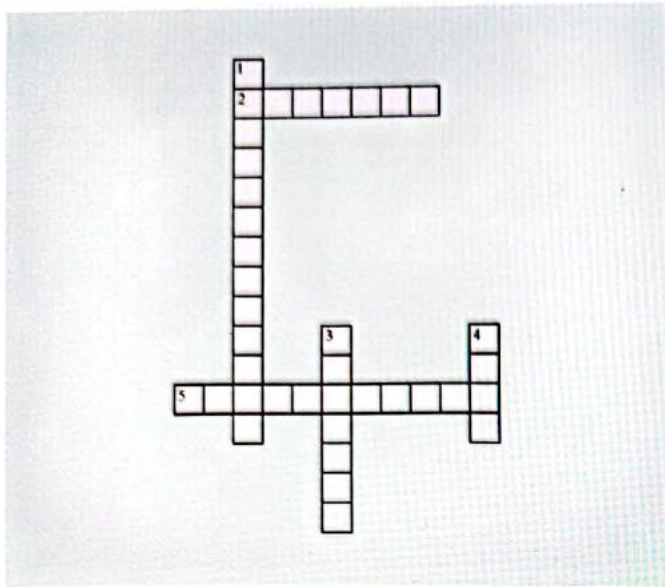
Prevention	Description
Active immunization	<ul style="list-style-type: none"> Measle vaccines: Measle rubella vaccine MRV (in National immunization schedule)
Passive immunization: WHO recommended dose	<ul style="list-style-type: none"> 0.25 ml per kg body weight
Strains	<ul style="list-style-type: none"> Edmonston-Zagreb
Schedule: According to NIS	<ul style="list-style-type: none"> First dose: 9 completed months (MR1-85% protection) Second dose: 16-24 months (MR2-98% protection) In case of delayed immunization, it can be given up to 5 years At 9 completed months, JE vaccine is given Both MR and JE is given subcutaneously (0.5 ml) MR is given in right arm It is a reconstituted vaccine (freeze dried vaccine) Diluent- distilled water, sterile water This vaccine is sensitive to light and heat Post vaccination: Measles like illness (1-3 days)



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Other name: German Measles
- 5. People are most commonly affected in both developed and developing countries

Down

- 1. Maculopapular confluent rash (starts behind the ear)
- 3. Communicable disease that causes respiratory infection
- 4. Maculo papular or maculopapular confluent (crowded) rash (retro auricular in origin)

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4

CHICKENPOX AND SMALLPOX



Chicken Pox (Varicella) 00:00:30

Epidemiological determinants 00:00:37

- **Agent:**
 - Varicella-zoster virus-HHV-3-human herpes virus-3
 - **Double-stranded DNA virus.**

Source of infection	case of chickenpox-rashes and scabs are formed. Scabs are not infected, but the vesicular fluid is contaminated.
Period of communicability	1-2 days before & 4-5 days after the onset of the rash.
Secondary attack rate	90%

• **Host factor:**

- Age**
- <10 years
 - Very common in school-going children
 - Both genders are infected
 - One attack- lifelong immunity
 - Reactivation can occur

• **Environmental factors-**

- Seasonal distribution
- More common in winters and early spring
- Virus can survive outside the body for 24-48 hours.
- Can be easily killed by disinfectants

Modes of transmission 00:06:44

Mode of Transmission	<ul style="list-style-type: none"> • Droplet infection and droplet nuclei- airborne disease • Other airborne diseases: Measles, influenza, TB and covid-19 								
	<table border="1"> <tr> <td>In droplet nuclei- <5 micron-size of particles</td> <td>In droplet infection- >5 microns- the size of micron</td> </tr> <tr> <td>indirect mode of transmission</td> <td>Direct mode of transmission</td> </tr> <tr> <td>It remains suspended in air</td> <td>Due to gravity-it falls</td> </tr> <tr> <td>Travels the distance of >1 meter</td> <td>Travel a distance of < 1 m</td> </tr> </table>	In droplet nuclei- <5 micron-size of particles	In droplet infection- >5 microns- the size of micron	indirect mode of transmission	Direct mode of transmission	It remains suspended in air	Due to gravity-it falls	Travels the distance of >1 meter	Travel a distance of < 1 m
In droplet nuclei- <5 micron-size of particles	In droplet infection- >5 microns- the size of micron								
indirect mode of transmission	Direct mode of transmission								
It remains suspended in air	Due to gravity-it falls								
Travels the distance of >1 meter	Travel a distance of < 1 m								

Vertical Transmission

Manifests In the form of congenital varicella

Incubation period

14-16 days

Clinical Features 00:10:00

1. Pre-eruptive stage-
 - Fever
 - Malaise
 - Coryza
 - Backache
2. Eruptive stage-
 - Starts the first day when the fever starts.
 - Rash is present.

Rash

- Rash starts on the trunk, spreads to rest of the body-face also
- It spares the palm and soles
- Affect the mucosal surfaces and axilla
- Centripetal in distribution



- These are superficial
- Unilocular
- Area of inflammation around the rash
- It is a clear fluid vesicle; it looks like a dew drop or rose petal
- Symmetrical
- Pleomorphism-all stages present simultaneously at one time
- Rashscab forms in 4-5 days (non-infective) vesicular fluid is infective

Complications 00:21:57

- Seen in <1% cases
- **Varicella pneumonia**-neonates, children, adults and immunocompromised- most serious
- Encephalitis
- Hemorrhage
- Treated with aspirin-can develop Reyes syndrome (rare)
- Pregnancy-if infection is within 20 weeks-congenital varicella syndrome

Maternal Varicella

00:23:38

- Maternal varicella during pregnancy may cause fetal wastage and birth defects such as:
 - Cutaneous scars
 - Atrophied limbs
 - Microcephaly
 - Low birth weight
 - Cataract
 - Microphthalmia
 - Deafness
 - Chorioretinitis
 - Cerebrocortical atrophy

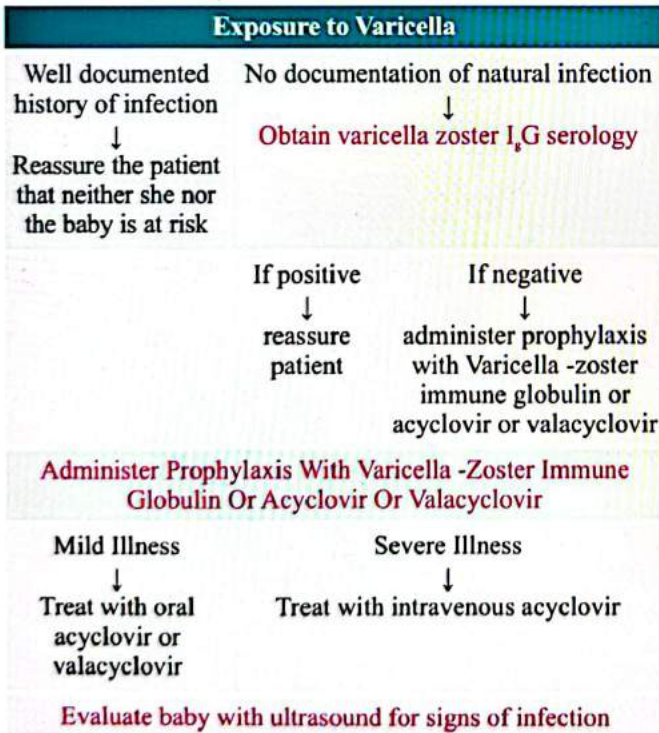


Important Information

- Varicella in first 2 trimesters
 - Congenital varicella
- Varicella at any stage of pregnancy especially 3rd trimester
 - Maternal varicella pneumonia-there will be no congenital varicella defect
- Varicella ≤ 5 days antepartum to 2 days postpartum
 - Neonatal varicella

Algorithm for Diagnosis and Management of Varicella in Pregnancy

00:25:32



Prevention

00:28:15

- Active immunization
- Strain: OKA strain
- Type: live vaccine

- Dose: 0.5 ml subcutaneous route
- Schedule:
 - Given in 2 doses between 12-18 months
 - Booster dose is given at 4-5 years of age - 12 months to 12 years of age range
 - If given < 12 years- the gap between two dosages should 1-3 months
- Can also be given to adolescents and adults.
- Two doses of 0.5 ml sc-if given to more than 12 years-then gap is 4-8 weeks apart
- Chicken pox vaccine can be given in the form of **MMRV-measles mumps rubella varicella**

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Combination Vaccine

00:30:46

- MMRV— administered to 9 months to 12 years old children
- Two doses schedule with an interval of 4 weeks
- It is preferred that 2nd dose be administered 6 weeks to 3 months after 1st dose or at 4-6 years of age.

Post Exposure Prophylaxis

00:31:20

- Can be done if there is known exposure to varicella virus — give OKA vaccine within 5 days of exposure

Varicella Zoster Immuno Globulin- VZIG

00:32:00

- VZIG is given within 72 hours of exposure is recommended for prevention of chickenpox in exposed individuals especially in:
 - Passive immunization
 - HIV/AIDS or immunocompromised persons
 - Immunosuppressive therapy patients
 - Congenital cellular immunodeficiency
 - Pregnant females, early neonates, premature infants or low birth weights
- Dose - 12.5 units/kg with a maximum of 625 units repeat the dose in 3 weeks if the high-risk patient remains exposed.

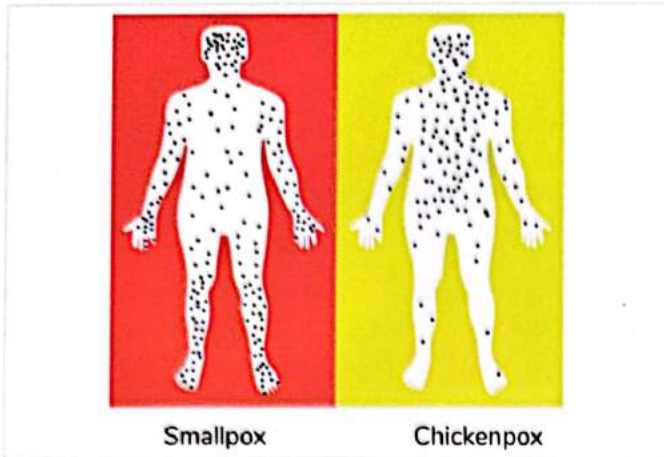
Smallpox

00:17:31

- Agent-
 - Variola Virus - double stranded DNA virus
- Globally eradicated— May 1980
- Total eradication of smallpox in India - April 23, 1977
- Smallpox mortality rate is higher than chickenpox mortality rate.

Rash

- Deep-seated rash
- Multilocular
- No area of inflammation around the rash
- Soles and palms - involved.
- Centrifugal in distribution (coming from the extremities and going towards the center).
- No pleomorphism (all stages separately will not be shown)



Smallpox Rash	Chickenpox rash
Deep seated	Superficial
No area of inflammation around the rash	Area of inflammation around rash
Multilocular	Unilocular
Centrifugal	Centripetal
No pleomorphism	Pleomorphism is present
Palms and soles are not spared	Palms and soles are spared

MCQs

Question: Is chickenpox infectious?

- 2 days before and 2 days after the rash appearance
- 2 days before and 5 days after the rash appearance
- 4 days before and 4 days after the rash appearance
- 4 days before, and 5 days after the rash appearance

Answer - (b) 2 days before and 5 days after the rash appearance

Question: WHO declares the global eradication of smallpox?

- 26th October 1977
- 5th July 1975
- 17th May 1975
- 8th May 1980

Answer- (d) 8th May 1980

Question: Smallpox eradication was successful due to all of the following reasons, except

- Subclinical cases did not transmit the diseases
- A highly effective vaccine was available
- Infection provides lifelong immunity
- Cross-resistance existed with animal pox

Answer- (d) Cross-resistance existed with animal pox

Question: What is the rate of secondary chickenpox attacks?

- 60
- 50
- 90
- 40

Answer- (c) 90

Question: What is the chickenpox vaccine?

- Live vaccine
- Killed vaccine
- Conjugated vaccine
- Toxoid vaccine

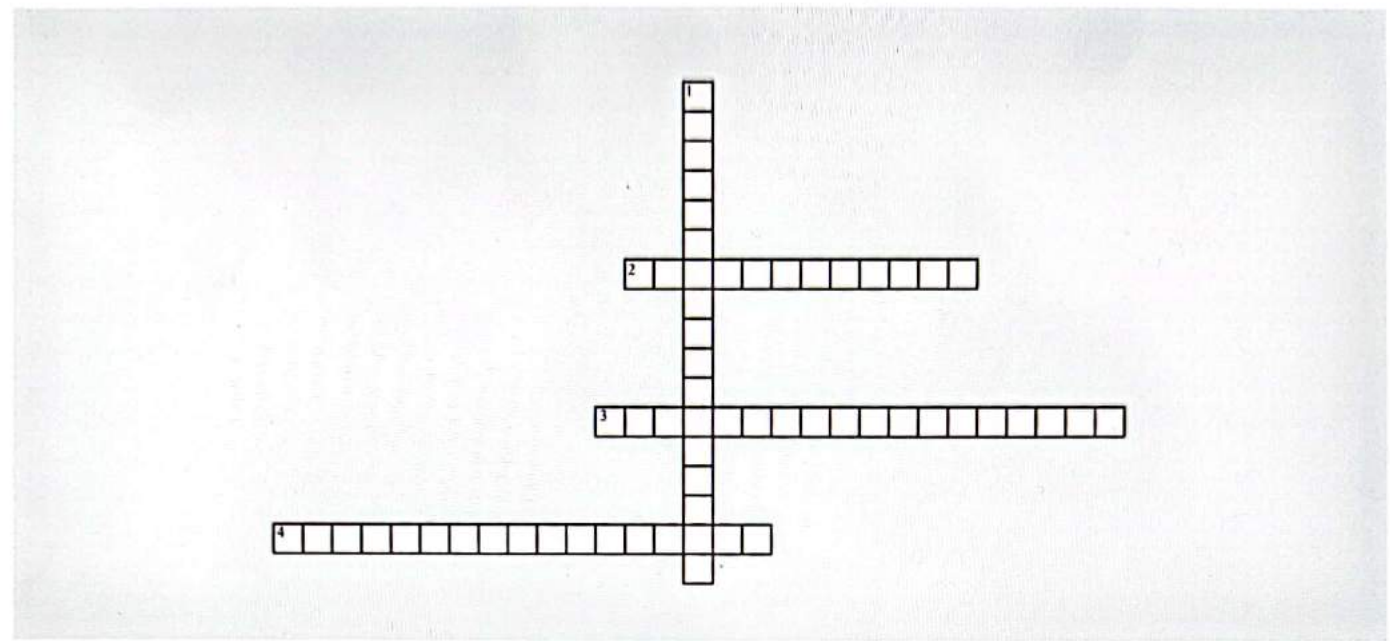
Answer - (a) Live vaccine



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. No it is not superficial- deep-seated rash
- 3. neonates, children, adults and immunocompromised- most serious
- 4. Varicella <= 5 days antepartum to 2 days postpartum

Down

- 1. Cutaneous scars

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5

MUMPS AND PERTUSSIS

Mumps



- There is a presence of unilateral swelling/inflammation of the parotid gland which is a characteristic feature of Mumps.

Epidemiological Determinants of Mumps

- Agent: It is a single stranded negative sense RNA virus.
 - It belongs to Family: **Myxovirus**
 - Source of infection: Case (Case of measles) & subclinical cases (30-40%)
 - Mumps follows an iceberg phenomenon
 - Period of communicability/transmissibility of mumps: 4 to 6 days before onset of symptoms and 1 week after.
 - Secondary attack rate: 85%
 - Period of communicability/transmissibility of infection is always displayed by secondary attack rate
 - Immunity: It gives life long immunity
- Host Factor
 - Age group affected: Children between 5-9 years old
 - Gender affected: Both genders can get affected
- Environmental Factor
 - It is more commonly seen in **winter and early spring**
- Mode of Transmission: **Droplets (direct mode)**
- Incubation period: **14 to 18 days**

Clinical Features

- Mumps presents with **high grade fever**, unilateral swelling of salivary gland particularly parotid gland and pain of the parotid gland.
- Child also presents with ear ache on the affected side
- There will be presence of stiffness and difficulty on opening the mouth
- **Maximum infectivity:** Just before and onset of parotitis.
- There will be no infectivity once the swelling subsides

Other organs affected in mumps/Extra salivary manifestations

- Testes
- Ovaries
- Pancreas
- Heart muscles
- Other salivary glands

Diagnosis of Mumps

- It is usually done clinically
- It can be done by isolating the mumps virus from saliva, urine or CSF
- Positive mumps IgM antibody without mumps immunization in previous 6 weeks
- Seroconversion with 4 fold or greater rise in mumps IgG titre

Complications in Mumps

- **Orchitis** - It is commonly unilateral and most common extra salivary gland manifestation
 - It also affects sublingual and sub mandibular gland
- **Ovaritis:** Inflammation of ovaries
- **Pancreatitis** - Mumps is the leading cause of pancreatitis in children
- **Meningoencephalitis**
- **Thyroiditis, Neuritis**
- **Hepatitis, Myocarditis**
- **Oophoritis (Mostly unilateral)**
- **Sensorineural deafness-** One of the most infectious cause for sensorineural deafness is mumps.
- **Most common complication of mumps in children : Aseptic meningitis**
- **Most common complication among adolescents: Orchitis (mostly unilateral), Oophoritis**

Prevention

- Previously, mumps vaccine was given in NRIS but now due to substantial immunity it is not given
- Strain used for mumps vaccine: **Jeryl Lynn strain**
- **Other strains:**
 - Leningrad 3
 - RIT4385
 - L-Zagreb
 - Urabe strains
- Rubini strain for mumps is not currently recommended by WHO.
- **Route:** Intramuscular

- **Dose:** 0.5ml
 - It is given in children of >1 year of age
 - It can be given either alone or in the combination of MMR and MMRV vaccine.
- Second dose is recommended at 4 - 6 years of age (just before entering school).

Pertussis

- It is also known as 100 days cough
- There is paroxysm of cough followed by inspiratory whoop

Epidemiological Determinants

1. **Agent:** *Bordatella pertussis*
 - In 5% cases, *para pertussis* is responsible.
 - **Source of infection:** Case of pertussis
 - There is no subclinical case and carriers reported
 - **Period of communicability/transmissibility:** 1 week post exposure till 3 weeks after onset of paroxysmal stage
 - **Secondary attack rate:** >90%
 - **Immunity:** Neither natural infection nor vaccination gives life long immunity

2. Host factors

- Age group: <5 years
- Highest mortality is seen in children <6 months
- **Gender:** Incidence and mortality is more among females

3. Environmental factors

- It can be present throughout year due to overcrowding
- Mode of transmission: Droplets and Formites
- Incubation period: 7-14 days
- **Complication:** Bronchitis, Bronchectasis, Bronchopneumonia, hemoptysis

Clinical Features

- **Catarrhal stage:** It lasts for 10 days
 - Insidious onset
 - Sneezing, Coryza
 - Lacrimation, Anorexia
 - Malaise
 - Hacking night cough that starts showing diurnal variation.
 - It is most infectious during the Catarrhal stage.
- **Paroxysmal stage:** It lasts for 2-4 weeks
- There is burst of rapid and consecutive cough followed by deep, high pitched inspiration (**Whoop**)
- Vomiting, Cyanosis and Apnea.
- **Convalescent stage:** Last for 1-2 weeks

Treatment: Erythromycin (30-50mg/kg/QID) for 10 days.

- For contacts: Prophylactic erythromycin or ampicillin can be given.

Prevention

- It can be prevented by *Diphtheria vaccine*
- Diphtheria vaccine is now given in the form of **pentavalent vaccine.**
- **DPT vaccine-** Combinational vaccine for Diphtheria, Pertussis and Tetanus
- Dose: 0.5ml
- Route: Intramuscular
- Site : Anterolateral aspect of left thigh.
- Schedule: It can be given separately or Pentavalent at 6 weeks, 10 weeks and 14 weeks as penta 1, 2 and 3 respectively
- At 16-24 months, DPT 1st booster is given
- At 5-6 years; DPT 2nd booster is given.
- **Delayed Vaccination/Immunization:** DPT can be given up to 7 years

Vaccine	Amount per dose
Diphtheria toxoid	25 If
Tetanus toxoid	5 If
Pertussis killed acellular bacilli	20000 million
Aluminous phosphate	2.5 mg
Thiomersal	0.01%

- **Aluminum phosphate or aluminum hydroxide:** It acts as adjuvant and increases immunogenicity of vaccine.
- **Thiomersal:** It acts as preservative in DPT

Reactions due to Pertussis Component:

- Inconsolable crying of the baby
- **Hypotensive hyporesponsive encephalopathy (HHE)**

Contraindications to Pertussis Vaccine

- Past history of anaphylaxis or vaccine reactions
- Encephalopathy
- Family history of ^{prince}epilepsy, convulsions and CNS disorders
- Any concurrent febrile illness

Disease	DPT status
Cerebral Palsy (non progressive disorder)	can be given
Active Epilepsy	not given
Epilepsy controlled on anti epileptic	can be given

Key Points

- DPT and measles vaccines result in fever.
- Antipyretic is must to be given as take home, need based medication.

MCQS

01. Most common complication of mumps in children is?

- A. Pneumonia
- B. Pancreatitis
- C. Aseptic meningitis
- D. Encephalitis

Ans: Aseptic meningitis

02. Which is not true regarding B. Pertussis?

- A. The source of infection is only a cause of pertussis
- B. Chronic carriers are main source of infection
- C. Chronic carriers are not known to occur
- D. Subclinical infection is not known to occur

Ans: Chronic carriers are main source of infection

03. Which of the following is not true regarding pertussis?

- A. Most infections during paroxysmal stage
- B. Affects infants & preschool children
- C. Highest mortality in infants < 6 months
- D. Recovery is followed by immunity

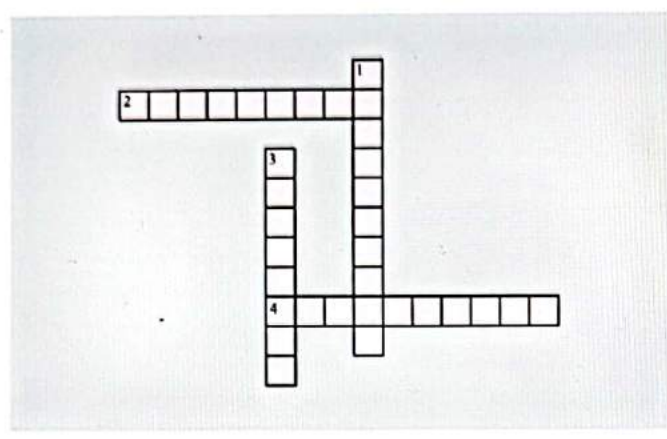
Ans: Most infectious during paroxysmal stage



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Age group of 5-9 years old
- 4. Acts as preservative in DPT

Down

- 1. It can be prevented by Diphtheria vaccine
- 3. Commonly unilateral and manifestation of the most common extra salivary gland.

6 DIPHTHERIA

- Endemic in India
- Caused by- *Corynebacterium diphtheriae* (produces a powerful exotoxin)

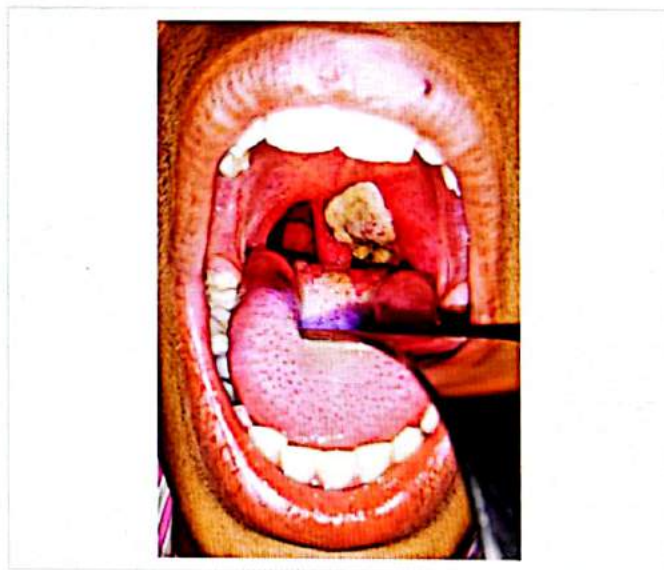
1. Agent	<i>Corynebacterium diphtheriae</i> <ul style="list-style-type: none"> • Gram-positive, non-motile organism
Types of diphtheria (<i>Corynebacterium diphtheriae</i>)	<ol style="list-style-type: none"> 1. Gravis - most severe 2. Mitis 3. Belfanti 4. Intermedius
Source of infection	Case of diphtheria
Carriers	<ul style="list-style-type: none"> • Healthy carriers • Chronic carriers • Incubatory carriers
Incidence of diphtheria carriers	0.5-1%
Period of communicability	14-28 days from onset of disease

Incubation period	2-6 days
Case Fatality Rate (CFR)	Up to 10% if not treated

Clinical Types

1. Pharyngotonsillitis Diphtheria
 - Sore throat
 - Difficulty in swallowing
 - Low-grade fever - malaise
 - Headache
 - Cervical lymph node enlargement
2. Laryngotracheal
3. Nasal diphtheria
4. Cutaneous diphtheria

Pseudo Membrane Formation



Epidemiological Determinants

00:00:56



Important Information

- Chronic carriers are responsible for 95% of the infection.
- Most dangerous – Nasal carriers > throat dangerous
- Immunization does not prevent carrier state
- A case or carrier is considered non-infectious when at least two cultures obtained from nose & throat 24 hours apart is negative for the bacilli.
- Secondary attack rate is not relevant.

2. Host Factor	Age - 1-5 years Both genders - equally susceptible
3. Environment Factors	Throughout the year More commonly - winters
Mechanism of transmission	Nasopharyngeal secretion Droplet infection Contaminated fomites Infected skin lesions

- Causes
 - Bacterial growth
 - Toxin production
 - Necrosis of underlying tissue
- Features of the membrane:
 - Greyish or yellowish membrane
 - Well-defined edges
 - Do not try to remove the membrane – bleeding occurs if removed or wiped off
 - Submandibular edema & enlargement of the anterior portion of the neck – bull's neck appearance



Complications

00:15:16

- Organ damage
 - Cardiovascular system- myocarditis, heart failure & arrhythmias
 - Respiratory system- respiratory failure
 - Renal system- renal tubular necrosis, proteinuria
 - CNS - palatal palsy and ocular palsy

Treatment

00:17:06

Cases

- Give diphtheria antitoxin
- IM/IV route
- Always perform skin sensitivity testing before giving anti-toxin
 - Mild/moderate - anti-toxin by IM route
 - Severe cases - by IV route
- Dose- 20,000-1,00,000 IU

Mild cases	20,000 to 40,000 IU
Moderate cases	40,000 to 80,000 IU
Severe cases	80,000 to 1,00,000 IU

Anterior nasal diphtheria (a mild form of diphtheria)	10,000-20,000 units
Tonsillar diphtheria	15,000-25,000 units
Pharyngeal/laryngeal diphtheria (<48 hours)	20,000-40,000 units
Nasopharyngeal diphtheria	40,000-60,000 units
Extensive disease (>3 days) or with bulls neck	80,000-1,20,000 units

- Obtaining serial cultures at regular intervals for negative report
- Antibiotics: penicillin or erythromycin for 12-14 days
- Diphtheria toxoid will be given in convalescent phase only if the case is unimmunized.

Carriers

00:22:10

- Oral erythromycin- for 10 days

Contacts

00:22:46

- Assess them for signs and symptoms
- Sample obtained for culture
- Put on antibiotics - penicillin or erythromycin- 7-10 days
- Stop antibiotics when culture is negative
- Diphtheria toxoid - given to contacts write of diphtheria.
 - Status is unknown and
 - Child has received less than three doses- of diphtheria toxoid - complete the series - 3 primaries + 2 booster dosage
 - Person has taken
 - >3 doses and
 - The last dose was taken > 5 years ago- single diphtheria toxoid booster dose
 - The child has taken
 - >3 doses or
 - The last dose was taken < 5 years ago- continue dosage as per NIS scheduled.

Control

- Diphtheria vaccine - DPT vaccine//pentavalent vaccine
 - 6 weeks - pentavalent₁
 - 10 weeks - pentavalent₂
 - 14 weeks - pentavalent₃
 - 16-24 months - pentavalent cannot be given so DPT given - DPT_{1a} booster
 - 5-6 years - DPT_{2ad} booster
 - Always known as combination vaccines

MCQ's

- Q. What is the infective period of diphtheria?
- A. From 1 week after exposure to 3 months
 - B. 14-28 days from the onset of disease**
 - C. 4-6 days before the onset of symptoms and a week after that
 - D. None of the above
- Q. Isolation of all suspected diphtheria cases is done till?
- A. Symptoms subside
 - B: 2 consecutive swabs are negative**
 - C. Schick test is -ve
 - D. Ab titer decreases

Q. All are true of carriers state in diphtheria except?

- A. Incidence 0.1- 5% in the community
- B. Immunization prevents carrier state**
- C. Chronic carrier persists for a year
- D. Nasal carriers are particularly dangerous

Q. Which of the following is not true about diphtheria?

- A. Grayish black membrane on the posterior pharynx or tonsil
- B. Membrane can be removed easily**
- C. Minimal mucosal erythema surrounding the membrane
- D. Cutaneous diphtheria is common in tropic

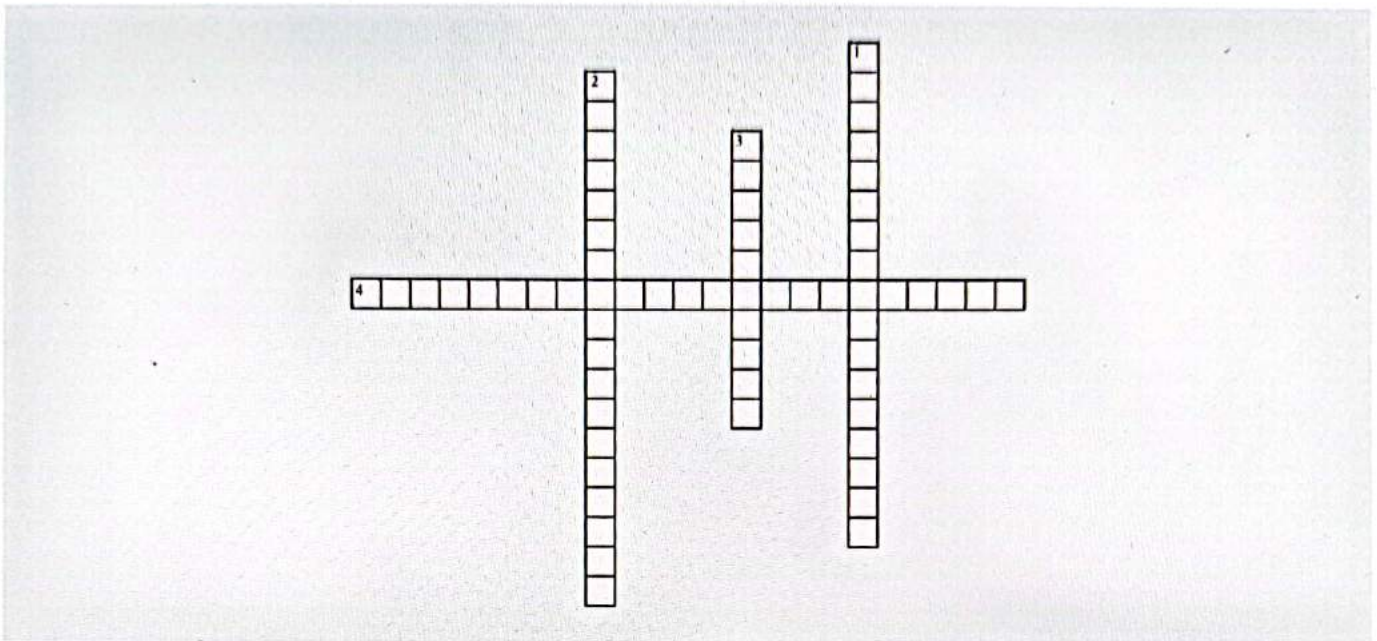
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 4. Nasopharyngeal secretion Droplet infection

Down

- 1. Case of diphtheria
- 2. Throughout the year but are more commonly reported during the winter months
- 3. Age - 1-5 years Gender - equally susceptible to diphtheria

7

ACUTE RESPIRATORY INFECTION



- ARI is divided into two types:
 - AURT (acute upper respiratory tract infection)
 - ALRT (acute lower respiratory tract infection) - Pneumonia

Pneumonia 00:01.38

Agent

- Developing nations:
 - Streptococcus Pneumoniae (infection and mortality in children and adults)
 - Hemophilus influenza B.
 - Staphylococcus aureus
- Developed nations- Viruses are responsible.

Host 00:03.41

- Children and specially malnourished children
- Risk factors:
 - Overcrowding
 - Malnutrition
- Low birth weight
 - Pollution
- Mode of transmission:
 - Droplet
 - Droplet nuclei

IMNCI 00:04.54

- Integrated management of neonatal and childhood illness.
- Age group: 0 to 5 years
- Disease included:
 - ARI (Pneumonia)
 - Diarrhea
 - Measles: (MC Complication-Otitis Media)
 - Malaria
 - Malnutrition

The Integrated Case Management Process 00:06.40

Check for danger signs	Assess main symptoms	Assess
1. Convulsions 2. Lethargy/ unconsciousness 3. Inability to drink/breastfeed 4. Vomiting	1. Cough/ difficulty in breathing 2. Diarrhoea 3. Fever 4. Ear problems	<ul style="list-style-type: none"> Nutrition Immunization status and Potential feeding problems
Check for other problems		

Classify the condition of the child and assign to one of the three color codes

And
Identify the treatment actions as per the actions listed in that color band

Urgent referral	Treat at the OPD	Home Management
1. Pre-referral treatments 2. Advise parents 3. REFER and child At the referral facility 1. ETAT 2. Diagnosis, treatment and 3. Monitoring and follow up	1. Treat local infection 2. Give oral drugs 3. Advise and teach mother 4. Follow-up	Counsel caretaker on how to: 1. Give oral drugs 2. Treat local infections at home 3. Continue feeding 4. Danger sings 5. Follow-up

Pneumonia Classification 00:10.13

- It is divided into two groups.

Age up to 2 months	Age up to 2 months to 5 years
<ul style="list-style-type: none"> No chest indrawing and/or fast breath ↓ No Pneumonia Simple cough and cold Chest indrawing and/or fast breath ↓ Severe Pneumonia 	<ul style="list-style-type: none"> No chest indrawing and/or fast breath ↓ No Pneumonia Simple cough and cold Chest indrawing and/or fast breath ↓ Pneumonia
<ul style="list-style-type: none"> Baby shows danger signs that are <ul style="list-style-type: none"> Convulsions Lethargy Unconsciousness Inability to drink/breastfeed Vomiting Cyanosis Abnormally sleepy or difficult to wake Stridor in a calm child ↓ Very Severe Pneumonia 	<ul style="list-style-type: none"> Baby shows danger signs that are <ul style="list-style-type: none"> Convulsions Lethargy Unconsciousness Inability to drink/breastfeed Vomiting Cyanosis Abnormally sleepy or difficult to wake Stridor in a calm child ↓ Severe Pneumonia

Important Information

- Fast breathing: **Rule of 60, 50, 40.**
 - If a child is up to 2 months and the respiratory rate is greater than 60 breaths per minute, it will be considered fast breathing.
 - If a child is between 2 to 12 months and the respiratory rate is greater than 50 breaths per minute, it will be considered fast breathing.
 - If a child is between 1 to 5 years and the respiratory rate is greater than 40 breaths per minute, it will be considered fast breathing.

- Always check for malnutrition status
 - If a child is **SAM child**, in that case the Pneumonia gets hidden, and the child will always belong to the category of **Very Severe Pneumonia**
- If malnutrition is superimposed, the child has to be referred to a hospital.

Red Flags

00:26:06

- Sign of respiratory distress, nasal flaring & chest indrawing
- Younger than 2 months
- Decreased level of consciousness
- Stridor when calm
- Severe malnutrition
- Associated symptomatic HIV/AIDS

Management

00:17:44

	Age upto 2 months	Age upto 2 months to 5 years
1. No Pneumonia	Symptomatic home management i.e., <ul style="list-style-type: none"> • Advice mother to keep baby warm, • Continue breastfeeding, • Look out for danger signs and come to hospital when danger signs appear. 	Symptomatic home management i.e., <ul style="list-style-type: none"> • Advice mother to keep baby warm, • Continue breastfeeding • Look out for danger signs and come to the hospital when danger signs appear.
1. Severe Pneumonia/ Pneumonia	<ul style="list-style-type: none"> • Refer to CHC (pediatrician) • Give first dose of antibiotic (Amoxicillin syrup) • Keep the baby warm 	<ul style="list-style-type: none"> • Give first dose of antibiotic (Amoxicillin syrup) • Home care advice
Very Severe Pneumonia/ Severe Pneumonia	<ul style="list-style-type: none"> • Refer urgently to hospital or CHC • Give first dose of antibiotic (Amoxicillin syrup) • Advice mother to keep baby warm, • Continue breastfeeding 	<ul style="list-style-type: none"> • Refer urgently to hospital or CHC • Give first dose of antibiotic (Amoxicillin syrup) • Advice mother to keep baby warm, • Continue breastfeeding

MCQ's

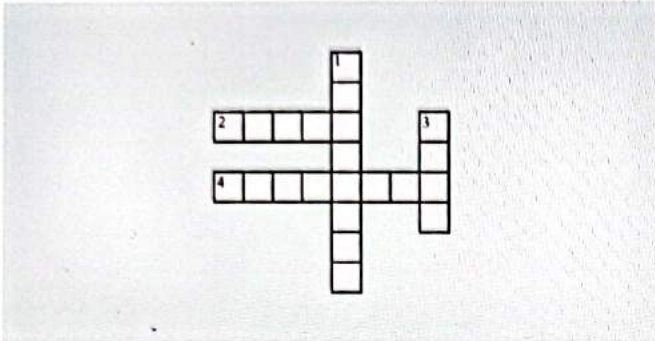
- Q. A child aged 24 months was brought to the PHC with complaints of cough and fever for the past 2 days. On examination the child weighed 11kg, respiratory rate was 38/minute, chest drawing was present. The most appropriate line of management for this patient is?
- A. Classify as pneumonia and refer urgently to secondary level hospital
- B. Classify the pneumonia, start antibiotic and advice to report after 2 days
- C. Classify as severe pneumonia, start antibiotics and refer urgently
- D. Classify as severe pneumonia and refer urgently



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Integrated management of neonatal and childhood illness.
- 4. Sign of respiratory distress, nasal flaring & chest indrawing
Younger than 2 months

Down

- 1. Streptococcus Pneumoniae (infection and mortality in children and adults)
- 3. Children and specially malnourished children

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8

TUBERCULOSIS



Introduction

00:00:31

- TB primarily affects the lungs.
- Can also affect other organs - **extrapulmonary TB**.
 - Intestine
 - Meninges
 - Bones and joints
 - Skin
 - Lymph nodes
- TB doesn't affect the hair and nail.
- **Bovine TB**
 - Affects animals like cattle.
 - Can be transmitted to man.
- TB is the barometer of social welfare.
 - **95% deaths** - in low and middle socio- economic countries.
- **Associations-**
 - HIV positive-
 - Most common opportunistic infection in India among HIV patients - **TB infection**.
 - Tobacco -
 - increases the risk of death due to TB.
 - 20% cases of TB worldwide are attributed to smoking.
 - Diabetes
- Patients with **active** infectious pulmonary TB can infect - **10 to 15 persons** per year.
- Duration of treatment reduces infectivity - **48 hours to 7 days**.
- If treatment stopped in middle- may develop resistance.

Epidemiological Factors

00:05:29

Agent

- **Typical bacteria** - affects new lungs
 - **Mycobacterium tuberculosis**.
 - Facultative
 - Intracellular parasite.
 - Acid fast bacilli.
- **Atypical Mycobacteria**: Affects already diseased lungs.
 - Photochromogens - **M. Kansassi**.
 - Produces pigment.
 - Scotochromogens - **M. Scrofulaceum**.
 - Non photochromogens - **M. Intracellulare**.
 - Rapid growers - **M. Fortuitum**.



Important Information

- **Other Acid-fast bacilli-**
 - Nocardia
 - Isospora
 - Mycobacterium leprae

Differences between typical and atypical mycobacteria

Typical mycobacterium	Atypical mycobacterium
Highly virulent	Less virulent
Can infect healthy lung	Capable of infecting diseased lung (eg: lung with congenital deformity, cystic fibrosis)
Can spread directly from human to human	There is no evidence of direct human spread. They spread from the environment to human
Are usually sensitive to standard anti mycobacterial drugs like INH or streptomycin	Are usually resistant to standard anti mycobacterial drugs
All typical mycobacterial are slow growers	Some atypical mycobacterial are slow grower and some are rapid growers
All are pigment non-producers	Some are photo chromogen. Some are scotochromogen and some are non-chromogen.

Source of infection

- Human case with sputum positive infected with **tuberculosis bacilli**.
- Has either received no treatment or not treated fully.
- **Bovine source** - infected milk.
- Patients remain infected as long as they are not treated or partially treated.
- **New case** - TB treatment for the first time or treated for less than **1 month**.
- **Previously treated** - treated for more than 1 month.

Host Factors

00:11:01

- Affects all ages.
- More common - **15 to 54 years**.
- No inherited immunity against TB.

Mechanism of transmission

00:11:19

- **Droplet nuclei**
 - Airborne disease
 - **Indirect mode of transmission**.
 - Size **< 5 microns**.
 - Remains suspended in air.
 - Travel a distance **> 1 meter**.

- **Droplet**
 - Direct mode of transmission.
 - Size > 5 microns.
 - Travel a distance < 1 meter.

Forms of TB

00:12:23

- **Latent TB:** 40% population has latent TB.
 - Infected with M. TB but does not have an active TB disease.
 - Bacilli is dormant.
 - Noninfectious.
 - 10% of infected people develop active TB later.
- **Tests**
 - Tuberculin skin test
 - Alpha interferon test.

Epidemiological Indicators of TB

00:13:53

TB infection

- **Incidence of TB infection - Tuberculosis conversion index aka Annual risk of infection (ARI).**
 - Over a period of 1 year out of all those who were tuberculin negative became tuberculin positive.
 - Not used nowadays.
 - For every 1% increase in ARI in any country there will be 50 new sputum smear positive cases / 100000 population.
 - Indicator of impact of recent control measures.
- **Prevalence of TB infection - tuberculin test.**

TB Disease

00:19:15

- **Incidence of TB disease –**
 - Measured by Sputum smear microscopy.
 - New cases.
 - Cohort study.
- **Prevalence of TB disease –**
 - Also by sputum smear microscopy
 - Existing cases.
 - Cross sectional study.
- **Best epidemiological Indicator of TB disease: Incidence of TB disease.**

Diagnosis

00:21:06

Sputum Microscopy

- 1st choice of diagnosis.
- Used in screening of TB in the community.
- Less sensitive.
- Cost effective.
- Sputum smears - stained for AFB with Ziehl Neelson stain.
- Decolorizer: Sulphuric acid.
- Counterstain: Löffler's methylene blue.

Sputum Microscopy Reporting

- 10,000 organisms per ml of sputum - test is positive.
- Sputum should be expectorated - at least 5 ml.
- 2 sputum samples should be taken.
 - One on spot.
 - Other in the early morning - fasting for 8 hours before the test.
- Any one is positive - a person is microbiologically TB positive.

Number of AFB	Field	Report
No AFB	In 100 immersion field	Negative
1 to 9	In 100 immersion field	Scanty
10 to 99	In 100 immersion field	1+
1 to 10	Per field examination	2+
> 10	Per field examination	3+

Disposal of sputum-

00:25:42

- In household-
 - Collect on paper or handkerchief.
 - Burn it.
- At facility level.
 - Take a tube with 5% cresol.
 - Spit the sputum in the tube.
 - Leave for 12 hours.
- At large hospitals
 - Burning (incineration).

Fluorescence Microscopy

00:26:52

- Performed in industrialized countries.
- Not performed in India.
- Performed with Auramine stain.
- Expensive

Radiography

00:27:00

- Used to diagnose smear negative pulmonary TB.
- TB in children
- Useful for extrapulmonary forms of TB.

Sputum Culture

00:27:19

- **Gold standard test - Liquid culture.**
- Can be done with different media.
 - Conventional egg based solid media - LJ medium.
 - Turn around time - 84 days.
 - Agar based - MiddleBrook 7H10 and 7H11.
 - Liquid media - Kirchner's or middle Brook 7H9 broth.
 - Turn around time - 42 days.

Molecular Susceptibility Tests

00:28:50

- Identification of mycobacterium directly from the sputum samples.

- **Genexpert** - Cartridge based nucleic acid amplification test (CBNAAT).
 - Turn around time - 2 hours.
 - Detects only **rifampicin resistance**.
- **Line probe assay** -
 - turn over time - 72 hours.
 - Detects both **rifampicin and isoniazid resistance**.

For drug resistant and drug sensitive TB:

- Cytopathology
- Histopathology
- Radio imaging supports extra pulmonary TB Diagnosis.

For drug resistant TB:

- Sputum microscopy
- CBNAAT
- Chest x-ray

Tests for Detecting TB Infection

00:31:49

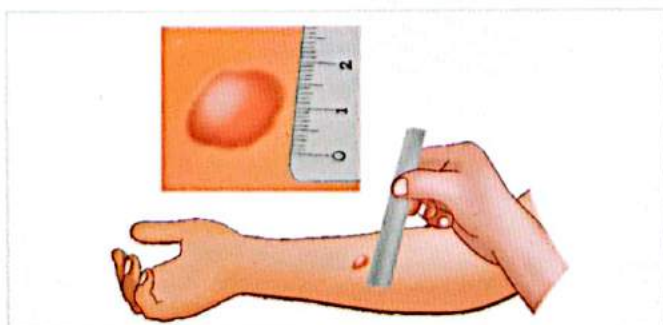
- **IGRAs** - interferon gamma release assay.
 - Diagnosis of TB infection not TB disease.
 - FDA or CDC approved IGRA -
 - **Quantiferon - TB gold in tube test**.
 - **T spot**.

Mantoux Test

00:32:21

- Also called **tuberculin test**.
- Tool for detection of TB infection.
- **Dose:** 1TU of PPD In 0.1 ml injected intradermally on the forearm.
- In India **PPT RT 23** with tween 80 is used.
- Test of **prognostic significance**.
- Limited validity due to lack of specificity.
- Result read after **72 hours**.
- Only induration is measured.

Induration	Result
Induration > 9mm	Positive (past or current infection)
Induration 6 to 9mm	Doubtful (M.TB or atypical mycobacterium)
Induration < 6mm	Negative (never infected)



- **False positive of tuberculin test**
 - Coverage of **BCG vaccine**.
 - Cross sensitivity to atypical mycobacterium.
- **>= 5 mm Induration** can be seen In
 - HIV positive.
 - Recent contacts with active TB.
 - **Fibrosis changes on chest x-ray with prior TB**.
 - Organ transplants and other
 - Immunosuppressive patients.
- **>= 10 mm**
 - Recent immigrants from high TB prevalence countries.
 - HIV negative drug abusers.
 - **Mycobacteriology lab personnel**.
 - Residents and employees of high risk areas.
 - DM, silicosis, cancers, blood disorders.
 - **Children < 4 years**.
- **>= 15 mm**
 - For persons with no risk factors.

Two Step Tuberculin Testing

00:35:38

- Done for:
 - Health personnel
 - Specific groups who are routinely tested.
- Previously infected persons as the immunity wanes off tuberculin test may be negative.
- The initial test given may boost the immunity to react to **tuberculin test** in the given future.
- Subsequent infection may be misinterpreted as a new infection, but due to immune modulation by previous test.
- Recommended for people who are to be **tested periodically**.
- 1st test read within 48 to 72 hours
 - If positive - tuberculin positive patients.
 - If negative - 2nd test after 3 weeks.
- 2nd test read within 48 to 72 hours - done **after 3 weeks**.
 - Positive - infected
 - Negative - uninfected

MCQs

- Q1.** One TB infected person can infect how many people
- 20
 - 10
 - 30
 - 5

- Q2.** Which of the following is the best indicator of the trend of TB which is not affected by the current control measures?

- Annual risk of infection
- Prevalence of TB infection
- % of Primary drug resistance
- % of multi drug resistance

Q3. Incidence of TB in a community is measured by

- A. Sputum smear positivity
- B. Tuberculin positive test
- C. Sputum culture
- D. Mantoux test positive

Q4. One of the following is known as tuberculin conversion test

- A. Incidence of infection
- B. Prevalence of infection
- C. Incidence of disease
- D. Prevalence of disease

Q5. Epidemic marker of TB

- A. Sputum AFB positivity rate
- B. Tuberculin test positivity rate
- C. Chest x-ray positivity rate
- D. None of the above

Q6. Percentage of individuals who show a positive reaction to a standard tuberculin test is

- A. Prevalence of infection
- B. Prevalence of disease
- C. Incidence of infection
- D. Tuberculin conversion index

Q7. During the asymptomatic phase, the only evidence of infection with TB may be

- A. Dry cough and fever
- B. Chest pain and dyspnoea
- C. Cervical node enlargement
- D. Skin test reactivity to tuberculin

Q8. McKeown's on decline in Incidence of infectious diseases like TB is better understood in terms of

- A. Increased awareness and knowledge
- B. Medical advertisement
- C. Behavioral modification
- D. Social and economic factors

Q9. True statement with regards to TB in diabetic is

- A. Severity of TB increases
- B. Incidence of TB increases
- C. Course of TB disease changes
- D. All of the above

Q10. Genexpert

- A. Detects DNA sequence by PCR
- B. Investigation for detection of HIV
- C. Investigation for detection of TB infection and rifampicin resistance
- D. Results obtained within 48 hours

Q11. Number of (+) tubercular bacilli if count in AFB sample is > 10 per cell immersion

- A. +
- B. ++
- C. +++
- D. Scanty

Tuberculosis and Diabetes

00:39:32

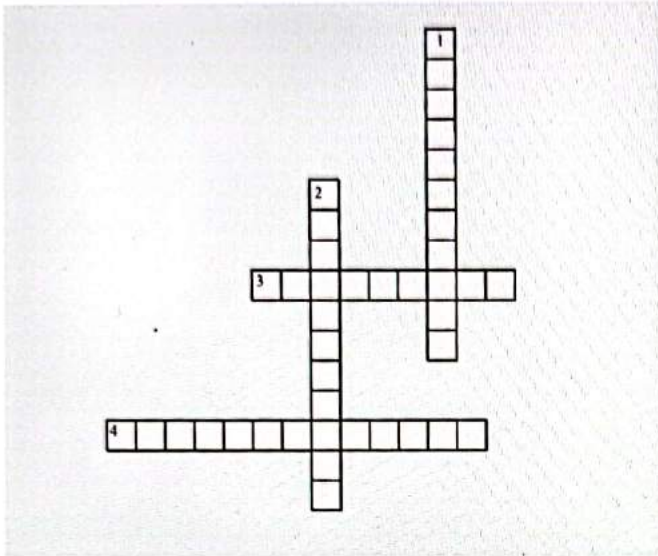
- Independent risk factor for TB.
- Accounts for 15% of all TB and 21% of smear positive TB.
- Risk of progression from latent to active TB is 2-3 times higher in diabetic.
- People with diabetes and TB are diagnosed very late
- Risk of death during TB treatment is high in diabetics (severity increases).



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Cartridge based nucleic acid amplification test (CBNAAT)
- 4. Under Sputum Microscopy, what acts as a decolouriser?

Down

- 1. Also called tuberculin test, it is a test of prognostic significance
- 2. Most common opportunistic infection in HIV patients



9 POLIO

Epidemiological Determinants

00:00:34

1. **Agents**
 - a. Wild Poliovirus-1 (WPV₁)
 - Still existing in Afghanistan & Pakistan
 - Most difficult to eradicate
 - Causes natural outbreaks
 - b. Wild Poliovirus-2 (WPV₂)
 - eradicated in September 2015
 - c. Wild Poliovirus-3 (WPV₃)
 - Eradicated in October 2019

Important Information

Polio Status in India

- India is currently Polio Free.
- The last case was seen in 2011.
- India achieved certification as a **Polio Free country in 2014.**
- But, there are chances of an outbreak from our neighboring countries.
- Hence, regular surveillance of polio must be adopted to prevent the outbreak.

Causative Agent	Poliovirus (Serotypes 1, 2 and 3)
WPV ₁	Most difficult to eradicate, natural outbreaks
WPV ₂	Eradicated, most antigenically stable
WPV ₃	Eradicated, VAPP

- WPV₃ is responsible for VAPP (Vaccine Associated Paralytic Polio). It is a rare form and **doesn't cause any outbreaks.**
- WPV₂ is responsible for C-VDPP (Circulatory Vaccine Derived Paralytic Polio). It is dangerous and **may cause outbreaks.**

Source of Infection

00:05:28

- Clinical case of polio
- Subclinical case of polio
- 1 Clinical case results in
 - 1000 subclinical cases in children.
 - 75 subclinical cases in adults.
- **Route of transmission:** Feces & Oropharyngeal excretion.
- **Period of communicability:** 7-10 days before & after the onset of symptoms.

2. Host factors

00:07:20

- a. Common in infancy
- b. Common in males compared to females (3:1)

3. Environmental factors

00:07:34

- Seasonal in distribution (June- September).

Clinical Presentation

00:08:41

Clinical Spectrum	Infection Rate	Remarks
In apparent (Subclinical)	95%	<ul style="list-style-type: none"> • No symptoms. • Diagnosed by isolation or rise in antibody titers
Abortive polio (Minor illness)	4-8%	<ul style="list-style-type: none"> • Mild illness (Self-limiting). • Diagnosed by isolation or rise in antibody titers
Non-paralytic polio	1%	Aseptic meningitis
Paralytic polio	<1%	Descending asymmetric flaccid paralysis

Diagnostic Tests

00:10:37

- Stool: Virus isolation
- Polio virus can be **isolated up to 8 weeks** after onset of paralysis.
- Maximum evidence is provided in the first 2 weeks after the onset of paralysis.

Vaccination

00:11:34

- Vaccination is done to control polio.
- Two types of vaccines are available

Characteristic	OPV (Sabin)	IPV (Salk)
Type of vaccine	Live attenuated virus	Killed formalized virus (All 3 types)
Mode of administration	Oral	SC or IM and ID (preferred)
Type of immunity	Humoral + Intestinal	Humoral
Prevention of	Paralysis + Intestinal re-infection	Paralysis
Control of epidemics	Effective	Not useful
Storage & transport	Requires sub-zero temperatures	Less stringent conditions
Shelf life	Short	Longer
VAPP	1 per 1 million vaccines	Zero incidences



Important Information

- Polio outbreaks OPV is considered as First line. Because IPV takes a longer time to develop immunity.
- We should vaccinate at least 500 children in the vicinity with OPV.
- SWITCH was proposed before IPV was introduced and polio virus was killed.
- IPV has no risk of paralysis.
- The Government of India wants to replace OPV with IPV completely.

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Oral (SABIN) Polio Vaccine (OPV)

- Live attenuated vaccine
- It has only 2 strains (bivalent) - WPV1 and WPV3
- Used in all routine and supplementary programmes
- WPV2 has been removed as it was causing C-VDPP.
- **MOA**
 - **Primary multiplication:** Intestinal epithelial cells.
 - **Secondary multiplication:** Peyer's patches (leads to viraemia)
 - Both local and systemic immunity (Nasal and duodenal IgA, Serum igM, igG, IgA).

Vaccination Schedule

OPV	IPV
<ul style="list-style-type: none"> • 6 weeks, 10 weeks, 14 weeks • Booster dose: 16-24 months 	<ul style="list-style-type: none"> • Given as Fractional IPV (Intradermally, 0.1ml) • 6 weeks, 14 weeks • 3rd FIPV dose is given at 9 completed months

Composition of OPV

Components	Strength
Poliovirus type 1	3 Lac TCID 50
Poliovirus type 2	1 Lac TCID 50
Poliovirus type 3	3 Lac TCID 50

Inactivated (SALK) Polio Vaccine (IPV)

00:16:08

Components of SALK vaccine	Strength
Poliovirus type 1	20D antigen units
Poliovirus type 2	2D antigen units
Poliovirus type 3	4D antigen units

Disadvantages of IPV Vaccine

- IPV is unsuitable during epidemics.
- Immunity is not rapidly achieved as >1 dose is required.
- Injections can precipitate paralysis during epidemics.

MCQ's

Q. What is the fractional dose of Inactivated polio vaccine (IPV) administered under the National Immunization Schedule?

- A. 0.5 ml
- B. 0.2 ml
- C. 0.1 ml
- D. 1 ml

Q. What is the status of polio in India currently?

- A. Polio-free
- B. Elimination
- C. Eradication
- D. All of the above

Q. Most natural outbreaks of polio are due to?

- A. Type I virus
- B. Type II virus
- C. Type III virus
- D. All of the above

Q. Which of the following serotypes of polio virus is most commonly associated with vaccine-associated paralytic poliomyelitis?

- A. Serotype 1
- B. Serotype 2
- C. Serotype 3
- D. Serotype 1 and 2

Q. Which of the following is not a type of vaccine-derived polio virus?

- A. cVDPV (Circulatory Vaccine-Derived Poliovirus)
- B. iVDPV (Immunodeficient Vaccine-Derived Poliovirus)
- C. aVDPV (Ambiguous Vaccine-Derived Poliovirus)
- D. mVDPV

Q. For every case of polio, the estimated number of subclinical cases is

- A. 10
- B. 50
- C. 500
- D. 1000

Q. The least common form of presentation of polio?

- A. Inapparent
- B. Abortive
- C. Non-paralytic
- D. Paralytic

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Q. The best way to diagnose poliomyelitis under the National Polio Elimination Program?

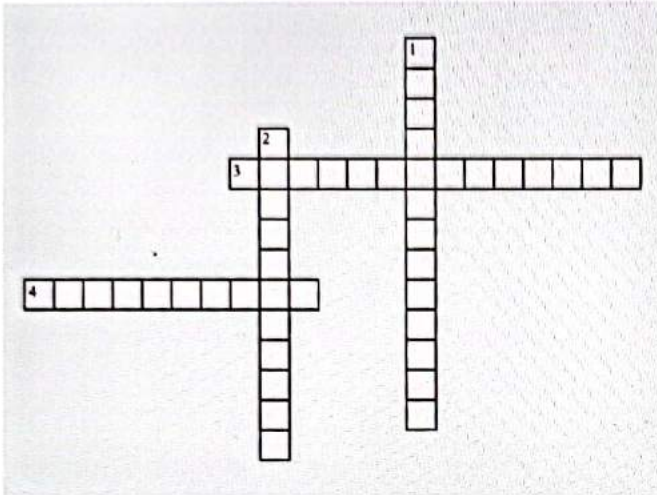
- A. Viral microscopy in stool
- B. Viral isolation in stool
- C. Clinical examination
- D. Antibodies titre raise in blood



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Descending asymmetric flaccid paralysis
- 4. No symptoms. Diagnosed by isolation or rise in antibody titres

Down

- 1. Mild illness (Self-limiting). Diagnosed by isolation or rise in antibody titers
- 2. Vaccination is done to control polio

10

HEPATITIS

Types of Hepatitis

00:00:08

Refer Table 10.1

Markers of Hepatitis-B Infection

00:06:14

Antigens

• HbsAg

- 1st to be detected
- Epidemiological marker
- Signals
 - Acute or chronic infection (if stays >6 months)
 - Carrier state

• HbcAg

- Rarely appears
- Infections viral material marker
- Most accurate index of viral replication
- Specific antibody is anti Hbc

• HbeAg

- Indicates active viral replication.
- Antigen appears during 3-6 week (indicates acute active infection)
- Persistent beyond 10 weeks (shows progression to chronic infection)

Antibodies

00:07:34

• Anti-HBc

- 1st to appear
- IgM - Acute infection
- IgG - Old infection

• Anti-HBe

- Good prognostic feature
- Signals low infectivity

• Anti-HBs

- Last to appear
- End of communicability period
- Recovery from HBV infection
- Development of Immunity and Cured
- Clinical recovery
- Subsequent immunity to HBV
- In immunized we can see Anti-HBs

Key Points

• Hepatitis B x antigen

- Hepatitis B x antigen is detected in HBeAg positive blood in patients with both acute and chronic hepatitis.

- HBxAg is a transcription activator.

- It does not bind to DNA.

- Specific antibody is Anti-HBx

- HBV DNA is detectable by PCR as soon as one week after initial infection but the test is generally only performed for research purposes or to detect mutants that escape detection by current methods.

- HBV DNA polymerase test for the presence of HBV DNA polymerase detectable within one week of initial infection are only performed for research purposes

Vaccine

00:09:32

Hep-B vaccine

- Recombinant monovalent combination or with other vaccines (prepared using HbsAg)

- Dose: 20 mcg (1ml)

- Given: 0, 1, and 6 months

- Route: IM

- High risk individuals

- IV drug users
- High risk sexual behavior
- Blood transfusion
- Health care workers
- Organ transplant recipients

- Hepatitis B post exposure prophylaxis is present

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Accidental Exposure

- Acute exposure to HbsAg positive blood
- HB-IG: 0.05-0.07 ml/kg as soon as possible within 24-24 hours
- Preferably start within 6 hours
- Administer Hep-B vaccine 1 ml IM at 0, 1, and 6 months
- Vaccine not needed
 - If Exposed person is HbsAg positive
 - History of previous infection in exposed person with HBV and anti HBs antibody >10mIU/ml

Mother to child transmission

- When mother is chronic carrier
- Suffers from acute infection during
 - First trimester
 - Passage through birth canal
 - Postnatal period due to close contact

To Remember: To newly born Hep-B vaccine is to be given within 24hrs (T-series vaccine 0.5ml IM, anterolateral aspect of the thigh)

MCQs

Q. The first antibody to appear against Hepatitis B is

- A. Anti HBs
- B. Anti HBe
- C. Anti HBc
- D. Anti HBm

Ans: Anti HBc

Q. Marker for infectivity of serum in Hepatitis B is

- A. HBsAg
- B. AntihbC
- C. HBeAg
- D. Anti HBC

Ans: HBeAg

Q. Which of the following viral markers signify on going viral replication in hepatitis B infection

- A. Anti HBs
- B. Anti HBc
- C. HBeAg
- D. HBsAg

Ans: HbeAg

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Table 10.1

	A	B	C	D	E
Classification	Picornavirus	Hepadnavirus	Flavivirus	Deltavirus	Calicivirus
Genome	ssRNA, Non-enveloped	dsDNA, Enveloped	ssRNA, Enveloped	ssRNA, Enveloped	ssRNA, Non-enveloped
Source	Feces	Blood/ body fluids	Blood/ body fluids	Blood/ body fluids	Feces
Transmission	Feco-oral route	Parenteral, perinatal, sexual	Parenteral, Blood transfusion, organ transplant	Paternal, Sexual	Feco-oral route
Incubation period	15-45 days	45-180 days	30-10 days	30-90 days	21-45 days
Onset	Abrupt	Insidious	Insidious	Abrupt	-
Severity	Mild	Occasionally severe	Usually subclinical	Co-infection with Hep B	Mild (except pregnant women)
Fulminant hepatitis	Rare	Very rare (1%)	Extremely rare	Co-infection	Rare
Symptoms	Fever, Malaise, Headache, Vomiting, Jaundice	Same as A, but 10-20% with serum sickness like joint pains, rash can also occur	20% symptomatic	Same as A	Same as A, more common in young immunocompromised pregnant women
To Remember: (Hep A)					
<ul style="list-style-type: none"> • Inapparent - 80-90 % • Icteric - 5-20% • Complete recovery - 95% 					
Chronicity (%)	0	5-10	80	5	0
Carrier state	None	Yes	Yes	Yes	None
Association with Blood Transfusion	Very rare	5-10%	Almost negligible	Can occur, but not known	Rare
Diagnosis	Stool sample, Anti HAV IgM antibody formed after 2 weeks of increase in liver enzyme	HbsAg, HbAg, Anti Hbs, Anti HbC, Anti HbV	Antibody to Hep C persists for 6 months, PCR-DNA can be used	IgM, IgG	IgM, IgG, RT-PCR
Post exposure prophylaxis	IGs, Hep A vaccine, Live vaccine 2 dose interval (6-12 months), Inactivated vaccine (should be given in >12 years)	IGs and Vaccine	Antiviral agents	None	Unknown



To Remember: Diseases where vaccines + IGs can given together

- Diphtheria
- Tetanus
- Rabies
- Hepatitis A B

Associated with cirrhosis	No	Yes	Yes	Yes	No
Associated with HCC (Hepatocellular Carcinoma)	No	Yes	Yes	Yes	No

11 DIARRHOEA



Introduction 00:00:25

- Passage of 3 or more watery stools in 24 hrs period
- **Change in consistency and character of stool** is more important
- It is dangerous due to
 - Dehydration
 - Electrolyte imbalance

- Two types of ORS
 - Standard ORS (previous)
 - Reduced osmolarity ORS (new)

ORS	Standard	Reduced Osmolarity
Contents	mEq/L	mmol/L
Glucose	111	75
Sodium	90	75
Chloride	80	65
Potassium	20	20
Citrate	10	10
Osmolarity	311	245 mmol/L

Clinical Types of Diarrhoea 00:01:52

1. Acute Watery Diarrhea

- Duration: Several hours to days
- **Main danger**
 - Dehydration
 - Weight-loss, if feeding isn't continued
- **Pathogens**
 - E.coli
 - Rotavirus (common in children)
 - Vibrio cholera

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- To Remember:**
- ORS to be used within 24 hours of making.

2. Acute Bloody Diarrhea 00:02:44

- Other name: **Dysentery**
- Duration: Several hours to days
- **Main danger**
 - Damage to intestinal tissue
 - Sepsis
 - Malnutrition
 - Dehydration
- Marked by **visible blood** in stools
- Pathogen: **Shigella**

Reduced Osmolarity ORS	g/L
Sodium chloride	2.6
Glucose anhydrous	13.5
Potassium chloride	1.5
Trisodium citrate, dihydrate	2.9
Total weight	20.5

3. Persistent Diarrhea 00:03:09

- Duration: **14 days or longer**
- **Main danger**
 - Malnutrition
 - Serious non intestinal infection
 - Dehydration
- People with **immunocompromised** diseases like AIDS can develop this

ReSoMaL 00:06:18

- Given for dehydration in a **severely malnourished child**.
- **Re** - Rehydration
- **So** - Solution
- **MaL** - Malnourished child
- **Composition of ReSoMaL:** WHO ORS packet + 2L water + 50g sucrose + 40 ml KCl solution (or 45 ml KCl solution, Mg, Zn, Cu)
- **Mg, Zn, Cu** are extra add-ons.

4. Diarrhea with Severe Malnutrition 00:03:28

- Severe malnutrition: Marasmus and Kwashiorkor
- **Main danger**
 - Severe systemic infection
 - Dehydration
 - Heart failure

ReSoMaL vs Standard vs Reduced Osmolarity ORS 00:07:21

Composition	ReSoMaL	Standard	Reduced Osmolarity
Glucose	125	111	75
Sodium	45	90	75
Chloride	70	80	65

Composition of ORS Solution 00:03:47

- ORS is an example of appropriate technology (principle of primary health care)

Potassium	40	20	20
Citrate	7	10	10
Magnesium	3	-	-
Zinc	0.3	-	-
Copper	0.045	-	-
Osmolarity	300 mmol/L	311 mmol/L	245 mmol/L

Super ORS

00:08:30

- Special ORS containing complex sugars.
- Glucose/ alanine or glycine/ food Based
- **Advantages**
 - Provides rehydration
 - Reduces stool output
 - Reduces frequency of stools
 - Reduces duration of diarrhea
 - Provides calories 180 kcal/L, contributing towards weight gain
- **Limitations**
 - Short shelf life <10 hrs
 - Need to be prepared freshly 2 or 3 times a day

Importance of Each Component of ORS

00:09:45

- **Glucose:** Allows the intestines to absorb the sodium, which in turn, drags the water into the intestinal cells.
- **Potassium:** It replaces the essential ion, which is lost during diarrhea and vomiting.
- **Trisodium citrate**
 - Improves the shelf life of ORS (makes ORS stable)
 - Helps in reducing the stool output by 25%
 - Enhancing the absorption of sodium and water.

Q. How will you manage when these ORS packets are not available?

Ans. If this mixture is not available a simple sugar and salt solution can be prepared as follows,

- Table salt - 5 g
- Sugar - 20 g
- Water - 1 L
- Dissolve the salt and sugar in 1 L water

Q. What are the alternatives if ORS is not available?

Ans. The alternatives to ORS solution are home available fluids. Some examples are as follows,

- Green coconut water
- Rice water
- Dal water

- Buttermilk
- Vegetable soup
- Unsweetened fresh fruit juice

Degree of Dehydration

00:12:07

Refer Table 11.1

Management of Diarrhea

00:17:04

- **3 categories**
 1. No signs - Plan A (mild)
 2. Some signs - Plan B (moderate)
 3. Severe signs - Plan C (severe)

Plan-A: Treat the Diarrhea at Home

00:17:13

- Counsel the mother about 4 rules of home treatment
 - Give extra fluids
 - Give Zn supplements
 - Continue feeding
 - Follow up
- **Additional fluid to be given:**

Up to 2 years	50-100 ml after each loose stool
2 or >2 years	100-200 ml after each loose stool

- Give frequent small sips from cup
- If child vomits, wait for 10 mins, continue slowly
- Continue the extra fluids until diarrhea stops

- **Zinc to be given:**
 - Give Zn 20mg tab (2 months to 5 years)

2-6 months	½ tab for 14 days
>6 months	1 tab for 14 days

- Infants - Dissolve tab in breast milk or ORS
- Older child - Chewable tabs

Plan-B: Treat Some Dehydration with ORS

00:19:22

- Recommended amount of ORS over 4 hours period is to be given in clinic
- **Amount of ORS during 1st 4 hours**

Weight	<6 kg	6-10 kg	10-12 kg	12-19 kg
Age	Up to 4 months	4-12 months	1-2 years	2-5 years
In ml	200-450	450-800	800-960	960-1600

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*For infants under 6 months who are not breastfed, 100-200ml clean water is given.

Plan-C: Treat Severe Dehydration Quickly

FOLLOW THE ARROWS, IF ANSWER IS "YES", GO ACROSS. If "NO", GO DOWN.

START HERE

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Can you give intravenous (IV) fluid immediately?

Yes

Start IV fluid immediately. If the child can drink, give ORS by mouth while the drip is setup. Give 100 ml/kg. Ringer's Lactate Solution (or, if not available, normal saline), divided as follows:

AGE	First give 30 ml/Kg in:	Then give 70 ml/kg in:
Infants (Under 12 months)	1 hour*	5 hours
Children (12 months up to 5 years)	30 minutes	2 ½ hours

* Repeat once if radial pulse is still very weak or not detectable.

- Reassess the child every 1-2 hours. If hydration status is not improving, give the IV drip more rapidly.
- Also give ORS (about 5 ml/kg/hour) as soon as the child can drink: usually after 3-4 hours (infants) or 1-2 hours (children).
- Reassess an infant after 6 hours and a child after 3 hours. Classify dehydration. Then choose the appropriate plan (A, B, or C) to continue treat

No

Is IV treatment available nearby (within 30 minutes)?

Yes

- Refer URGENTLY to hospital for IV treatment.
- If the child can drink, provide the mother with ORS solution and show her how to give frequent sips during the trip.

No

Are you trained to use a naso-gastric (NG) tube for rehydration?

Yes

- Start rehydration by tube (or mouth) with ORS solution; give 20 ml/kg/hour for 6 hours (total of 120 ml/kg).
- Reassess the child every 1-2 hours.
 - o If there is repeated vomiting or increasing abdominal distension, give the fluid more slowly.
 - o If hydration status is not improving after 3 hours, send the child for IV therapy.
- After 6 hours, reassess the child. Classify dehydration. Then choose the appropriate plan (A, B or C) to continue treatment.

No

Can the child drink?

No

Refer URGENTLY to hospital for IV or NG treatment.

NOTE:

- If possible, observe the child at least 6 hours after rehydration to be sure the mother can maintain hydration giving the child ORS solution by mouth.

MCQs

- Q. Which of the following about the composition of new ORS is wrong
- a. NaCl - 2.6 g/L
 - b. KCl - 1.5 g/L
 - c. Glucose - 13.5 g/L
 - d. Total osmolarity - 300 mmol/L

- Q. ORS once prepared should be used within
- a. 1 hr
 - b. 6 hrs
 - c. 12 hrs
 - d. 24 hrs

- Q. Ratio of sodium : glucose in who reduced osmolarity ORS is
- a. 1:4
 - b. 1:3
 - c. 1:2
 - d. 1:1

- Q. Dehydration in a child with diarrhea first present, tears absent is
- a. Mild
 - b. Moderate
 - c. Severe
 - d. None

Table 11.1

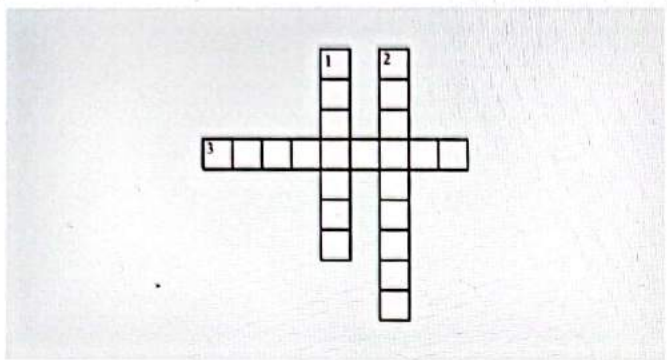
Factors	Mild	Moderate	Severe
General Condition	Well, alert	Restless, thirsty, irritable	Drowsy, cold extremities, lethargic
Eyes	Normal	Sunken <small>prince ankitkarnawat9@gmail.com 9818635293</small>	Very sunken, dry
Anterior fontanelle	Normal	Depressed	Very depressed
Tears	Present	Absent	Absent
Mouth + tongue	Moist	Sticky	Dry
Skin turgor	Slightly decrease	Decreased (1-2 sec)	Very decreased (> 2 sec)
Thirst	Normal	Drinks eagerly, thirsty	Unable to drink or drinks poorly
Pulse (N=110-120 beat/min)	Slightly increase	Rapid, weak	Rapid, sometime impalpable
BP (N=90/60 mm Hg)	Normal	Decreased	Decreased, may be unrecordable
Respiratory rate	Slightly increase	Increased	Deep, rapid
Urine output	Normal	Reduced	Markedly reduced
Treatment	Plan A	Plan B	Plan C



CROSS WORD PUZZLES



Crossword Puzzle



Across

3. E.coli

Down

- 1. Dehydration in a severely malnourished child
- 2. Acute Bloody Diarrhea

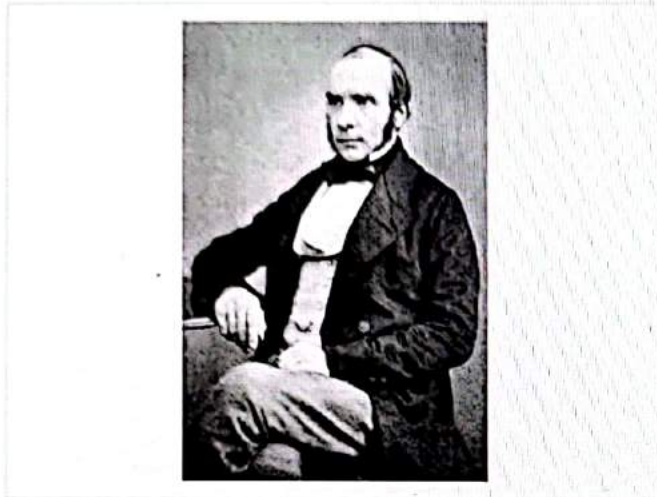
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12 CHOLERA

Introduction

00:00:21



- John Snow conducted study in 1854 when an epidemic of cholera erupted in the Golden square of London.
- He began his investigation by determining where persons with cholera lived and worked in this area.
- He made spot map.
- John Snow: Father of Epidemiology/Modern Epidemiology
- **Spot Maps** - to show the local distribution of cases



Epidemiological Determinants

00:02:01

Agent:

- V.cholera O1 (classical or El tor) and O139
- Most common: **EL tor biotype and O139**
- Each biotype further divided into
 - Ogawa
 - Inaba
 - Hikojima

- Source of cholera:
 - Case
 - Carrier- 75% of people
- **For every case of cholera, there 50-100 subclinical cases**
- Infective material: stool or vomitus of case/carrier

Types of Carriers

00:03:57

1. Incubatory carriers: shedding infectious agent during incubation period
2. Convalescent carriers: shedding infectious agent during recovery period
3. Contact carriers:
4. Chronic carriers: shedding infectious agent for more than 3 months

Reservoir of infection	Humans are only reservoir
Period of communicability	8-10 days to weeks/months
Mode of transmission	Water, food, direct contact
Incubation period	1-2 days

Clinical Features

00:05:20

- 75% do not develop symptoms
- 5-10% mild cases
- 15-20% severe dehydration
- Stage of evacuation- **Profuse, painless diarrhea**
- Stage of collapse: Severe diarrhoea and dehydration and electrolyte imbalance
- Stage of recovery

Diagnosis

00:06:08

- Stool collection and transportation
 - **Mc cartney bottles for transport of stool**
 - Transport holding media: **Venkatraman ramakrishna (VR) media**
- Rectal Swabs are transported in
 - **Alkaline Peptone water**
 - **Cary blair media**
- **Culture Method:**
 1. Enrichment: Inoculation onto peptone water tellurite media
 2. Hanging drop preparation: Demonstrate **scintillating movements**
 3. Darkfield illumination: **Shooting stars** in dark sky
- **Serological tests**

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Treatment

00:07:25

- Isolation of patient till 2-3 negative stool reports
- Cholera is a notifiable disease
- ORS + zinc
- Antibiotics as per culture report:
 - Doxycycline
 - Tetracycline
 - Fluoroquinolone
- For children: Erythromycin
- For pregnant women: Erythromycin or azithromycin

Important point

- Cholera is a notifiable disease
- Other notifiable diseases are:
 - Plague
 - Occupational diseases except for SARS
 - Smallpox
 - Bagassosis
 - Polio
 - Influenza

Sanitation measures

00:09:25

- Concurrent and terminal disinfection– Stool and vomitus disinfected with Cresol.
- Safe water supply
- Safe excreta disposal
- Disinfection

Control

00:09:54

- Chemoprophylaxis: Tetracycline * 3 days
 - Adults 500mg BD for 3 days
 - Children (4-13 years)- 125 mg BD * 3 days
 - Children (0-3 years) 50 mg BD * 3 days
- Other alternative: doxycycline 300 mg single oral dose

Immunization

00:10:29

- Parental vaccine: heat killed; phenol preserved vaccine not used
- Oral vaccines:
 1. Dukoral: For O1 type
 - Gastric buffer used as it contains cholera toxin B subunit
 - Dose: 2 doses 1-6 weeks apart
 - Children - 3 doses 1-6 weeks apart
 - Children < 2 years not given
 2. Sanchol and mORCVAX
 - Only oral suspension, no gastric buffer is used
 - 2 doses 2 weeks apart
 - For O1 and O139
 - Not given to children < 1-year-old
 3. Newly invented vaccine- EUVICHOL

Cholera Outbreak Measures

00:12:09

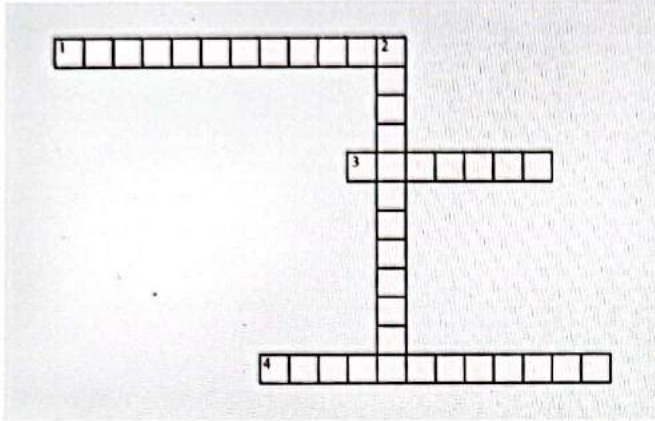
- Best way to control outbreak: construction of sanitation barrier
- Mass chemoprophylaxis never advisable in case of cholera outbreak as to prevent a single case of cholera, 10000 individuals must be provided chemoprophylaxis
- Mass vaccination also not recommended



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 1. CHEMOPROPHYLAXIS
- 3. notifiable disease
- 4. Parental vaccine

Down

- 2. For children

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13

TYPHOID

- Typhoid is endemic in India.

Epidemiological Determinants

00:00.47

1. Agent

- Salmonella typhi.
- **Type:** Gram -ve flagellated motile bacillus.
- **Antigens:** 3 main Ag
 - a. **Somatic O Antigen** - Specific for **group**.
 - b. **Flagellar H Antigen** - Specific for **type**.
 - c. **Capsular Vi Antigen** - Specific for **virulence**.
- **Reservoir of infection:** Man is the only reservoir.
- Sources of infection
 - a. **Primary source-** (Fecal > urine)
 - Feces
 - Urine
 - b. **Secondary sources (contaminated)**
 - Water
 - Food
 - Fingers
 - Fomites
- **Carriers of typhoid**
 - a. **Convalescent carriers** - Excrete bacilli for 6 to 8 weeks.
 - b. **Chronic carriers**
 - Excrete bacilli for a >1 year.
 - 5-8% cases will become chronic carriers.
 - Reside in the gallbladder.
- **Mode of transmission:** Feco-Oral route.
- **Period of communicability:** Person can transmit as long as bacilli is present in the urine or feces.
- **Incubation period:** 10-14 days.

2. Host factors

- **Age:** 5-19 years.
- **Sex:** Males > females.

3. Environmental factors

- Seen more during monsoon (July- September)



Important Information

- **Somatic O Ag** – Higher in the post infection phase.
- **Flagellar H** – higher in the post vaccination phase.

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Clinical Features

00:05.52

1. Early phase

- Fever for **3-4 days**
- Paradoxical bradycardia
- **Pea soup diarrhea**

2. Late phase

- Lasts for **7-10 days**
- Splenomegaly
- **Rose spots on chest and trunk**
- **Case fatality rate:** 1-4%
- **Complications**
 - Hemorrhage
 - Perforation

Diagnosis

00:06.25

- 1. **Gold standard:** Blood culture.
- 2. **Serology:** Widal test.
 - Somatic O Ag: 6-8 days to show.
 - Flagellar H Ag: 10-12 days
- 3. **Rapid serological tests (New)**
 - Tubex test
 - Typhidot (can detect both O and H antigen)

Plan of investigation

- 1st week - Blood culture.
- 2nd week - Widal test.
- 3rd & 4th weeks - Fecal and urine cultures.

Prevention and Control

00:07.28

Immunization

Ty21a	Vi Polysaccharide Vaccine
Live vaccine	Killed vaccine
Oral	Subcutaneous/ Intramuscular
>5 years	>2 years (mostly given in Delhi)
3 dose regimen (1, 3, 5 days); repeated every 3 years.	Single dose shot; repeated every 3 years.
Immunity develops after 7 days.	Immunity develops after 7 days.

Special Vaccine Recommendations for High-Risk Patients

- Household contacts
- Groups at high risk of infection like hospital staff and school children
- Living in endemic areas
- Travelers proceeding to endemic areas
- Attending big gatherings
- Attending large scale religious ceremonies

Treatment

00.08.36

- Vaccine not included under NIS.
- **Isolation:** Till 3 negative stool/urine culture obtained on 3 different days
- **Drug of choice:** Fluoroquinolone 15 mg/kg for 5-7 days
- **Fluoroquinolone resistance:** Azithromycin, ceftriaxone, cefixime
- **In case of carrier:** Ampicillin/amoxicillin + probenecid
- **Best management for carrier state:** Cholecystectomy (as bacilli reside in the gallbladder) + Ampicillin.
- **Disinfection of stool/urine:** 5% cresol for 2-4 hours.
- **Disinfection of soiled clothes:** 2% chlorine and steam sterilization.

MCQs

Q. Reservoir of enteric fever is

- A. Birds
- B. Cattle
- C. **Man**
- D. Cow

Q. Incubation period of typhoid is

- A. 1-2 days
- B. **10-14 days**
- C. 4-6 days
- D. 1 month



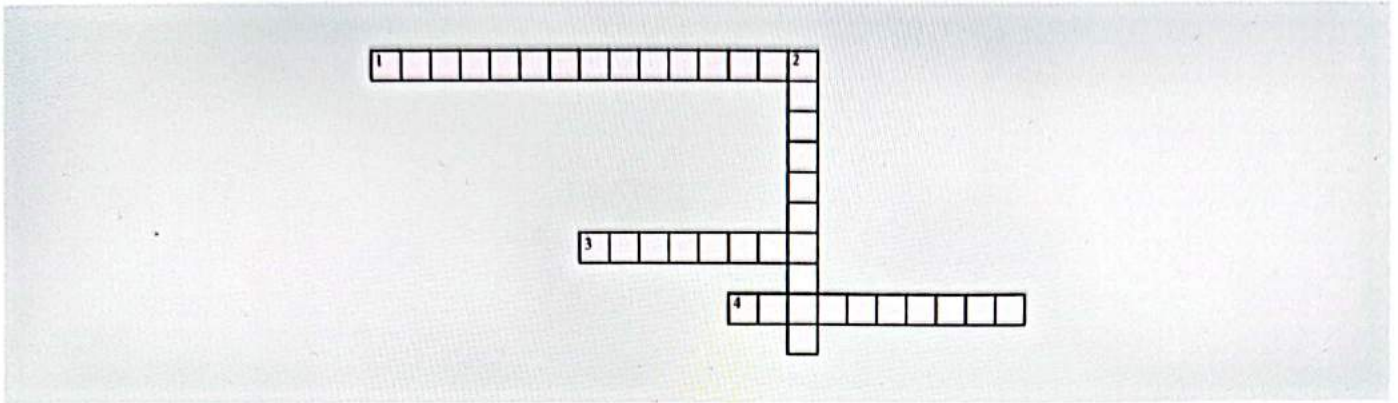
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CROSS WORD PUZZLES



Crossword Puzzle



Across

1. Chronic carriers are such carriers which excrete bacilli for a minimum of 3 months.
3. O for Group, Vi for Virulence.
4. More common in the post vaccination phase.

Down

2. More common in the post infection phase.

14

SOIL TRANSMITTED HELMINTHIC INFECTIONS

- Intestinal roundworms - Ascariasis
- Hookworms -
 - Ancylostoma duodenale
 - Necator americanus
- Whipworms - Trichuris trichina

Common Types of Feline Intestinal Worms

00:01:04



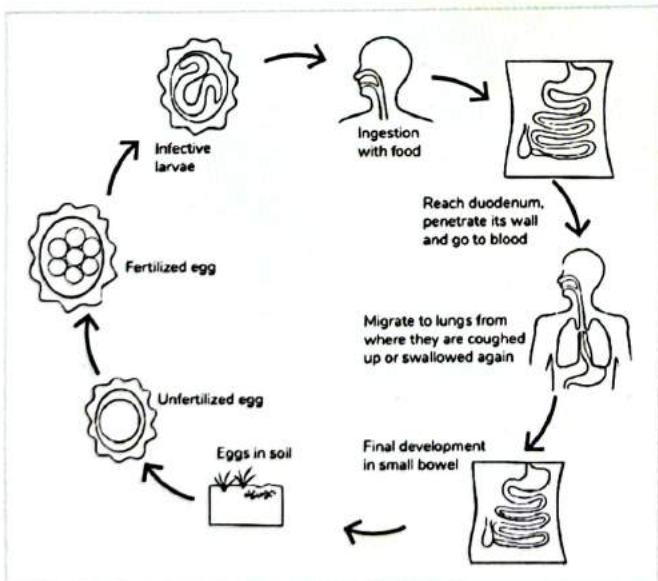
Ascariasis Lumbricoides

00:01:41

- **Most common soil-transmitted Helminth infection**
- Mechanism of transfer: by eggs that are passed through faeces of the infected person.
- Reservoir: **humans** (live in small intestine)
- Source: **soil containing infective form of eggs**
- Females lay 2.5-3 lacs eggs/day
- Eggs become mature and infective in 2-3 weeks
- Incubation period: 18 days to several weeks

Life cycle of roundworms

00:03:09



1. Eggs are in the soil
2. Then they become fertile and larva is formed
3. They reach the duodenum, penetrate its wall and enter the bloodstream
4. Migrate into the lungs where they can be coughed up and swallowed again.
5. Final development happens in the bowel where they are excreted and passed into the soil and again the cycle continues.

Symptoms

00:03:56

- Intestinal:
 - Diarrhoea
 - Abdominal pain
- Malaise, weakness
- Pulmonary symptoms:
 - Asthma
 - Cough
- Eosinophilia skin rash
- Gastro-intestinal:
 - Intestinal obstruction
 - Intussusception

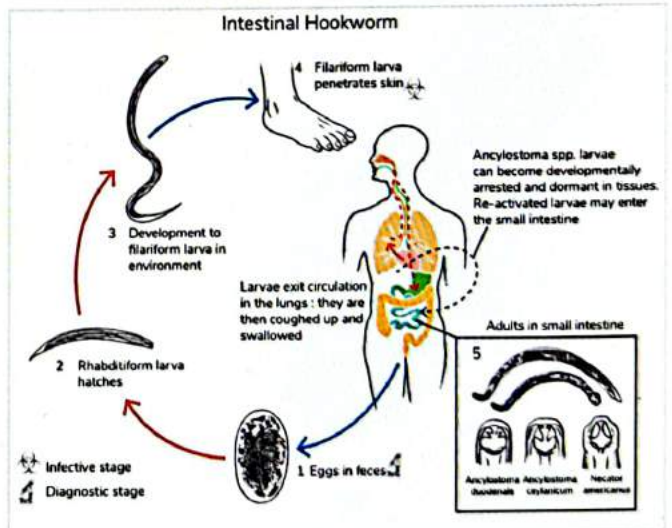
Hookworms

00:04:34

- Ancylostoma duodenale, Necator americanus
- Lives in small intestine - jejunum
- Reservoir- Man.

Life cycle

00:04:48



1. Eggs are released in the faeces
2. They are released into the soil where they develop and Rhabditiform larva hatches

- 3. Filariform larvae is developed in the environment
- 4. This larva penetrates the skin
- 5. Ancylostoma larvae can developmentally arrest
- 6. Reactivated larva can enter small intestine
- 7. Once inside the host, migrate via lymphatics and blood to lungs, alveoli, coughed up and swallowed again to reach the intestine where they sexually mature.
- Ancylostoma Duodenale: 10000-30000 eggs
- Necator americanus - 5000-10000

Symptoms 00:06:08

- Chronic blood loss and iron deficiency anaemia.
- Hypoalbuminemia
- Responsible for child morbidity growth retardation, LBW

Chandler's Index 00:06:19

- It identifies the importance of Hookworm infestation as public health problems in community
- Average number of Eggs/GM of stool
 - Less than 200 - not significant
 - 200-250- potential danger
 - 250-300- minor public health problem
 - More than 300 eggs / Gm stool - Public health problem

Whipworm 00:07:34

- Lives in large intestine

Life Cycle 00:07:50

Refer Image 14.1

1. Female lays 200-10000 eggs/days which is excreted in faeces
2. Eggs mature occurs in 21 days in soil
3. Eggs ingested reach the intestine where they hatch into larvae in the villi of the small intestine.
4. Larva re-emerges and attaches to the mucosa of the colon and grows into an adult.

Clinical features 00:08:38

- Mild epigastric pain
- Nausea
- Flatulence

Prevention and Management 00:08:41

- Sanitation and health education
- Tablets given:
 - Albendazole
 - Mebendazole
- National Deworming days:
 - 10th February
 - 10th August
- Given to: 1 - 19 years old
- Tablets are given in anganwadi
- Less than 2 years - half tab of albendazole
- More than 2 years - full tab albendazole

MCQs

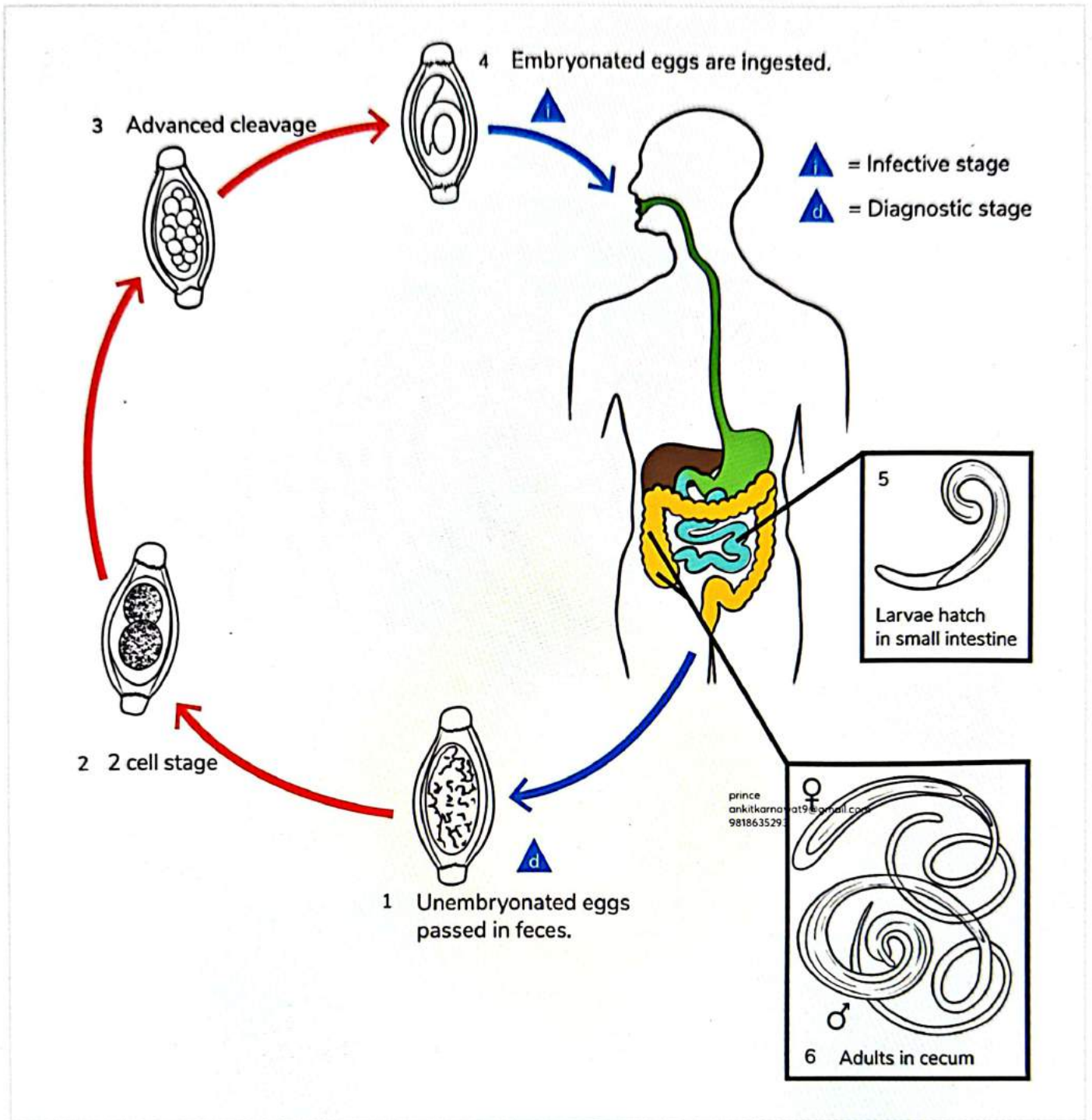
Q. Hookworm infection is considered a major health problem if Chandler index is?

- a. More than 300
- b. More than 200
- c. More than 100
- d. More than 50

Q. Chandler index is used for?

- a. Hookworm
- b. Roundworms-
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- c. Sandfly
- d. Guinea worms

Image 14.1

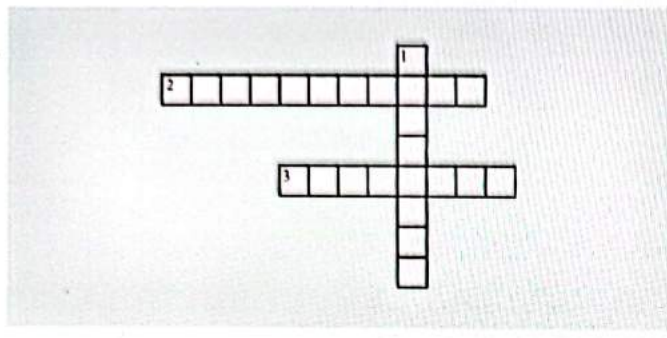




CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. HOOKWORMS
- 3. Lives in large intestine

Down

- 1. Chandler index is used for

15 DENGUE

Epidemiological Determinants

00:00:24

Agent

- Flavivirus - 1, 2, 3, 4 serotypes
- No cross-immunity among serotypes
- Recovery from one serotype can only give immunity to that serotype in particular.

Vector -

- **Aedes Mosquito**
 - **Aedes aegypti**
 - Comparatively less aggressive
 - Discordant feeder (needs >1 feed)
 - **Aedes albopictus**
 - More aggressive
 - Concordant feeder (1 feed is enough)



Features of Aedes aegypti

00:02:05

- Hunchback appearance
- White stripes on black body
- Artificial collection of water
- Flight range - 100 meters
- Eggs - Single and cigar-shaped
- Larvae - Siphon tube
- Reservoir of infection: Man and mosquito
- Transmission cycle: Man-mosquito-man
- Incubation period: 3 to 10 days

Host factors

00:03:22

- All ages
- Birth genders
- Children have a milder disease than adults.

Environmental factors

00:03:30

- Humidity - 60 to 80%
- Temperature - 16 to 30 C

Clinical Features - Dengue Syndrome

00:03:55

Uncategorized fever - No typical features

Break bone fever - Classical dengue fever

- Acute viral infection
- Retro orbital pain
- Arthralgia
- Myalgia
- Bimodal presentation of fever
 - Peaks on day 1-2
 - Resurges on day 5-6
- Recovery within 7-10 days.

Dengue hemorrhagic syndrome

- Dengue fever + hemorrhagic manifestations (bleeding from any orifice)
- Rash: Maculopapular/ rubelliform
- Lab diagnosis
 - 20% increase in hematocrit
 - Thrombocytopenia (platelet count <100000)
- Clinical diagnosis
 - Tourniquet test (>10 petechiae/ sq inch area)

Dengue shock syndrome

- Pulse pressure - <90
- Blood pressure - <80 mmHg

Diagnosis

00:05:58

- Within 1-5 days- NS antigen test
- >5 days - IgM ELISA

Treatment

00:06:11

- Symptomatic treatment
- IV fluid resuscitation
 - Crystalloids preferred.
 - Initial - 0.9% Normal saline
 - Maintenance - Ringer lactate

Prevention and Control

00:06:19

Larval Surveillance

- Sampling unit: Houses or premises searched for water-holding containers.
 - **House index:** Number of houses positive for aedes larvae/Number of houses searched.
 - **Container index:** Number of containers positive/ Number of containers checked.
 - **Breteau index:** Number of containers positive for larva or pupa/ Number of houses checked.
 - **Aedes Aegypti Index**
 - **Other name:** House index
 - Percentage of houses and their premises showing **actual breeding of aedes aegypti larvae.**
 - Should not be >1%
 - Airports and seaports in endemic areas should be kept at least 400m around their premises free from the breeding of Aedes aegypti.

Vector Control

00:09:44

- Integrated vector management
 - Anti adult measures
 - Anti larval measures
 - Personal protection

Vaccine

00:09:59

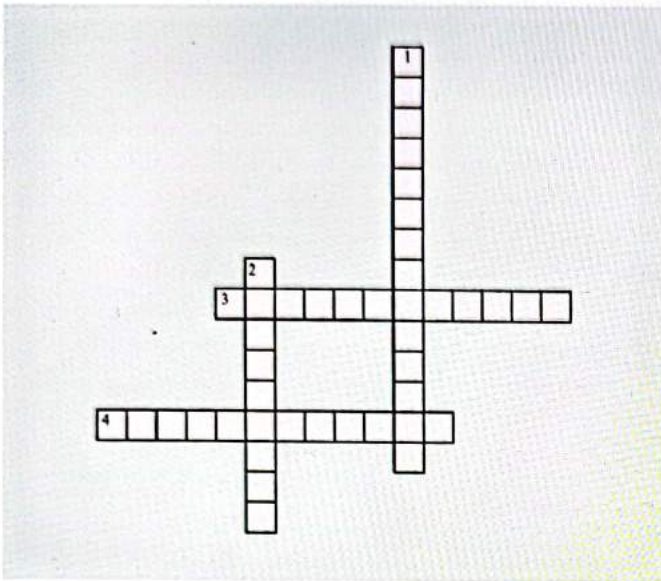
- 1st dengue vaccine - **Dengvarix (CYD-TDV)**
- **Age:** 9-45 years
- Not used in India on a routine basis.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. This has a hunchback appearance and white stripes on black body
- 4. Number of containers positive for larger or pupa/ Number of houses checked

Down

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- 1. Classical dengue fever is also called _____
- 2. This was the first dengue vaccine

16 MALARIA

NVBDCP

00:00:33



- National vector-borne disease control program.
- Launched in 2002.
- All vector-borne diseases are included in NVBDCP.

Malaria

00:01:28

- Malaria transmission was discovered by - Sir Ronald Ross.
 - It was discovered that transmission of malaria is by a vector.
- India contributes to 3% of malaria cases.
- Africa is responsible for the majority of malaria cases worldwide - 95%.

Epidemiological determinants

00:02:05

Agent

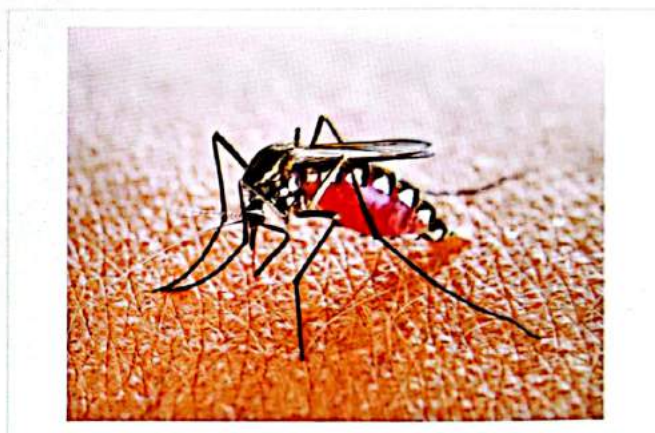
- Plasmodium
 - Plasmodium vivax
 - Plasmodium falciparum
 - More common
 - More dangerous
 - Plasmodium malariae
 - Plasmodium ovale
 - Case reported in 2019 in Kerala.
 - Plasmodium Knowlesi
 - Cases reported in Andaman and Nicobar.
- All malarial species occur in India.

Vector

- Anopheles mosquito
 - Anopheles culicifacies - common in rural and peri-urban areas.
 - Anopheles stephensi - common in urban and industrial areas.
 - Anopheles fluviatilis - hilly areas, forests, forest fringes.
 - Anopheles minimus - foothills (northeastern states).
 - Anopheles epiroticus - Andaman and Nicobar islands.

Anopheles mosquito

00:04:48



- It sits at an angle of 45°.
 - Head is downwards - resting in an inclined position.
- Has spotted wings
- Anopheles breeds in clean stagnant water.
 - Also called sophisticated mosquitoes.
- Eggs are laid singly.
 - Eggs are boat-shaped with lateral floats.
- Larva doesn't have a siphon tube - no breathing tube.
 - Rests parallel to the surface of the water.
- Flight range - 2 to 3 km.

Mode of Transmission

00:06:48

- Vector-borne
 - Most common.
 - Bite of female Anopheles mosquito.
- Accidental injections of blood or plasma.
 - Parasite remains infectious for at least 14 days in blood bottles stored at -4°.
- Congenital transmission - rare.
- Newborn infants-resistance to infection with P. Falciparum.
- Pregnancy increases the risk of malaria in women.
- Febrile Herpes - common in all malaria patients.

Host Factors

00:07:53

- Malaria follows a **holoendemic pattern** of disease distribution.
 - Seen among children of **2 to 10 years** - more common.
 - Fewer cases are seen in childhood.
- **Age < 6 months** - chances of falciparum infection are low.
 - Because fetal haemoglobin is resistant to falciparum.
- **Sickle cell trait** - exhibits mild infection.
 - Resistant to falciparum.
- **Duffy negative RBCs** - resistant to P. vivax.

Environmental Factors

00:09:16

- **Season** - July to November.
- **Malaria month** - June
 - Awareness about malaria can be spread in this month.
- Higher altitudes - less mosquitoes.
- Relative humidity - 60 to 75%.
- Temperature - 16 to 30°.

Incubation Period

00:09:43

- **Falciparum** - 12 days
- **Vivax** - 14 days
- **Ovale** - 16 days
- **Malariae** - 28 days

Epidemiological Indicators

00:09:57

Pre Eradication Era

- Spleen rate
- Average enlarged spleen
- Infant parasite rate
- Parasite rate
- Proportional case rate

Eradication Era

- Annual parasite incidence
- Annual blood examination rate
- Annual falciparum incidence
- Slide positivity rate
- Slide falciparum rate

Spleen Rate

00:11:31

- **Measure of endemicity** of malaria.
- **Spleen rate:**
 - **Below 10%** - non endemic
 - **10 to 25%** - hypo endemic
 - **25 to 40%** - endemic
 - **> 40%** - hyperendemic

Infant Parasite Rate

00:13:12

- Number of **infants** showing **malarial parasites** in their blood films.
- Indicator of recent malaria transmission in a community.

$$IPR = \frac{\text{Number of infants positive for malarial parasites in a year}}{\text{Total infants examined}} \times 100$$

- Blood slides are examined.

Parasite Rate

00:14:40

- Percent of **children 2 to 10 years of age** showing **malarial parasites in their blood film**.

Annual Parasite Incidence (API)

00:15:46

- The population positive for malarial parasite in a year out of the total population under surveillance multiplied by 1000.

$$API = \frac{\text{Total cases diagnosed}}{\text{Total population under surveillance}} \times 1000$$

- Best measure of the **burden of malaria**.
- NVBDCP aims to achieve an API of **less than 1/1000 population**.

Annual blood examination rate (ABER)

00:17:17

- Total blood slides examined out of the total population under surveillance multiplied by 100.

$$ABER = \frac{\text{Total blood slides examined}}{\text{Total population under surveillance}} \times 100$$

- Indicator for **operational efficiency** of a program.

Slide Positivity Rate

00:18:24

- Number of slides positive for malarial parasite out of total slides examined multiplied by 100.

$$SPR = \frac{\text{Slides positive for malarial parasite}}{\text{Total slides examined multiplied}} \times 100$$

- Calculated during an **outbreak**.

MCQ's

Q. Vector of Urban Malaria

- A. Culicifacies
- A. Stephensi
- A. Fluviatilis
- A. Sundaicus

Answer: A. Stephensi

Q. Which of the following is not an epidemiological indicator for malaria?

- Annual blood examination rate
- Annual parasite incidence
- Annual parasite index
- Annual falciparum incidence

Answer: Annual parasite index

Q. Measurement of operational efficiency of the National Anti-Malaria Programme (NAMP) is done by?

- a. Annual parasite incidence (API)
- b. Annual blood examination rate (ABER)
- c. Infant parasite rate
- d. Slide positivity rate

Answer: Annual blood examination rate(ABER)

Q. The following rate measures the endemicity of malaria in the community?

- a. Infant parasite rate
- b. Annual parasite incidence
- c. Annual blood examination rate
- d. Spleen rate

Answer: Spleen rate

Q. The most sensitive index of recent transmission of malaria in a community

- a. Spleen rate
- b. Infant parasite rate
- c. Annual parasite incidence
- d. Slide positivity rate

Answer: Infant parasite rate

Q. Overall the most important indicator of malaria control is-

- a. Spleen rate
- b. Infant parasite rate
- c. Annual parasite incidence
- d. Slide positivity rate

Answer: Annual parasite incidence

Q. A population of 100000 is under surveillance during a year. 100 cases were positive for the malarial thick smear. 20 developed complications, and 10 died among cases. What is the Annual parasite incidence?

- a. 1 per 1000
- b. 2 per 1000
- c. 10 per 1000
- d. 20 per 1000

Answer: 1 per 1000

Explanation

- $API = \frac{\text{Total cases diagnosed}}{\text{total population under surveillance}} \times 1000$.
- $API = 100 \div 100000 \times 1000$
- On cancellation - 1 per 1000.
- If in the same question Number of slides examined is given as 10000 then
 - $10,000 \div 100000 \times 100$
 - 10%.
- $SPR = 100 \div 10000 \times 100 = 1\%$.

Q. Throughout the country, every year, Anti-malaria month is observed during the month of-

- a. July
- b. January
- c. ~~June~~ June nawal9@gmail.com 9818635293
- d. December

Answer: June

Q. The burden of malaria is best estimated in-

- a. Mosquito rate
- b. Annual parasite incidence
- c. Parasite rate
- d. Slide positivity rate

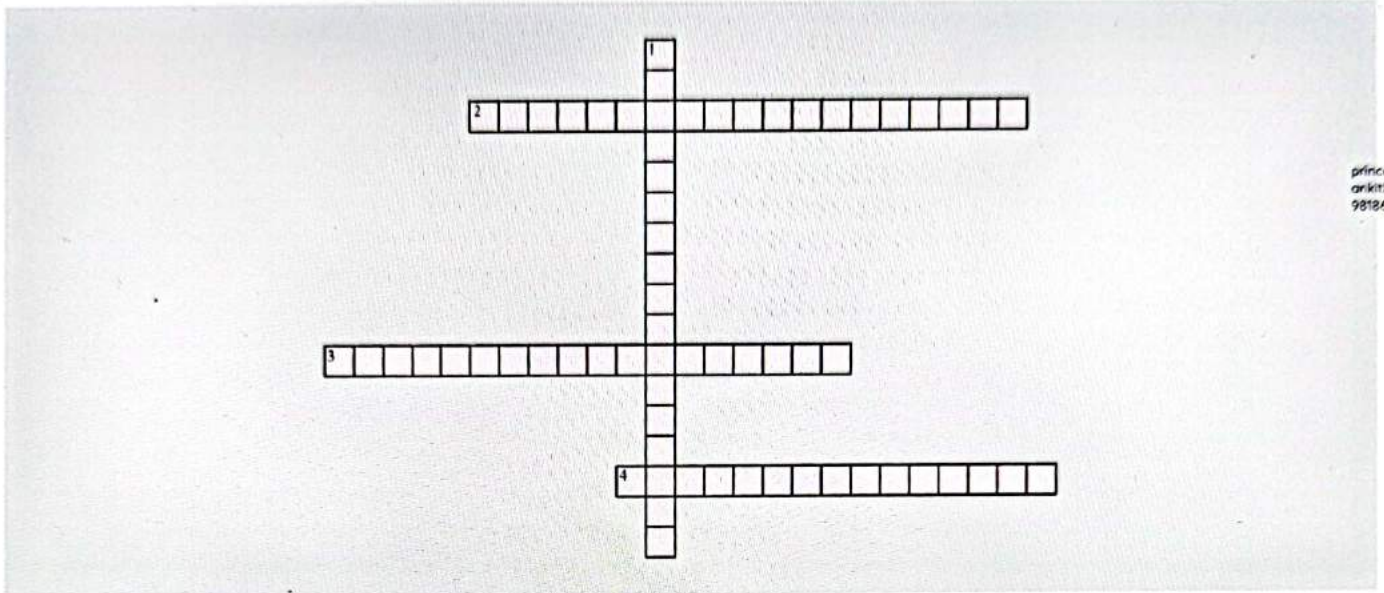
Answer: Annual parasite incidence



CROSS WORD PUZZLES



Crossword Puzzle



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Across

- 2. Number of slides positive for malarial parasite out of total slides examined multiplied by 100
- 3. Number of infants showing malarial parasites in their blood fluids
- 4. Resistant to falciparum, it exhibits mild infection

Down

- 1. Common in rural and peri-urban areas



17

LYMPHATIC FILARIASIS

Epidemiological Indicators

00:00.18

1. Agent

- Caused by-
 - *Wuchereria bancrofti* causes Lymphatic Filariasis (90%)
 - *Brugia malayi* causes Brugian Filariasis (seen in Kerala)
 - *Brugia timori*
- Endemic in certain areas:
 - Bihari
 - Jharkhand
 - Uttar Pradesh
 - Orissa
 - Andhra Pradesh
 - Tamil Nadu
 - Kerala
 - Gujrat

Wuchereria bancrofti – mf	Brugia malayi
300 × 10 μm Lie - graceful curves head space - short nuclei - countable,	260 μm Kinked (acute angles) Long Overlapping

2. Host Factors

00:03.11

- Definitive host: Man
- Intermediate host: Mosquito - *Culex* (Secondary host)
 - Species:
 - *Culex quinquefasciatus*
 - *Culex fatigans*

Vectors

- a. Bancroftian Filariasis
 - *Culex quinquefasciatus*
 - *Culex fatigans*
- b. Brugian Filariasis
 - *Mansonia*- Breeds in large water bodies beneath aquatic plantations

Mode of transmission:

- Bite of the infected vector
- Bite of infected mosquito

Incubation period- 8 -16 months

Clinical Features of Lymphatic Filariasis

00:06.09

- It has two stages:

Stages	Description
1. Asymptomatic Amicrofilaria	Does not show Microfilariae or clinical manifestations of the disease
2. Asymptomatic Microfilaria	Asymptomatic, but blood is positive for Microfilariae

Stage of Acute Manifestations

- Occurs in first few months and years
- Recurrent episodes of acute inflammation in lymph glands and vessels
- It is manifested as
 - Filarial fever,
 - Lymphangitis
 - Lymphadenitis
 - Lymphoedema
 - Epididymo-orchitis (male)

Stages of Chronic Manifestations

- Occurs 10-15 yrs after the onset of first acute attack
- It causes permanent structural changes due to fibrosis and obstruction of lymphatic vessels
- Main clinical features are
 - Hydrocele
 - Elephantiasis
 - Chyluria.
- In Brugian filariasis- genitalia are rarely involved

Occult Filariasis

00:07.41

- The classical clinical manifestations are not present
- Microfilariae are not found in the blood
- It occurs due to hypersensitivity reaction to filarial antigens derived from microfilariae
- Ex: Tropical pulmonary eosinophilia

Diagnosis

00:08.18

Preferred investigation

- Demonstration filarial parasite in the thick peripheral blood film
- *Wuchereria bancrofti* or filarial parasite has the nocturnal activity.
- Filarial parasites is seen in blood between 10PM to 2AM so slides are prepared at night

Epidemiological Survey

- Mass blood survey to demonstrate the filarial parasite in thick blood films prepared at night

Rapid Detection Test

- It is known as the **filarial strip test**
- This test are also used for
 - Monitoring
 - Mapping
 - Evaluation activities

Other Methods

- Membrane filter concentration method:**
 - Most sensitive methods for detecting low density microfilaraemia
- DEC provocation test:**
 - Microfiliari can appear in the blood in day time.
 - In this test single oral dose 100mg DEC is given
 - After 1 hour, blood film is prepared

Serological tests

- It cannot differentiate between past and present infection

Prevention

00:13.10

- India is looking to eliminate the filariasis under NHM
- It is trying to eliminate it since 2015

1. Annual Mass Drug Administration (MDA)

00:13.25

- It is done **yearly**.
- It is a part of WHO Lymphatic filariasis elimination strategy
- In **India** it has started in **2004**
- Since 2017 - **Triple drug therapy** is preferred.
 - DEC
 - Albendazole
 - Ivermectin
- MDA is continued for **4 to 5 years**.
- Coverage->**80%** of population
 - Community with MDA coverage of 65% for five to six years- microfilariae prevalence will come to less than 1%.
- Each round of MDA should be **effective**
- MDA is done after conducting a filarial survey in all age groups- done in **4 sentinel sites and 4 random sites collecting 4000 slides**
- After MDA, evidence for interruption of transmission is obtained by the conducting a **TAS (Transmission Assessment Survey)** among **6-7 years** age group.
 - If the number of infected children found in TAS is less than the threshold number (2% Ag or Ab prevalence) then MDA is stopped.
- After stopping MDA, post MDA surveillance initiated consists of **two more rounds of TAS**
- MDA is avoided in children with less than 2 years of age

Elimination of lymphatic Filariasis means:

- When prevalence of microfilariae carrier rate <1% and children born after initiating MDA are free from circulating antigenemia

1. DEC Medication Salts

- It was started in **Maharashtra**
- **1-4 gms of DEC** is added per 1kg of salt

2. Vector Control Method

- Integrated vector management.
- Anti Larval and Anti adult measures to control Culex.

Treatment

00:21.43

- DEC - 6 mg/ kg/day for 12 doses to be completed in 2 weeks +
- Albendazole 400 mg stat (or age greater than 2 years) +
- Ivermectin (150 - 200 mcg/kg of BW)

Monitoring and Evaluation Indicators

00:22.17

- **Microfilaria rate:**
 - Most sensitive indicator
 - (Persons with microfilaria/20 mm³ of blood/Total population under survey) x 100
 - Indicates prevalence of infection
- **Filarial endemicity rate:**
 - Number of persons with microfilaria clinical diagnosis diseases/Total population under survey x 100
 - Indicates prevalence of disease

Q. The vector for transmission of bancroftian filarial is?

- Culex fatigans
- Aedes aegypti
- Mansonoides annulifers
- Anopheles stephensi

Q. Which is true for MDA (Mass drug administration)

- MDA is done with DEC and Ivermectin in India
- Transmission assessment survey is done in under 5 children
- MDA is done after a filariasis survey in all age groups**
- The MDA coverage should be more than 50% in endemic zones

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Q. The currently given regimen for bancroftian filariasis is?

- DEC-6 mg/Kg/day × 21 days
- DEC-6 mg/Kg/day × 12 days**
- DEC-100 mg/ day 21 days
- DEC-100 mg/day 12 days

Q. The DEC-medicated salt for mass treatment in lymphatic filariasis was shown to be safe, cheap and effective in?

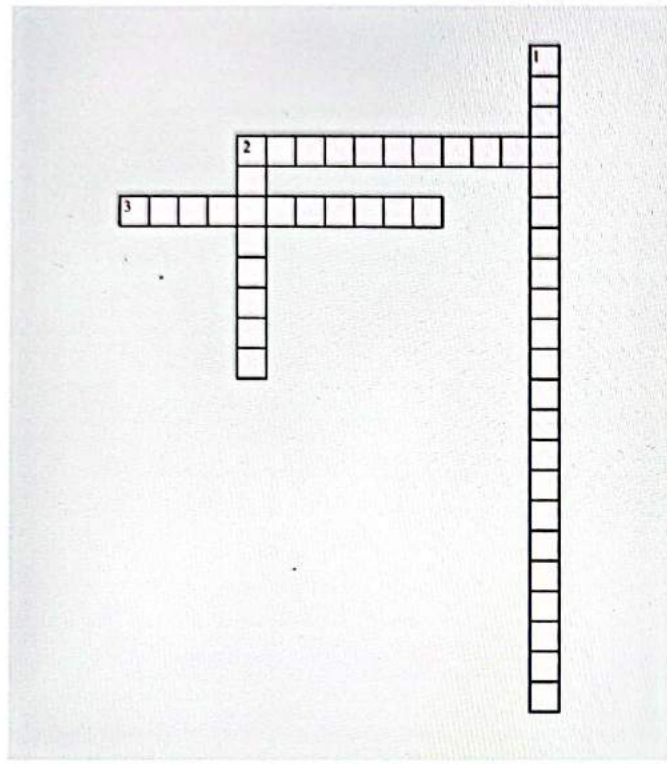
- Goa
- Daman and Diu
- Andaman and Nicobar islands
- Lakshadweep Islands**



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. DEC Medication Salts were started in which state?
- 3. In 2017 the government also said for mass Drug administration, triple drug therapy is also preferred, So the drugs include DEC, Ivermectin and _____

Down

- 1. Number of persons with microfilaria clinical diagnosis diseases/Total population under survey x 100
- 2. Vector for Brugian Filariasis which breeds in large water bodies beneath aquatic plantations

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18

KALA AZAR LEISHMANIASIS

Other Names

00:00.46

- Black sickness: Pigmentation of hands, face, feet, and abdomen.
- Orient boils, Baghdad boils, Kala Azar, black fever, sandfly disease, dum-dum fever with leprosy espundia.

Introduction

- Protozoan disease
- Endemic - Uttar Pradesh, Bihar, Jharkhand, West Bengal
- Prevalence-
 - Lower socioeconomic status
 - Overcrowded areas.

Epidemiological determinants

00:02.26

Agent

00:02.27

- Agent: Leishmaniasis
- There are three types of Leishmaniasis.
 1. Visceral leishmaniasis (Kala Azar) - Leishmaniasis donovani
 2. Cutaneous leishmaniasis (it is a skin infection)- Leishmaniasis tropica
 3. Mucocutaneous leishmaniasis - Leishmaniasis braziliensis
- Post Kala Azar dermal (PKLD) leishmaniasis - immune response after leishmaniasis.

Reservoir of Infection

00:05.31

- Indian Kala Azar- it's a non-zoonotic infection. Its only reservoir is humans.

Vector

00:06.21



- Sandfly (Phlebotomus argentipes)
- Identified by lanceolate shaped hairy wings.

- Phlebotomus papatasi and Phlebotomus sargentii - causes Cutaneous leishmaniasis.
- These live in crooks and crevices of trees/ cool, damp places.

Host factors

00:08.37

1. Age:
 - It can affect all ages.
 - More common among 5-9 years of age.
2. Gender:
 - This is in the ratio of Male/Female - 2:1.
 - More in lower socio-economic status.
3. Seasonal distribution:
 - It occurs between November to April.

Life cycle

00:09.58

- It is an intracellular parasite that divides into macrophages.
- In the vertebrate host, it is present in Amastigote form (unflagellated)
- Within the cells - Leishmanian or Donovan bodies.
- Among the non-vertebrate- present in Promastigotes form or flagella form.

Mechanism of transmission

00:11.52

- Bite of sandfly
- Blood transfusion (rare)

Incubation period

00:12.10

- The incubation period for these stands from 10 days to 2 years.

Clinical features:

00:12.20

- Fever
- Weight loss
- Hepatosplenomegaly
- Anemia.

Diagnosis

00:12.52

- Rapid diagnostic kits - rk39-dipstick test.
- It is also used for field surveys.

Gold standard diagnosis - Demonstration of Leishmania Donovan bodies in bone marrow, liver, spleen, and lymph nodes.

Tests

00:14.14

- Aldehyde test for Napier
- Used for surveillance purposes.

Control

- Control Sandfly
- DDT in a small quantity (1-2gm/m²).

00:14.32

- Miltefosine capsule – given for 2-65 years old.
- Paramomycin
- According to NVBDCP- 1st choice is LAMB.

Treatment

- Liposomal Amphotericin B (LAMB)
- 10 ml/kg (single dose)
- Other drugs are:

00:14.57

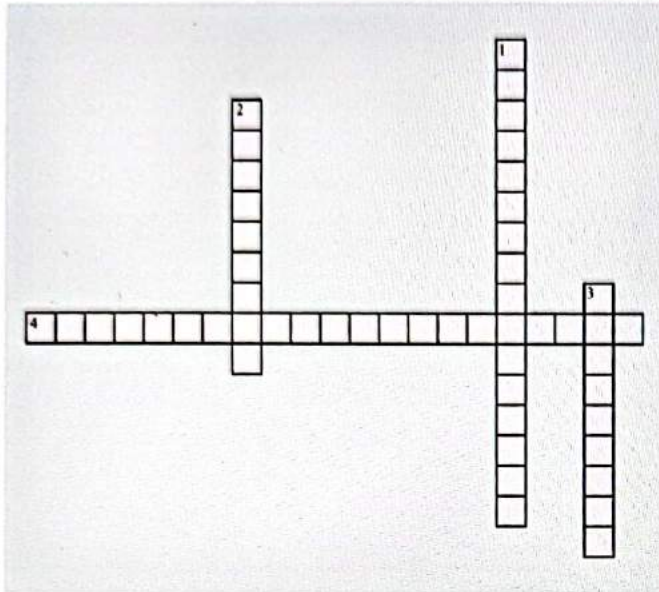
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CROSS WORD PUZZLES



Crossword Puzzle



Across

4. Demonstration of leishmania donovani bodies in bone marrow, liver, spleen, and lymph nodes.

Down

- 1. The incubation period for these stands from 10 days to 2 years.
- 2. Liposomal Amphotericin B(LAMB)
- 3. It is an intracellular parasite that divides into macrophages. In the vertebrate host, it is present in Amastigotes form and within the cells called leishmanian or Donovan bodies

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19

JAPANESE ENCEPHALITIS



Topics

00:00:04

- Epidemiology of Japanese Encephalitis (JE)
- Life cycle of JE
- Prevention of JE

Epidemiologic Determinants

00:00:32

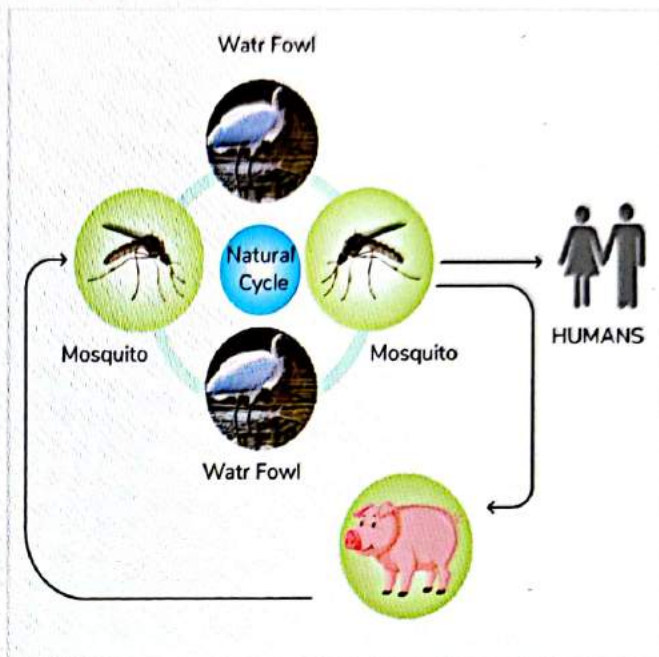
- Japanese Encephalitis is a **vector-borne zoonotic disease**.
- **Causative agent**
 - Group B Arbovirus
 - Belongs to the flaviviridae family.
- **Host factors**
 - **Age:** Most common in below 15 years.
 - **Pigs:**
 - They are amplifier hosts.
 - Doesn't develop the disease but maintains viraemia.
 - No manifestation of symptoms.
 - **Birds:** Ardeid birds, pond herons, ducks, poultry.
 - Maintenance hosts.
 - Maintains the life cycle of viruses.
 - Found in natural reservoirs.
 - **Man:** Accidentally or dead-end host.
 - No man-to-man transmission.
 - **Cattles and buffaloes:** Acts as a mosquito attractants.
 - **Horses:** Only animals that manifest symptoms.

Vector

- Culex mosquito.
- mostly found in areas with rice and paddy fields.
- Every mosquito bite doesn't cause Japanese Encephalitis.
- **Species**
 1. Culex tritaeniorhynchus
 2. Culex vishnui

Life Cycle of Japanese Encephalitis

00:07:30



The life cycle of the JE virus is between

1. Pig → Mosquito → Pig.
2. Ardeid birds → Mosquito → Ardeid bird.

- Culex has a **hunchback appearance** when it sits.
- There are no **white stripes on the black bodies** that differ from aedes.
- Culex has **long legs**.

Environmental Factors

00:09:32

- Japanese Encephalitis follows:
 - Seasonal distribution: **More during monsoon**
 - **Endemic:** To 21 states but mainly includes:
 - Jharkhand
 - Bihar
 - West Bengal
 - Uttar Pradesh
 - Assam
 - Haryana

Mode of transmission

- Bite of culex mosquito.
- But not all culex mosquito bites will result in disease.
- Therefore, a lot of inapparent infections are also present.
- **Case fatality rate:** 20% to 40% (average 30%).



Important Information

- Culex is the vector even in **filariasis**.
- **Species are**
 - Culex quinquefasciatus
 - Culex fatigans

Clinical Features

00:12:08

Prodromal stage

- Patient presents with
 - Fever
 - Coryza
 - Lasts for 1 to 6 days.

Encephalitis stage

- Presents with
 - Neurological deficits
 - Convulsions etc.
 - Lasts from 3 to 6 days.

Post Encephalitis stage

- Residual Neurological deficits

Investigation of choice

- IgM ELISA.



Important Information

- **Endemicity** of JE in India - 1 to 2 cases per village.
- **Epidemic**
 - Occurs every 2 to 15 years.
 - More than 2 cases per village.
- Not all humans bitten by the mosquito develop the disease.
- Ratio of JE overt disease and inappropriate infections varies from **1:300 to 1:1000**.
- 85% of cases occur in children <15 years.
- Does not occur in infancy.
- Incubation period of JE (man) - 5 to 15 days.
- Case fatality rate: 30%.
- **Treatment:** Symptomatic, so symptoms are treated.
- **Control:** Vaccines are given.
 - **Live vaccines are given.**
 - **Strain: SA-14-14-2**
 - Given under the National Immunization Programme.
 - Vaccine is
 - Reconstituted (or)
 - Freeze dried (or)
 - Lyophilized.
 - Diluent used - **phosphate buffer.**
 - Should be used within 2 hours.

Schedule of Vaccination

00:16:12

- **After completing 9 months** - 1st dose of JE₁ is given.
- **After 16 to 24 months** - 2nd dose JE₂ is given.
- Both the JE vaccine and measles & rubella vaccines are given after 9 months.
- **Dose:** 0.5ml.
- **Route:** Subcutaneous.
- As the measles & rubella vaccine is given on the right arm, the **JE vaccine** is administered on the **left arm**.
- In case of **delayed immunization**, the JE vaccine is given for up to **15 years**.

MCQs

Q. Amplifier for Japanese Encephalitis

- A. Horse
- B. Dogs
- C. Pigs
- D. Monkeys

Q. Japanese Encephalitis transmitted by

- A. **Culex**
- B. Aedes
- C. Mansonia
- D. Anopheles

Q. All are true about JE except?

- A. Man is incidental dead-end host
- B. Culicines are vectors involved
- C. **Case fatality rate is over 90%**
- D. 85% of cases occur in children below 15 years of age

Q. JE life cycle in nature runs between?

- A. **Pigs - mosquito**
- B. Cattle - birds
- C. Pigs - humans
- D. Birds - pigs

Q. Major determinant to the eradication of JE is

- A. No effective vaccine
- B. Breeding place of vector
- C. **A Large number of inapparent infections**
- D. Numerous animals

Q. Not true about JE is

- A. **Man to man transmission**
- B. Vector is culex tritaeniorhynchus
- C. Rice fields
- D. Horse shows symptoms

Q. All of the following are true about JE vaccine except

- A. 2 primary doses given to children at 9 months and 16 to 24 months
- B. Not given to infants less than 6 months of age
- C. It is a freeze-dried Lyophilized vaccine
- D. **In endemic areas, vaccination is given to cover children of 1 to 9 years of age.**

Q. False about Japanese Encephalitis is

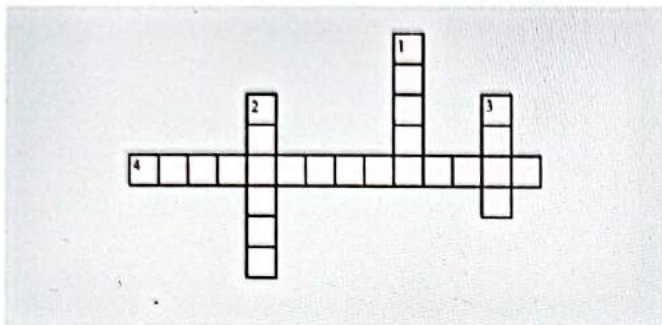
- A. Occurs in children more than adults
- B. **Mosquito bite always results in disease**
- C. Apparent and non-apparent cases ratio is 1:1000
- D. Epidemic is defined as the occurrence of 2 to 3 cases in a village.



CROSS WORD PUZZLES



Crossword Puzzle



Across

4. Lasts for 1 to 6 days. Patient presents with:

Down

- 1. Ardeid birds, pond herons, ducks, poultry.
- 2. Only animals that manifest symptoms.
- 3. They are amplifier hosts.

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20

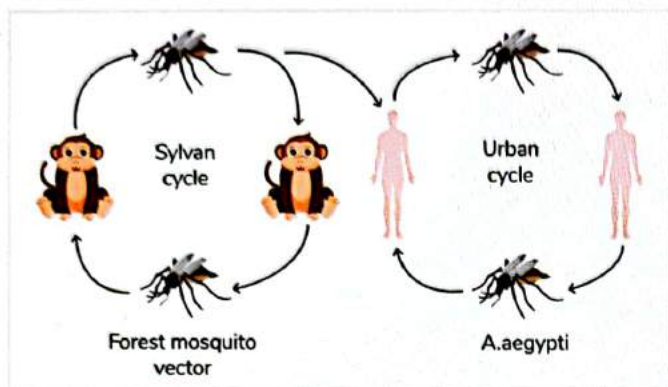
YELLOW FEVER, KFD

Yellow Fever

00:00:06

Life cycle

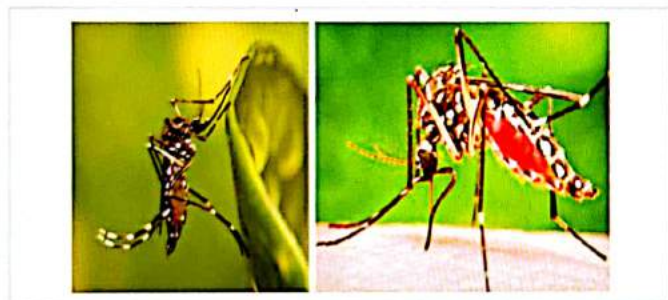
00:00:07



- **Sylvian cycle** or sylvatic cycle
 - Also called **jungle cycle**
- **Urban cycle.**

Aedes Mosquitoes

00:00:58



- **Hunchback** appearance with white stripes on black body.
- **Aedes mosquito** - vector of yellow fever.

Epidemiology

00:01:44

Agent

- Caused by - **Arbovirus - Flavivirus**
- **Zoonotic disease**
- **Endemic area:** Tropical Latin America & Africa
- **In India:** does not occur.
- **Exotic disease in India.**
- Even if a **single case** occurs in India, it is considered an **Epidemic.**
- **Reservoir:** **Monkeys** and other wild animals
- **Period of communicability-** 3-4 days
- **Mosquitoes** are also infectious after completing the IP of 8-10 days.
 - Once infective, the mosquito shall remain so all its life.
- One attack gives **lifelong immunity.**

Host factors

- **Infants** born to immune mothers have antibodies upto 6 months of life.

Environmental factors

- **Humidity** > 60%
- **Temperature-** 24-36° C

Modes of transmission

00:04:19

- **Sylvatic cycle/ jungle:** Monkey mosquito human.
- **Intermediate yellow fever:** Monkey and or Humans mosquito humans
- **Urban yellow fever:** Human mosquito human
 - **IP:** 3-6 days.
 - **Quarantine-** 6 days.

Clinical features

00:04:53

- **Hemorrhagic fever**
 - **Black vomit, epistaxis, Malena**
 - **Hepatic or renal manifestations**
- **Case Fatality Rate (CFR)- 80% in severe cases.**

Favourable conditions for transmission:

- **Population unvaccinated.**
- **Vector aedes aegypti found.**
- **Climate conditions are favourable**
- **Reservoir monkeys are susceptible.**

Vaccine

00:06:00

- **Vaccine:** 17D vaccine- strain
- **Storage:** +5 to -30° C
- **Yellow fever vaccine** cannot be stored under cold chain temperature of India.
- **Type of vaccine:**
 - **Reconstituted vaccine**
 - Should be kept on ice away from light.
 - **Cold physiological saline diluent is added.**
 - **Does not follow open vial policy.**
 - It should be used up to half an hour
- **Route:** Subcutaneous
- **Dose:** 0.5ml at insertion of deltoid
- **Immunity** starts after 7-10 days and lasts lifelong.
- **Never give the yellow fever vaccine and cholera vaccine together.**
 - There has to be a gap of 3 weeks

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Vector control

00:09:15

- **Aedes aegypti Index:** No. of Aedes mosquito found within 400 mts of an area.
 - Also known as **house index**.
 - The no. of houses showing the breeding of Aedes aegypti.
 - The seaports and airports must be kept free from breeding Aedes aegypti up to 400 mts.
 - The AAI is kept as **<1 (Or zero)** for all international connection's airports and seaports.
- **Quarantine:** A traveller without a valid international certificate of vaccination is placed on quarantine in a mosquito-proof ward for 6 days.

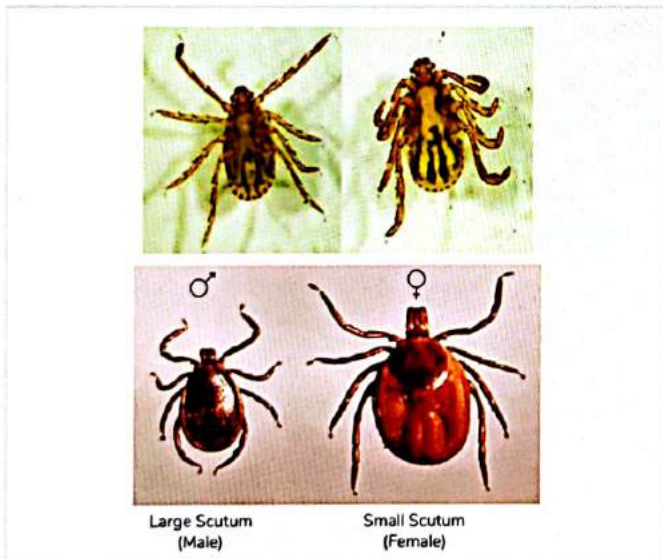
Kyasanur Forest Disease (KFD)

00:11:08

KFD Virus Ecology

Refer Picture 20.1

- Monkeys
- Humans
- Egg larva, nymph and adult stage.
- The vector - **Hard tick**.
 - They have **scutum**- cutaneous covering.



Epidemiology

- Arbovirus disease caused by **Group B toga virus (flavivirus)**
- **IP:** 3-8 days
- **CFR:** 5-10%
- **Vector:** Hard tick (haemaphysalis spinigera and haemaphysalis turtura in India)
- Transmitted to man by the bite of infective ticks (**nymphal stages**)
- Man is an incidental or dead-end host.
- No evidence of man-to-man transmission.
- **Main reservoir:** Rats, squirrels
- **Amplifying hosts:** Monkeys and cattle

- Majority of cases between- 20-40 years
- Males > female
- Mostly occurs in people dependent on forests for livelihood.

Control of ticks

00:13:08

- Insecticide spray (carbaryl, fenthion, propoxur- 2.24 kg/hectare in host spot (50m around the spot of monkey death)
 - Besides endemic foci.
- Restriction of cattle movement in Forest
- Vaccination of at risk population
- Personal vaccination:
 - Adequate clothing
 - Insect repellent (dimethyl phthalate)

MCQs

Q. Jungle yellow fever is primarily a disease of

- Man
- Dogs
- Foxes
- Monkeys

Q. All are features of yellow fever except?

- Subclinical cases present
- Fatality rate > 90%**
- One attack gives lifelong immunity
- Hepatic and renal involvement in severe case

Q. The classical vector of yellow fever is?

- Aedes**
- Culex
- Anopheles
- All the above

Q. Which is correct regarding the administration of the 17D vaccine?

- 0.5 ml IM dose
- 1ml IM dose
- 0.5ml SC dose**
- 1ml SC dose

Q. The main reason yellow fever does not exist in India is?

- High vaccination coverage
- Vector is absent
- Environment conditions not suitable
- None of the above**

Q. Yellow fever certificate of vaccination valid for?

- 6 years starting from 6 days after vaccination
- 10 years starting from 10 days after vaccination
- 10 years starting from 6 days after vaccination
- Lifelong, starting from 10 days after vaccination**

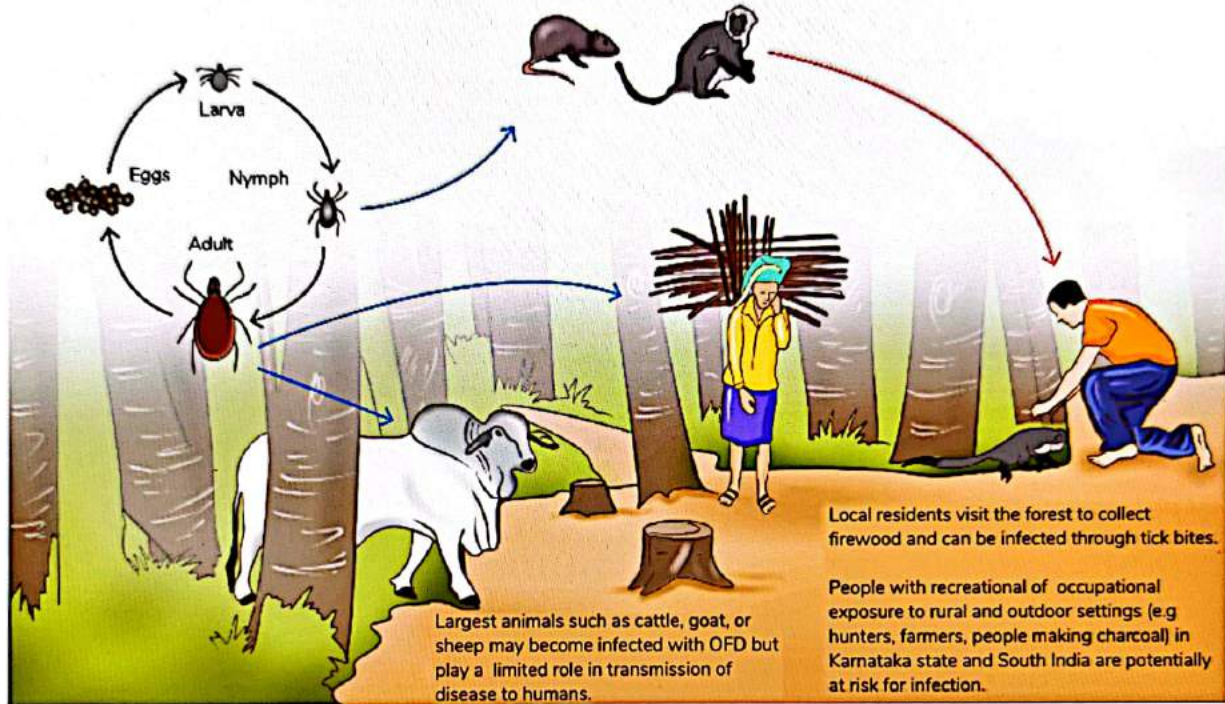
Picture 20.1

The hard tick *Hemaphysalis spinigera* is the reservoir and vector of Kyasanur Forest Disease Virus (KFDV). Once infected ticks remain so for life and are able to pass KFDV to offspring via egg.

Transmission of KFDV to humans may occur after a tick bite or contact with an infected animal, most commonly a sick or recently dead monkey. No person-to-person transmission has been described.

Human cases occur more frequently in drier months (Nov-June in Southwest and South India).

Monkey and small mammals are common hosts for KFDV infection with KFDV causing episodes with high fatality in primates.

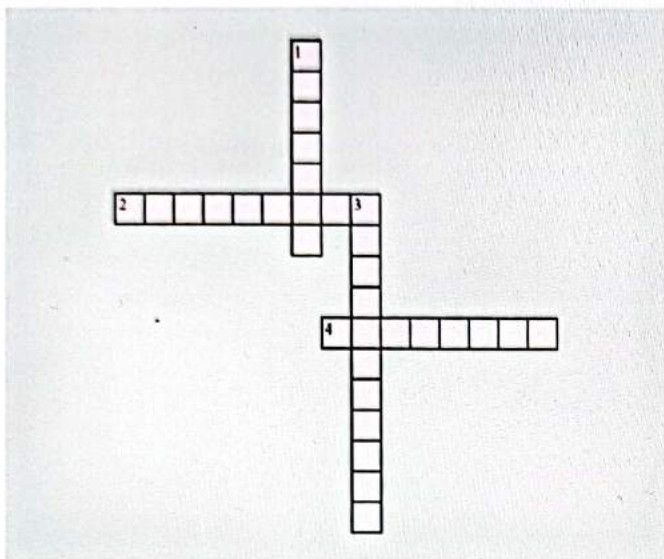




CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Zoonotic disease is caused by an _____
- 4. What is the vector of Kyasanur Forest Disease (KFD)

Down

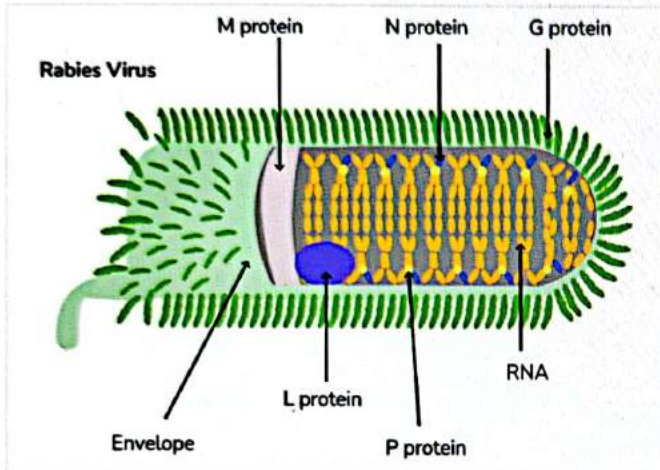
- 1. Yellow fever vaccine is never given along with _____ vaccine
- 3. Jungle cycle is a cycle of yellow fever also called as _____

21

RABIES



- Zoonotic disease
- It has a maximum case fatality rate: 100% fatality rate
- If someone bit by the rabid animal and post prophylaxis is not given on time, the person will die for sure without any escape.
- It doesn't follow the iceberg phenomenon.



- In India, Urban Rabies is very common.
- Rodent bites don't require vaccination.
- Licks on abraded skin (integrity of the skin is broken) is also considered as the route of transmission.
- Aerosol (Rabies infected bats) transmission is very rare.
- In India, bat rabies (Aerosol mode transmission) is not reported.
- Human bite is very dangerous bite- no documented cases so far



Important Information

- Most common form of Rabies in India: **Urban Rabies**
- Which form of Rabies not reported in India: **Bat Rabies**
- For which bite you don't require vaccination: **Rodent Bite**
- Incubation period lasts from 2 to 8 weeks.

Epidemiological Determinants

00:02:15

1. Agents

- **Lyssavirus type 1**
 - Bullet shaped RNA virus.
 - Belongs to the Rhabdoviridae family.
- **Two Types of Viruses**

a. Street virus

- Responsible for Natural infection
- Street Virus causes Rabies.

b. Fixed virus

- Not responsible for Natural infection.
- Used for production of the Vaccine.
- Does not demonstrate Negri bodies.

2. Host factors

- The dog bite mostly occurs in children and as well as adults
- **Age group:** 1 to 24 years

3. Occupation

- Dog handlers
- Forest workers
- Veterinarians.

Route of Transmission

00:06:10

- **Animal bite:** Dog bite, Cat bite, Monkey bite or Wild animal bite.
- They all require vaccination.



Important Information

- Rabies is not found in certain places which are bounded with water.
- Australia
- China (Taiwan)
- Cyprus
- Iceland
- Ireland
- Malta
- Japan
- New Zealand
- Britain
- In India-
 - Andaman and Nicobar Islands
 - Lakshadweep
 - Goa- will be declared as Rabies free very soon.

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Categories of Exposure to Suspect or Confirmed Rabid Animal Bite

00:09:30

- Management depends on these categories only.
- **There are 3 categories**
 1. Category-1
 2. Category-2
 3. Category-3
- **Post exposure prophylaxis:** Primary level of prevention.
 - The virus doesn't get attached to the nerve endings and travel to the brain.

Categories of contact with suspect rabid animal	Post-exposure Prophylaxis
Category 1: Licks or touch on intact skin. <ul style="list-style-type: none"> The integrity of the skin is not broken. 	<ul style="list-style-type: none"> Local wound management
Category 2: Minor scratch or Abrasions without bleeding. <ul style="list-style-type: none"> Integrity of the skin is broken. 	<ul style="list-style-type: none"> Local wound management Immediate Rabies vaccination
Category 3 <ul style="list-style-type: none"> It can be a single bite or multiple transdermal bites. Bleeding occurs. Licks on broken skin. Contamination of mucus membrane from the saliva through licks. Contact with bats. Wild animal bite. 	<ul style="list-style-type: none"> Wound management Rabies vaccination Rabies immunoglobulin administration

Wound Management

00:15:36

- Wound must be kept under running water
- Wash it with soap and water for 10 to 15 minutes.
- Three purposes of Wound Management:
 - Physical
 - Chemical
 - Biological

Physical	<ul style="list-style-type: none"> Wash with running tap water 	<ul style="list-style-type: none"> Mechanical removal of virus from wound
Chemical	<ul style="list-style-type: none"> Wash the wound with soap and water Apply disinfectants like tincture, Iodine. 	<ul style="list-style-type: none"> Inactivation of virus
Biological	<ul style="list-style-type: none"> Infiltrate immunoglobulin in the depth and around the wound in Category 3 exposures 	<ul style="list-style-type: none"> Neutralisation of Virus

Management of Animal Bite

00:16:39

Local Wound Treatment: It is done in all the categories

- The wound must be kept under running water and washed with soap and water for 15 to 20 minutes.
- Purpose-** The virus must be removed and doesn't get attached to the nerve endings.

- You can clean with alcohol and tincture.
- Don't suture the wound because it may cause spreading of the virus.
- If suturing of a wound is required it will be done 24 to 48 hours later.

Rabies Vaccination (Post Exposure Prophylaxis)

Recommended Regimens

00:19:17

- It can be given both in the form of Intramuscular (IM) and Intradermal (ID) prince ankitkarnawat9@gmail.com 9818635293
- According to the **Natural Rabies Control Program**, Intradermal regimen is preferred over Intramuscular regimen.
- Because the ID regimen is cost effective.
- The ID regimen is the updated THAI Red Cross regimen.

THAI Red Cross Regimen

00:20:54

- Intradermal regimen.
- Schedule:** On Days: 0, 3, 7, 28 the Rabies vaccination is given.
- In the four visits, the vaccine is given on two sites simultaneously (2-2-2-2)
- In the IM regimen, the vaccine is also given on day 14.
 - It is given like 2-2-2-0-2
 - Meaning the vaccine is not given by ID route on day 14.
 - Because on day 14, the vaccine is given through the IM route.
- Dose: 0.1ml
- Total: 8 doses are given in this schedule.
- Day 0 is not the first day of dog bite.
 - Day 0 means the day when first dose of vaccination is administered.

Essen Regimen

00:23:37

- Intramuscular regimen
- It has 5 visits: On days 0, 3, 7, 14, 28
- It's been given on one site only.
- So, it is 1-1-1-1-1
- Site:
 - For adults, it is given on the deltoid but not on the gluteal region.
 - For children, the Anterolateral aspect of the thigh.
- Dose: 0.5ml; one complete vial is used.
- Government is preferring to give in the Intradermal regimen whereas in private the Essen regimen is followed.
- This regimen is not cost effective.

Re-Exposure Guidelines

00:25:30

- Same person suffers from dog bite again.
- It has 2 visits- on days 0, 3
- Intramuscular or Intradermal regimens can be used.
- It can be divided into two:

1. A dog bite again within 3 months-
 - o No Vaccination required.
 - o Person is previously immunized.
2. A dog bite again beyond 3 months-
 - o Vaccination is required
 - o **Only 2 visits** are needed- On days 0,3 through ID/IM
 - o Do Not repeat immunoglobulins in Re exposure prophylaxis if it is administered prior (need not be repeated for life)

Pre-Exposure Guidelines

00:29:12

- Given to people at high risk
 - o Veterinarians
 - o Forest workers
 - o Animal handlers
- 3 visits are required.
- Days: 0, 7, 21 or 28
- Route: IM or ID

Rabies Immunoglobulin

00:31:23

- It is given in category 3 bite.
- In certain conditions, it is also given in category 2.
 - o In HIV case
 - o Immunocompromised case
- **Rabies Immunoglobulin is two types**
- 1. Equine immunoglobulin
 - o Not preferred
 - o It's units are 20 IU/kg
- 2. Human rabies Immunoglobulin
 - o Preferred.
 - o Given with 40 IU/kg.
 - o It must be started on Day 0 along with vaccination.
 - o Can be given Up to 7 days (after that not required as antibodies start forming due to vaccination)
 - o Given through **IM route**
 - o It is given 70 % in and around the wound and the rest can be given distant from the wound.
- Immunoglobulin once given in life need not be repeated even in re-exposure cases.

Special Considerations

00:33:30

- No contraindication to post exposure prophylaxis as it is 100% fatal.
- Rabies vaccine be given in pregnancy, HIV, Immunocompromised, infants and children.
- Rabies vaccine is a killed vaccine.
- Individuals on **chloroquine** treatment for malaria - **IM route is preferred** as ID route reduces response of vaccine.
- Even if the bite is from a vaccinated pet dog – post exposure prophylaxis is given.
 - o If the dog is observed and remains healthy for 10 days- continue and finish vaccination.
 - o Day 14th vaccine can be omitted (but not recommended to omit)

- In comparison of Rabies vaccine and COVID vaccine
 - o Preference is given to Rabies vaccine.
 - o Any other vaccine can be given after 14 days gap.

Anti-Rabies Vaccine

00:38:02

- The different types of Anti Rabies Vaccines are
 - o Nervous tissues Vaccines
 - o Avian Embryo Vaccines
 - o **Primary cell culture Vaccines: Human Diploid Cell Vaccines- Currently used**
- **Vaccines approved for ID use:** Verorab, Rabipur, Abhayrab; these are commonly used.
- Rabies vaccine is a killed and Reconstituted vaccine.
- It has to be used within 6 hours.

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MCQs

- Q. A 10 year old child with an unprovoked dog bite comes to you. He has suffered a deep wound. Appropriate action is:
- a. Local treatment of wound for 15 minutes
 - b. Withhold vaccine and observe dog for 10 days
 - c. Give cell culture derived vaccine
 - d. Kill the dog and send brain for biopsy
 - e. Immediate suturing of the wound should be done
- A. a, d
B. a, b, e
C. a, c, d
D. a, c
E. a, c, e

Rabies in Dogs

00:40:16

- Dogs are the most important source of Urban rabies.
- Control
 - o Dogs need to be vaccinated.
 - o If in any community, **80% of the dog population is vaccinated**, Rabies can be controlled.
 - o 80-90% of the dog population is accessible for vaccination
 - o Dogs should receive primary immunisation at age of 3-4 months and booster doses should be given at regular intervals
- Rabies in dogs manifest in 2 forms:
 1. Furious rabies- the dog has got mad and it is biting everyone
 2. Dumb rabies- the dog has become completely silent

MCQ's

- Q. An urban area has higher No. of rabies cases. Most cost effective and logical approach of controlling rabies is
- A. Testing all dogs for rabies
B: Capacity building
C. **Removing stray dogs and vaccinating dog population**
D. Building cooperation among health workers

Types of Vaccines

00:43:06

1. BPL inactivated nervous tissue vaccine (single dose)
 - Dose
 - 5ml for dogs
 - 3 ml for cats.
 - Revaccination advised after 6 months and subsequently every year.
2. Modified live virus vaccine
 - Dose is
 - 3ml by single injection
 - Booster dose every 3 years
 - Eliminate all the stray dogs and zone adults 80% of the dog population.

Other Methods Include

00:44:00

- Registering and licensing of all domestic dogs
- Restraint of dogs in public places
- Immediate destruction of dogs and cats bitten by rabid animals.
- Quarantine for 6 months of imported dogs.
- Health education of people regarding care of dogs and prevention of rabies.

MCQs

Q. In India, urban rabies is maintained by?

- A. Dogs
- B. Cats
- C. Rats
- D. Mongoose

Q. All are features of rabies in man except?

- A. Dead end infection
- B. Aerosol transmission is quite common
- C. Common age group 1-24 years
- D. All animals are susceptible to rabies

Q. Rabies is not found in?

- A. Lakshadweep islands
- B. Rajasthan
- C. Meghalaya
- D. Orissa

Q. A classical cause of Rabies is characterised by all except?

- A. Variable incubation period
- B. Short period of illness
- C. Encephalomyelitis always present
- D. Fatal only some cases

Q. A 10 year old child with an unprovoked dog bite comes to you. Appropriate action is?

- A. Withhold vaccine and observe dog for 10sae a
- B. Give cell culture derived vaccine
- C. No further action is necessary
- D. Kill the dog and send brain for biopsy

Q. Pre-exposure prophylaxis for rabies is given on?

- A. Days 0, 3, 7, 14, 28, 90
- B. Days 0,3, 7, 28, 90
- C. Days 0, 3
- D. Days 0, 7, 28

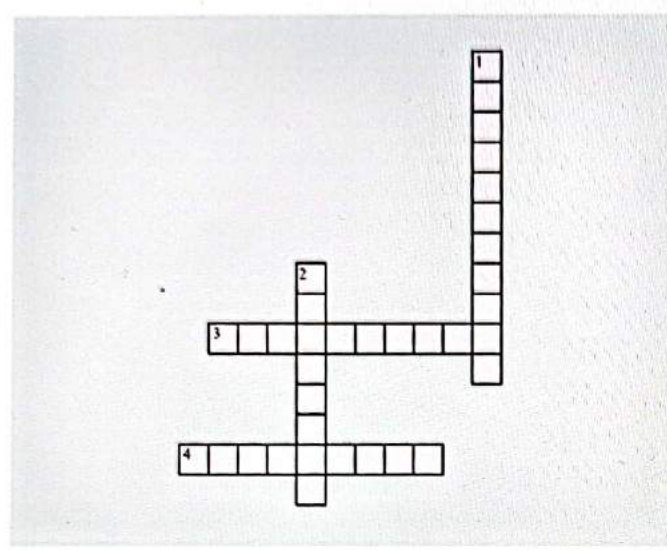
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. For which bite you don't require vaccination
- 4. Which form of Rabies not reported in India

Down

- 1. Most common form of Rabies in India
- 2. Wash the wound with soap and water

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Epidemiology

00:00:13

- Agent: *Leptospira interrogans*.
- Thin and motile spirochete.
- Reservoir: Wild domestic animals.
 - Rodents: *Ratus norvegicus*, *Mus musculus*.
 - Domestic animals: Cattle, sheep, goats.
- Source of infection
 - Direct contact or environment contaminated with excreta, urine of infected animals.
- *Leptospira* is released into the rodent's urine
- The urine contaminates the mud (Soil) or water.
- Sports like rafting, fishing, and swimming can bring infection and leptospirosis.
- Leptospirosis associated with 3 R:
 - Rats
 - Rain
 - Rice fields



Important Information

- Post-disaster leptospirosis can be reported.
- Zinc phosphide - rodenticides can be used to control leptospirosis in post disaster phase

Mode of Transmission

00:02:58

- Direct contact.
- Indirect contact
 - Contact of broken skin with soil, water, vegetation (Rice field) contaminated with *Leptospira*.
- Droplet infection
 - Inhalation while milking cows.
 - Organism is directly inhaled while milking the cows.
- IP (Incubation Period): 4-20 days.
- Males are affected mostly.
- Most common age: 20-45 years.

Clinical features

00:03:57

Anicteric Leptospirosis

- Milder form.
- Pulmonary manifestations

Icteric leptospirosis

- More severe form.
- Jaundice, fever, myalgia, hypotension, circulatory failure
- Pregnancy- Associated with foetal complications, abortions.

Diagnosis

00:04:22

- Blood smear: Dark field examination.
- IgM ELISA: Sensitive test for diagnosis.

Treatment

00:04:31

- DOC (Drug of Choice): Penicillin 6 milliunits daily IV.
- Alternate drugs:
 - Tetracycline
 - Amoxicillin
 - Ampicillin.

MCQs

Q. True about leptospirosis are all except

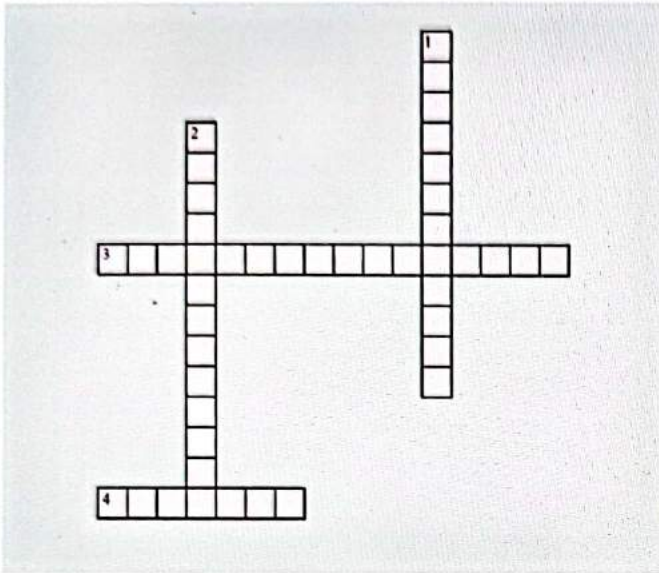
- a. It is a zoonosis.
- b. Incubation period is 2-3 months.
- c. Transmission occurs through direct skin contact.
- d. Drug of choice is penicillin.
- e. Is a spirochaetal disease.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. A mode of transmission that takes place through Inhalation while milking cows
- 4. _____ leptospirosis is the more severe form

Down

- 1. Alternate drugs instead of Penicillin include amoxicillin, ampicillin and _____
- 2. Rodenticides that can be used for the management of leptospirosis are _____



23 PLAGUE

- Zoonotic disease.
- It has epidemic potential.
- **Notifiable** under International Health Regulation like covid 19, yellow fever etc.
- Other names
 - Black death
 - Mahamari

Epidemiological Determinants

00:01:46

1. Agent

- **Yersinia pestis**
- Cocobacilli
- Gram negative
- Non motile

Identified by

- Bipolar staining with **Wayson's stain**.
- Giemsa stain can also be used.

Reservoir of infection

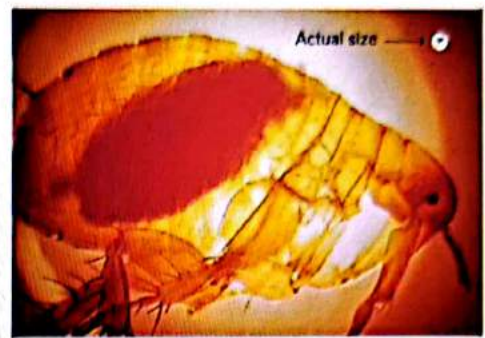
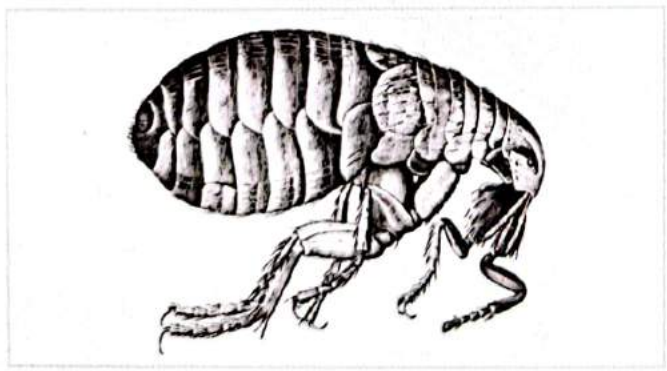
- Wild rodent - **Tatera indica**

Vector

- Rat flea
- Most common and most efficient vector- **Xenopsylla cheopis** (both sexes involved).
- Plague bacilli shows **propagative mode of transmission** in the flea.
- **Partially blocked fleas** are more efficient in transmitting the disease as it survives longer.

Flea Index

- **Total flea index:** Average number of fleas per rat.
- **Cheopis index:** Average number of cheopis per rat.
 - Cheopis index >1: Indicates explosiveness of the disease.
- **Burrow index:** Average number of free-living fleas per species per rodent burrow.
- A rat flea may ingest up to 0.5 cubic mm of blood - containing as many as 5000 bacilli.



Xenopsylla cheopis (oriental rat flea) engorged with blood

Source of infection

- Blocked flea
- Infected flea
- Case of pneumonic plague (man to man transmission).

2. Host factors

- Overcrowding
- Unhygienic condition
- **Case fatality rate - 50% to 100%.**
- 100% is seen pneumonic plague.

Clinical Features

00:10:58

1. Pneumonic plague
2. Bubonic plague
3. Septicemic plague

Bubonic Plague	Pneumonic Plague	Septicemic Plague
<ul style="list-style-type: none"> • Most common • Incubation period: 2 to 7 days. • Forms bubos mainly at the groin and lower limbs. • Flea bites on the lower limbs ↓ • Travel to lymph nodes ↓ • Start replication ↓ • Forms bubos at the groin and lower limbs • Bubos - Swollen lymph glands • No man to man transmission. 	<ul style="list-style-type: none"> • Rare • complications of Bubonic plague. • Person to person transmission. • If not treated leads to 100% fatality. • Sputum shows the plague bacilli. • Incubation period - 2 to 7 days. • Has public health importance. 	<ul style="list-style-type: none"> • Rare. • Plague bacilli present in blood. • Associated with <ul style="list-style-type: none"> ◦ Eschar formation ◦ Gangrene formation • No person-to-person transmission. • Mortality can be up to 90%.

**Diagnosis**

00:16:03

- **Staining**
 - Wayson's stain shows Bipolar staining.
 - Giemsa stains are also used.
- **Gold standard test - blood culture.**
 - Culture medium: **Cary Blair transport medium.**

Prevention and Management

00:17:09

- **Effective method** to break transmission of plague:
 - Control rat fleas
 - By spraying insecticides
 - DDT
 - BHC
 - Carbaryl
 - Most recommended - **5% malathion.**
- To know whether the rats are controlled total flea index is measured
 - If controlled - the total flea index should be **<1 or 0.**
 - Within 48 hours of spraying.
- **Management**
 - First notification under IHR should be done.
 - Isolate the cases at least for 7 to 10 days.
 - **Streptomycin** for 7 to 10 days used for treatment.
 - **Tetracycline** can also be used.

Vaccination

00:20:01

- Effective usually if carried out in 1 week before anticipated plague outbreak.
- Level of prevention - Primary.
- Vaccine stain: **Sokhey modified haffkine vaccine.**
- **Dose**
 - **Day 0:** 0.5ml, SC.
 - **Day 14:** 1ml SC, (day 7 to 14).
- In case of outbreak primary dose at 3 ml for adults is given.
- Immunity is developed 5 to 7 days after vaccination.
- Booster dose for high-risk individuals at 6 months interval.
- Vaccination is mainly recommended for

- Travelers
- Health professionals

- **Chemoprophylactic treatment:** Tetracycline for 5 days

MCQ's

Q. All are true about plague except

- A. **Domestic rat *rattus rattus* has been incriminated as main reservoir**
- B. Both sexes of rate flea bite to transmit the disease
- C. IP for Bubonic plague is 1 to 3 days
- D. Infants under 6 months are not given the killed vaccine

Q. In India main reservoir of plague transmission is

- A. *Rattus rattus*
- B. *Bandicota bengalis*
- C. ***Tatera indica***
- D. *Mus booduga*

Q. Index which is an indicator of potential explosiveness of plague outbreak

- A. Total flea index
- B. ***Xenopsylla cheopis* index**
- C. Specific % of fleas
- D. Burrow index

Q. Plague is transmitted by

- A. Hard tick
- B. Soft tick
- C. **Rat flea**
- D. Louse

Q. Severity of spreading of plague detected by

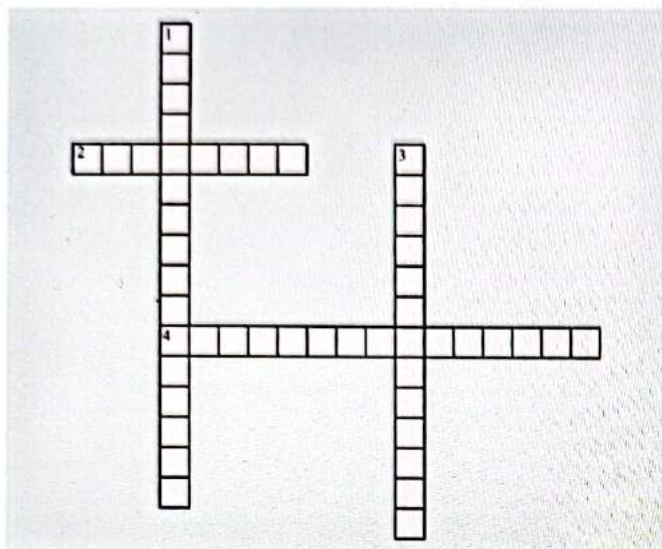
- A. Burrow index
- B. ***Cheopis* index**
- C. Specific flea index
- D. Total flea index



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Waysons stain shows Bipolar staining.
- 4. Rare complications of Bubonic plague.

Down

- 1. Plague bacilli present in blood.
- 3. Forms bubos mainly at the groin and lower limbs.

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24 TETANUS

Epidemiology 00:00:14

- Agent**
- Organism: **Clostridium tetani**
 - It is gram-positive, anaerobic
 - Appearance: **Drum stick**
 - Spore-forming bacilli**
 - The contamination of the wounds with the spores of the bacilli may transmit infection.
 - Tetanus is mainly due to the production of **exotoxin**.

Types of toxins 00:01:18

- Tetanospasmin**
 - Most potent and dangerous toxin in the world.
 - Manifestations: **Opisthotonos (Lockjaw)**.
- Reservoir and source: Soil**
- Mode of transmission:** Contamination of wound with the organism's spores.
- Period of communicability:** None
- Incubation Period:** 6 - 10 days and can extend up to months.

Neonatal Tetanus and Tetanus Neonatorum 00:03:13

- Other Name: **8th-day disease**
- Cause:** Infection of the umbilical stump.
- Elimination** of tetanus was achieved in India around 15th May 2015.
- Criteria for elimination: **Less than one case per 1000 live birth.**

Prevention of Maternal and Neonatal Tetanus 00:05:10

- Safe, clean delivery
- Follow **7 cleans**
 - Clean surface
 - Clean hands
 - Clean cord
 - Clean cut
 - Clean tie
 - Clean water
 - Clean towel
- Never use an unsterilized blade or old blade.
- Cow dung should not be used on cord.

Prevention and Control 00:05:52

- Active Immunization:**
- In a National immunization schedule, tetanus toxoid is given in the form of **tetanus-diphtheria vaccine (Td vaccine)**
 - Time: Pentavalent vaccine
 - 6th week: Penta 1**

- 10th week: Penta 2**
- 14th week: Penta 3**
- Pentavalent vaccine protects from five diseases:
 - Diphtheria
 - Pertussis
 - Tetanus
 - Hemophilus influenzae B
 - Hepatitis B
- At 16 to 24 months- **1st DPT booster.**
- At 5 to 6 years: **DPT 2nd booster**
- 10 to 16 years: **tD 1 and tD 2**
- 7 doses of tetanus are recommended.**
- TT vaccine:** Trauma cases
- tD vaccine:** National immunization schedule

- Passive Immunization: 00:08:45**
- Human tetanus immunoglobulin
 - Dose:** 250 IU for all age groups
 - Protection:** 30 days

Tetanus Management Protocol 00:09:40

Category	Clean wound	Unclean wound
A - Full immunization within 5 years.	Only wound care.	Only wound care.
B - Full immunization > 5 years ago < 10 years.	Wound Care + TT single dose.	Wound Care + TT single dose.
C - Full Immunization > 10 years ago.	Wound Care+ TT single dose.	Wound Care + TT single dose + Human Tetanus Immunoglobulin.
D - Unknown, not known, never taken immunization.	Wound Care + TT complete course.	Wound Care + TT complete course + Human Tetanus Immunoglobulin.

Important Information

Active and passive Immunization is given together in case of

- Rabies
- Diphtheria
- Tetanus

Antibiotics

00:13:01

- Recommended for a non-immune person with sustained injury
- Not active against spores
- **Dose:** 1.2 mega units of Benzathine Penicillin

- a. Full course of TT
- b. Single dose of TT
- c. Human tetanus globulin
- d. Human tetanus globulin and a single dose of toxoid

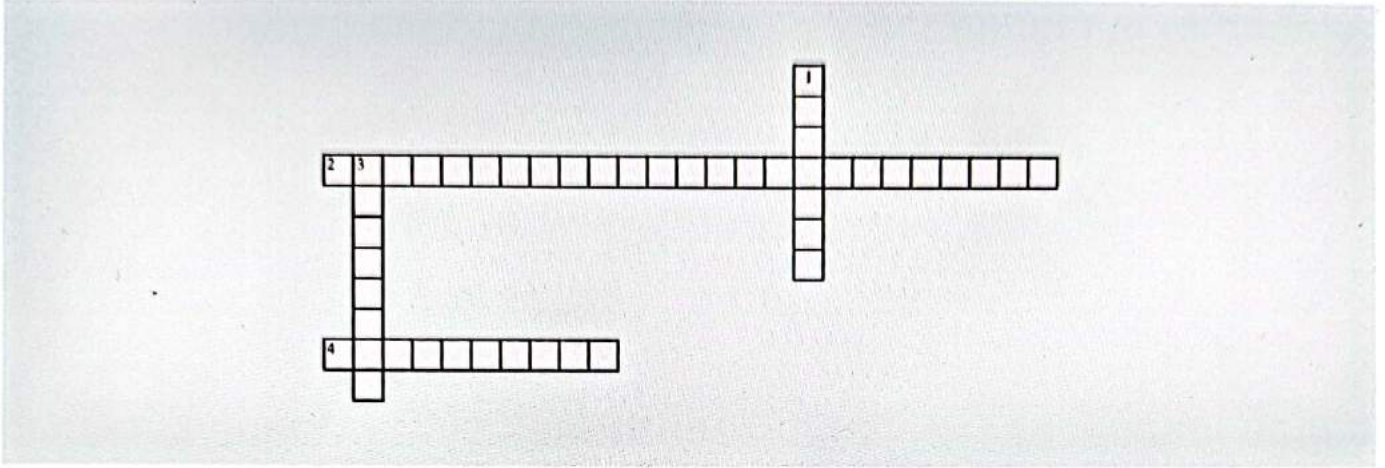
Q. A person has received complete immunization against tetanus 10 years ago; now he presents with a clean wound without any lacerations from an injury sustained 3 hours ago. He should be given



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. In a National immunization schedule, tetanus toxoid is given in the form of this
- 4. Active and passive Immunization is given in case of rabies, tetanus and _____

Down

- 1. The contamination of the wounds with the spores of the _____ may transmit infection
- 3. Tetanus is mainly due to the production of _____

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25 HIV AND AIDS



Epidemiological Determinants

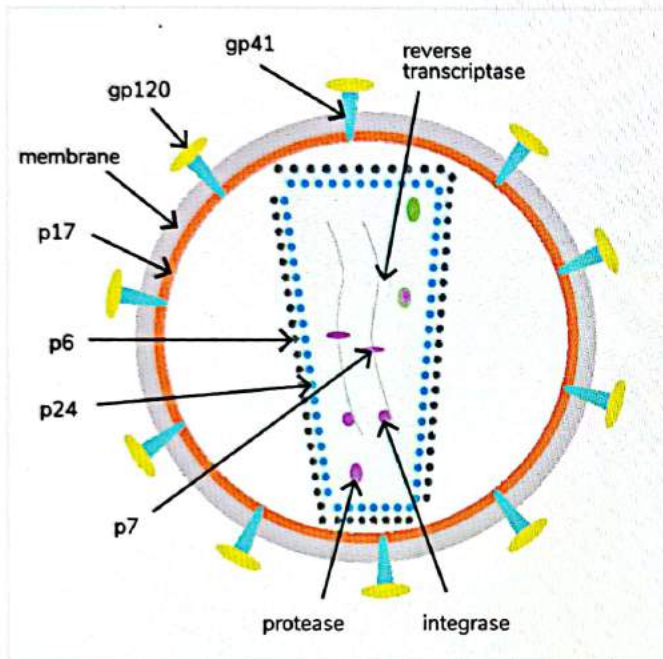
00:00:31

Agent

- Single stranded RNA virus
- Family: **Lentivirus**

Types of HIV

- It is of two types
 - HIV 1 - more common
 - HIV 2



- You can identify the HIV virus with the help of:
 - gp41
 - gp120
 - Reverse transcriptase

Important Information

HIV virus is sensitive to

- Alcohol
- Detergents solvent
- Resistant to radiation

Route of Transmission and Efficiency of The Route

00:01:41

- Route of transmission includes:
 - Sexual transmission
 - Blood
 - Sharing needles and syringes
 - Mother to child transfusion
 - Needle prick injury

Route of Transmission	Maximum Burden (Prevalence)	Efficiency of the Route (Risk of transmission)
Sexual route	87 - 90% of the cases	0.01 - 1%
Blood Transfusion	Less than 1% of the cases	greater than 90%
Sharing needles and syringes	1% of the total cases	5-10%
Needle prick injury	Less than 1% cases	0.3%
Mother to child transmission	5% of the total cases	25 -30% <ul style="list-style-type: none"> • 30% for developing countries

Important Information

- **Most effective route of transmission:** Blood transfusion (Maximum risk of transmission)
- **Most common route of transmission of HIV / AIDS:** Sexual route (Heterosexual route)
- **Sexual transmission is of two types**
 - Homosexual
 - **Most efficient route**
 - Heterosexual

Q1. The most common mode of HIV transmission in India is?

- A. Blood transfusion
- B. Mother to child transmission
- C. **Sexual transmission**
- D. Use of unsterile syringes and needles

Q2. Route for HIV transmission with maximum efficiencies:

- A. Sexual
- B. **Transfusion of blood/blood products**
- C. Sharing needles/syringes
- D. Mother to child transmission

Q3. The commonest mode of transmission of AIDS in India (in descending order)

- A: Transplacental, homosexual, heterosexual
- B. Homosexual, heterosexual, transplacental
- C. **Heterosexual, transplacental, homosexual**
- D. Heterosexual, homosexual, transplacental



High risk of transmission 00:10:00

- Concentration of HIV is **higher in semen** than in vaginal secretions
- Risk of transmission is more from male to female
- More vaginal area is exposed with less concentration of HIV
- The **viral load** of HIV in urine is less
- The viral load in **saliva** is almost negligible

Host Factors 00:12:30

- Age: **30 - 40 years** (May extend to 50 years also)
- No sex prediction

Q4. The highest number of AIDS cases in India have occurred in the age group of:

- A. 0-14 years
- B. 15-29 years
- C. **30-44 years**
- D. Above 45 years

- Associated with **social discrimination**
- **High risk transmission:** Male to female transmission is higher
- Anal sexual intercourse is 3-4 times more dangerous than vaginal.
- **STD is a predisposing factor**
- Presence of STD increases the risk of HIV 10 times
- Adolescents chance of transmission higher due to **thinning of mucosal lining**

High Risk Groups for HIV 00:15:24

- Commercial sex workers (CSW)
- Men having sex with men (MSM)
- Women having sex with women (WSW)
- IV drug abusers
- Transgender groups (Hijras)

Bridge Population 00:16:35

- It is the **connection** between the high risk population and general population
 - Long distance truck drivers
 - Single male migrates
 - Clients of sex workers
 - STD patients

General Population 00:17:20

- Difficult to assess prevalence of HIV in general population
- **Antenatal women are taken as a proxy indicators of general population**
- Results are extrapolated to the general population
- Currently this system is used for **HIV sentinel surveillance**

Target Interventions in NACP 00:18:29

- **National AIDS Control Programme**

- These are **specific groups** of interventions directed towards the high-risk group.
- E.g.-
 - Provision of female condoms for **commercial sex workers** (Under NACP)
 - For IV drug users, **opioids substitution therapy** are given

Important Information

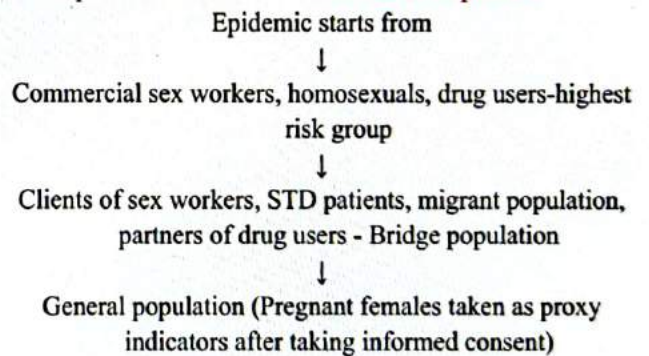
- Doctors suffer accidental injury and are not at high risk
- Female condoms are not promoted under National Family Welfare Program as it requires motivation and expertise to use and has high failure use under the National Family Welfare Programme because female condoms require **experts** for insertion though they have a high failure rate

Q6. Targeted Interventions for HIV is done for all except:

- A. Commercial sex workers
- B. Migrant laborers
- C. Street children
- D. **Industrial workers**

Epidemiological Pattern of HIV Epidemic in India 00:21:37

- This pattern is known as the **concentrated epidemic**.



Classification of the States 00:23:18

- This is done based on the HIV Sentinel Surveillance data
- It helps to find out the
 - Prevalence of the disease
 - High risk states
 - High risk districts

Prevalence groups	Description
<small>anjtkarnawat9@gmail.com</small> Group - 1 (High Prevalence)	<ul style="list-style-type: none"> • Maharashtra, Tamil Nadu, Andhra Pradesh, Karnataka, Manipur, Nagaland • High risk groups: > 5% • Antenatal clinics: > 1%



Group II (Moderate Prevalence)

- Gujarat, Goa, Pondicherry
- **High risk groups:** > 5%
- **Antenatal clinics:** < 1%

Group III (Low Prevalence)

- Remaining states and UTs
- **High risk groups:** < 5%
- **Antenatal clinics:** < 1%

Most common mode of transmission of HIV (Northeastern states): Injectable drug use

Categorization of Districts

00:25:22

Refer Table 25.1

Stages of HIV

00:27:54

Refer Table 25.2



Important Information

- MC opportunistic infection among PLHIV in **India:** Tuberculosis
- 2nd most common opportunistic infection in India: Candida
- MC opportunistic infection among PLHIV in **World:** Pneumocystis Carinii pneumonia

Prevention

00:30:17

- To prevent
 - Opportunistic infections
 - Cotrimoxazole preventive therapy.
 - Given when the CD4 count is decreased or less than 350 cells/cubic millimeter.
 - It will prevent Pneumocystis Carinii pneumonia.
 - TB- Isoniazid prophylactic treatment is recommended.

Table 25.1

Category of Districts	ANC (Antenatal Clinics)	High Risk Groups	Hotspots
A	> 1% among antenatal women anytime, anywhere in the last 3 years	-	-
B	1-4% <small>prince ankitkumar9@gmail.com 9818635293</small>	> 5% anytime, anywhere in last 3 years	-
C	< 1%	< 5%	Known hotspots
D	< 1%	< 5%	No known hotspot

Table 25.2

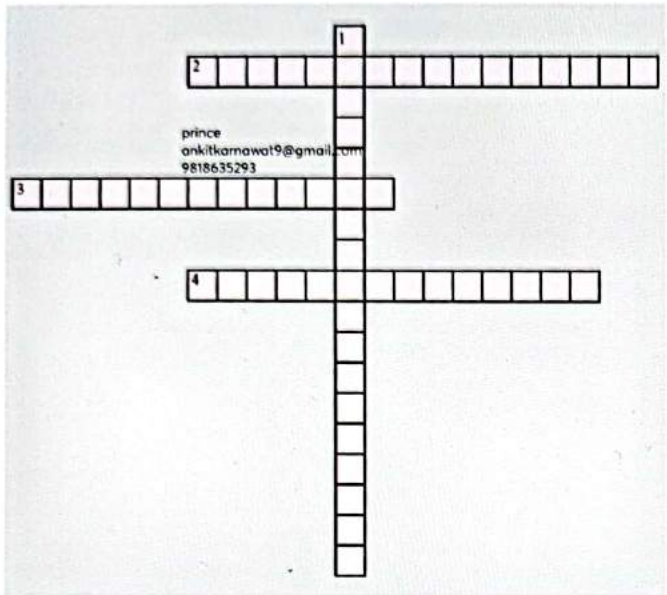
Stage 1 Asymptomatic	Stage 2 Mild disease	Stage 3 Moderate Disease	Stage 4 Severe disease (AIDS)
No symptoms	Wt loss > 5 - 10%	Wt loss > 10%	HIV wasting syndrome
Persistent Generalized Lymphadenopathy	Sore or cracks around the lip	Oral thrush	Esophageal thrush
	Seborrhea	Oral hairy	More than 1 month: Herpes simplex ulceration
	Pruritis	Leukoplakia	Lymphoma
	Herpes Zoster	More than 1 month Diarrhea	Kaposi sarcoma
	Recurrent URTIs	Acute necrotizing ulcerative gingivitis	Invasive cervical cancer
	Recurrent mouth ulcer	Unexplained fever	Pneumocystis pneumonia
		Severe bacterial Infection	Extrapulmonary TB
		Pneumonia	Cryptococcal meningitis
		Muscle infection	Toxoplasma Brain abscess
		Pulmonary TB	Visceral leishmaniasis
		TB lymphadenopathy	HIV encephalopathy



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. It is the connection between the high risk population and general population
- 3. To avoid opportunistic infections which preventive therapy is given?
- 4. These are taken as a proxy indicators of general population

Down

- 1. Most common mode of HIV transmission in India is _____



Diseases	Rickettsial Agent	Vector	Mammalian host
Typhus Group			
Epidemic Typhus	E. Prowazekii	Louse	Humans
Murine Typhus	R. Typhi	Flea	Rodents
Spotted Fever Group			
Indian Tick Typhus	R. Conorii	Tick	Rodents, dogs
Rocky Mountain Spotted Fever	R. Rickettsiae	Tick	Rodents, dogs
Rickettsial pox	R. Akari	Mite	Mice
Orientia Group			
Scrub Typhus	O. Tsutsugamushi	Mite (trombiculid mite)	Rodents
Others			
Q Fever	C. Bruneti	Nil	Cattle, sheep goats
Trench fever	R. Quintana	Louse	Humans

- Epidemic Typhus- R. Prowazekii - Louse - human
 - Endemic Typhus - Murine Typhus- R. Typhi- flea - Rodents
 - Scrub Typhus-Orientia Tsutsugamushi-Trombiculid Mite- Rodents
 - Q-fever has no vector-only Inhalation of infected dust or consumption of milk
- Q. Not spread by Louse is :**
- a. Epidemic Typhus
 - b. Q fever
 - c. Relapsing Fever
 - d. Trench fever

MCQs

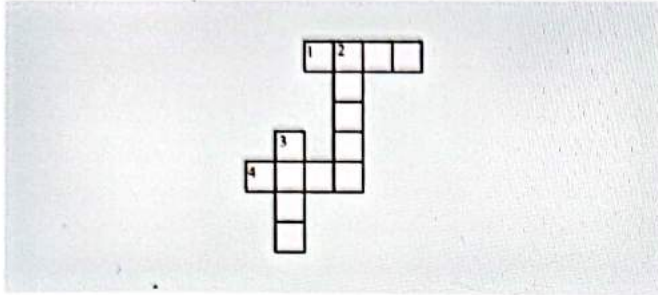
- Q. All are true about scrub Typhus except:**
- a. Mite is a vector
 - b. Adult mite feeds on vertebral host
 - c. Caused by R. Tsutsugamushi
 - d. Tetracycline is treatment



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 1. Murine Typhus
- 4. Rickettsial pox

Down

- 2. Epidemic Typhus
- 3. Rocky Mountain Spotted Fever



Ebola

00:00:08



- **Bio-terrorism agent category A**
- Filoviridae family
- Most common serotypes:
 - Ebola
 - Tai
 - Reston
 - Bundibugya
- Reservoir: Bats and wild animals
- Incubation period: 2-21 days
- Mode of transmission:
 - Body secretion (urine, faeces, sweat, seminal secretion, blood)
 - Bat bites
 - Sexual route
- Case fatality rate: 50% -90%

Clinical features

00:01:48

- Nausea
- Diarrhoea
- Pneumonia
- **The most common cause of death:**
 - Renal failure
 - Liver failure

Immunization

00:02:00

- Viral Vector vaccine

Treatment

00:02:04

- Monoclonal antibodies
- Remdesivir

Life cycle

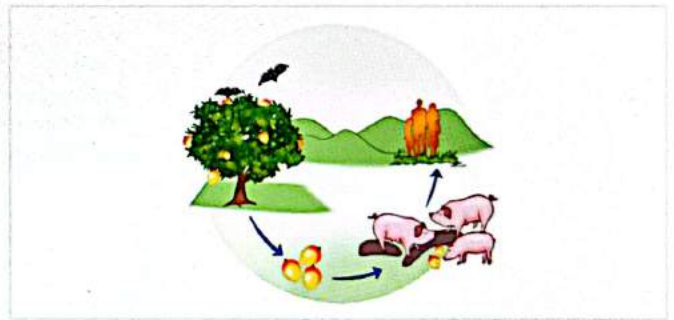
00:02:08

- Bat, chimpanzee and humans.

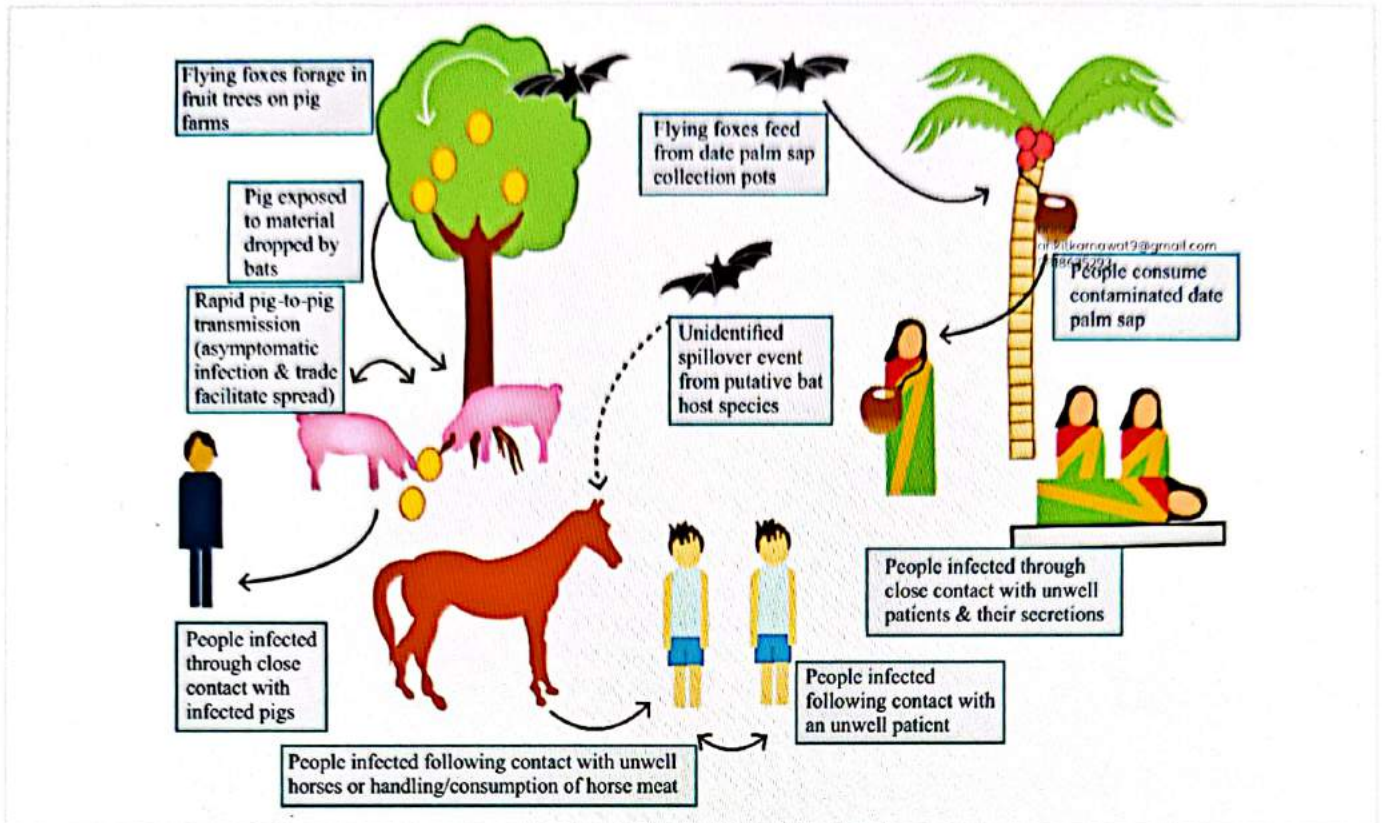
Enzootic Cycle Epidemic among animals	Epizootic Cycle Epidemic
<p>New evidence strongly implicates bats as the reservoir hosts for ebolavirus, through the means of local enzootic maintenance and transmission of the virus within bats population remain unknown</p>	<p>Epizootics caused by ebolaviruses appear sporadically, producing high mortality among non-human primates and duikers and may precede human outbreaks. Epidemics caused by ebolaviruses produce acute disease among humans, except Reston virus, which does not produce detectable disease in humans. Little is known about how the first passes to humans, triggering waves of human-to-human transmission and an epidemic</p>

Nipah Virus

00:03:41

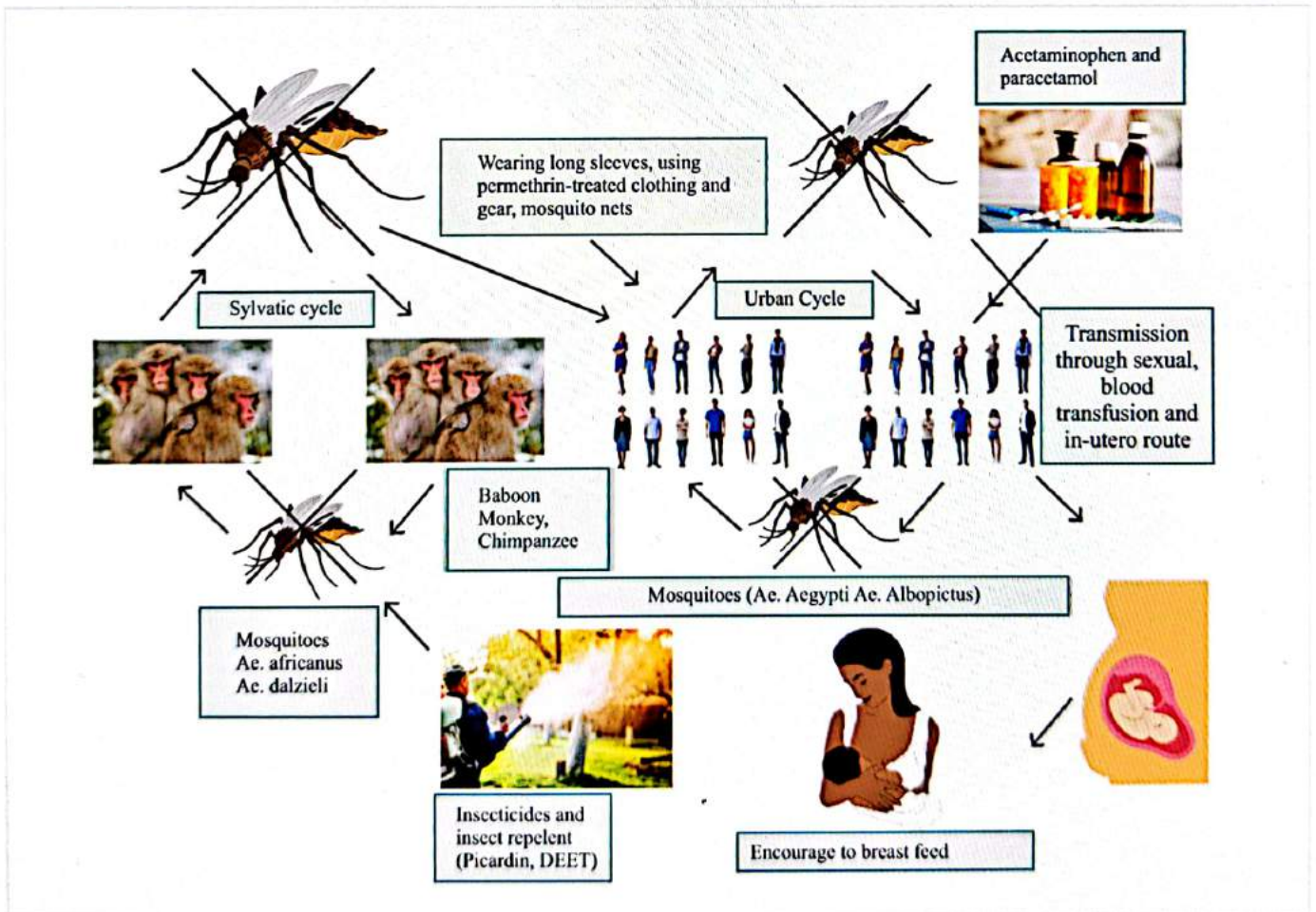


- **Bioterrorism - Category C**
- Paramyxoviridae family
- Nipah is a small town in Malaysia where it was first diagnosed and isolated
- 2018 - Nipah outbreak in Kerala
- Reservoir:
 - Fruit bat (Pteropus genus)
 - Transmits disease
 - But do not suffer from disease
- Incubation period: 4-14 days
- Mode of transmission:
 - Pigs (amplifying host)
 - Bat bite
 - Infected humans
- Case Fatality Rate - 40-70%
- Severe cases -
 - ARDS
 - Encephalitis
- Treatment
 - Symptomatic
 - Ribavirin



Zika Virus

00:06:46



- **Single-stranded RNA flavivirus**
- **Most common vector:**
 - Aedes Aegyptus (most common)
 - A. Albopictus
- **Reservoir:** unknown
- **Mode of Transmission:**
 - Vector and perinatal
 - Breast feeding
 - Sexual route
 - Blood transfusion
 - In utero mother to child transfer
- **Incubation period:** 5-15 days

Clinical Features:

- 80% asymptomatic
- Mild self-limiting disease
- Maculopapular rash + arthralgia
- Microcephaly + GBS in children
- Diagnosis – RTPCR
- Treatment is symptomatic

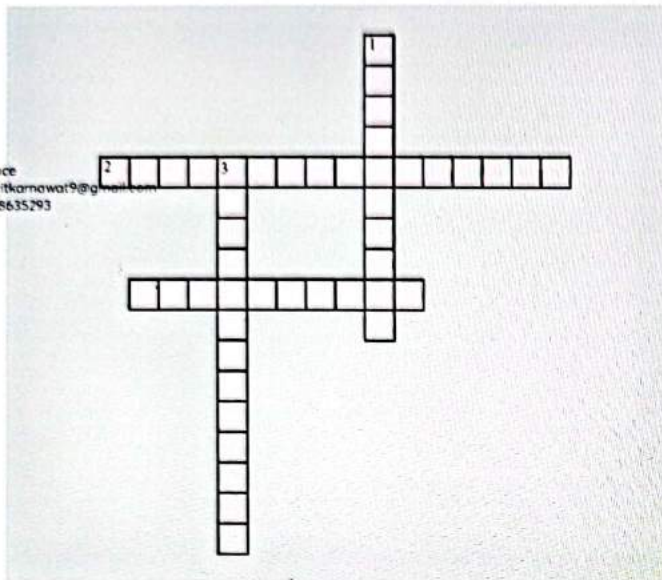
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CROSS WORD PUZZLES



Crossword Puzzle



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Across

- 2. Respiratory distress syndrome
- 4. Most common vector

Down

- 1. Emerging virus
- 3. Epidemic among animals



PREVIOUS YEAR QUESTIONS



- Q. Vaccine contraindicated in pregnancy is? (NEET 2019)
- Hepatitis A
 - Hepatitis B
 - Rabies
 - Varicella**
- Q. Subacute Sclerosing panencephalitis (SSPE) is a complication of? (FMGE DEC 2019)
- Measles**
 - Mumps
 - Rubella
 - Varicella
- Q. Vaccine strains changed every year in? (NEET 2019)
- Measles
 - Rubella
 - BCG
 - Influenza**
- Q. The following serological status is noted in a patient: HbsAg positive and HbeAg positive diagnosis is? (FMGE Dec 2019)
- Acute viral hepatitis
 - Chronic viral hepatitis
 - Acute viral hepatitis with infectivity**
 - Remote infection
- Q. Urban malaria scheme, following is not true? (FMGE Dec 2018)
- Utilization of anti-larva measures
 - Slide positivity rate more than 10%**
 - It is done in town/city with a minimum of 50,000 population
 - Introduction of active surveillance
- Q. Rapid diagnosis of rabies in a rabid living dog? (FMGE Dec 2018)
- Fluorescent antibody test**
 - Cornel impression
 - Inoculation in mouse
 - None of the above
- Q. Causative agent for Kala-azar/visceral leishmania's is? (FMGE June 2018)
- Leishmania donovani**
 - Leishmania tropica
 - Leishmania braziliensis
 - None of the above
- Q. True regarding mother-to-child transmission of HIV is? (NEET 2019)
- Rate of transmission is 80-90%
 - Very low chance of transmission if the mother is newly infected
 - Transmission is a direct relationship with the maternal viral load**
 - Elective C-section has no role in prevention
- Q. A 32-year-old patient develops vomiting 3-4 hrs after eating a meal what is the most likely cause? (NEET 2020)
- Staphylococcus aureus**
 - Salmonella enteritidis
 - Clostridium botulinum
 - Clostridium perfringens
- Q. Vector for Zika virus disease is? (NEET 2020)
- Anopheles stephensi
 - Phlebotomus
 - Aedes Aegypti**
 - Culex
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- Q. SARS is caused by a novel variant of? (FMGE Dec 2019)
- Lyssavirus
 - Coronavirus**
 - Pox Virus
 - Toga virus
- Q. A 32 years old Male presented to OPD with progressive black discoloration of the nose. He was subsequently diagnosed as a case of Mucormycosis. The treatment will include? (NEET June 2022)
- Terbinafine
 - Ketoconazole
 - Amphotericin B**
 - Clotrimazole
- Q. Rabies immunoglobulin, true is/are (Multiple response)? (INICET May 2022)
- Not useful after 72 hours
 - Maximum dose in deltoid muscle
 - Dose 20 IU per kg**
 - If human Ig is not present, then given equine IG**



Q. Height-independent obesity index? (FMGE Jun 2018)

- A. **Corpulence index**
- B. Quetelet's index
- C. Broca's index
- D. ponderal index

Q. Most common cause of Blindness in India? (FMGE Dec 2019)

- A. **Cataract**
- B. Refractive error
- C. Trachoma
- D. Glaucoma

Q. A baby has come to PHC OPD for a routine checkup. His growth chart shows the weight of the baby between 85-95th percentile. He is considered to be: (FMGE June 2022)

- A. Underweight
- B. Normal
- C. **Overweight**
- D. Obese

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29

**NATIONAL HEALTH MISSION RMNCH-A
MATERNAL INITIATIVES**



National Health Mission

00:00:36

- National Health Mission supervises everything.
- Launched in 2013.
- Includes
 1. NRHM (National Rural Health Mission- launched in 2005)
 2. NUHM (National Urban Health Mission)

- Nischay Kits (home based UPT testing kits provided free by Asha)
- Sterilization Services

Goals of NHM

00:03:03

- To lower
 - Maternal mortality rate 1/1000 live births.
 - IMR (Infant Mortality Rate) to 28/1000 live births.
 - TFR (Total Fertility Rate) to 2.1
 - Anemia in women of reproductive age group
 - Mortality & Morbidity from communicable, non-communicable and other emerging diseases.
 - Out of pocket expenditure (Ayushman Bharat covers the insurance packages and provides a financial protection of 5 lakh per family per year)
 - Annual incidence and Mortality from TB by 50%
 - Prevalence of leprosy to < 1/10000 population and incidence to 0 in all districts.
 - Annual malaria incidence to <1/1000
 - Microfilaria prevalence in all districts to <1%
- To eliminate kala-azar by 2015, <1 case per 10000 population in 1 block.

Important Information

- **Nikshay:** Technology based surveillance for TB patients
- **Nikusht:** Technology based surveillance for Leprosy patients

Components under NHM

00:07:33

1. National Rural Health Mission
2. National Urban health Mission
3. RMNCH+A (Reproductive, Maternal, Child Health+ Adolescent)
4. Control of Communicable Diseases
5. Control of Non-communicable Diseases
6. Administrative components

2. Maternal Health

- Use Mother child tracking system (MCTS)
- High risk pregnancies
- Highly trained Health professionals.
- Reviewing maternal and infant deaths
- Identify low institutional delivery areas and incentivize ANMs for domiciliary care services.

3. Newborn health

- Exclusive breastfeeding
- Homebased new-born care through ASHA
- Essential newborn care
- Special newborn care unit
- Use of Gentamicin by ANM

4. Child Health

- Focus on nutrition (managed by program ICDS)
- Diarrhea management (Managed by IMNCI)
- Management of Pneumonia (managed by IMNCI)
- Full immunization coverage
- RBSK (Rashtriya Bal Swasthya Karyakram)

RMNCH+A

00:09:10

- Launched in 2013.
- Based on a 5X5 strategy.
- 5 Beneficiaries have 5 interventions/Strategies.

5. Adolescent Health

- Teenage Pregnancy
- Peer educators
- Strengthen ARSH clinics (Adolescent Reproductive Sexual Health)
- Iron Plus initiatives (Anemia Mukht Bharat)
- Promote Menstruation hygiene.

Refer Table 29.1

1. Reproductive Health

- More targeted on Family planning.
 - Spacing Method PPIUCD
 - Internal IUCD
 - HDC and ESB

Child Survival and Safe Motherhood Program

00:16:00

- Launched in 1992
- Focus: Antenatal services.

Janani Suraksha Yojana

00:16:22

- Started in 2005.
- Purpose - to promote institutional Deliveries.
- Incentives are provided to-



- o pregnant females to deliver in institutions.
- o ASHA workers to mobilize women to health institutions for delivery.
- In Low performing states given for all births
- In high performing states, given only to below poverty line women, SC/ST women who are delivering in government setups and is given only up to 2 live births.
- Subsidizes the cost of C section and obstetrics complications up to Rs. 1500
- All BPL women delivering at home gets incentive of Rs 500.

Category	Rural Areas		Urban Areas	
	Mother's Package	ASHA'S package	Mother's Package	ASHA'S package
LPS (Low performing states)- % of institutional deliveries is poor	Rs. 1400	Rs. 600	Rs 1000	Rs. 400
HPS (High Performing states)- % of institutional deliveries is high.	All BPL /Scheduled caste/ scheduled Tribe (SC/ST) women delivering in a government health center (maximum- 750 rs)	Rs. 600	Rs. 600	Rs. 400

Janani Shishu Suraksha Karyakram

00:26:05



- Launched in 2011.
- Beneficiaries
 1. pregnant women
 2. Women up to 42 days post delivery
 3. Infants up to 1 year
- Purpose - to reduce out of pocket expenditure.

- Free entitlement
 - o Up to 3 days for normal delivery
 - o Up to 7 days for c section
- Free components under this program are:
 - o Free Delivery
 - o Free Diagnostics
 - o Free Drug
 - o Free Diet (3 days for normal & 7 days for C section)
 - o Free Transport
 - o Free Blood

LAQSHYA (Labor Room Quality improvement initiatives)

00:31:09



- Aim- improve care in the Delivery services in labour room and ensuring satisfaction of beneficiaries.
- Incentives - provided to Health care setups (CHC, sub-district hospital and District hospital)
- Sub centers and PHC are not a part of LAQSHYA.
- NQAS score (National quality assurance standard)

Score	Badge
70%	Silver
80%	Gold
90%	Platinum

- 80% satisfied beneficiaries will be provided incentive of
 - o Rs. 6 lakhs: for Medical College hospitals
 - o Rs. 3 lakhs: District hospitals
 - o Rs 2 Lakhs: FRU (mainly CHCs, Subdistrict hospitals)

Pradhan Mantri Matru Vandana Yojana

00:35:59



- Cash incentive is given only up to 1 birth.
- Cash incentive given - Rs. 5000
- given in 3 installments
 1. At the time of registration: Rs. 1000
 2. At the time of prenatal checkup after 6 months of pregnancy: Rs. 2000
 3. At the time of vaccination of the baby (BCG, OPV, DPT): Rs. 2000
- This program is under Ministry of women and child development.

Pradhan Mantri Surakshit Matritva Abhiyan 00:38:22



- On the 9th of every month free antenatal services are provided to women particularly in the end/3rd trimester in government and private facilities which have become a part of it.
- Purpose- identify high risk pregnancies on time.
- This is also under the Ministry of health and family welfare
- If the woman is at high risk- red card.
- If the woman is at no risk- green card.
- If the woman is a case of PIH- blue card.
- If the woman is under any comorbidity (Diabetes, Thyroid)- yellow card.

Surakshit Matritva Aashwasan (SUMAN) scheme

00:40:33



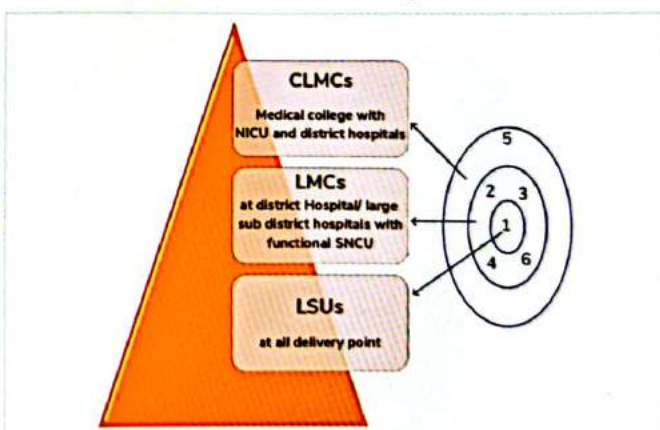
- Launched in 2019.
- This is also under the ministry of health and family welfare.
- Initiative: Zero preventable maternal and newborn deaths.
- **Beneficiaries**
 1. Pregnant women during antenatal period
 2. Women during delivery,
 3. Women up to 6 months post-delivery.
 4. All sick neonates
- Total number of services provided-18.

Maa Programme (Mother Absolute Affection) 00:45:04



- promote breastfeeding.
- Human Milk Bank: it has
 - i. Lactation support unit.
 - ii. Lactation management centers- present at all district and large sub district hospitals which have special newborn units.
 - iii. Comprehensive Lactation management Centers.

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- Lactation counseling and breastfeeding initiations.
- Stimulation and expression support through electric breast pumps
- Collection of donor human milk
- Storage of donor human milk
- Processing of donor human milk
- Dispensing of donor human milk



ICDS (Integrated child development services) 00:47:00

- includes pregnant females where we are providing her supplementary nutrition.



Anemia Mukht Bharat

00:47:27



- Provides prophylactic iron & folic acid tablets to pregnant and lactating women.
- 60 g Fe & 500 mg folic acid daily.
- Deworming of pregnant women around the 2nd trimester.

MCQ's

Q. All are true about Janani Shishu Suraksha Karyakram except?

- A. Free Diet to mother during hospital stay
- B. Free delivery
- C. Free transport from home and back
- D. Free treatments of sick infants upto 6 months

Q. Under NRHM who will be the link personally between community and health care service?

- A. Anganwadi worker
- B. TBA
- C. ASHA
- D. ANM

Q. Janani suraksha Yojana includes:

- A. Tetanus Immunization
- B. Institutional Deliveries
- C. Iron supplementation
- D. Abortions

Q. Which health care center is not a part of LaQshya?

- A. CHC
- B. District hospital
- C. PHC
- D. sub district hospitals

Q. Which is the incentive known to trained medical officers and ANMs for intrapartum care?

- A. LaQshya
- B. Sparsh
- C. Dakshatha
- D. MAA

Q. An initiative for zero preventable maternal and newborn deaths is:

- A. Janani Shishu Suraksha Karyakram
- B. Pradhan Mantri Surakshit Matritva Abhiyan
- C. Surakshit Matritva Aashwasan
- D. Navjat Shishu Suraksha Karyakram

Q. Pradhan Mantri Matru Vandane Yojana was launched by which ministry?

- A. Ministry of health and family welfare
- B. Ministry of women and child development
- C. Ministry of human resource and development
- D. Ministry of education

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Table 29.1

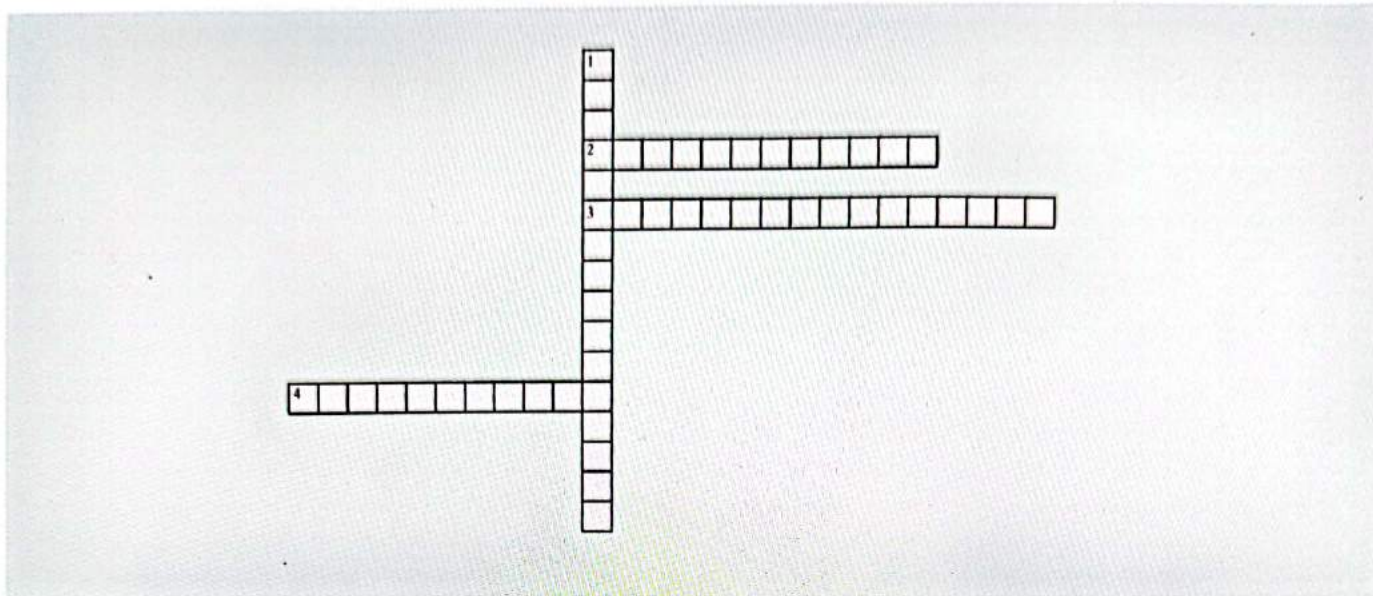
Reproductive Health	Maternal Health	Newborn Health	Child Health	Adolescent Health
<ol style="list-style-type: none"> 1. Spacing methods PPIUCD 2. Interval IUCD 3. HDC and ESB 4. PTK: "Nischay Kits" 5. Sterilization services. 	<ol style="list-style-type: none"> 1. Use MCTS 2. High risk pregnancies 3. Highly trained HR 4. Review maternal and infant deaths 5. Identify low institutional delivery areas and incentivize ANMs for domiciliary care services 	<ol style="list-style-type: none"> 1. Exclusive breastfeeding 2. HBNC through ASHA 3. Essential Newborn care 4. Special Newborn Care Units 5. Use of Gentamycin by ANM 	<ol style="list-style-type: none"> 1. Focus on nutrition 2. Diarrhoea management 3. Management of pneumonia 4. Full immunization coverage 5. RBSK 	<ol style="list-style-type: none"> 1. Teenage pregnancy 2. Peer educators 3. Strengthen ARSH clinics 4. Iron Plus Initiative 5. Promote Menstrual Hygiene



CROSS WORD PUZZLES



Crossword Puzzle



Across

2. In this, we are trying to promote breastfeeding. It should be done exclusively upto 6 months and can also be done upto 2 years.
3. Teenage Pregnancy (common problem, sexual and reproductive health)
4. Focus on nutrition (managed by program ICDS)

Down

1. Under this we are Targeting providing prophylactic iron & folic acid tablets to pregnant and lactating women. 60 g Fe & 500 mg folic acid daily. Also, we are ensuring deworming of pregnant women around the end trimester here.



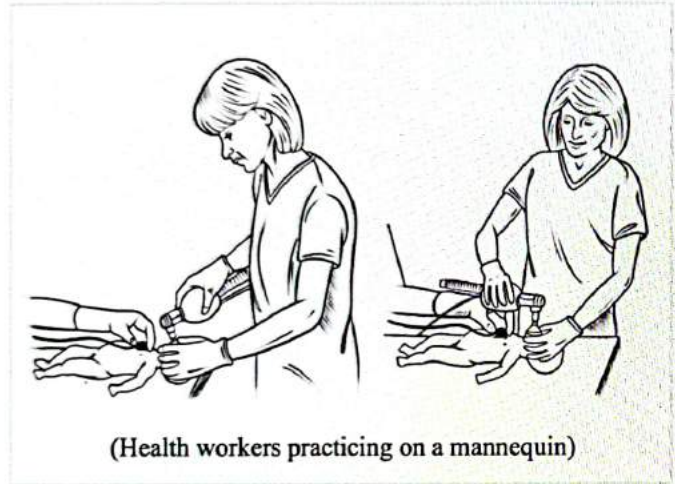
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CHILD AND ADOLESCENT HEALTH INITIATIVES

Important Child Health Initiative Programmes 00.00.09

1. Navjat Shishu Suraksha Karyakram
2. Rashtriya Swasthya Bal Karyakram
3. Home Based Newborn Care
4. Home Based Young Child Care
5. Facility Based Newborn Care
6. IMNCI
7. Indian Newborn Action Plan
8. ICDS (Integrated Child Development Services) Scheme
9. Anemia Mukh Bharat

1. Navjat Shishu Suraksha Karyakram (NSSK) 00.02.15



- 2 days training is provided to healthcare workers / medical officers in newborn care and resuscitation services.
- **Purpose**
 - To provide basic knowledge about newborn care.
 - To make aware about the resuscitation services, as sometimes childbirth can also be carried out at PHCs (Primary Healthcare Centers) by medical officers.
- **Aim:** There shouldn't be any health care place where professionals don't know basic knowledge about newborn care.

2. Rashtriya Bal Swasthya Karyakram (RBSK) 00.03.44

- Bal - Child
- Age: 0-18 years
- Launched in 2013
- Relies on early childhood screening and interventional services.

Age group	Area
0-6 years	Rural areas + Urban slums
6-18 years	Enrolled in government schools

What is this screening done for? (Questions may be asked)

- Screening is a secondary level of prevention.
- Screening done for 4Ds :-
 - Diseases
 - Defects
 - Deficiencies
 - Developmental delays
- Targets: 0-18 years group.

Defects at birth	Deficiencies
<ul style="list-style-type: none"> • Neural tube defects • Down's syndrome • Talipes (club foot) • Developmental dysplasia of the hip • Congenital cataract • Congenital deafness • Congenital heart diseases • Retinopathy of prematurity 	<ul style="list-style-type: none"> • Anaemia especially severe anaemia • Vitamin A deficiency (Fagot spot) • Vitamin D deficiency (rickets) • Severe Acute malnutrition • Goitre

Diseases of childhood	Developmental delay
<ul style="list-style-type: none"> • Skin conditions (scabies, fungal and eczema) • Otitis media • Rheumatic heart disease • Reactive airway disease • Dental conditions • Convulsive disorders 	<ul style="list-style-type: none"> • Vision impairment • Hearing impairment • Neuromotor impairment • Motor delay • Cognitive delay • Language delay • Behaviour disorder • Deficit hyperactivity disorder • Sickle cell anaemia, beta thalassemia, congenital hypothyroidism

- Screened via **mobile teams** and this includes: -
 - Medical officers
 - Ayush officers
 - Pharmacists
 - Lab technicians

To Remember
(Previous year question)

Screening Criteria (4Ds)	Not Screened
Defects at birth	Congenital glaucoma
Deficiencies	Vitamin C and Vitamin B

- In Adolescents the same programme is termed as **Rashtriya Kishore Swasthya Karyakram** (Kishore - Adolescent).
- Janani Shishu Suraksha Karyakram can also be included in child health initiatives (0-1-year age).

3. Home Based Newborn Care (Most Questions Asked) 00:09:28

- Provided by ASHA workers.
- Home visits are made by ASHA workers.
- Essential visits – 4 ANC or 4 PNC
- If it is a home delivery, additional visits have to be made.
- **Purpose:** Counsel the women about newborn care.

Type of Delivery	When to Visit	Number of Visits
Home	Days 1, 3, 7, 14, 21, 28, 42.	7
Institutional	Days 3, 7, 14, 21, 28, 42.	6 (1st day mother is at hospital)
Lower segment C-section	Days 7, 14, 21, 28, 42.	5 (1st 3 days mother is at hospital)

- **Objectives**
 - To ensure that vaccination is given to infant.
 - To ask about the diet of the mother.
 - To counsel and educate the mother about
 - Breast-feeding
 - Keeping baby warm
 - Newborn care
- After all visits **ASHA workers get 250/-** as incentives

4. Home Based Young Child Care 00:12:16

- Additional visits are being made by both ANM and ASHA workers.

- For
 - Children with low birth weight (LBW)
 - Children released from SNCU (Special Newborn Care Unit).
- Visits performed after the 42nd day.
- Starts from 60 days onwards with a 3-month gap.
- Usually **3, 6, 9, 12 and 15 months**.
- **Rs 50/-** is given as incentives per visit.

Care of normal newborn	Care of normal newborn	Care of normal newborn
Breastfeeding support	Breastfeeding support	Breastfeeding support
Care of sick newborn	Care of sick newborn	Care of sick newborn
Identification and prompt referral of at risk and sick newborn	Phototherapy for newborns with hyperbilirubinemia	Managing all sick newborns (except those requiring mechanical ventilations)
	Management of newborn sepsis	Follow-up of all babies discharged from the SNCUs.
	Stabilisation and referral of sick newborns and those with very low birth weight (rooming in)	Immunisation services
	Referral services	Referral services

5. Facility Based Newborn Care 00:14:34

- Done differently at different health facilities.
- Different units have been set up.

Health facility	New-borns at birth	Sick newborns
MCH level I- PHC, Sub-Centre (Where delivery is happening)	Labour room new born care corner (Basic care of new born will happen)	Urgent referral
MCH level II- CHC, first referral unit	Labour room and operation theatre newborn care corner	Newborn stabilization unit
MCH level III- District hospital	Labour room and operation theatre newborn care corner	Special newborn care unit

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Services Provided at NBCC, NBSU, and SNCU (Important Questions are Asked)

1. NBCC - Newborn Care Corner
2. NBSU - Newborn Stabilization Unit
3. SNCU - Special Newborn Care Unit



Important Information

- NBCC- is present at all delivery points next to the labour room and is present at Sub-centers and PHCs levels.
- NBSU- is present at CHC level.
1800 to 2500 grams weighing babies are looked at NBSU.
- SNCU- is present at district hospitals and higher.
<1800 grams weighing babies are looked at SNCU.

6. IMNCI - Integrated Management of Neonatal and Childhood Illnesses

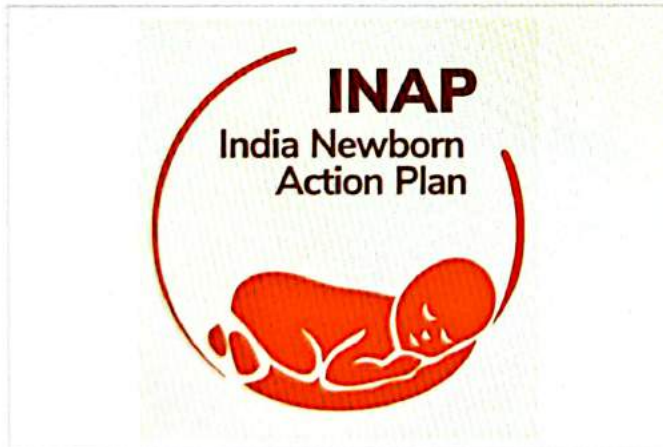
00:20:10

- Launched by Government of India
- Target: 0-5 years
- **Illnesses included**
 - Acute respiratory infections (ARI) like Pneumonia is a major concern.
 - Diarrhea
 - 3Ms - Measles, Malaria, Malnutrition.
 - Otitis media (most common complication of measles)

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7. Indian Newborn Action Plan (INAP)

00:22:52



- Launched on 18th September 2014.
- **Aim**
 - To fulfill country's commitment and response to global Every Newborn Action Plan (ENAP)
 - End all preventable newborn deaths and stillbirths.
 - Achieve single digit Neonatal mortality by 2030.
- **Targeting Things**

INDIA NEWBORN ACTION PLAN

8. Integrated Child Development Services (ICDS)

00:24:48



- Target: 0-6 years.
- Provides
 - Supplementary nutrition
 - Non formal education
 - Immunization services
 - Health checkups
 - Referral services
- Pregnant women and adolescent girls are also benefited.

9. Anemia Mukht Bharat


00:25:50



- Previous name: Intensifying Natural Iron Plus Initiative
- Prophylactic iron and folic acid tablets are given.
- Target

Target Group	Dose	Regimen
6 to 9 months	<ul style="list-style-type: none"> Elemental iron 20mg Folic acid 100 mcg 	Biweekly (Syrup)
5 to 9 years	<ul style="list-style-type: none"> Iron 45mg Folic acid 400mcg 	Weekly (Pink tablets)
10 to 19 years (Adolescents)	<ul style="list-style-type: none"> Iron 60mg Folic acid 500mcg 	Daily

- o 6 to 59 months
- o 5 to 9 years
- o 10 to 19 years
- Deworming is also done:
 - o <2 years: 1/2 tab Albendazole
 - o >2 years: Full tab Albendazole

 **Important Information**

- NSSK and RBSK
- Home Based Newborn Care
- Facility Based Newborn Care (Expected)

Initiatives of Adolescents

00:28:18

1. Rashtriya Kishor Swasthya Karyakram (RKSK)

00:28:22



- Kishore is male adolescent and kishori is female adolescent.
- India's 1st comprehensive adolescent health
- Targets
 - o Girls and boys
 - o Married and Unmarried
 - o Poor and affluent
 - o School and out of school
- Objectives
 - o Improve nutrition.
 - o Enable sexual and reproductive health.

- o Enhance mental health.
- o Prevent injuries and violence.
- o Prevent substance abuse or misuse.
- o Address conditions for non-communicable diseases
- Critical components (AIIC)
 - o Coverage
 - o Content
 - o Communities
 - o Clinics
 - o Counseling
 - o Communication
 - o Convergence
- Strategy: RMNCH + A (reproductive, maternal, newborn, child health + adolescent)
- AFHC - Adolescent Friendly Healthcare Clinics
 - o Setup under RKSK
 - o Provides clinical and counseling services like
 - Sexual and reproductive health is setting up friendly health clinics.
 - Nutrition
 - Substance abuse
 - Injuries and violence
 - Non communicable diseases
 - Mental health
 - o Trained service providers
 - Medical Officers
 - ANM
 - Counselors
 - o Location
 - PHCs
 - CHCs
 - District hospitals
 - Medical colleges
 - Not located at Sub-centers

2. Menstrual Hygiene Scheme (MHS)

00:31:12

- Introduced by Ministry of Health and Family Welfare
- Aim: Promote menstrual hygiene among adolescent girls (10-19 years) in rural areas.
- Objectives
 - o Increase awareness about menstrual hygiene in adolescent girls.
 - o Increase access to use of high-quality sanitary napkins in adolescent girls in rural areas.
 - o To ensure safe disposal of sanitary napkins.

FREEDAYS

- Sanitary packs provided at Rs 6 for 6 napkins to adolescent girls in rural areas.
- ASHA workers get Rs 1 for a pack sold and a free pack of napkin every month for personal use.

3. Kishori Shakti Yojana (KSY)

00:34:04



- Comes under ICDS for adolescent girls.

Ministries

00:33:34

- Ministry of Health and Family Welfare (MOHFW)
 - All programmes from child initiatives.
 - All programmes from adolescent initiatives (except ICDS).
- Ministry of Women and Child Development (MOWCD)
 - ICDS - Kishori Shakti Yojana

Ujjawala Scheme

00:34:34

- To protect from child and women trafficking.
- **Ministry:** Ministry of Women and Child Development (MOWCD)

Do not get confused with

- Ujjawala Scheme
 - All below poverty line women are provided with LPG cylinders.
 - **Ministry:** Ministry of Petroleum
- Ujala Scheme
 - Scheme for LED bulbs.

MCQs

Q1. Under Navjat Shishu Suraksha Karyakram training for health workers should be provided for how many days?

- A. 1 day
- B. 2 days**
- C. 7 days
- D. 15 days

Q2. Programme for screening development delay, deficiency, and neonatal genetic defects is?

- A. Janani Suraksha Yojana
- B. Janani Shishu Suraksha Karyakram
- C. Rashtriya Bal Swasthya Karyakram**
- D. Rashtriya Kishor Swasthya Karyakram

Q3. All facilities are provided in the newborn care corner except.

- A. Care of sick newborn
- B. Care of normal newborn
- C. Breastfeeding support
- D. Support to low-birth-weight babies**

Explanation

- Support to low-birth-weight babies between 1800-2500 grams is provided in the Newborn Stabilization Unit.
- Support to low-birth-weight babies between <1800 grams is provided in the Special Newborn Care.

Q4. This program was launched by which ministry?



- A. Ministry of Women and Child Development
- B. Ministry of Health & Family Welfare**
- C. Ministry of Human Resource Development
- D. None of the above

Extra Information

- The Ministry of Human Resource Development launched the Mid-Day Meal, but later shifted to the Ministry of Education.
- Ministry of Women and Child Development
 - Maternal health initiative which is Pradhan Mantri Mathur Vandana Yojana
 - ICDS
 - Poshan Abhiyan
 - Ujjawala
 - Integrated Child Health Protection Services



31

NACP GLOBAL INITIATIVES

Global initiatives to control HIV/AIDS

00:00:50



- Headquarters: Geneva.
- Target
 - a. (90-90-90) - which was to be achieved in 2020.
 - Out of all infected with HIV, at least 90% should be diagnosed.
 - Out of all diagnosed at least 90% should receive ART (antiretroviral therapy).
 - Out of all who received ART, at least 90% should show a decreased viral load.
 - b. Later one more 90 was added to the target (90-90-90-90), which was to be achieved in 2020
 - 90% of people should have a good quality of life.
 - c. Now, 95-95-95-95 is to be achieved in 2024.
- Sustainable development goal (SDG)- End HIV/ AIDS epidemic by 2030

Important Information

- World AIDS day - 1st December every year
- Theme 2022- " Equalise" - call to action.
- ALL IN - This is a global initiative to end adolescent AIDS.

National AIDS Control Programme

00:06:44



- First case of HIV/AIDS - 1986 (Chennai)
- National AIDS Control Programme (NACP) launched in 1992.
- National AIDS Prevention and Control Policy (NAPCP) in 2021
- National strategic plan for HIV/AIDS elimination - 2017-2024
- Merged with the National Health Mission in 2021.
- NACO
 - National AIDS Control Organisation
 - Headquarters: New Delhi

National Strategic Plan for HIV/AIDS

00:09:26

- India to End HIV/AIDS by 2024
- Before target and Objectives, there is a goal that says there should be 0 deaths, 0 disease, 0 stigma.
- Objectives
 1. Objective 1: Reduce 80% new infections by 2024 (Baseline 2010)
 2. Objective 2: Ensure 95% of estimated PLHIV (people living with HIV) know their status by 2024.
 3. Objective 3: Ensure 95% PLHIV (people living with HIV) have ART Initiation and retention by 2024.
 4. Objective 4: Eliminate mother to child transmission of HIV and Syphilis by 2020 (it has been also extended)
 5. Objective 5: Eliminate HIV/AIDS related stigma and discrimination by 2020
 6. Objective 6: Facilitate sustainable NACP service delivery by 2024.

Broad Strategies

00:12:35

- Strategy: Prevention test treat.
- The incidence of HIV in India- 5 cases per lakh population every year.
- To know the prevalence of HIV, Sero Surveillance is done. It is also known as HIV Sentinel Surveillance.
- Three types of surveillance
 1. Active surveillance - going house to house and collecting information.
 2. Passive surveillance - hospital reporting of diseases received.
 3. Sentinel surveillance - for missing cases.
- Surveillance purpose - constant scrutiny of cases.
- Purpose of surveillance
 - Increase notification of cases.
 - Prevalence of cases
 - Distribution of disease.

Sentinel Surveillance

00:16:43

- Last done 2016-17.
- Done among
 - a. High risk groups- (sentinel size- 250)
 - CSW - Commercial sex workers
 - MSM - Men sex with men
 - Injectable Drug abusers
 - Transgenders
 - b. Bridge Population- (sentinel size- 250)
 - Single male migrants
 - Long distance truck drivers
 - c. General population- (sentinel size- 400)
 - Antenatal women- used as a proxy indicator to reflect HIV prevalence.
 - Among Antenatal women the HIV prevalence was 0.22.
- Total sample size for sentinel Surveillance is (250+250+400) = 900.

Sentinel site	ANC (antenatal) Clinical
Sample size	400
Duration	3 months
Frequency	Biennial - once every two years
Sampling method	Consecutive sampling
Eligibility	All ANC women (15-49 years), who were attending ANC clinics for the first time.
Test or strategy	Unlinked anonymous
Blood specimen	Venous blood sample
Testing protocol	Two-step testing

MCQ's

- Q.** Sentinel surveillance for HIV under the National AIDS Control programme is used for all except?
- A. Estimation of total infection in community
 - B. Estimation of total cases in hospitals**
 - C. Estimation of trend of the disease
 - D. Classification of districts

Diagnosis

00:25:58

1. Screening Test for HIV
 - ELISA (most sensitive)
2. Confirmatory test
 - Western blot (highly specific)
3. p24 antigen detection test
 - Done in window period.
 - Window period- the time between the entry of an organism and the coming lab test positive.
4. Confirmatory test for adults

- qPCR for HIV I
- 5. For infants (less than one year)- the test of choice will be HIV DNART PCR.

ICTC centres

00:28:34

- Integrated counselling and targeting centres
- For testing, ERS batteries is used
 - ELISA - most sensitive
 - RAPID
 - Spot test
- One out of three tests- done when a person is going for blood transfusion.
- Two out of three test - done when a person is having symptomatic.
- All three tests- done when person is Asymptomatic.
- To know the progress of person's treatment or even the HIV viral count is decreasing:
 - Viral load estimation- done by RT PCR technique.
 - Reliable test: Assess response to treatment and progression of disease: CD4 count.

MCQ's

- Q.** For diagnosis of HIV infection in asymptomatic, minimum number of tests required is/are: -
- A. 1
 - B. 2
 - C. 3**
 - D. 4
- Q.** According to CDC recommendations, HIV screening of pregnant women is:
- A. Opt-in testing
 - B. Opt-out testing**
 - C. Compulsory
 - D. Symptomatic

Opt-in/Opt-out Testing

00:33:33

- Opt-in- Testing is offered and the patient is required to actively give permission before it can occur.
- Opt- out- consent is assumed unless the patient denies testing.
- WHO and CDC recommends opt-out testing.

Testing Strategy

00:35:18

- Mandatory testing - In blood banks for transfusion safety: 1/3 test ELISA.
- Unlinked and anonymous Epidemiological survey- HIV sentinel surveillance
- Voluntary and confidential (if someone comes for test on his own will) Confirmatory testing for subclinical/ clinical case and voluntary testing.

Management of HIV

00:37:11

- Treat all strategy: WHO.
 - Anyone who is HIV positive will be put on ART irrespective of CD4 count.
- Regimens preferred: Tablets are given according to FDC
 1. Adults and adolescents - 1st line regimen
 - Preferred - **Tenofovir + lamivudine + dolutegravir.**
 - Alternative regimen: Tenofovir + lamivudine + Efavirenz
 2. For children - 1st line regimen
 - Preferred - **Abacavir + Lamivudine + Dolutegravir.**
 - Alternate - Abacavir + Lamivudine + Lopinavir/ritonavir.
 3. Neonate
 - **Zidovudine + Lamivudine + Raltegravir (lopinavir + ritonavir)**

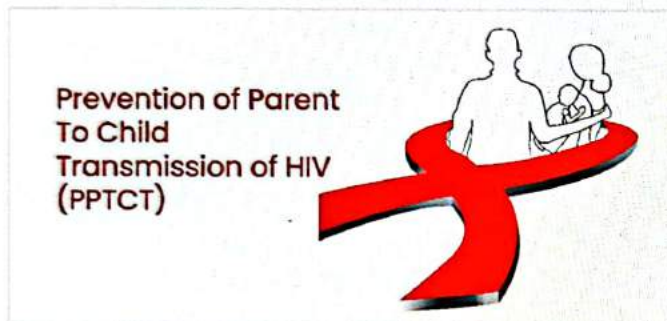
- If this test comes positive, the baby will be put on ART.
- If this test comes negative, then **repeat testing till 2 months.** And confirm HIV status by 2 years.

Prevention of MTCT in India

Method	Dosage	Efficiency reduced by
Zidovudine	Mother: 300 mg BD from 36 weeks POG + 300 mg 3h during delivery	66%
Nevirapine (preferred)	Single oral dose Mother: 200 mg at labour onset	50%
Caesarean section	Elective	50%

Prevention of parent to child transmission

00:43:49



- Prevalence
 - Burden: 5%
 - Efficiency: 25% (developed) to 30% (developing nations)

How to achieve

For a child born to any HIV positive mother

- The child - put on **Syrup Nevirapine**
- 10 mg single dose for 6 weeks.
- Initiated within 72 hours.
- If the mother says she has been taking Nevirapine in pregnancy, then we must replace Nevirapine in baby with Zidovudine for 6 weeks.
- Mother on ART
 - a. With sufficient ART (when taking for > 4 weeks)
 - Put the baby on **Nevirapine** for 6 weeks.
 - If the mother has taken it during pregnancy, **Zidovudine** for 6 weeks.
 - b. Insufficient ART (when taking for < 4 weeks)-
 - High risk of exposure to the baby - give Nevirapine and Zidovudine for 12 weeks.
 - Low risk of exposure - give Nevirapine for 12 weeks.
- To diagnose Infant ankitkarnawat9@gmail.com
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 - At 6 weeks - HIV DNART PCR

Triple ARV Prophylaxis for PMTCT

- New modality introduced under NACP for **Prevention of Mother to Child Transmission of HIV in India**
- Pregnant females would be put on single tablets of TLE (Tenofovir, lamivudine and efavirenz)

Breast feeding protocol

- Breastfeeding is **not contraindicated** for a baby born to an HIV positive mother in developing countries like India.
- In case the baby is HIV positive, breastfeeding will **continue till 2 years.**
- If negative: till 1 year

MCQ's

Q. Most effective to prevent HIV vertical transmission:

- A. HAART
- B. Nevirapine
- C. Zidovudine
- D. Elective CS

Post Exposure Prophylaxis

00:53:33

- Needle prick injury
- Drug of choice: single tablet of
 - Tenofovir + Lamivudine + dolutegravir
 - Given for 28 days
 - Best if started within 2 hours.
 - Can be given upto 72 hours.
- People can get paid leaves during this time.
- Health professionals are at risk.

Q. HIV post exposure prophylaxis should be started within:

- A. 24 hours
- B. 48 hours
- C. **72 hours**
- D. 6 hours

Prophylaxis for TB

00:55:24

1. To prevent, drug of choice

- Isoniazid preventive therapy only after ruling out TB
- Any child (1-10 years)
 - Isoniazid (10 mg/kg) + pyridoxine (25mg)
 - For 6 months
- Any adult
 - Isoniazid (300mg) + pyridoxine (50 mg)
 - For 6 months

2. If someone has both HIV TB Coinfection.

- Start ATT first.
- And rifampicin to be replaced with rifabutin.
- And after two to four weeks, put on ART.
- Sputum will not be diagnostic, and cavitations in lungs are also not seen.

Cotrimoxazole preventive therapy

00:58:13

- Prophylaxis of Opportunistic infection: *Pneumocystis carinii* (also known as *pneumocystis jiroveci*)
- One double strength tablet- 800 sulfamethoxazole + 160 mg trimethoprim
- Start- CD4 <350/mm³.
- Stop - CD4 >350 on two occasions six months apart ascending trend of CD4+ no WHO stage 3,4.

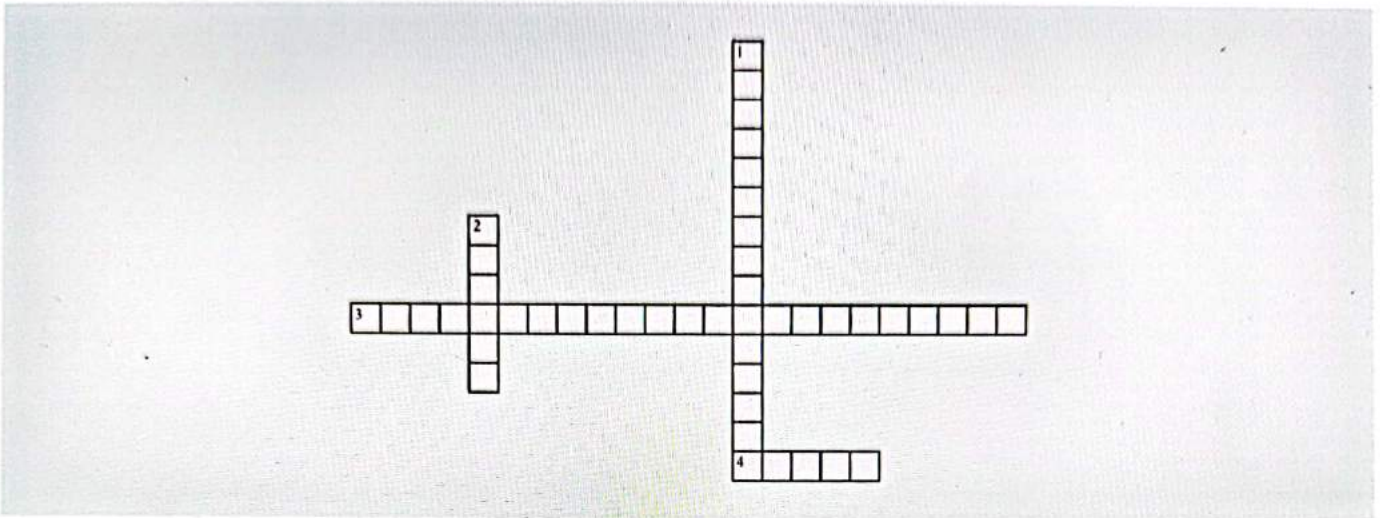


CROSS WORD PUZZLES



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Crossword Puzzle



Across

- 3. To know the prevalence of HIV, Sero Surveillance is done which is also known as _____
- 4. Most sensitive Screening Test for HIV

Down

- 1. For a child born to any HIV positive mother, the child has to be put on this.
- 2. All the international organisations have their headquarters in New York, but UNAIDS has its headquarters in _____

32

NATIONAL TUBERCULOSIS ELIMINATION PROGRAMME

Global Initiatives to Control TB

00:00:59

1. End TB



- Launched by WHO in 2015.
- Frameline- 5 years (2015- 2035)
- Aim- eliminate TB by 2035.
- Target- 95-90-0
 - Reduce mortality of TB by 95%
 - Reduce incidence of TB by 90%
 - Zero Out of pocket expenditure. Government should look after the treatment.

2. Sustainable Development Goals (SDG)

00:03:58



- Aim- to eliminate TB by 2030.
- Target- set by WHO
 - to reduce mortality of TB by 90%.
 - To reduce incidence of TB by 80%.
 - To reach 90% of all people with TB.
 - To reach 90% of all key populations (Slum dwellers, prisoners, difficult to reach, occupational exposures-silicon).
 - To achieve 90% treatment.

3. Stop TB

00:06:30



- Was initiated before END TB.
- It was in alignment with Millennium development goals.
- Target-
 - to reduce mortality & incidence of TB by 50%.
 - Eliminate TB by 2050.



Important Information

- 90-90-90 is an initiative for NACP (National AIDS control programme).

National Tuberculosis Elimination Programme (NTEP)

00:07:56



- TB Harega Desh Jeelega is a tagline for NTEP.
- Targets
 - Elimination of TB by 2025.
 - To reduce mortality of TB by 90%.
 - To reduce incidence of TB by 80%.

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History

- 1962: NTCP (National Tuberculosis Control Programme).
- 1997: RNTCP (Revised National Tuberculosis Control Programme).
- 2020: RNTCP was changed to NTEP



Important Information

- DOTS: Directly Observed Treatment Short course.
- In the intensive phase, the patient takes medicines under supervision of a healthcare worker



Important Information

- Health in our own hands, is a tagline for the National Programme for prevention and control of cancer, diabetes, cardiovascular diseases and stroke (NPCDCS).
- HIV elimination by 2024.
- Malaria elimination by 2030.
- National strategic plan for HIV elimination: 2017-2024.
- National strategic plan for Malaria elimination: 2017-2030.

National Strategic Plan for TB Elimination

00:11:43

- Initiative of NTEP.
- Launch date: 2017-2025.
- Vision: TB free India.
- Tagline: 0-death, 0-disease, 0-poverty.
- Eliminate TB by 2025.
- Strategy:
 - Detect-Treat-Prevent.
 - Universalization of CB-NAAT is done- Anyone with cough >2 weeks (presumptive TB case) CB-NAAT is done at baseline.
 - ICMR developed TRUENAT- Indian version of CB-NAAT. (It gives result of rifampicin resistance within 1 hour)
 - New drug regimens like: Bedaquiline & Delamanid are introduced.
 - Shorter & Longer MDR/XDR regimens are introduced.



Important Information

- 0-death, 0-disease, 0-discrimination is in the National strategic plan for HIV elimination.
- Strategy of HIV elimination: Prevent-Detect-Treat.

JEET Strategy

00:17:55



Joint Effort for Elimination of Tuberculosis

- JEET (Joint Effort for Elimination of Tuberculosis).
- Indian organizations, Ministry, NGOs and International organizations work together to eliminate TB.
- Strategy: To increase the notification rates of TB by private practitioners.



Important Information

Q. Why TB isn't Eliminated Completely?

- Non-notification by private practitioners.
- Different regimens.
- Complexity in regimens.
- Non-adherence to regimens.

Steps Under NTEP

00:20:53

- Case detection
- Categories of TB treatment
- Newer definitions
- Diagnosis
- Treatment
- Special situations
- Prophylaxis
- Incentives
- Technology based incentives.
- New research modalities
- Organizational setup

Case Detection

00:21:49

i. Active Case Detection

- House to house search for TB cases.
- Vulnerable groups
 - Slum dwellers
 - Prisoners
 - Difficult to reach population.
 - Occupational exposure-silicon
 - Migrants
 - Tribals
 - Shelter homes

- ASHA workers are involved.
- Incentive- Rs. 500 is given to ASHA workers for finding a presumptive case.
- Any member in the community helping in identification of presumptive TB cases gets an incentive of Rs. 500.

ii. Intensified Case Finding

- Provider initiated screening for TB symptoms in OPD.
- TB screening of patients presenting to health facilities with other comorbidities.

iii. Community Based Screening

- It has a CBAC (community-based assessment checklist).
- ASHA worker- fills the form, asking the risk factors for diabetes along with TB.
- She gets Rs.10 per form filled.

iv. Passive Case Detection

- Passive surveillance from the hospital reports.

Categories of TB Treatment

00:29:08

- Category-1
 - New & previously treated TB patients.
- Category-4
 - MDR (Multi Drug Resistant) TB patients.
- Category-5
 - XDR (Extensive Drug Resistant) TB patients.

New Terminologies in NTEP

00:30:07

- Presumptive TB case:
 - used in place of TB suspect.
 - Any person with cough >2 weeks duration or more.
 - An individual having fever or night sweats or appreciable weight loss of 2 weeks or more.
 - Contacts of a smear positive TB patient having a cough of any duration.
 - Suspected/ confirmed extra pulmonary TB having cough of any duration.
 - HIV positive patients having coughs of any duration.
- Sputum positive TB: Bacteriologically confirmed case
- Sputum negative TB: Clinically confirmed case
- Confirmed TB case: Biological specimen is positive by sputum AFB &/or CBNAAT
- Clinically diagnosed TB case: Sputum negative, but clinically suspicion is high

- **Extrapulmonary TB- Tuberculosis of organs:**
 1. Lymph node
 2. Pleura
 3. Intestine
 4. Genitourinary tract
 5. Joints & bones of TB
 6. Meninges of Brain
- Extrapulmonary TB cannot affect Hair & Nails.

Classification of TB Patients Based on History of Treatment


00:32:43

- **New case**
 - newly diagnosed case.
 - Has never taken TB treatment before/ taken treatment for <1 month duration.
- **Previously treated case**
 - Taken TB treatment for >1 month.
- **Recurrent TB case**
 - A TB patient who was declared cured or treatment complete, presents again as a microbiologically confirmed TB case.
- **Treatment after failure**
 - A TB patient who had been treated for TB & presents as a failure at the most recent course of treatment.
- **Treatment after loss to follow up**
 - A TB patient who received treatment for >1 month & registered as loss to follow up, is presenting again as a microbiologically positive TB case.
- **Other previously treated patients**
 - Earlier treatment is not known or not documented.
- **Transferred in**
 - Treatment starts at one TB unit, then the patient is transferred to another TB unit.

Classification of TB Patients Based on Drug Testing

00:38:44

- **Drug sensitive TB**
 - MTB (Mycobacterium TB) is sensitive to TB drugs.
 - 4 drugs: R,H,Z,E (Rifampicin, Isoniazid, Pyrazinamide, Ethambutol).
- **Drug resistant TB**
 - Mono-resistant (MR): resistant to one 1st line anti-TB drug only.
 - H-Mono-resistant (H-MR): resistant to Isoniazid (H) only.
 - Rifampicin resistant (RR): resistant to Rifampicin (R) only.
 - Multi drug resistant (MDR): resistant to both Rifampicin (R) & Isoniazid (H).
 - Poly-Drug resistant (PDR): resistant to 2 drugs other than Rifampicin (R) & Isoniazid (H)

 **Important Information**

- **Extrapulmonary TB- Tuberculosis of organs:**
 1. Lymph node
 2. Pleura
 3. Intestine

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- Pre-Extensive resistant (pre-XDR): Any MDR patient (H+R) resistant to any fluoroquinolone.
- Extensive resistant (XDR): Any MDR patient (H+R) resistant to any fluoroquinolone and Group-A drugs (Bedaquiline, Linezolid, Levo/Moxifloxacin).

Group	Medicines
Group-A (Includes all 3 medicines)	<ul style="list-style-type: none"> • Levofloxacin or Moxifloxacin • Bedaquiline • Linezolid
Group-B (Add one or both medicine)	<ul style="list-style-type: none"> • Clofazimine • Cycloserine or Terizidone
Added to complete regimens when medicines from Group-A and Group-B cannot be used	<ul style="list-style-type: none"> • Ethambutol • Delamanid • Pyrazinamide • Imipenem- Cilastatin or Meropenem • Amikacin or Streptomycin • Ethionamide or Prothionamide • P-aminosalicylic acid

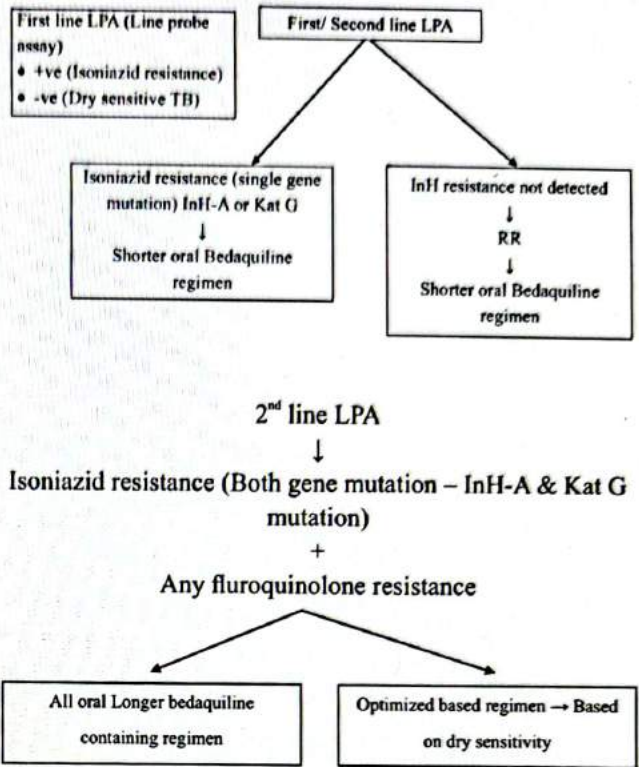
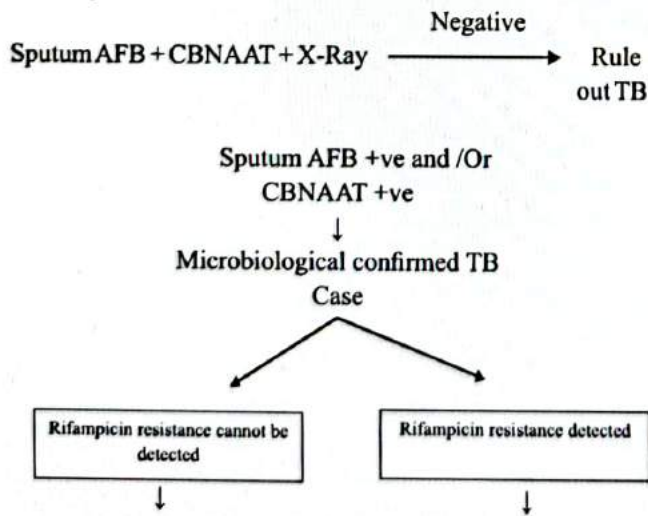
Presumptive MDR

- Arecurrent TB case
- Contact of MDR TB
- Person on ATT, not showing any clinical improvement or sputum/culture positive at the end of 3 months or 5 months.
- Received ATT >1 month, lost for follow up.

Diagnosis of TB

00:47:45

Presumptive TB case



Treatment

00:58:38

1. Regimen in Drug Sensitive TB

- 2HRZE+4HRE
- Duration: 6 months
- **Daily Drug Regimen (DDR)**
 - Drugs given in FDC (Fixed Dose Combination).
 - Dispensed according to weight bands.
 - Advantages
 - i. Increased compliance
 - ii. Decrease chance of Drug resistant TB
 - In Adults: 5 weight bands are present.

Weight category (KG)	Number of tablets (FDC's)	
	Intensive phase- 4FDC (HRZE) 75/150/400/275	Continuation phase- 3FDC 75/150/275
25-34	2	2
35-49	3	3
60-64	4	4
65-75	5	5
>75*	6	6

- Total doses taken in the Intensive phase (IP) is 56 doses.
- Total doses taken in the Continuation phase (CP) is 112 doses.
 - In **Pediatrics**- 6 weight bands are present.
 - 2HRZE + 4HRE regimen.

Weight category (KG)	Number of tablets (FDC's)	
	Intensive phase-4FDC (HRZE) 50/75/150/100	Continuation phase-3FDC
4-7	2	2
8-11	3	3
12-15	4	4
16-24	5	5
25-29	6	6
30-39		

- Total doses taken in the Intensive phase (IP) is 56 doses.
- Total doses taken in the Continuation phase (CP) is 112 doses.

2. Regimen in Drug Resistant TB

01:04:36

i. Shorter oral Bedaquiline containing regimen-

- It is given in
 - **RR & INH** (Single gene mutation-INHA or KATG)
 - Only Rifampicin resistant, not Isoniazid resistant.
- Course
 - 4-6 months: ZEECHOB (Z- Pyrazinamide, E-Ethambutol, E-Ethionamide, C-Clofazimine, H-High dose Isoniazid, O-Levofloxacin, B-Bedaquiline).
 - 5 months: ZEOC (Z- Pyrazinamide, E-Ethambutol, C-Clofazimine-Levofloxacin).

ii. Longer oral Bedaquiline MDR/XDR containing regimen

- It is given in
 - **RR & INH** (Both gene mutation-INHA or KATG)
 - Any fluoroquinolone resistant.
- Course
 - 18-20 months: BC2L2 (B-Bedaquiline, C-Cycloserine, C-Clofazimine, L-Linezolid, L-Levofloxacin).

iii. Oral Regimen

- It is given in
 - **Isoniazid Mono resistant**
 - **Poly Drug resistant**
- 6 months: ZERO (Z- Pyrazinamide, E-Ethambutol, R-Rifampicin, O-Levofloxacin).

iv. XDR regimen

- Use of OBR (optimized basal regime) with DST (Drug sensitivity testing).

v. BPaL (Bedaquiline+Prothionamide+Linezolid)

- It is from Nix TB trials by WHO.
- Used for
 - XDR TB cases
 - Failures of MDR TB treatment regime.
- BPaL along with OBR may be initiated at selected centers.

3. Special Situations

i. TB in pregnancy

- If <20 weeks,
 - advice MTP.
 - If MTP is done, put her on a shorter oral Bedaquiline regimen.
- If >20 weeks- if the patient denies MTP.
 - If <32 weeks, longer oral Bedaquiline regimen is given.
 - We should give advice for MTP.

ii. TB & HIV co-infection

- Start ATT for 4 weeks and then put on ART.
- Rifampicin is replaced with Rifabutin.

Prophylaxis of TB

01:17:49

a. Household Contacts

- Isoniazid (300 mg OD) for 6 months or
- Shorter TPT (TB preventive therapy)
 - Rifapentine + Isoniazid, given weekly for 3 months.

b. COVID-19 & TB

- Bi-directional screening is done.
- CBNAAT

MCQs

Q. No. of adult weight band categories for treatment of TB is?

- A. Three
- B. Four
- C. Five
- D. Six
- E. Seven

Q. What are the current weight band categories for FDC's in adults as per NTEP?

- A. 25-40,41-55,56-69,>=70
- B. 25-34,35-49,50-64,65-75,>75
- C. 25-39,40-54,55-69,>=70
- D. 21-34,35-40,41-55

Q. MDR in TB is defined as resistance to which of the following drugs?

- A. Streptomycin, Rifampicin, Isoniazid
- B. Streptomycin, Rifampicin
- C. Rifampicin, Isoniazid
- D. Streptomycin, Isoniazid

Q. Xpert MTB/RIF test is used to detect?

- A. For assessing resistance to Isoniazid
- B. For assessing MDR
- C. For assessing resistance to Rifampicin
- D. Monitoring drug response in mDRTB
- E. Diagnosis of TB

Q. Patient presented for a screening test for TB. He doesn't have any signs or symptoms. The method of choice to detect TB during mass screening is?

- A. Tuberculin test
- B. Mass miniature radiography
- C. Sputum smear examination by direct microscopy
- D. Sputum culture

Q. To address morbidity of COVID19 and TB the following activity should be done?

- A. Bi-directional TB COVID screening
- B. TB screening for ILI cases
- C. TB screening for SARI cases
- D. All the above

Incentives Under TB

01:20:39

Nikshay Poshan Yojana

- Nutritional incentives of Rs. 500/month- given to all notified TB cases/patients.
- It is an Aadhar linked transfer.
- Includes patients notified by private practitioners also.
- Nutritional incentives for Tribal patients is Rs. 750

Incentives to treatment supporters

- Anyone can act as DOT's provider, except the own parents of the patient.
- Health care workers, previously treated patients, ASHA workers can act.
- DOT's provider who ensures treatment completion of:
 - New & previously treated case: Rs.1000
 - Drug resistant TB case (MDR & XDR): Rs. 5000 (Rs. 2000 after IP phase and Rs. 3000 after CP phase)
- Any person from the community, who helps in detecting a presumptive TB case, will get an incentive of Rs. 500

Incentives for Private practitioners

- On notifying a case of TB- Rs.500
- On notifying treatment completion- Rs.500

- Total incentive for complete case is Rs.1000
- Duration: can notify a TB case up to 30 days.
- If fails to do so, it is a punishable offense under IPC 269 & 270.
- Fine: Rs.10000 &/or imprisoned for 6 months.

Technology Based Initiatives

01:29:48

1. NIKSHAY



- It is the HMIS (Health Management Information System) for TB patients.
- It is an online software, for reporting & compliance of treatment.



Important Information

- NIKSHAY: Technology based surveillance for TB patients
- NIKUSHT: Technology based surveillance for Leprosy patients
- NISCHAY: Home based UPT (Urine pregnancy test) testing kit, provided by ASHA workers for free.

2. TRUENAT

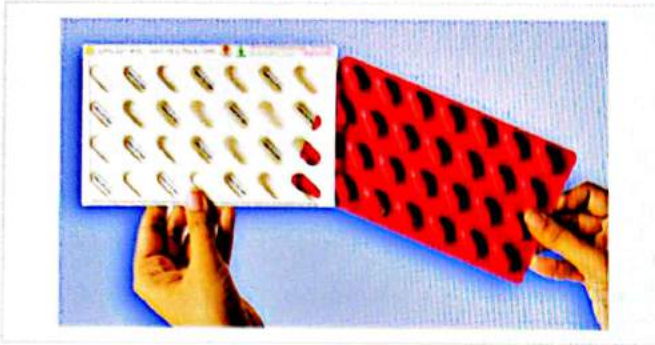
01:33:21



- Indian version of CBNAAT, developed by ICMR.
- Detects Rifampicin resistance, within 1 hour.
- Portable and Battery-operated machine.

3. DOTS-99

01:33:59



- It has a **Toll-free number** written below the tablets.
- Patients in the CP phase are expected to call the Toll-free number, when they take the medicine.
- This ensures that the patient has taken the medicines.
- By this initiative, we are trying to achieve a **99% cure rate**.
- This initiative is best for consumer compliance.

4. MERM Container Box

01:35:02



- **MERM - Medicine Event Reminder**
- GPS enabled box- detects when the patient has taken the medicine.
- This informs the NIKSHAY portal.

New Research Modalities

01:36:06

- Indian TB Genomic Surveillance Consortium: 24th March 2022 (Genomic Sequencing of TB bacilli to find different types of mutation).**



Important Information

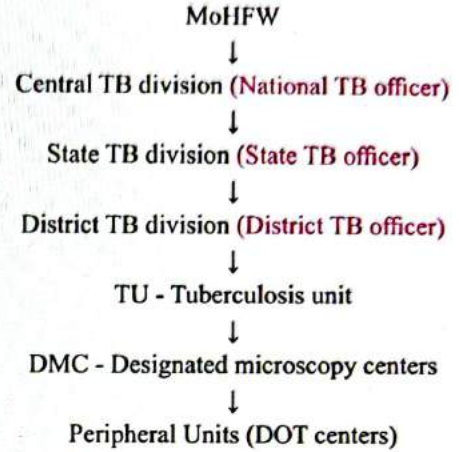
- **24th March - World TB day.**
- **Theme for 2022: Invest to End TB, Save Lives.**

- DT3 centers: Difficult to treat Centers (Early diagnosis and management of drug resistant TB)**
- Dare2erad TB (2022): Artificial intelligence.**
- TRACE-TB project: Transformative Research & AI Capacity for elimination of TB & infectious diseases.**

Organizational/Structural Setup

01:37:29

Organizational/Structural Setup



- **Tuberculosis Unit**
 - Present at the level of CHC's.
 - Present per 1-2 lakh population
 - It has STS (Senior Treatment Supervisor) and STLS (Senior TB Lab Supervisor)
- **DMC**
 - Present at PHC's level.
 - Present per 50,000 population
 - DMC contains microscopes and CBNAAT machines.
 - 1 microscope for TB detection should be presented for every 1 lakh population.
- **Peripheral Institutes/ DOT's**
 - They are present at Health and wellness centers, subcenters.
- **National Reference Laboratory- 6 NRL under NTEP**
 - National TB Institute: Bangalore
 - National Institute of TB & Respiratory diseases: New Delhi
 - National JALMA institute for Leprosy: Agra
 - National Medical resource center: Bhubaneshwar
 - National TB Institute: Bangalore
 - National Institute of TB & Respiratory diseases: New Delhi

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MCQs

- Q. All the following regarding the NTEP are wrong except?**
- Active case finding is not done.
 - DOT short course strategy is applied.**
 - Treatment is only given to smear positive cases.
 - All the above



Q. For DRTB what is the incentive to DOT's providers currently?

- A. 3000 INR on completion of IP & 2000 INR on completion of CP
- B. 3000 INR on completion of IP & 3000 INR on completion of CP
- C. 2000 INR on completion of IP & 3000 INR on completion of CP**
- D. 4000 INR on completion of IP & 2000 INR on completion of CP
- E. 4000 INR on completion of IP & 4000 INR on completion of CP

Q. What is the incentive to private practitioners for notification of TB patients?

- A. Rs 1000 as one time payment on notification
- B. Rs 1000 to private practitioners for updating the patients treatment

C. Rs 500 as one time payment on notification & Rs 500 to private practitioners for updating the patients treatment

- D. Rs 2000 to private practitioners for updating the patients treatment
- E. Rs 500 as one time payment on notification & Rs 1000 to private practitioners for updating the patients treatment

Q. For TB case detection under NTEP, what is the incentive to be given to any member of the community who helps in TB case detection?

- A. Rs 1000
- B. Rs 2000
- C. Rs 500**
- D. Rs 1500
- E. Rs 750

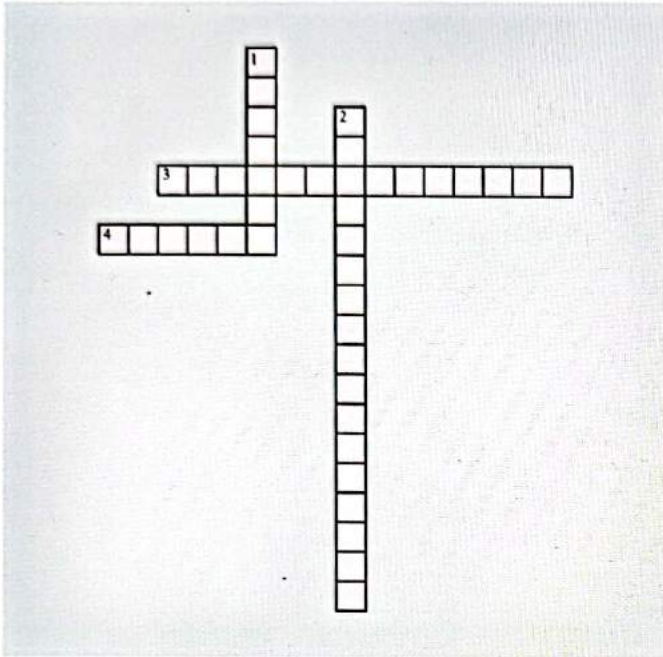
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. A TB patient, who is resistant to Isoniazid (H) only
- 4. Preferred investigation of choice in Diagnosis of Pediatric TB

Down

- 1. Developed by ICMR, this is an Indian version of CB-NAAT
- 2. Any MDR patient (H+R) resistant to any fluoroquinolone and Group-A drugs (Bedaquiline, Linezolid, Levo/Moxifloxacin)

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- Elimination: Kala-azar and lymphatic filariasis
- Reduce morbidity and mortality due to dengue.

National Strategic Plan for Malaria Elimination 00:09:54

- 2017-2030
- The goal of the government of India via NVBDCP is to eliminate malaria by 2030.
- We should have 0 indigenous cases.

Important Information

- National strategic plan for TB elimination - 2017-2025
- National strategic plan for HIV elimination - 2017-2024

History 00:01:49

- National malaria control programme was started separately in 1953.
- In 1958: National malaria eradication programme
- 1971: Urban malaria scheme.
- 1977: The Modified plan for the operation.
- 1997: Enhanced the malaria control project.
- 1998: Roll back malaria - got funding from WHO.
- 2002: NVBDCP
- 2005: RDT introduced (rapid diagnosis kit or test).

Diseases included in NVBDCP 00:0:4:12

- Protecting from (6 letters 6 diseases)
- The names of the mosquitos are as follows:
 - Anopheles
 - Culex
 - Aedes

Disease	Responsible For
Anopheles	Malaria
Culex	Japanese encephalitis and Filariasis
Aedes	Dengue and Chikungunya
Sandfly	Kala-azar

MCQ's

Q. NVBDCP does not include:

- A. Filariasis
- B. Zika virus disease
- C. Kala-azar
- D. Chikungunya

Target 00:07:39

- APT (Annual parasite incidence) < 1/1000 population
- ABER (Annual blood examination rate) > 10%

Integrated Vector Control 00:11:47

- Anti-larval measures
- Anti-adult measures
- Personal protection
- Legislation.

Mosquito Control Measures			
Anti larval measures	Anti adult measures	Against mosquito (personal protection)	Legislation
E - Environmental measures C-Chemical control B-Biological control	• Space sprays • IRS- indoor residual sprays • Genetic control	• Nets • Screening • Repellents	Laws

Anti-Larval Measures 00:15:09

1. Environmental measures:

- Yields permanent results.
- Source reduction via engineering modalities
- E.g.:
 - Filling drains and ditches
 - Leveling of ground
 - Proper drainage of breeding areas
 - Intermittent irrigation
 - Changing the alkalinity of water so the larva cannot breed.

2. Chemical Control:

- Using larvicides.
- E.g.:
 - Mineral oil (Not preferred)

- Paris green (Not preferred)
- Temephos - Abate dosage - 200l/hectare.

3. Biological Control:

- Larvivorous fishes - *Gambusia fish* which eats the larva.
- Anti larva bacilli - *Bacillus thurengiensis*
- Predator mosquitos-*Toxorhynchites splendens* can eat up aedes.

Anti- adult Measures

00:02:51

- It contains space sprays and indoor residual sprays.
- Depends on API

Space sprays

- Only one time spray will be done
- Achieved through the technique of fogging.
- Chemicals used in sprays:
 - Malathion
 - Pyrethroid
 - DDT

Indoor residual space

- Done at regular intervals
- Chemicals used:
 - DDT
 - Malathion
 - Pyrethroid

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Strategy:

00:22:17

Classification of states/UTs level on API on primary criteria:

Categories of State /UTs	Definition
Category 0: Prevention of re-establishment phase.	<ul style="list-style-type: none"> • 0 indigenous cases. • There is no state at this stage.
Category 1: Pre-elimination phase	API < 1 case/1000 population at risk
Category 2: Elimination phase	
Category 3: Intensified control phase.	

MCQ's

Q. The following is an anti-larval measure in malaria vector control.

- Indoor residual sprays
- Space application
- Individual protection
- Source reduction**

NVBDCP: Malaria

00:25:41

- **Areas with API > 2:** Regular insecticide sprays at 6-week intervals particularly at transmission season.
 - API 2-5- Conventional mosquito nets
 - API > 5- Long lasting insecticide treated nets
- **Areas with API < 2:** Focal space sprays only when a case of pf (plasmodium falciparum) occurs.

Insecticides of choice for IRS

00:27:39

- Done when the API > 2.
 - DDT - 2 rounds of DDT (1 gm/m²) at a 6 weeks interval during the transmission season.
 - If the vector is refractory to DDT- add malathion. → 3 rounds of malathion (2gm/gm²) at 6 weeks intervals.
 - If the vector is still refractory to malathion- add 2 rounds of a synthetic pyrethroid (0.25gm/m²) at 6-week intervals.

MCQ's

Q. In areas with API > 2 if insecticides are refractory to DDT:

- Regular spraying with 1 round of malathion
- Regular spraying with 3 rounds of malathion**
- Regular spraying with 1 round of pyrethroid
- Regular spraying of 2 rounds of pyrethroids

DDT

00:30:30

- Anti- adult measure
- India cannot use more than 10000 metric tons of DDT.
- Sprayed 150 metric tons / million population.
- Residual effect is 12-15 weeks

Malathion

00:30:58

- Sprayed 900 metric tons/million population.
- Anti-adult
- Residual effect of 6-8 weeks.

Personal protection

00:31:11

- Conventional nets or long-lasting insecticide treated nets are used.

Conventional nets

- It has **synthetic pyrethroids**.
- They are of 2 types:
 - Deltamethrin- 2.5% in dosage of 25 mg/m²
 - Cyfluthrin- 5% in dosage of 50mg/m²
- Other insecticides used- Permethrin
- Have to retreat every six months - 1 year.

Long-lasting nets

- It has an **additional chemical binder** that can increase the shelf life of the nets.
- Can use up to 3 yrs
- Households bed nets used for mosquito control:
 - No. of holes per sq. inches: 150
 - Diameter of each hole: **< 0.0473 inches**



Common insect repellents

00:33:53

- DEET (N, N-diethyl-m-toluamide)
- Lemongrass oil
- Soybean oil
- Neem oil
- Chrysanthemum oil

MCQ's

Q. What is the half-life of insecticide-treated bed nets:

- A. 3 months
- B. 6 months**
- C. 9 months
- D. 1 year

Q. What is the minimum number of holes / sq inches of mosquito nets?

- A. 100
- B. 150**
- C. 200
- D. 250

Other Strategies

00:34:24

1. Active Case Detection - Multipurpose workers (male)

- Posted at the sub-centre, which will prepare malaria slides every fortnight for fever cases.
- Areas have high pf cases - Link worker 1/1000 population.
- Active case detection is also used for TB, Malaria and Leprosy and is not for HIV.

2. Passive Case Detection- Hospital reporting or healthcare facility reporting

- But this concept has been introduced under the urban malaria scheme. (1971)
- For this, the govt. has set up fever treatment depots (in every village) from where the cases were being reported. Also, the govt. has set up malaria clinics.

3. Modified Plan of Operations - 1977 in which areas were divided according to $API < 2$ and $API > 2$.

4. Roll-Back Malaria- This concept came in 1998; basically, we got WHO funding for roll-back malaria, and this new insecticide was being developed.

5. Enhanced Malaria Control Project (EMCP) - World bank supported project for a 6-crore tribal population in 8 states.

- Annual parasitic incidence (API) > 2 in the last three years.
- PF cases > 30% of all malaria cases.
- 25% of the population is tribal.

Organization of NVBDCP

- Central division
- State division
- District malaria officer

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34 NVBDCP PART-II (DIAGNOSIS TREATMENT PROPHYLAXIS)



• National Vector Borne Disease Control Program (NVBDCP)

Malaria Diagnosis 00:00:55

Blood Smear examination: Gold standard for the diagnosis of malaria

- It can be diagnosed through **two types of smears:**
 - Thick smear
 - Thin smear

Smear	Description
Thick smear	It is used to identify whether the malarial parasite is present or not.
Thin smear	It tells about the species of the malarial parasite.

- Under program for the diagnosis of malaria, 1 microscope should be present for a population of 25,000.
- Whereas, in the case of TB, 1 microscope is needed for a population of 1,00,000.
- **Stain used:**
 - JSB (Jaswant Singh Bhattacharya) stain - preferred
 - Giemsa stain

Rapid Diagnostic Kits

- These are used in fields.
- **These are also known as Dipstick test.**
- This test is used to detect Plasmodium falciparum.
- It is based on **histidine rich protein II** antigen detection test.
- It gives results in 3-5 minutes.
- The other test used is the **optimal test** used for the detection of Plasmodium falciparum and Plasmodium vivax.
- It gives results **faster** than that of the dipstick test.

Clinical Diagnosis

- Diagnosis can also be done through clinical examination.

Q1.Preparation of thin smear for Malaria reflects which property of a screening test?

- a. Sensitivity
- b. Specificity**
- c. Predictive value
- d. None of the above

- Thick smear reflects sensitivity as it tells us whether malarial parasite is present or not.

Q. One microscope for diagnosis of Malaria covers how much population?

- a. 10000
- b. 15000
- c. 25000**
- d. 50000

Optimal Test

- It is a type of **rapid diagnostic kit.**
- It is used in detection of both Plasmodium falciparum and Plasmodium vivax.
- It is based on the **lactic dehydrogenase.**
- It is more superior and quicker than rich protein II antigen detection dipstick test for the detection of **Plasmodium falciparum**
- It is based on the parasite specific lactic dehydrogenase (LDH Dipstick Test).

Q. Dipstick test for rapid diagnosis of Plasmodium falciparum is based on

- a. Arginine-rich protein
- b. Histidine-rich protein**
- c. Tyrosine-rich protein
- d. Serine-rich protein

Q4. Optimal test is used for detection of

- a. Plasmodium falciparum
- b. Plasmodium vivax
- c. Both falciparum & vivax**
- d. None of the above

Q5. k-39 dipstick test is for detection of

- a. Plasmodium falciparum
- b. Plasmodium vivax
- c. Visceral leishmaniasis (Kala azar)**
- d. Cutaneous leishmaniasis

High Yielding Points

00:08:53

- **Link Workers:** Team was introduced under NVBDCP.
- It is the initiatives for rapid diagnosis.
- 'One Link Worker' per 2000 population in high Plasmodium falciparum areas
- They collect smears, provides presumptive treatment and forwards slides to PHCs)
- In active surveillance, multipurpose worker male is going from house to house every fortnight and preparing slides from suspected fever cases.
- 1 Fever Treatment Depot (FTD) in every village.
- Early case detection and prompt treatment (EDPT) is enabled through
 - Link worker (1 per 2000 population)
 - Microscopy
 - Dipstick test (field)
 - 1 FTD (Fever Treatment Depot) for every Village
- These Link workers will work the same way as a multipurpose worker male.

Treatment Strategies of Malaria

Treatment of Malaria

- Presumptive treatment under the program is no longer recommended: All fever cases suspected to be malaria must be investigated by microscopy or RDT
- There is fever treatment depot in every village.
- Now, any fever case which is suspected to be malaria should be investigated by gold standard microscopy or rapid diagnostic test.

Plasmodium Vivax Infection

- Treatment: Chloroquine and Primaquine 00:11:40
- Treatment for Vivax and Ovale: Chloroquine (Mnemonic: VOC)
- In case of pregnant women or non-pregnant women: Chloroquine is preferred.
- In case of non-pregnant women along with Chloroquine, primaquine is used.
- **Dose of Chloroquine:** 25 mg/kg body weight (divided over 3 days).

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Day 1	Day 2	Day 3
10 mg/ kg body weight + Primaquine: 0.25 mg /kg body weight	10 mg/ kg body weight + Primaquine: 0.25 mg /kg body weight	5 mg /kg body weight + Primaquine: 0.25 mg /kg body weight

- The dose of primaquine is 0.25 mg /kg body weight.
- Primaquine should be continued for 14 days.

Plasmodium Vivax In Pregnancy:

- Drug of choice: Chloroquine
- Primaquine should be avoided.

Plasmodium Falciparum Infection (ACT)

00:14:32

- Preferred therapy: Artemisinin Combination Therapy
- It is divided into two categories:
 - Other states: ACT- SP
→ A: Artesunate
→ S: Sulphadoxine
→ P: Pyrimethamine
 - Northeastern States: ACT-LM
→ A: Artesunate
→ L: Lumefantrine
→ M: Artemether
- ACT-SP: It is divided over 3 days.

Day 1	<ul style="list-style-type: none"> • Artesunate • Sulphadoxine • Pyrimethamine
Day 2	<ul style="list-style-type: none"> • Artesunate • Primaquine (single dose)
Day 3	<ul style="list-style-type: none"> • Artesunate

- In case of Plasmodium falciparum and malariae, ACT combination therapy is used.
- In Other States, ACT-SP is used and in North Eastern States, ACT-LM is used.

Dosage Of ACT-SP (Age Based Categories)

Refer Table 34.1

- AS: Artesunate
- SP: Sulphadoxine
- P: Pyrimethamine
- PQ: Primaquine

Dosage of ACT-AL (Age Based Categories)

Refer Table 34.2

Plasmodium Falciparum Infection in Pregnancy

00:19:41

Trimesters	Drug of choice
1st trimester	<ul style="list-style-type: none"> • Quinine
2nd and 3rd trimester	<ul style="list-style-type: none"> • ACT <ul style="list-style-type: none"> ○ Other states: ACT-SP ○ Northeastern states: ACT-LM

- Primaquine is contraindicated in case of pregnancy.
- Drug of choice for plasmodium falciparum in pregnancy if trimester is not mentioned is
 - Other States: ACT-SP
 - NE States: ACT-LM

High Yielding Points: Important Contraindications

- Contraindications of Primaquine in Pregnancy.
 - G6PD deficiency.
 - Infants (In 0-1 years primaquine is not given).
- C/I of ACT-SP & ACT-LM: 1 trimester pregnancy and child <5 months.
- If trimester is not mentioned, we will give ACT.
- **Resistant cases in Malaria:** Resistance is suspected if full treatment shows no response in 72 hours.
- Treatment in resistance cases:
 - Oral Quinine + Tetracycline/Doxycycline

Severe Malaria (Black water fever, Cerebral Malaria)

- Impaired consciousness/coma
- Repeated generalized convulsions
- Renal failure
- Jaundice
- Severe anemia
- Pulmonary edema
- Hypoglycemia
- Metabolic syndrome
- Circulatory collapse/shock/abnormal bleeding/ DIC
- Treatment For Severe Malaria
 - Drug of choices are
 - Artesunate
 - Artemether
 - Quinine

Q. A pregnant woman in third trimester having fever was diagnosed as a case of Falciparum malaria. Under the National Health Program, which drug is recommended?

- ACT only
- ACT with a single dose of primaquine on day 2
- Chloroquine (VOC)
- Quinine only (1st trimester)

- Chloroquine: VOC
- Quinine only: 1st trimester
- Primaquine is contraindicated in pregnancy.

Q. First line of treatment for Plasmodium Ovale

- Sulphadoxine
- Pyrimethamine
- Lumefantrine
- Chloroquine (VOC)**

Q. Plasmodium vivax malaria in pregnancy should be treated in pregnancy by

- Chloroquine**
- Quinine
- Pyrimethamine
- Mefloquine

Chemoprophylaxis

00:23:53

- It is given for selective groups like Military, paramilitary, labor force, travelers from non endemic areas for long stay in high P. falciparum areas.

Short Term	Long Term
Traveling for less than 6 weeks	Traveling for more than 6 weeks
Drug of choice: Doxycycline	Drug of choice: Mefloquine
Dose: 100 mg daily (start 1-2 days before travel) The dose has to be continued for 4 weeks (post travel)	Dose: 250 mg weekly (start 2-3 weeks before travel) The dose has to be continued for 4 weeks (post travel)

Summary

00:26:57

- Diagnosis of Malaria: Blood Smear Examination using JSB Stain (Gold Standard)
- In fields for Plasmodium falciparum - rapid diagnostic kits or dipstick test
- Dipstick test for Plasmodium falciparum is based on the histidine rich protein antigen II detection test.
- In fields: For both PF and PV optimal test is preferred (superior test)
- **Treatment: VOC** (for Vivax and Ovale the DOC - Chloroquine)
 - For malariae and falciparum the DOC - ACT.
 - Other States: ACT-SP
 - NE States: ACT- LM

Q. Drug of choice for short term chemoprophylaxis of Malaria

- Mefloquine
- Doxycycline**
- Primaquine
- Quinine

Q. Drug of choice for long term chemoprophylaxis of Malaria

- Mefloquine**
- Doxycycline
- Primaquine
- Quinine

Explanation

Chloroquine is also used for short term but slight resistance has been developed against it.

Table 34.1

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Age Group (Years)	1 st day	2 nd day	3 rd day		
	AS	SP	AS	PQ	AS
0-1 Pink Blister	1 (25 mg)	1 (250 +12.5 mg)	1 (25 mg)	NB	1 (25 mg)
1-4 yellow Blister	1 (50 mg)	1 (500+25 mg each)	1 (50 mg)	1 (7.5 mg base)	1 (50 mg)
5-8 Green blister	1 (100 mg)	1 (750+37.5 mg each)	1 (100 mg)	2 (7.5 mg base each)	1 (100 mg)
9-14 Red Blister	1 (150 mg)	2 (500+25 mg each)	1 (150mg)	4 (7.5 mg base each)	1 (150 mg)
15 & above white blister	1 (200 mg)	2 (750+37.5 mg each)	1 (200 mg)	6 (7.5 mg base each)	1 (200 mg)

Table 34.2

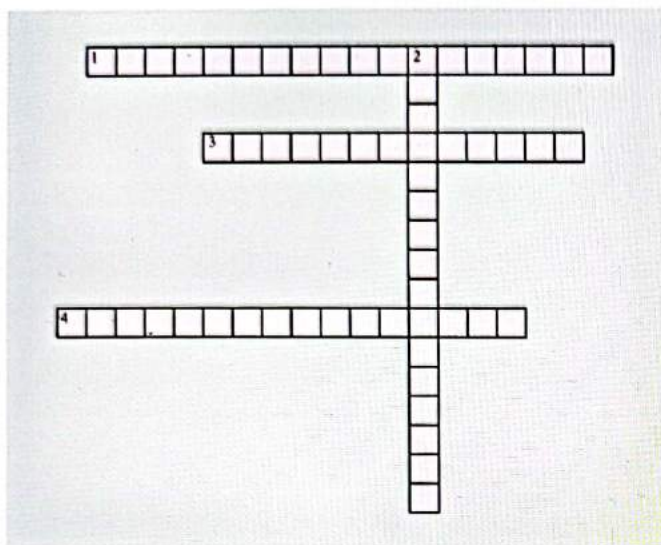
Co-formulated tablet ACT-AL	5-14 kg (>5 months to <3 years)	15-24kg (≥3 to 8 years)	12-34 kg (≥9-14 years)	> 34 kg (≥ 14 years)
Total Dose of ACT-AL	20 mg/120mg Twice daily for 3 days	40mg/240mg Twice daily for 3 days	60 mg/ 360 mg twice daily for three days	80 mg/480 mg twice daily for three days
Pack Size				
No. of tablets in the Packing	6	12	18	24
Give	1 tablet twice daily for 3 days	2 tablets twice daily for 3 days	3 tablets twice daily for 3 days	4 tablets twice daily for 3 days
Color of the pack	Yellow	Green	Red	White



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 1. Presumptive treatment under the program is no longer recommended: All fever cases suspected to be malaria must be investigated by microscopy or RDT
- 3. Other Name: Black water fever, Cerebral Malaria
- 4. It is given for selective groups: (Military, paramilitary, labor forcers, travelers from non endemic areas for long stay in high P. falciparum areas).

Down

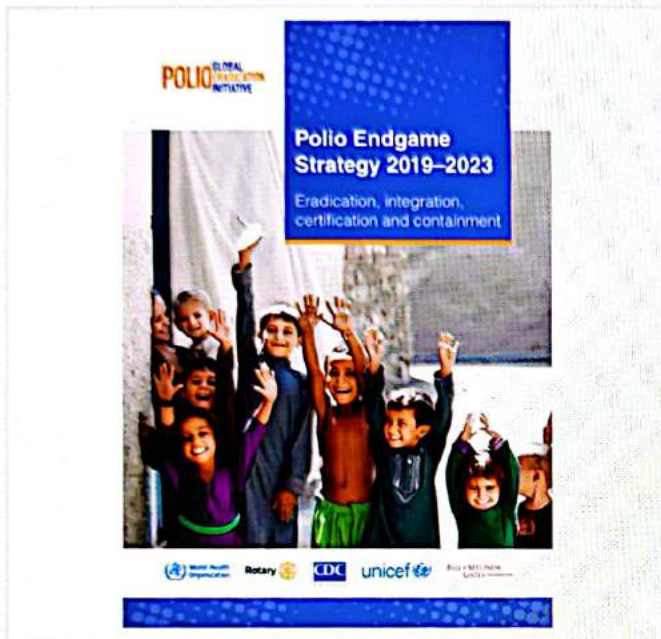
- 2. It can be diagnosed through two types of smears

35

END GAME STRATEGY & NATIONAL POLIO SURVEILLANCE PROGRAMME

Polio Endgame Strategy

00:00.19



- Launch date - 2019 to 2023.
- Trying to eradicate Polio by 2023.
- 3 strains of poliovirus
 1. Wild poliovirus 1
 - Still seen in Afghanistan and Pakistan.
 - **Most difficult to eradicate.**
 - Responsible for natural outbreaks.
 2. Wild poliovirus 2
 - Eradicated in **September 2015**.
 3. Wild poliovirus 3
 - Eradicated in **October 2019**.

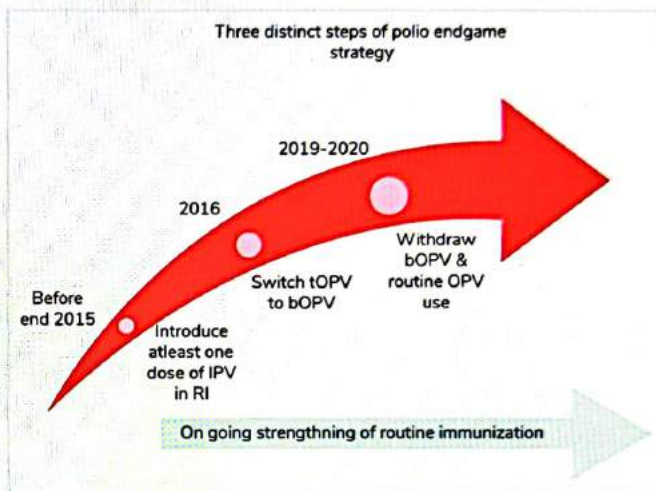
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Switch

00:02.24

- Given by WHO.
- Switching from **trivalent OPV to bivalent OPV**.
- Happened in India in **April 2016**.
- India declared **free from Trivalent OPV - May 9, 2016 - National Validation Day**.
- Trivalent OPV has all 3 strains.
- Bivalent OPV has 1 and 3 strains.
 - Because wpv2 was responsible for causing CVDPV (Circulatory Vaccine Derived Polio Virus).
 - Dangerous
 - Responsible for outbreaks
 - Used everywhere in life routine Immunization round or supplementary Immunization round.
- Last case of polio in India- **Jan 2011, West Bengal**.
- India was declared **polio free on 27th March 2014**.

- Sequential pulling back of OPV and start of IPV is called **Endgame and Eradication Strategy**.
- **Update**
 - At 6 weeks - Fractional IPV1 is given.
 - At 14 weeks - Fractional IPV2 is given.
 - 9 completed months - Fractional IPV3 is given.



- Before 2015 - First dose of IPV in routine Immunization was introduced.
- 2016 - Switch from **tOPV to bOPV**.
- 2021 to 2020 - Withdrawal of bOPV and routine OPV use.
 - Replaced with IPV.
 - Still to be achieved.

Goals of The Endgame Eradication Strategy 2019 to 2023

00:07.08

Goal 1: Eradication

- Interrupt transmission of all wild poliovirus (WPV)
- Stop all circulating vaccine-derived poliovirus (CVDPV) outbreaks within **120 days** of detection
- Eliminate the risk of emergence of future VDPVs.

Goal 2: Integration

- Contribute to strengthening immunization and health systems to help achieve and sustain polio eradication.
- Ensure sensitive poliovirus surveillance through integration with comprehensive **vaccine-preventable disease (VPD)** and communicable disease surveillance systems.
- Prepare for and respond to future outbreaks and emergencies.

Goal 3: Certification and Containment

- Certify eradication of WPV
- Contain all polioviruses.

National Polio Surveillance Programme 00:08.44

- Responsibility of- Surveillance Medical Officer and District Immunization Officer.
- Strategy to keep India polio free.

AFP Surveillance 00:09.15



Non-polio acute flaccid paralysis (NPAFP) is characterized by weakness

- Acute Flaccid Paralysis Surveillance.
- Clinical syndrome- Collection of signs and symptoms instead of a diagnosis.
- Acute onset of weakness, paralysis with a reduced muscle tone in children.
- Age - 0 to 15 years.
- Can be due to polio or other causes.
- The AFP case should be immediately reported and kept under investigation for up to 48 hours.
- Non probable causes of polio:
 - Transverse myelitis
 - Galleon Barrel syndrome

Process of AFP Surveillance 00:11.34

- Active case finding and passive reporting of AFP in children
- Start investigating within 48 hours of reporting of an AFP case.
- 1st stool sample collected within 48 hours of reporting.
- Two stool samples are collected.
 - 24 hours apart ideally within 14 days of onset of paralysis but can be collected till 2 months.
 - Size - 8gms (equal to the size of thumb).
- Transported to NIV (National Institute of Virology, Pune) in reverse cold chain (red carriers - carries stool sample at +2 to +8°).
 - Should reach within 72 hours.
- Check for Residual paralysis on the 60th day.
- Isolation of wild polio virus and mapping on the 60th day.
- Confirmation of a case of polio within 90 days.
 - Confirmed case - Isolated polio virus in stool.
 - Compatible case - Death within 60 days of paralysis or only 1 stool sample available with residual paralysis on 60th day.

- Mop up operation is done for wild poliovirus is detected.
 - Done at least for 500 persons in the vicinity.

Monitoring and Evaluation Indicators of AFP Surveillance 00:16.10

- AFP Reporting Rate
 - Should be more than 1 AFP case / 100000 children / 1 year < 15 years of age.
 - Sensitive indicator for ability to detect polio in a community.
- Stool adequacy rate
 - Should be more than 80%.
 - Indicator for operation efficiency of program.
 - The stool sample should reach the laboratory within 72 hours of collection.
- Surveillance Indicators
 - Completeness of reporting - 80% of expected AFP surveillance
 - Sensitivity of surveillance - >1 AFP / Lac population / year in age < 15 years
 - Completeness of case investigation - > 80% adequate stool sample collection
 - Completeness of follow up > 80% AFP cases should have residual paralysis check at 60 days
 - Environmental surveillance- Testing sewage or other environmental samples for the presence of poliovirus

Mopping Up 00:19.19

- End stage strategy for polio eradication used when poliovirus transmission is reduced to a few foci.
- It involves door to door immunization (min 2 rounds, 4-6 weeks apart, in India 3 rounds done).
- Practiced in high-risk districts with known or suspected WPV circulation.
- Neighboring districts are also targeted.
- Recommended to cover 2- 5 million under 5 children in each mopping up.

Line Listing of Cases 00:20.48

- Initiated in 1989 with following objectives:
 - Check for cases duplication.
 - Screen children who developed poliomyelitis prior to years of reporting.
 - To identify high risk pockets.
 - To document high risk age groups.

MCQs

- Q. Acute Flaccid Paralysis is reported in a child aged?
- A. 0 to 3
 - B. 0 to 5
 - C. 0 to 15
 - D. 0 to 25

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Q. Follow up examination is done after how many days for residual paralysis under AFP Surveillance

- A. 15 days of onset of paralysis
- B. 30 days of onset of paralysis
- C. 45 days of onset of paralysis
- D. 60 days of onset of paralysis**
- E. 90 days of onset of paralysis

Q. Confirmation of polio should be done after how many days for residual paralysis under AFP Surveillance

- A. 15 days of onset of paralysis
- B. 30 days of onset of paralysis
- C. 45 days of onset of paralysis
- D. 60 days of onset of paralysis
- E. 90 days of onset of paralysis**

Q. All are true regarding AFP in the national polio Eradication program, except?

- A. AFP in child < 15 years of age
- B. 2 stool samples selected per case
- C. 2 specimens collected within 14 days of paralysis onset and at least 24 hours apart.
- D. 30 days follow up examination**

Q. Pulse Polio Immunization is the administration of OPV to?

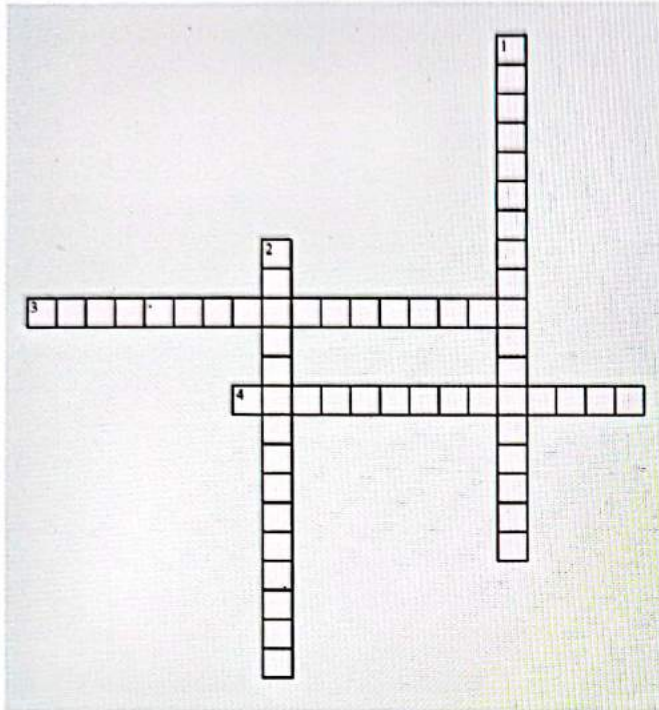
- A. All children between 0-5 years of age on a single day, Irrespective of their previous Immunization status.**
- B. Children in the age group of 0-1 year only who have not been immunized earlier
- C. Children in age group of 12- 24 months only as booster dose
- D. All children between 0-5 years of age whenever there is an outbreak of poliomyelitis



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Refers to collection of signs and symptoms instead of a diagnosis
- 4. Death within 60 days of paralysis or only 1 stool sample available with residual paralysis on 60th day

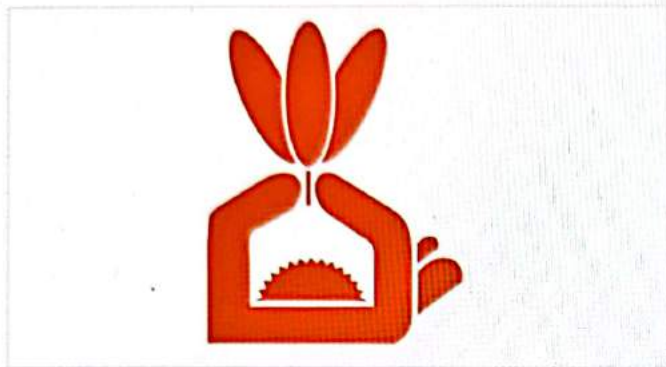
Down

- 1. Non probable causes of polio are Galleon Barrel syndrome and _____
- 2. Responsible for natural outbreaks, this is the most difficult to eradicate

36 LEPROSY AND NATIONAL LEPROSY ERADICATION PROGRAM

Leprosy / Hansen's Disease

00:00:22



- Status of Leprosy in India - Eliminated
- **Criteria for elimination**- Prevalence rate is less than 1 case per 10000 population and 0 incidence in all districts

Epidemiological Determinants

00:01:25

- Attack rate among household contacts: 4.4-12%
- Youngest case in India - 2½ month infant
- Current prevalence rate is 0.45
- Current Annual New Case Detection Rate= 5.52 (Target = <10 lakh Population)

Agent factors

- **Mycobacterium Leprae**
 - Acid fast Bacilli
- Affects **reticuloendothelial and Schwann cell**
- Source Factors: No animal source
 - Human is only source of infection
 - Large no. of subclinical cases compared to clinical cases
- Infectivity - low
- Pathogenicity- high

Host Factors

- Common among males
- Peak around 20-40 years

Environmental factors

- Low socioeconomic status disease / overcrowded areas / poverty
- Also seen in winter season

Mode of Transmission

00:02:52

- Droplet Infection
- Contact Transmission
- Breast milk from lepromatous mother
- Transplacental

- Insect vector
- Tattooing needles

National Leprosy Eradication Programme

00:03:06



- Launched in 1983

Objective of Programme

00:03:22

- Reduce prevalence rate <1/10000 population at national and district level
- Annual new case detection rate <10 lakh
- Reduce grade II disability % to <1 among new cases at national level
- Reduce grade II disability cases to <1 case per million population at national level
- Zero disabilities among new child cases
- Zero stigma and discrimination against person affected by leprosy.

Strategy

00:04:04

Primary Level of Prevention

- Health Education



- The girl in the 3rd image is known as Sapna who is spreading awareness on Leprosy.
- The concept of Sapna was adopted by the girl in 1st image, Meena. It is for child rights and impairment.
- This concept was given by UNICEF and was successful and adopted by Leprosy Trust Mission to spread awareness.

Sparsh Programme

00:05:00

- Create awareness about leprosy using mascot SAPNA
- Prophylaxis is given to close contacts.
 - upto 10-13% close contacts will develop leprosy within 5 yrs if prophylaxis is not given
- Prophylaxis of Leprosy:
 - Single dose Rifampicin is given.
 - >= 15 yrs - 600mg
 - 10-14 yrs - 450mg
 - Children 6-9 yrs - 300 mg
 - Children <20 kg - 10-15 mg / kg

Secondary Level of Prevention

00:06:03

- Early diagnosis and treatment.
- Detection is done by ASHA.
- She gets an incentive to detect.
 - A case without disability - Rs. 250
 - A case with disability - Rs. 200
- Diagnosis:

Paucibacillary	Multibacillary
Lesions: ≤ 5	≥ 6
Nerve involvement: No or 1 nerve involved	2 or more nerves
No positive skin smear	Any skin smear positive

Skin Lesions:



- M/c type: Hypopigmented
- M/c specific type: Hypo anesthetic



- M/c nerve involved: Ulnar nerve
- Sensory deficit more specific than motor deficit

Skin Smear Examination:

- Bacteriological index calculation - indicates prognosis
- BI = Total score in all smears / no. Of smears
- BI <2 (Paucibacillary leprosy)
- BI = 2 (multibacillary leprosy)

Bacteriological index (BI)	
0	0 Bacilli in 100 fields
1+	1-10 Bacilli in 100 fields
2+	1-10 Bacilli in 10 fields
3+	1-10 Bacilli, on average, in each field
4+	1-100 Bacilli, on average, in each field
5+	100-1000 Bacilli, on average, in each field
6+	>1000 Bacilli, on average, in each field

- Morphological Index: indicates live Bacilli

Classification in Leprosy

00:09:33

- Not used for diagnosis/ treatment
- Has only prognostic value

Ridley Jopling classification	Indian classification	Madrid classification
TT (Tuberculoid)	Indeterminate	Indeterminate
BT (Borderline Tuberculoid)	Tuberculoid	Tuberculoid
BB (Borderline borderline)	Borderline	Borderline
BL (borderline lepromatous)	Lepromatous	Lepromatous
LL (Lepromatous Leprosy)	Pure Neuritic	

Operational Classification of Leprosy (According to skin smear positivity)

00:10:25

	Paucibacillary Leprosy (PBL)	Multibacillary Leprosy (MBL)
	BI <2	BI 2
Included types	Indeterminate Polar Tuberculoid Border Tuberculoid	Polar Lepromatous Borderline Lepromatous Mid-borderline
Multidrug therapy (MDT) in NLEP	Rifampicin, Dapsone Clofazimine	Rifampicin OAMS Dapsone Clofazimine



Treatment duration	6 months	12 months
Follow up (after treatment)	Annually for 2 yrs	Annually for 5 yrs

Definitions under NLEP 00:11:20

- Paucibacillary Leprosy: 1-5 skin lesions with no or only one nerve involvement
- Multibacillary Leprosy: 6 or more skin lesions or more than one nerve involvement
- Adequate treatment: Patient has received 6 months of therapy in 9 months (for PBL) or 12 months of therapy within 18 months (for MBL)
- Regular Treatment: Received MDT for two-thirds of total duration of therapy, i.e., 4 months for PBL (out of 6 months of duration of therapy) and 8 months for MBL (out of 12 months of duration of therapy)
- Case: clinical signs of leprosy (with or without bacteriological confirmation of Diagnosis) and who has not yet completed a full course of treatment with multi-drug Therapy.
- Newly diagnosed case: Diagnosed case who has not taken MDT in past
- Defaulter: A leprosy patient on MDT, who has not collected treatment for 12 consecutive months.
- Relapsed case: A patient whose therapy was terminated successfully, completed adequately, who subsequently develops new signs and symptoms of disease, either during surveillance period or thereafter

Revised Leprosy Treatment Guidelines (2019-20) 00:13:01

- It relies on **Three drug therapy**
- Treatment of children with body weight 40 kg requires single formulation medications since no MDT combination blister packs are available

Age	Drugs	Dosage & Schedule	Duration (PB & MB)
Adult	Rifampicin	600 mg once a month	6 months for PB
	Clofazimine	300 mg once a month and 500 mg daily	12 months for MB
Children (10-14 years of age)	Dapsone	100 mg daily	
	Rifampicin	400 mg once a month	6 months PB
	Clofazimine	50 mg Alternate days	12 months MB

Color Packs (MDT Regime) 00:13:43

- Color:
 - Paucibacillary: adult (Green), children (Blue)
 - Multibacillary: adult (red), children (brown)



Tertiary Prevention 00:14:32

- Treatment of drug resistant leprosy
- Disability Limitation and rehabilitation
- Reconstructive surgeries
- Crutches to walk

Drug Resistant Leprosy 00:14:45

- Duration of treatment: **24 months**
 - First 6 months: Ofloxacin (400mg) + Minocycline (100mg) + Clofazimine (50mg)
 - Next 18 months: Ofloxacin (400mg) or Minocycline (100mg) + Clofazimine (50mg)
- Rifampicin and Ofloxacin resistance: Clarithromycin (500mg) + Minocycline (100mg) + Clofazimine (50mg)

New Initiatives 00:15:17

- Active case detections campaigns (14 days) in high endemic districts
- Focused Leprosy Campaign (FLC) in low endemic Districts
- ASHA based Surveillance for Leprosy Suspects (ABDULS)
 - ASHA gets incentive of Rs. 400 on successful treatment completion of Paucibacillary cases
 - Rs. 600 on successful treatment completion of Multibacillary case
- Grade II disability epidemiological investigation
- Implementation of post exposure Prophylaxis (administration of single dose of Rifampicin)
- Sparsh leprosy awareness campaigns
- NIKUSHTH+ Real leprosy reporting software across India
- Leprosy has been converged under Rashtriya Bal swasthya Karyakram and Rashtriya Kishor Swasthya Karyakram for screening of children (0-18 years)

- Population based screening of women and men of age 30 years and above has been included in Comprehensive primary health care under Ayushman Bharat at the health and wellness center.

Monitoring & Evaluation 00:17:33

Primary Indicators

- Annual new case detection rate: Most important Epidemiological Indicator
- Treatment completion rate (cohort analysis)

Indicators For Case Detection

- Proportion of new cases with Grade II disability
- Proportion of child cases (<15 years) among new cases
- Proportion of MB cases among new cases
- Proportion of female cases among new cases

Indicators For Quality of Service 00:18:05

- Proportion of new cases correctly diagnosed
- Proportion of defaulters
- Number of replaced during a year
- Proportion of cases with new disabilities

Important Information

- Most important Epidemiological Indicator: ANCDR
- Most important operational Indicator: Grade 2 disability Indicator
- Most important health awareness/ Leprosy awareness indicator: Grade 2 disability Indicator

Test For Detecting Immunity 00:18:48

Tests of cell mediated immunity	Tests of humoral Immunization
Lepromin Test	FLA- ABS test
Lymphocyte transformation test	Monoclonal antibodies test
Leukocyte migration inhibition test	ELISA TESTS
	Radioimmunoassay

Lepromin Test 00:19:02

- Test of CMI in Leprosy
- Test: 0.1 ml of lepromin intradermal on inner aspect of forearm
- Antigens used in lepromin test:

- Dharmendra Antigen (extensively used in India)
- Mitsuda antigen
- Readings: after 48 hours and 21 days

Reactions in Lepromin Test 00:19:30

- Early Reaction (Fernandes Reaction):** 00:19:30
 - Read at 48 hours
 - Redness > 10mm indicates +ve test
 - Indicates prior exposure or infection
 - Delayed type of hypersensitivity
 - Induced by soluble components of leprosy Bacilli
 - Superior to late reaction
 - Corresponds to Mantoux Reaction (TB)
- Late Reaction (Late Mitsuda Reaction):** 00:19:54
 - Read at 21 days
 - Nodule > 5 mm diameter is +ve
 - Indicates cell mediated immunity
 - Induced by bacillary component of antigen
 - BCG vaccine can convert it from -ve to +ve

Uses of Lepromin Test: 00:20:20

- Prognostic significance
- Evaluation of Cell mediated immunity status of patients
- Aid to confirm the classification of Leprosy
- Estimation of prognosis of cases

Drawbacks of Lepromin Test 00:20:37

- Positive in non-cases
- Negative in Lepromatous and near-lepromatous cases
- Most infants < 6 months are Lepromin negative, done become positive by end of 1st year
- BCG vaccination converts lepra reaction from negative to positive

Difficulty in Eradication 00:21:00

- Long and variable incubation period
- Disputed modes of transmission
- Presence of subclinical cases and our inability to detect them
- Complicated spectrum of disease Manifestations
- Mycobacterium Pranii indicus* was the vaccine for leprosy
- Failure of cell mediated Immunization in Lepromatous cases
- Bacterial resistance and persistence in the human body
- Absence of vaccine
- Social and cultural taboos leading to concealment of disease
- Discovery of extra-human reservoir

Leprosy Mukht Bharat 2027 00:22:20

Features

- Early detection (based on 2nd level prevention)
- Free of cost treatment to prevent development of disabilities and deformities
- Medical rehabilitation of those with existing deformities



New Achievements

- Welfare allowance raised from Rs 8000 to Rs 12000 to patients for reconstructive surgeries
- Enhance awareness regarding stigma surrounding Leprosy

MCQ's

Q. Leprosy is considered a public health problem if the prevalence of leprosy is more than?

- A. 1 per 10000
- B. 2 per 10000
- C. 5 per 10000
- D. 10 per 10000

Q. Under NLEP, the following social workers are involved in bringing out suspected leprosy cases from their villages?

- A. ASHA
- B. Anganwadi Workers
- C. Multipurpose workers
- D. Villages health guide

Q. Adequate treatment in case of Paucibacillary Leprosy is considered if the patient has received the 6 monthly treatment doses of combined therapy within?

- A. 6 months
- B. 9 months
- C. 12 months
- D. 15 months

Q. Two years duration in terms of leprosy is with regard to?

- A. Treatment of Paucibacillary Leprosy
- B. Treatment of Multibacillary Leprosy
- C. Post treatment surveillance of Paucibacillary Leprosy
- D. Post treatment surveillance of Multibacillary Leprosy

Q. In the management of leprosy, the Lepromin test is most useful for?

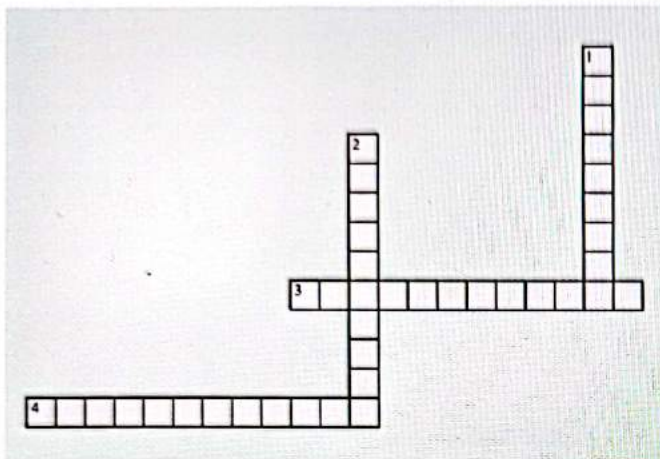
- A. Hard immunity
- B. Prognosis
- C. Treatment
- D. Epidemiological investigations



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. FLA-ABS test
- 4. Read at 21 days

Down

- 1. Lepromin test is most useful for
- 2. Prophylaxis

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37

NCDS AND NPCDCS



Non-Communicable Diseases

00.00.52

NPCDCS

00.05.25

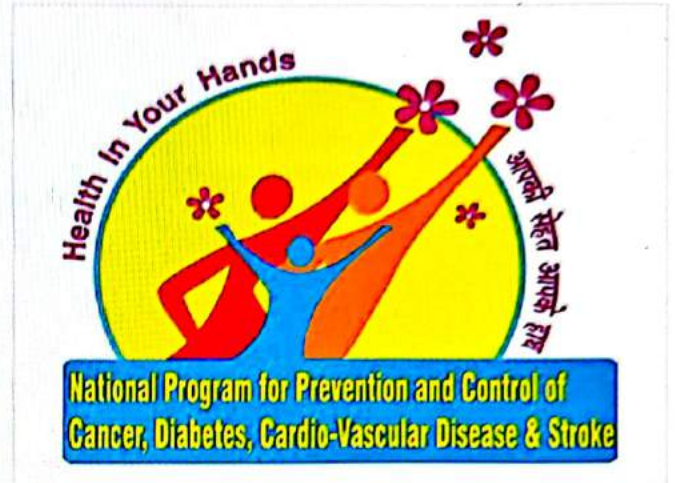
- NCDs are non-infectious in origin
- One Exception- **Rheumatic heart disease**
 - With sequelae rheumatic fever due to streptococcal infection.
- Do not transmit from one person to another.
- They are result of unhealthy behaviours.
- Lifestyle-related disorders.
- NCDs are responsible for **maximum DALY** and deaths throughout the world and India.

Types of NCDs

00.02.57

Refer Diagram 37.1

- There are **four main types** of NCDs;
 1. Cardiovascular diseases- contributes maximum DALY
 2. Cancer
 3. Chronic respiratory diseases
 4. Diabetes
- **Other types of NCDs, are;**
 - Hypertension
 - Dyslipidaemia
 - Obesity
 - Metabolic Syndrome
 - Rheumatoid arthritis (RA)
 - Cerebrovascular disease
 - Osteopenia/osteoporosis
 - Degenerative disc disease
 - Sarcopenia and frailty
 - Depression
 - Cognitive impairment
 - Neurodegenerative disease
- **Chronic NCD:**
 - Irreversible pathology
 - Duration of >3 months according to the WHO.
- **Latent Period**- incubation period for NCDs.
- **Best level of prevention for NCDs**- Primordial prevention.
 - Do not develop risk factors.



- National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS).
- Implemented since 2010 up to the District level under the National Health Mission.
- Tagline for the logo - Health in Your Hands.

New Initiatives Under the Programme

00.06.07

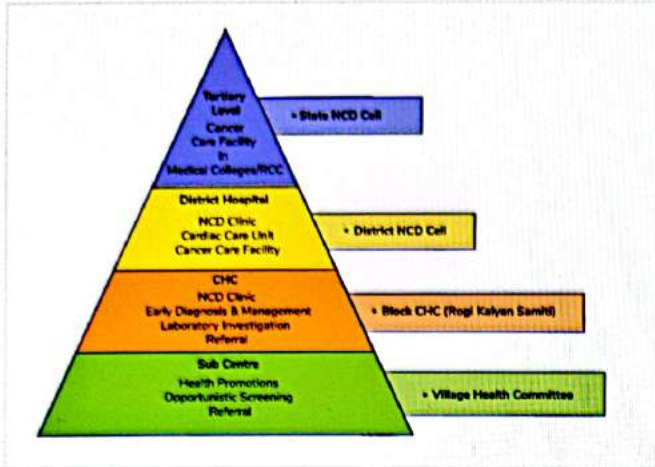
1. COPD and CKD disease inclusion.
 2. Population-based screening for NCDs.
 3. Integration of AYUSH with NCDs.
 4. Prevention and control of **rheumatic fever and rheumatic heart disease** under NPCDCS and Rashtriya Bal Swasthya Karyakram.
 5. Integration of **joint NTEP (RNTCP - Prior)** with NPCDCS. Joint TB and diabetes collaboration activity.
- ASHA worker fills out a form **CBAC-Community-Based Assessment Checklist**.
 - ASHA workers screen the community for NCDs like diabetes, risk factors for TB, and other NCDs.
 - For each form filled ASHA gets ₹10.

Q. What is the new change in the National Program on Prevention and Control of Diabetes, Cardiovascular diseases, and Stroke?

- A. Opportunistic screening
- B. Awareness of lifestyle and behaviour-related diseases
- C. Specialised units at Medical College
- D. Integration with National Cancer Control Program

Administrative Set Up under the Programme

00.11.03



- In the sub centres;
 - Rely on health promotion.
 - The identification of suspected cases of NCDs is done by multipurpose work males and multipurpose work females at the village levels.
 - It also has village health committees, which are particularly set up for finding cases of NCDs.
- At CHC level:
 - NCD clinic- Early diagnosis and management with laboratory investigation referral.
 - To keep a check on the activities at the CHC level, Rogi Kalyan Samiti is present.
- At District Hospital:
 - NCD clinic- Provided with the cardiac care unit and cancer care facility.
- At tertiary level;
 - Cancer care facility in medical colleges or RCC.

Urban health check-up scheme for Diabetes and HTN

- Screen urban slum population.
- Screen population >30 years and pregnant females.

Cancer control

- Regional cancer control scheme act as referral centres;
- Oncology wing development scheme.
 - Decentralised NGO scheme.
 - IEC at the Central level.
 - Research and training.

Global Initiatives to Control NCDs

00.14.25



- Initiated by WHO
- Expected to be achieved by 2025.

Q. WHO global target for prevention and control of non-communicable disease by 2025 is to decrease hypertension by

- A. 25%
- B. 35%
- C. 55%
- D. 75%

9 Voluntary Targets Set Up by WHO Global Framework

00.15.29

- Harmful use of alcohol - 10% reduction
- Physical inactivity - 10% reduction
- Salt/sodium intake - 30% reduction
- Tobacco use (Smoking) - 30% reduction
- Premature mortality from NCDs - 25% reduction
- Raised blood pressure - 25% reduction
- Essential NCD medicines and technologies - 80% coverage
- Drug therapy and counselling - 50% coverage
- Diabetes/Obesity - 0% increase

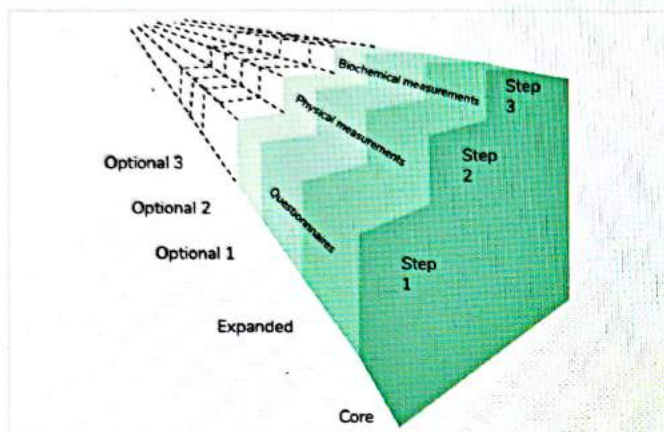
Centres	Activities
Sub-centres	<ul style="list-style-type: none"> Health promotion for behaviour and lifestyle change. Opportunistic screening of BP >30 years age- blood glucose (Strip method) Referral to CHC.
CHCs	<ul style="list-style-type: none"> Diagnosis and management at NCD clinic. Home visits for bedridden cases. Referral to a district hospital.
District hospital	<ul style="list-style-type: none"> Health promotion. Screening of population >30 years. Diagnosis and management of cardiovascular diseases. Home-based palliative care. Separate cardiac care unit and cancer care facility.

Trick to Remember

- **2A 2S 2O**
 - **A for 10%**
 - Harmful use of **alcohol** 10% reduction.
 - Physical **inactivity** 10% reduction.
 - **S for 30%**
 - **Salt/ sodium** intake 30% reduction.
 - Tobacco use (**Smoking**) 30% reduction.
 - **O for 25% (O for Outcome)**
 - Premature mortality from NCDs 25% reduction.
 - Raised blood pressure by 25% reduction.

Steps Approach

00.19.25



Step 01 - Questionnaire

- All about lifestyle and behavioural factors. Like:
 - Smoking habits,
 - Drinking habits, and
 - Dietary habits.

Step 02 - Anthropometric Measurements

- Height
- Weight
- Waist and hip circumference.

Step 03 - Biochemical Measurements

- Lab investigations.

Q. WHO STEPS is done for:

- A. Surveillance of risk factors for non-communicable diseases
- B. Surveillance of incidence of non-communicable diseases
- C. Surveillance of evaluation of treatment of non-communicable diseases
- D. Surveillance of mortality from non-communicable diseases

MPOWER MEASURES - For Tobacco Control

00.21.16

- **M** - Monitor tobacco use and prevention policies.
- **P** - Protect people from tobacco use.
- **O** - Offer help to quit tobacco use.
- **W** - Warn about the dangers of tobacco.
- **E** - Enforce bans on tobacco advertising, promotion, and sponsorship.
- **R** - Raise taxes on tobacco.

Q. MPOWER strategy is directed to control consumption of

- A. Alcohol
- B. Tobacco
- C. Drugs
- D. All of the above

Risk factors

00.22.15

Modifiable	Non-modifiable
Tobacco	Age
HTN	Gender
Physical inactivity	Family history
Alcohol	Ethnicity
Elevated blood sugar level	Past medical history
Elevated cholesterol levels	
Improper diet	

Q. Modifiable risk factors in coronary artery disease are all except:

- A. Past medical history
- B. Smoking
- C. Obesity
- D. Hypertension

Ideal Recommended Values

00.23.24

Indicators	Recommended/cut-off values
Threshold level of cholesterol	220 mg/dl
HDL	>40 mg/dl - Good Cholesterol
Cholesterol/HDL ratio	<3.5
Reduction of fat intake	20-30% of total energy intake.
Consumption of saturated fats	<10% or 7-10%
Reduction of dietary cholesterol	Below 100 grams/1000 kcal/day
Reduction of salt intake	<5 grams
Hypertension (diagnosed if)	Systolic - >140 mm of Hg. Diastolic - >90 mm of Hg.

Indicators of Obesity

00.25.13

BMI or Quetlet Index

- **Formula = Weight in kg/ Height in m².**

Classification of BMI-
1. According to WHO:

Normal BMI	18.5-24.99
Overweight (Pre obese)	25-29.9
Obese class I	30-34.9
Obese class II	35-39.9
Obese class III	≥ 40

2. According to Asian classification:

Normal BMI	18.5-22.9
Overweight (Pre obese)	23-24.9
Obese class I	25-29.9
Obese class II	≥ 30

Lethal BMI

- Lethal means maximum level of toleration.
- Lethal BMI for males - 13.
- Lethal BMI for females - 11.

Other Indices

00.29.16

- **Ponderal Index**
 - o Height in cm/Cube root of body weight.
- **Broca's index**
 - o Height in cm - 100.
- **Corpulence index**
 - o It is an **independent indicator of obesity**.
 - o Actual weight/Desirable weight.
- **Lorentz formula**
 - o Height in cm-100-[Height in cm-150/ 4 (In Men) or 2 (Women)].

- Q.** What will be the BMI of a male whose weight is 89 kg and height is 172 cm?
- A. 27
 - B. 30**
 - C. 33
 - D. 36

- Q.** BMI level for men which is considered lethal?
- A. 13**
 - B. 23
 - C. 11
 - D. 15

- Q.** Which of the following indices of obesity is height-independent?
- A. Quetlet's Index
 - B. Ponderal Index
 - C. Broca's Index
 - D. Corpulence Index**

- Q.** Corpulence index is given by:
- A. Actual weight-Desirable weight**
 - B. Actual weight/Desirable weight
 - C. Desirable weight/Actual Weight
 - D. Height (cms)-100

Other Indicators of Obesity

00.33.52

1. SKIN FOLD THICKNESS:

- Measured by **Harpender Calliper**
- Measured at **4 sites-**
 - o Subscapular
 - o Supra-iliac
 - o Mid-biceps
 - o Mid-triceps
- Sum of all 4 sites measurement.
 - o Males ->40.
 - o Females ->50.

2. Waist circumference.

- Males ->102.
- Females ->88.
- **Indian population waist circumference.**
 - o Males ->90.
 - o Females ->80.

3. Waist-hip ratio

- Males ->1.
- Females ->0.85.

Morbid Obesity and Super Obesity

- Super Obesity - BMI: >50.
- Morbid Obesity - BMI: >40.

- Q.** A patient is called obese if BMI is:
- A. 20-30
 - B. >25
 - C. >30**
 - D. >40
- Ans.** C > 30 (According to WHO)

Q. Super Obesity is defined as

- A. BMI>40
- B. BMI>50**
- C. BMI>60
- D. BMI>70

Q. Which is the cutoff level of the Waist-Hip Ratio in Women indicating abdominal fat accumulation?

- A. 0.75
- B. 0.85
- C. 0.95
- D. 1.05

Indicators

00.37.02

Indicators	Recommended/cut-off values
BMI	Normal range -18.50-24.99 (WHO).
Corpulence index (To rule out obesity)	<1.2
Waist circumference (classified as obese if)	>102 cm in men and >88 cm in women
Waist -to-hip ratio (WHR) (Recommended)	<1 in males and <0.85 in females
Waist-Height ratio	Cutoff is 0.5
Fasting plasma glucose (diabetes)	≥7 mmol/L or 126 mg/L
2-hour postprandial venous plasma glucose	> 11.1 mmol/L. or 200 mg/L

Coronary Artery Disease

00.38.11

It contributes the maximum DALY.

• Preventive strategy:

- a) **Primordial**
 - o Best level of prevention.
 - o Do not adopt smoking.
- b) **Primary prevention**
 - o Lead a healthy lifestyle.
 - o Population strategies or high-risk strategies are also used.
- c) **Secondary prevention**
 - o Early diagnosis and treatment.
 - o For CAD- Angioplasty can be done.
- d) **Tertiary prevention**
 - o Stop smoking after an attack.

Q. What is the MONICA project?

- A. Multinational monitoring of trends and determinants in Cardiovascular disease
- B. Mother, Newborn, Child, Adolescent project
- C. Monitoring of noninvasive cardiac accidents
- D. Management of new coronavirus infection

Q. Best-known large sample study programme for coronary heart disease is?

- A. Framingham study
- B. North Karelia study
- C. Stanford study
- D. Oxford study

Research Evidence

00.41.19

1. Framingham heart study

- Began in 1948.
- Largest cohort study to study the association of risk factors causing heart diseases.

2. MONICA

- MONICA-monitoring trends and determinants in cardiovascular disease.
- Surveillance and assessment of trends in cardiovascular events.

3. Oslo heart study

- To study lowering of serum lipids and smoking cessation on the incidence of CAD in males aged 40-50.

4. Lipid research study clinics

- Double Blind randomised clinical trial
- To assess whether reducing serum cholesterol would prevent CHD events.

5. Stanford three community study

- Trial to see whether community health education can reduce the risk of cardiovascular disease.

6. North Karelia project

- To reduce the high levels of risk factors (Smoking, HTN, cholesterol) in cardiovascular disease.
- To promote the early diagnosis, treatment, and rehabilitation of patients with CV disease.

7. Multiple Risk Factor Intervention Trial (MRFIT)

- Began in 1971.
- Randomised, primary prevention trial.
- To test whether lowering elevated serum cholesterol and diastolic blood pressure and ceasing cigarette smoking would reduce coronary heart disease mortality.

Q. Stanford-three-community study, The North Karelia project, and the Lipid Research Clinics study are types of:

- A. Cohort studies
- B. Nested case-control studies
- C. Case series report studies
- D. Risk factor intervention trials

Ans: (d) Risk factor intervention trials for CAD.

Hypertension

00.42.58

- Most important risk factor for CAD.

Classification of Hypertension

00.43.18

Range	Systolic (mm of Hg)	Diastolic (mm of Hg)
Optimal	<120	<80
Normal	120-129 and/or	80-84
High Normal	130-139 and/or	85-89
GRADE I	140-159 and/or	90-99
GRADE II	160-179 and/or	100-109
GRADE III	> or equal to 180	> or equal to 110

- In isolated systolic hypertension:
 - Systolic - >140 mm of Hg.
 - Diastolic - <90 mm of Hg.

Lifestyle Modification to Manage to HTN

00.44.38

Modification	Recommendation	Approximate Systolic BP Reduction, Range
Weight reduction	Maintain normal body weight (BMI, 18.5-24.9 kg/m ³)	5-20 mm of Hg/ 10kg weight loss
Adopt the DASH eating plan	Consume a diet rich in fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat.	8-14 mm of Hg.
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mEq/L (2.4 g sodium or 6 g sodium chloride).	2-8 mm of Hg.
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min/d, most days of the week).	4-9 mm of Hg.
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks/d (1 oz or 30 mL ethanol (e.g., 24-oz beer 10-oz wine, or 3-oz 80-proof whiskey) in most men and no more than 1 drink/d in women and lighter-weight persons.	2-4 mm of Hg.

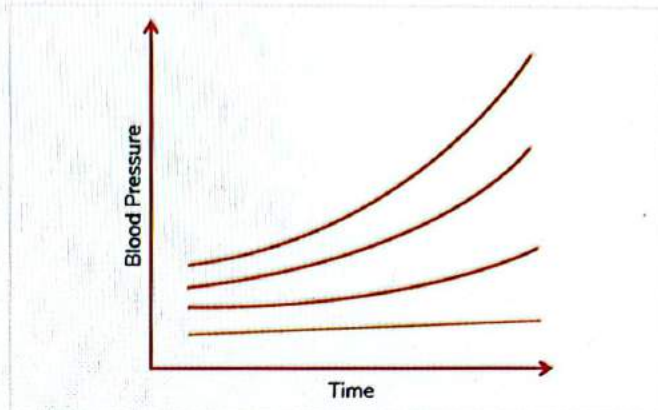
BMI indicates body mass index calculated as weight in kilograms divided by the square of height in metres; BP, blood pressure; and DASH, dietary approaches to stop hypertension.

Q. Physical activity like brisk walking for 30 minutes a day will reduce systolic BP by approximately:

- A. 10-20mm Hg
- B. 5-10 mm Hg
- C. 2-4 mm Hg
- D. 4-9 mm Hg

Tracking of Blood Pressure

00.46.35



- Blood pressure is tracked from childhood to adulthood - Tracking phenomenon.
- If a person is hypotensive in childhood then the person remains hypotensive in adulthood.
- If a person is hypertensive in childhood, then the person remains hypertensive in adulthood.

Q. Tracking of BP implies

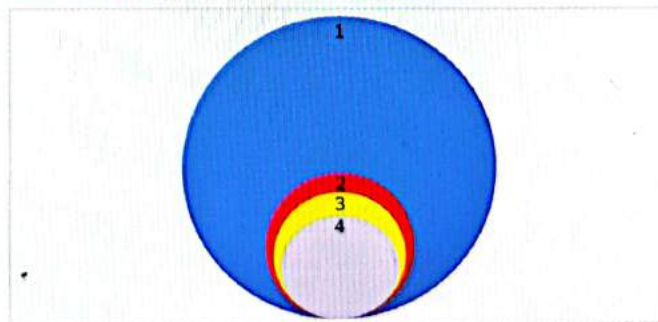
- A. BP increase with age
- B. BP decreases with age
- C. BP of hypotensive become hypertensive
- D. BP of hypotensive remains hypotensive

Q. Tracking of BP means:

- A. Keeping a track of a person with hypertension for follow-up
- B. Keeping a track of relatives of a hypertensive for screening
- C. BP levels of individuals are followed up from early childhood into adult life
- D. Checking BP at regular intervals once hypertension is diagnosed

Rule of Halves

00.48.46



- Out of the entire population, only 50% of people know or are aware that they are hypertensive.
- Out of that 50% who are aware that they're hypertensive, only 50% receive the treatment.
- Out of those who're receiving the treatment, only 50% of the population's BP is controlled.

Q. 'Rule of Halves' is seen in:

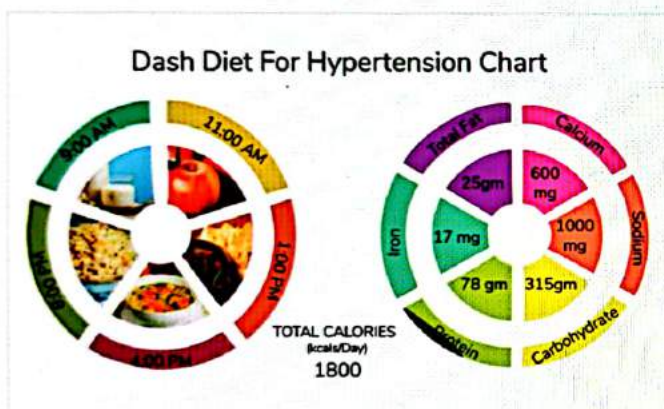
- CHD
- Hypertension
- Blindness
- Accidents and Injuries

Q. What is DASH?

- Dietary approaches to stop hypertension
- Domestic approach to safeguard hepatitis
- Dietary approaches to stop hyperlipidemia
- Domestic approaches to stop hypertension

DASH Diet for Hypertension Chart

00.50.25



- Total calories (kcal/day) - 1800.

Diabetes Mellitus

00.50.35

- Almost 7-8% of the population in India is diabetic.
- The urine of the diabetic patient contains glucose - Glucosuria.
- Sensitivity of glycosuria is less.
- Urine sugar is not recommended for epidemiological purposes.
- Crude idea - Random blood sugar.
 - It is the first but not more reliable
- Glucose tolerance test is done - 2 hours postprandial values are taken.

Q. Most reliable test for screening of diabetes mellitus?

- Random blood sugar
- Fasting blood sugar
- Glucose tolerance test
- Urine sugar

Diagnostic Criteria According to WHO

00.52.28

Diabetes	Diabetes Mellitus
Fasting plasma glucose	7.0 mmol/L (126 mg/dL)
2-hour plasma glucose	11.1 mmol/L (200 mg/dL)
Impaired Glucose Tolerance:	
Fasting plasma glucose	<7.0 mmol/L (126 mg/dL)
2-hour plasma glucose	7.8-11.1 mmol/L (140-200 mg/dL)

Rheumatic Heart Disease

00.52.53

- Infectious disease.
- Most common causative agent: **Group A streptococci**.
 - Also- Coxsackievirus can be responsible.
- Most common age group: **5-15 years**.
- Most common valve involvement: **Mitral Valve** (Mitral valve stenosis or regurgitation).
- Risk factors:
 - Poverty
 - Lower economic status
 - Overcrowding.
- Drug of choice for prevention and prophylaxis- Benzathine Benzylpenicillin
- Prevalence of RHD- 5-7 cases per 1000 population.

Jai Vigyan Mission

00.54.12

- Programme to control of RHD/ RF by the government of India.

Objectives

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- Sero surveillance to find out epidemiological determinants for Group A streptococci and sore throat.
- To establish a registry for RHD/RF across the country.
- To promote vaccine development (It is not for any treatment options).
- To promote research and studies for investigation and pathology of RHD/RF.
- Jag Vigyan Mission is for:
 - Non-Communicable disease.
 - Cancer.
 - Vector-borne diseases.
 - Tuberculosis.

Cancer Component Under NPCDCS

00.55.17

- Launched in 1975-76.
- In 2010 it got integrated with NPCDCS.
- Objectives of programme:
 - Primary prevention by health education.
 - Secondary prevention for CA cervix (Acetic acid - Visual inspection, breast (Mammography), tobacco-related cancer by early diagnosis and treatment.
 - Tertiary prevention by strengthening existing institutions of comprehensive therapy including palliative care.

World Cancer Awareness

00.56.17



Important Information

- Red colour ribbon for HIV/AIDS.
- Pink colour ribbon for breast cancer.
- Blue colour ribbon for prostate cancer.
- Green colour ribbon for mental illness.
- Orange/Yellow colour ribbon for suicide prevention.

Q. National Cancer awareness day is observed on

- A. 7th November
- B. 1st December
- C. 4th April
- D. 25th July



Q. The most common cancer affecting Indian urban women in Delhi, Mumbai, and Chennai is?

- A. Cervical cancer
 - B. Ovarian cancer
 - C. Breast cancer
 - D. Uterine cancer
- Cancer Data provided by GLOBOCON:
 - The most common cancer worldwide (Both Genders) - Breast cancer > Lung cancer
 - Most common cause of cancer in India:

- Males - Lip/oral cancer.
- Females - Breast cancer.

- According to National Cancer Registry
 - The most common cause of cancer in males in India - Lung cancer.
 - Among females - Breast cancer.

Q. The present strategy of initial screening of cervical cancer:

- A. PAP smear
- B. Cervical biopsy
- C. High vaginal swab
- D. Visual inspection after application of freshly prepared 5% acetic acid

Cancer Screening

00.58.55

a) CA Breast

- Most sensitive screening modality for Ca breast (India): Mammography.
- Mammography in a woman who's less than 40 years is difficult because of dense fibrous tissue.
- < 40 years - self-examination is done.

b) CA Cervix

- PHC level: Visual inspection after application of freshly prepared 5% acetic acid.
- CHC level: PAP smear.

National Cancer Registry Programme

00.59.28

- Process of systematically and continuously collecting information on malignant neoplasms.
- Two types:
 - a) Hospital based.
 - b) Population-based.
- Launched in 1982 by the ICMR (Indian Council of Medical Research) to provide true information on cancer prevalence and incidence.

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Population-based cancer registry	Hospital-based cancer registry
All cases in a defined population are registered.	Records all cases of cancer treated in a given hospital.
Represents true (unbiased) profile of cancer in a community (Incidence, survival rates, stage distribution) Used for epidemiological purposes.	The population from which cases come is not defined. Majorly used to determine the etiological reasons for cancer.
Collects a minimal set of data items about all cancer patients.	Collects extended sets of data items with a primary focus on patients' treatment received at an oncological facility.

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Primary source: Registration form.

Serves the needs of local and national oncology services.

Main interest is in Epidemiology and Public Health.

Primary source: Medical record

Serves needs of oncological facilities.

Main interest is clinical care hospital administration.

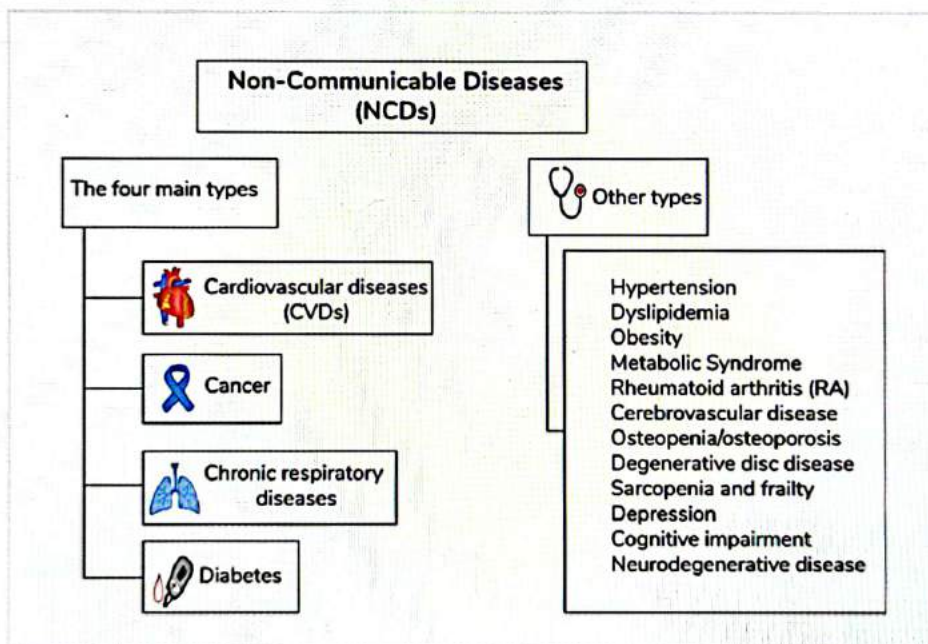
Q. Which of the following is not a goal of the Population-based cancer registry?

- A. Administrative information
- B. Determination of cancer rates and trends
- C. Patterns of care and outcomes
- D. Cancer prevention

Q. Population-based registries are better than hospital-based registries due to the following reasons except

- A. May be used for etiological studies
- B. Help in assessing the effectiveness of the control program
- C. Measure the burden of disease in a defined population
- D. Provide readily accessible information about patients and treatment outcomes.

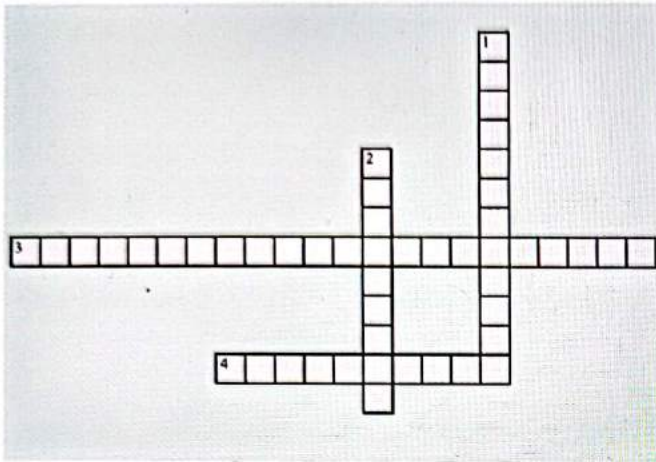
Diagram 37.1





CROSS WORD PUZZLES

Crossword Puzzle



Across

- 3. Provider Initiated screening to screen the patient for NCDs.
- 4. Characterised by irreversible pathology and duration of >3 months according to the WHO.

Down

- 1. It is a term reflecting the incubation period for NCDs.
- 2. Provided with the cardiac care unit and cancer care facility.

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NATIONAL PROGRAM FOR CONTROL OF BLINDNESS AND VISUAL IMPAIRMENT

- Launched-1976 as a National Programme for Control of Blindness.
- 100% centrally sponsored
- Was continuation of the national programme for trachoma control
- India was the first country to start a blindness control programme.

Definition of blindness according to National Program for Control of Blindness and Visual Impairment

- According to a Survey VI (2017-2109), **Blindness** is visual acuity < 3/60 in better eyes with available correction.
- **Visual Impairment** is VA (Visual Acuity) < 6/18 in better eyes with available correction in India.
- M/C cause of blindness in people
 - ≥50 yrs-Cataract
 - 0-49 yrs - Non trachomatous corneal opacity.
- M/C cause of visual Impairment in people
 - >50 yrs - cataract
 - 0-49 yrs - refractive errors.
 - Overall the most common cause of blindness and visual impairment in India is Cataract
- According to a survey (2015-2019)
 - Prevalence of blindness was 0.365.
 - Blindness in age >50 yrs: 1.99
 - Prevalence of Visual Impairment (VI) in all ages - 2.55%

Category Definitions

Visual Impairment	Presenting VA <6/18 in better eye with available correction
Early Visual Impairment	Presenting VA <6/12 to 6/18 in better eye with available correction
Moderate Visual Impairment	Presenting VA <6/18 to 6/60 in better eye with available correction
Moderately severely Visual Impairment	Presenting VA <6/18 to 3/60 in better eye with available correction
Severe visual Impairment	Presenting VA <6/60 to 3/60 in better eye with available correction
Blindness	Presenting VA <3/60 in better eye with available correction

Vision 2020

- A global initiative by WHO and international NGOs to decrease preventable and curable blindness by 2020
- It is done based on the theme of "The right to sight".

- Aims to reduce avoidable (preventable and curable)- blindness by 2020 in India as well as globally.
- **Diseases under Indian Vision 2020**
 - Cataract
 - Childhood Blindness
 - Refractive errors & low vision
 - Corneal Blindness
 - Diabetic retinopathy
 - Glaucoma
 - Trachoma
- **Disease under vision 2020 globally**
 - Cataract
 - Trachoma
 - Onchocerciasis
 - Childhood Blindness
 - Refractive error & Low vision

Proposed structure for Vision 2020, NPCB

No. of authorized bodies	Population norms
2(APEX)	1/500 million
20 (Centre of excellence)	1/50 million
200 (training center)	1/5 million
2000 (service center)	1/500000
20000 (vision center)	1/50000

Health Care Level	Proposed structure	Services provided
Primary (1 per 50,000)	Vision centers - 20000 (paramedic ophthalmic assistant)	<ul style="list-style-type: none"> • Primary eye care, • School eye screening • Refraction test and prescription of glass • Screening and referral
Secondary (1 per 5,00,000)	Service centers - 2000 (ophthalmologist)	Facility for refraction, cataract and other common surgery referrals
Tertiary (1 per 5 million)	Training centers - 200 (medical College)	<ul style="list-style-type: none"> • Retinal surgery • Corneal transplantation • Glaucoma surgery
Next Level (1 per 50 million)	Centers for excellence -20	Professional leadership, strategy making, CME, laying standards, and quality assurance and research



Important Information

- M/C cause of preventable blindness in children is Vitamin A deficiency.
- M/C cause of preventable blindness in adults is Trachoma Onchocerciasis.
- M/C cause of curable blindness is Cataract, refractive errors and glaucoma

Strategies

00:06:54



- To strengthen service delivery
- To develop human sources for eye care
- To promote outreach activities and public awareness
- To develop institutional capacity
- To establish eye care facilities for every 5 lakh people.

School Vision Screening Programme

00:07:09

- Classes V-VIII - block- 10 - 14 years of age - 1,50,000 children
- 1 teacher for 150 students
- Referral <6/9 in either eye - referred to the nearest PHC where paramedical ophthalmic assistant will check.
- Unit of cost of providing cataract surgery in India
 - Private hospital: Rs 5331/ least cost effective
 - NGO: Rs 4977
 - Government camps: Rs 2143
 - NGO organized screening camps at base hospital: Rs 1128 (most cost effective)
- Minimum target for cataract surgery rate in India is 400 per lakh Population per year
- NGO working at secondary level.
- Grant in aids for NGOs:
 - Rs. 750 per case for cataract / IOL implantation surgery (850/- NE, hilly, desert)
 - Rs 1000 per case of other major eye disease (1100/- NE, hilly, deserts)

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MCQ's

Q. WHO defines blindness if the visual acuity is less than?

- A. 3/60
- B. 18/38
- C. 9/60
- D. 6/6

Q. Under vision 2020, to check visual acuity, will the teacher refer the school child to?

- A. Service center
- B. Training center
- C. Center for excellence
- D. Vision center

Q. A person with vision <3/60 in right eye and perception of light present in left eye presents to PHC OPD. he belongs to which category?

- A. Low vision
- B. Economic blindness
- C. Social blindness
- D. Manifest blindness



Important Information

- Low vision: <6/18 to 6/60
- Economic blindness: <6/60 to 3/60 (work vision)
- Social blindness: <3/60 to 1/60 (walk vision)
- Manifest blindness: <1/60 - Perception of Light (PL) +
- Absolute blindness: PL -

Q. Most common cause of blindness due to easily preventable cause in children

- A. Diabetes
- B. Trachoma
- C. Vit. A Deficiency
- D. Cataract

Q. Most common cause of Ocular Morbidity in India is

- A. Cataract
- B. Xerophthalmia
- C. Trachoma
- D. Refractive error

Q. The visual acuity used as a cut off for differentiating normal from abnormal children in school visit screening programs in India is:

- A. 6/6
- B. 6/9
- C. 6/12
- D. 6/60



Q. If blindness is surveyed using schools as compared to population surveys, then estimation of prevalence of blindness will have

- A. Overestimation
- B. Underestimation**
- C. Remains same
- D. None of them is used for evaluation

Q. Most cost effective method for cataract Surgery in India has been found to be:

- A. Private hospital
- B. NGO hospital
- C. Government camps
- D. NGO organized screening camps followed by surgery at base hospitals**

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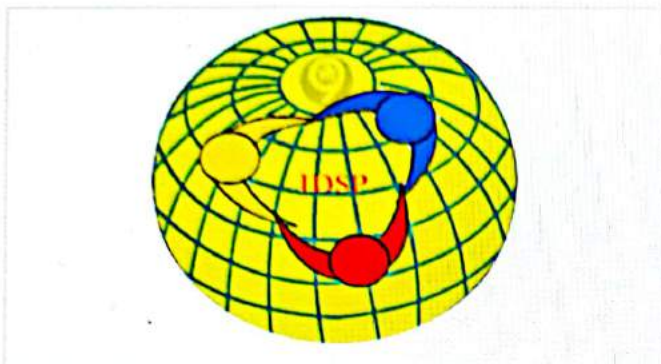
HEALTH INITIATIVES: IDSP, AYUSHMAN BHARAT AND PRADHAN MANTRI RELATED YOJNAS



IDSP

00:00:10

- In IDSP three forms are filled:
 - a. **S**: Syndromic form or suspect form filled by Health worker
 - b. **P**: Probable form filled by Medical Officer
 - c. **L**: Confirmed form filled in Laboratories



- Integrated Disease Surveillance Program.
- It is a decentralised state surveillance program started in 2004.
- Surveillance for 33 diseases at once.

Surveillance

00:01:09

- There are certain diseases which are under routine surveillance.

Disease Type	Disease Name
Vector borne	Malaria, Dengue, Japanese Encephalitis(JE), Chikungunya etc.
Water borne	Acute Diarrheal Disease (Cholera), Typhoid, Gastroenteritis, Hepatitis.
Respiratory	Tuberculosis
Vaccine Preventable	Measles
Under Eradication	Polio
International Commitments	Plague, Yellow fever.
Unusual Clinical Syndrome	Meningoencephalitis, respiratory distress, haemorrhage, fevers, other undiagnosed conditions.
Sexually transmitted diseases (under sentinel surveillance)	Blood-borne, HIV/HBV, HCV
Non-communicable diseases (Regular periodic surveys)	Cardiovascular, Diabetes, Stroke, Fluorosis, etc.
Others	Water Quality, Outdoor Air Quality, Road Traffic Accidents.

Ayushman Bharat

00:03:42



- Pradhan Mantri Jan Arogya Yojana.
- Launched in 2018
- Aim- to achieve **Universal Health Coverage in India.**
- It is a flexible scheme.
 - It is not rigid or mandatory for all states to follow.
 - The States can opt to choose.
- Private Hospitals that have up to 10 beds can provide services under Ayushman Bharat Scheme.

At the primary level

00:04:46

- Upgrading the existing subcenters and primary health centres (PHC) to Health and wellness Centre (HWC).
- It broadened the range of services provided
- Focuses on providing-
 - RMNCH+A facilities.
 - NCDs

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Secondary and Tertiary level

00:05:51

- Government provides financial protection- in the form of Insurance Coverage.
- It comes under the **National Health Protection Scheme Modi Care.**
- Provides insurance coverage - **5 lakh per family, per year.**
- There is no restriction on number of family members.

Important Information

Rashtriya Swasthya Bima Yojana

- It was an initiative of the Congress Government.
- Financial protection was given as insurance coverage of **30000 per year for up to 5 family members.**

Initiatives under Ayushman Bharat 00:08:50

- Rashtriya Swasthya Bima Yojana
- Senior Citizen Health Insurance Scheme

Target Beneficiaries 00:10:10

- Six deprivation criteria:
 1. D1: Only one room with kucha walls and a kucha roof.
 2. D2: No adult members between the ages of 16 to 59.
 3. D3: Female headed household with no adult male member between the ages of 16 to 59.
 4. D4: Disabled members and no able bodies members.
 5. D5: SC/ST households.
 6. D6: Landless households.

Pradhan Mantri Swasthya Suraksha Yojana (PMSSY) 00:11:02

Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)
Aiming to create balance in healthcare system

Components of PMSSY

- Setting up of Institutions like AIIMS
- Upgradation of Government Medical College/Institutions

Highlights of PMSSY

- ✓ 8 Institutions like AIIMS set up in Patna, Raipur, Bhopal, Bhubaneswar, Jaipur & Ranchi
- ✓ All existing AIIMS have functional medical & nursing colleges
- ✓ Upgradation of 30 Medical colleges / Institutions approved by CCEA
- ✓ Cost of Rs.150 crore approved for upgrading each medical college

- Aims to create balance in the healthcare system.
- Government is setting up institutes like AIIMS.
- Upgradation of government Medical/ College/ Institution.

Jan Aushadhi Scheme 00:11:17

jan aushadhi
Quality Medicines At Affordable Prices for All

- Under these schemes, medicines are provided at subsidized rates.

Pradhan Mantri Jan Dhan Yojana 00:11:43



- Everybody should have a bank account.

Pradhan Mantri Swasthya Suraksha Nidhi (PMSSN) 00:11:52

CABINET APPROVES

Pradhan Mantri Swasthya Suraksha Nidhi (PMSSN)

Committed towards enhancing access to universal and affordable healthcare through availability of additional resources

- Launched in 2021 by the Ministry of Health and Family Welfare
- It is committed towards enhancing action to universal and affordable healthcare through the availability of additional resources.
- There is a **National Reserve Fund (NRF)** that provides funds in situations like disasters and to run schemes like Ayushman Bharat.

Updates in MOHFW

- **M- Diabetes:** For diabetes primary and secondary protection.

Easily manage every aspect of Diabetes

Diabetes : M

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- **E- Rakhthkosh:** For safe blood donation and blood bank services.



- **Mera Aspataal:** A platform for feedback from private and public hospitals.



- **M- Cessation:** For tobacco cessation.



- The grievances of the patients will be addressed through this app
- In slums and small villages there are Rog Kalyan Smiti who take feedback and Mera Aspataal is an **online** platform of that type where anyone can submit feedback.

- **E- Sanjevani:** An online OPD. It started in the year 2019.



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PREVIOUS YEAR QUESTIONS



Q. Minimum number of sputum specimens required to confirm the diagnosis of TB according to RNTCP guidelines? (NEET 2018)

- A. One
- B. Two**
- C. Three
- D. Four

Q. Treatment of AIDS (ART) is started at CD4 cutoff? (FMGE Dec 2018)

- A. 200
- B. 350
- C. 500
- D. No cut-off**

Q. Vision 2020 include all except? (FMGE Jun 2018)

- A. Onchocerciasis
- B. Epidemic conjunctivitis**
- C. Cataract
- D. Trachoma

Q. Under the Ayushman Bharat scheme, how much money can a family get per year as insurance? (FMGE Jun 2021)

- A. 4 lac
- B. 5 lac**
- C. 4 lac
- D. 9 lac

Q. Under ICDS, intersectoral coordination is found with? (FMGE Dec 2020)

- A. NREGA
- B. NRHM**
- C. NLEP
- D. NACP

Q. More than one Doctor's opinion is required for doing MTP (As per the latest regulations 2021)? (FMGE June 2022)

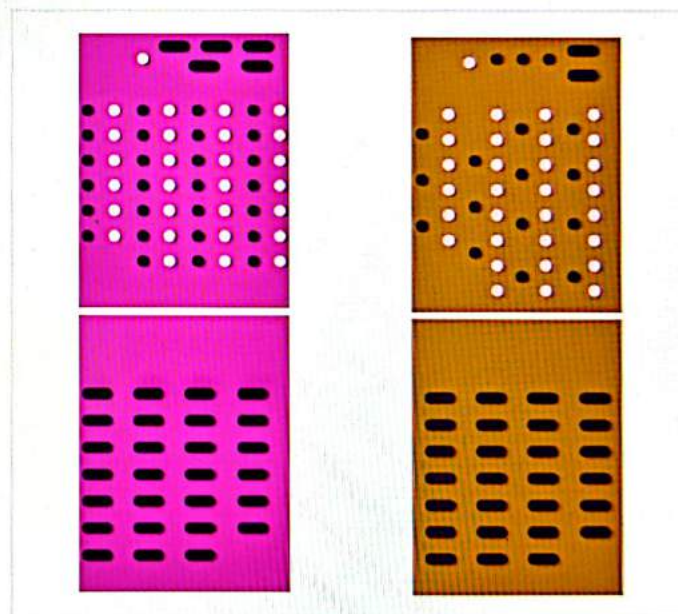
- A. 12-20 weeks
- B. 20-24 weeks**
- C. 24-28 weeks
- D. 28-32 weeks

Q. A 2-year-old child has been brought to PHC OPD with fever and cough since last 2 days. On examination, chest indrawing is present. RR is 38 per minute. The Management will be? (FMGE June 2022)

- A. Home treatment
- B. Pneumonia: Clinical treatment at PHC**
- C. Severe pneumonia: Referral
- D. Severe pneumonia: Antibiotic and Referral

Q. Mr. Mayitree Sarkar is 38-year-old male with single stellate hypopigmented skin lesion and thickening of nerve. Which dose is to be given under NLEP? (INICET May 2022)

- A. A blister pack x 6 months**
- B. A blister pack x 12 months
- C. B blister pack x 6 months
- D. B blister pack x 12 months



Q. Correct about additional nutritional calories in pregnancy is? (NEET PG May 2022)

- A. 300 Kcal throughout pregnancy**
- B. 400 Kcal in the second trimester
- C. 400 Kcal in the third trimester
- D. 200 Kcal in the second trimester



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HEALTH EDUCATION

Topics 00.00:19

- Definition.
- Differences Between Health Education and Health Propaganda.
- Models of Health Education.
- Approach for Health Education.

Definition 00.00:37

- Process by which individuals learn to behave in a manner which is conducive to promotion, maintenance, and restoration of good health.
- Targets behavioral change - the adoption of healthy behavior.
- **Purpose:** To make people
 - Adopt
 - maintain and
 - disseminate healthy behavior.
- John M Last gave this definition.

Principles of Health Education 00.03:12

- **Credibility**-trustworthy message.
- **Interest**-should be appealing enough to bring a desired change.
- **Participation** - should be community participation.
- **Motivation**-the message should be engaging and motivating.
- **Comprehension**-messages should be delivered in an understandable language.
- **Reinforcement** - repetition of message.
- **Learning by doing** -demonstrations can be performed to enhance learning.
- **Known to the unknown** -do not disrespect any community. Educate them from what they know to what they don't know.
- **Setting an example** - practice yourself.
- **Good human relationships** good communication with other people.
- **Feedback** -take feedback from the community to know their understanding.
- **Leaders** - good leadership is necessary.

Important Information

- **Punishment** is not a principle of health education.

Differences Between Health Education and Propaganda

00.08:55

Health Education	Propaganda
• Actively acquired knowledge and skills (active thinking).	• Knowledge (may be false or exaggerated) instilled in the minds of people (facts).

- Develops
 - Reflective behavior
 - Trains people to use judgment before acting.
- Appeals to reason.
- Develops individuality, personality, and self-expression.
- Knowledge acquired through self-reliant activity.
- Behavior-centered process
 - Aims at developing favorable attitudes, habits, and skills.
- Develops
 - Reflexive behavior
 - Aims at impulsive action.
- Appeals to emotion.
- Develops a standard pattern of attitudes and behaviors according to what would be used - a set pattern of behavior.
- Knowledge is spoon-fed and received.
- Information-centered process
 - No changes of attitude-behavior designed.

Health education is better than Propaganda

Models of Health Education 00:12:09

- 1. Medical model**
 - Includes diagnosis and treatment of diseases using medical technologies.
- 2. Motivation model or Adoption model**
 - **Best model for health education.**
 - **Phase 1:** Spreading awareness and building interest in the message provided.
 - **Phase 2:** Evaluation and trial of the message.
 - **Phase 3:** Adopt and disseminate the message.
- 3. Social interventional model**
 - Social environment shapes the behavior of individuals and communities.

Approaches for Health Education 00:15:07

- 1. Regulatory Approach**
 - Also called **managed prevention.**
 - Change in health behaviors during Government intervention/law.
 - Enforcing laws or interventions which will stop people from doing bad things.
 - Useful in terms of emergency control of:
 - Epidemic
 - Management of fairs
 - Festivals.

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Important Information

- **Currently used model for health education:** Motivation model or Adoption model.
- **Currently used best approach:** Health education approach.

MCQ's

Q. Principles of Health Education includes all except?

- A. Participation
- B. Motivation
- C. Reinforcement
- D. Punishment

Q. In which health education model does internalization occur?

- A. Medical model
- B. Socio-environmental model
- C. Service model
- D. Motivational model



Important Information

- **HE - Health Education**
- **IEC - Information, Education, Communication**
- **BCC - Behavior Change Communication**
- Suitable environment with IEC promotes BCC.
- If a suitable environment is not provided, BCC is affected.
- **IEC + Suitable environment = BCC**

- **Examples**
 - Child marriage restraint.
 - Compulsory screening during COVID
 - Compulsory seat belts while driving etc.
- **Disadvantage**
 - It's a personal choice like diet, exercise, smoking, etc., where the government can't force you by law.

2. Service Approach 00:17:35

- Health services are provided at the doorsteps of people without assessing community needs.
- Based on the assumption that people would use it.
- **Disadvantage**
 - Does not depend on felt needs of people.
 - Needs of the community are not assessed.
- **Example:** Water seal latrines provided in rural areas free of cost but were not utilized by the people due to lack of habit to use.

3. Health Education Approach 00:18:31

- Best approach.
- Slow but enduring results.
- People are informed, educated, and encouraged to choose a healthy life.
- **3 phases:**
 - **Phase 1:** Spreading awareness and building interest in the message provided.
 - **Phase 2:** Evaluation and trial of the message.
 - **Phase 3:** Adopt and disseminate the message.
- Internalization is seen here.
- Meaning, new ideas or acquired behavior become part of your existing values.

4. Primary health care approach: 00:19:24

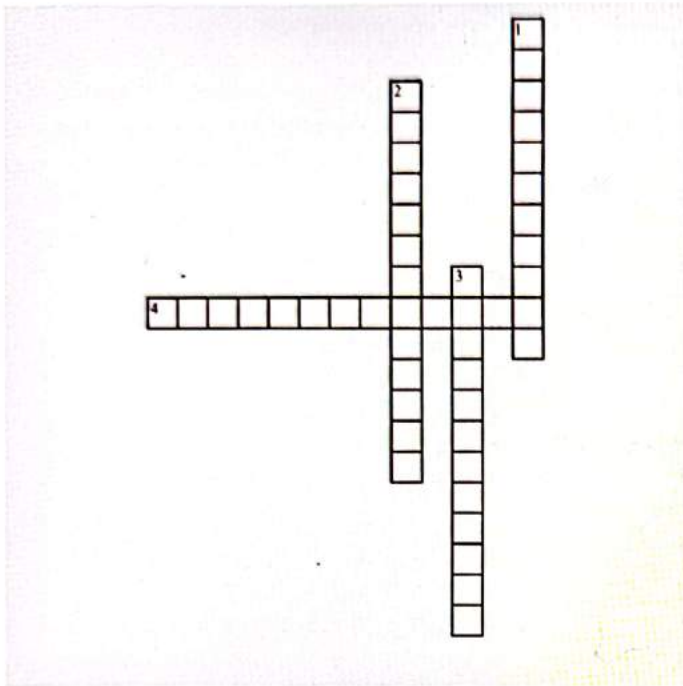
- Radically new approach.
- Community involvement and intersectoral coordination.
- **Example:** ASHA workers or any grass root workers.
- Helps individuals become self-reliant in identifying health problems and finding workable solutions.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 4. Repetition of message.

Down

- 1. Trustworthy message.
- 2. Messages should be delivered in an understandable language.
- 3. Includes diagnosis and treatment of diseases using medical technologies.

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HEALTH COMMUNICATION INTERVIEWS



Topics

00:00:25

1. Health communication (definition)
2. Communication cycle
3. Barriers to communication
4. Types of communication
5. Methods in health communication
6. Individual methods discussion
7. Types of interview
8. Steps of conducting an interview

Health Communication

00:00:55

- Health Communication is an **exchange of ideas, feelings, and information in the field of health.**
- It's an important part of community medicine as being a public health specialist, one needs to deal with many people and communities.
- So, it's important to know how to approach them, how we try to present them, etc.

MCQ's

- Q. Which of the following is the correct sequence of various components of the 'communication process'?
- A. Receiver, Message, Channel, Feedback, Sender
 - B. Sender, Feedback, Message, Channel, Receiver
 - C. **Sender, Message, Channel, Receiver, Feedback**
 - D. Message, Sender, Channel, Feedback, Receiver
- Receiver is the Audience

Communication cycle

00:04:02

- Sender frames a message.
- It goes through a proper channel to a receiver or audience.
- And from the receiver, we have taken feedback.
 - **Sender → message → channel → receiver → feedback** (sent back to sender)
- Communication should generate awareness.
- It should be interesting and motivating.
- The person should evaluate it, and ultimately it should be adopted.
- This sequence of events towards the receivers is also very important.
 - **Sequence: Awareness → interesting/motivation → evaluation → adoption.**
- **Example:** Advertisement in which Amitabh Bachchan is saying two drops of polio can save the lives of people. Here, Amitabh Bachchan is on the channel here, through whom the sender's message is sent to the receiver)
- Sender is usually a government or non-government organization that wants to bring change. They frame the message and send it to the channel (Amitabh Bachchan).
- **Feedback can be taken as an exit poll or survey.**

Barriers of communication

00:07:53

- Barrier means
 - why one is not able to communicate the information.
 - What is the problem that the message is not being conveyed
- Some barriers
 1. **Physiological**
 - Difficulties in hearing, expressions
 2. **Psychological**
 - Emotional disturbances,
 - Levels of intelligence,
 - Neurosis,
 - Language or comprehension difficulty
 3. **Environmental**
 - Noise,
 - invisibility,
 - congestion
 4. **Cultural**
 - Illiteracy,
 - Levels of knowledge/understanding,
 - Customs,
 - Beliefs,
 - Religion
 - Attitude

Types of communication

00:10:16

- **One-way communication**
 - Only one is active, or one is only talking.
 - One way is also given by the word **Didactic**
 - E.g. -TV, radio, newspaper, internet, lecture
- **Two-way communication**
 - Both the people are active, or both are talking.
 - Two ways are also given by the word **Socratic**.
 - One is delivering the message, and one is taking the feedback.
 - Panel discussion
 - Symposium
 - FGD (Focused Group Discussion)
 - Workshop
 - Conference/seminar
 - Role plays
 - Demonstration

One Way- Didactic communication

00:12:50

- Learning is authoritative
- Knowledge is imposed
- Little or no audience participation
- No feedback
- Does not influence human behaviour or **remove misconceptions.**

Two Way- Socratic communication 00:13:20

- Learning is active, participatory and democratic more likely to influence behavior
- Better than one-way communication.
- We can **expect desired changes**.

Methods in Health Communication 00:14:03

Mass Approach	Individual Approach	Group Method (smaller groups)
TV	Personal contact	Lecture
Radio	Home visits	Panel
Newspaper	Personal letters	Demonstration
Posters	Counselling	Symposium
Direct mailing	Interviews - in-depth interviews from one person	Workshop
Folk methods		Conference
Exhibition and museum		Seminar
Internet		Role playing
Printing materials		Delphi

Lecture 00:17:05



- Lecture is also known as **chalk and talk method**.
- Theoretically, It is one-way or didactic.
- Size of the group should be not more than 30 people.
- And the duration of the lecture should be 15-20 minutes.
- Learning is passive.

Demonstration 00:18:48

- Two-way or Socratic communication
- Relies on the principle of "**Seeing is believing and learning by doing.**"

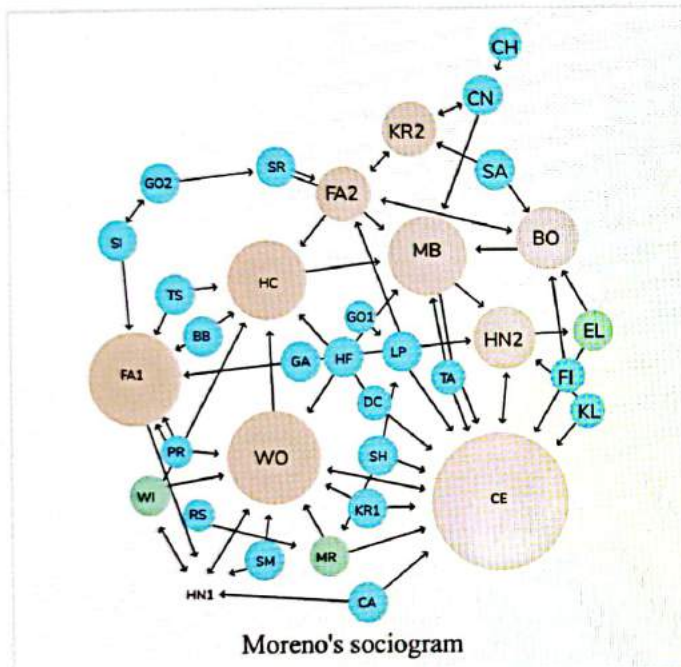
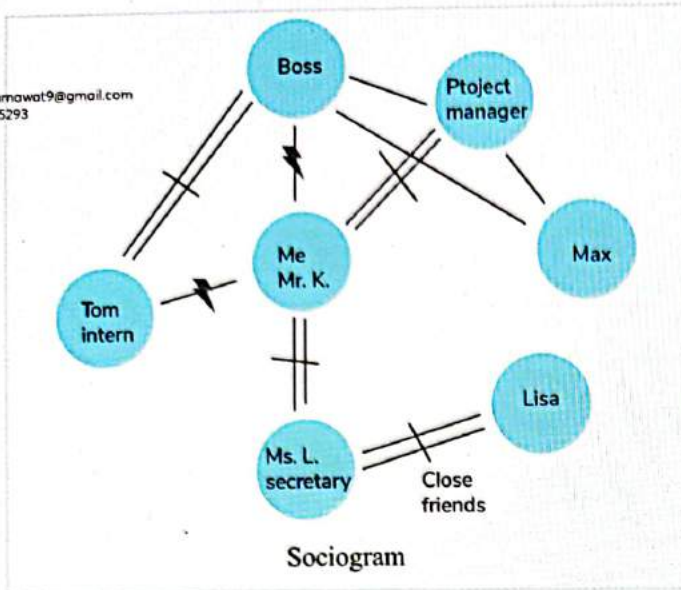
- It is one of the most efficient methods of behaviour change because it involves '**community participation.**'
- This method has high motivational values.
- Example- ORS Demonstration or preparation, application of Scabies ointment, installation of handpump, construction of sanitary latrines.

Focus Group Discussion (FGD) 00:21:02



- It is a technique of qualitative data collection.
- There are **6-12 participants**.
- They are sitting in a circle.
- A **Moderator** leads the FGD.
- Moderator puts forward the **10-12 leading questions**.
- These questions are **open-ended**.
- **Sociogram** will reflect the quality of FGD. Quality here means how interactive FGD is.
- Sociogram is a type of diagram or chart made by a person present there.
- Sociogram reflects who is actively talking and making arguments and who is not doing anything.
- One more person is there who is a **recorder**, who records everything with prior permission.
- Analysis would be done on certain common themes.
- FGD is a two-way or Socratic method of communication.
- Example: Suppose there is a community, where there is a problem of domestic violence. To find out why this is happening, one can either do quantitative study design or qualitative.
 - Meaning, one can frame a questionnaire, where they can put 20 close ended questions such as are you a victim of domestic abuse, what is the reason, why is it happening, etc.
 - So, as an answer one will get it in numbers like 20 women say that husband drinks and beats them, 30 women say that family has expectations. So, this way one gets an answer in numbers.

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Not set speeches	Set speeches
No set order of speaking	Set order of speaking
Audience is present	Audience is present
Experts can discuss among themselves (they can intervene in between)	Experts cannot intervene in between (they cannot discuss among themselves)
Feedback can be taken	Feedback can be taken
Example- news channel	



Panel discussion



Symposium

Panel Discussion

00:26:54

- There are 4 to 8 experts.
- Two-way or Socratic method of communication.

Symposium

- There are 4 to 8 experts.
- Two-way or Socratic method of communication.

Difference between Panel Discussion and Symposium

00:27:19

Panel Discussion	Symposium
4-8 experts	4-8 experts
Two way or Socratic	Two way or Socratic
No set agenda	Set agenda

Workshop

00:32:08

- Two-way/Socratic method of communication
- Workshop is like a series of ≥ 4 meetings under an expert.
- It always has a purpose to impart skills and develop problem-solving skills.
- One always leave a workshop with an agenda in mind.
- It requires lots of preparation.



Conference

00:34:04

- Conferences are like **macro events**.
- They can be held **at the national level, state level, or regional level**.
- It happens on a big scale and has a huge audience.
- It is a good place to develop social relations.



Seminar

00:35:01

- Seminars are like **micro-events**.
- It can last for half day to a week.
- It happens on a small scale.
- There is a discussion of a single topic in depth.
- It can be more comprehensive.
- Simultaneously, a **lot of activities are happening**.
- It is a good place to develop social relations.

Role Play

00:36:12

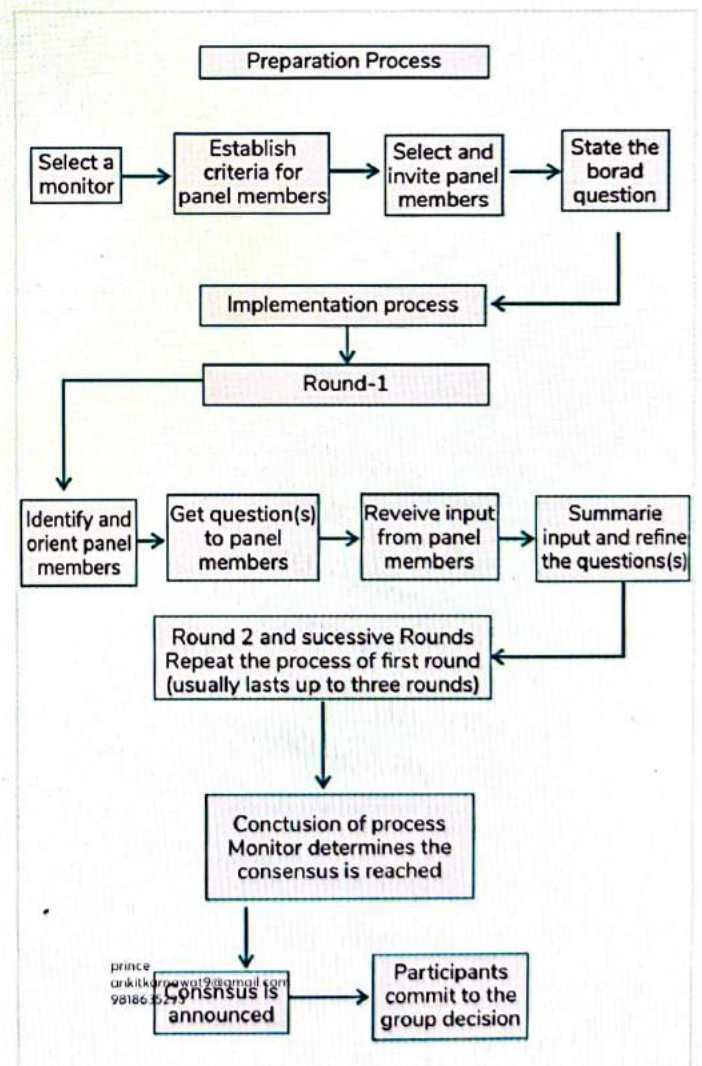
- It is also known as **Nukkad Natak or Sociodrama**.
- Two-way or Socratic method.
- Size of the audience is maximum 25.
- It has huge audience participation.



Delphi Technique

00:37:32

- Structural communication technique that relies on a **panel of experts**
- This is regarded as an **exploratory and detailed procedure**.
- Highly used in collective intelligence, i.e., shared or group Intelligence that emerges from the collaboration, collective efforts, and competition of many individuals and appears in **consensus decision making**.
- The process remains **anonymous**, and the experts can share feedback without any discretions.
- It is a group method.
- **Need to reach a level of agreement**.
- Example-.KAP (Knowledge attitude practice) study among Medical students on genetics. So, one frames the questions on this and sends them to a group of experts. Every question will be given a ranking, and then experts will mail the feedback. If, from the feedback, we know that we have not achieved the desired level of agreement, then we will make the changes and then resend them to experts. This will continue until we reach "consensus decision-making".
- Purpose of the Delphi Technique is to select the best possible questions with the best possible answers.





Important Information

- Economical - Lecture
- Most common mode of imparting education: - Health Education
- Seeing is believing and learning by doing: Demonstration
- Very effective where long-term compliance or change in attitude is desired: focus group discussion
- No discussion permitted among experts: symposium
- Opportunity to improve the effectiveness as a professional worker. - workshop
- Limited number of participants with a lot of baseline preparation required: workshop
- Active audience involvement: Role play
- Social interaction and long-term bonding associations: Conferences & seminars
- Most popular media for mass education of the general public is loss of interpersonal communication is managed by: Check telecommunication
- If there is any 6-12 participation: it is FGD
- If there is more than equal to 4 meetings: it is workshop
- If there are 4 to 8 experts discussing among themselves: panel
- If there is 4 to 8 experts not discussing among themselves: Symposium

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Types of interviews

00:44:04

- **Direct or Structured:** A schedule containing a set of predetermined questions is prepared
- **Nondirective or Unstructured:** No predetermined questions. The researcher collects information by free discussion
- **Focused Interview:** To Study social and psychological effects of mass communication. **Example:** reaction to a film show
- **Repetitive Interview:** To study the gradual influence of some social or psychological process

Steps for conducting an interview

00:44:56

- Establishing contact (Look eye to eye)
- Starting an interview
- Securing rapport
- Recall
- Probe questions (if gone off track, bringing one back to the point)
- Encouragement
- Guiding the interview
- Recording
- Closing
- Report

Q. Which one is an example of ONE-WAY communication?

- A. Socratic method
- B. Didactic method**
- C. Visual communication
- D. Telecommunication

Q. Which of the following is the Socratic method of teaching?

- A. Lecture
- B. Films
- C. Exhibition
- D. Panel discussion**

Q. All are true about Panel discussion except

- A. Panel of 4-8 experts discuss a health topic
- B. Audience is present
- C. Specific order, Set speeches**
- D. Audience can take part

- Hint: Panel discussion - 4-8 experts
- Panel of 4-8 experts discuss a health topic - symposium

Q. Workshop is

- A. Discussion of 4-8 experts in front of an audience (hint: panel discussion)
- B. Discussion between 6-12 members (FGD)
- C. Series of 4 or more meetings**
- D. Series of speeches on a given subject (Symposium)

Some other methods

00:47:35

Gather Approach/ counselling

- It is an approach for contraceptive counselling.
- Initially, we had a cafeteria approach for counselling and now it has been replaced with a Gather Approach.
- In the cafeteria approach, a basket full of contraceptives is offered to the clients.
- Gather approach has Mnemonic **GATHER**
 - G - Greet the couple
 - A - Ask them what they want
 - T - Tell them
 - H - Help them choose
 - E - Explain
 - R - Return to follow up

Spikes Approach

00:50:32

- This approach is adopted when one needs to break the bad news to the patient or their family.
- Mnemonic: **SPIKES**
 - S - Set up an interview
 - P - Assess Perceptions
 - I - Invite to explain
 - K - Share your knowledge
 - E - Address their Emotion
 - S - Strategies

Flannel Graph

00:51:47



- It is a Flannel Graph
- It is also a method of health communication
- It is a **series of pictures on a piece of clothes.**
- It is a way of making people learn.

Flipcharts

00:52:38

- It is similar to Flannel Graph.
- Just like a small calendar in which one can turn the pages and know the details.
- So, Flipchart can be used to share knowledge.

Q. Most popular media for mass education of the general public is

- A. **Television**
- B. Radio
- C. Newspaper
- D. Internet

Q. Loss of Interpersonal communication is managed by

- A. Group counselling
- B. Individual counselling
- C. **Check telecommunications**
- D. Improving language

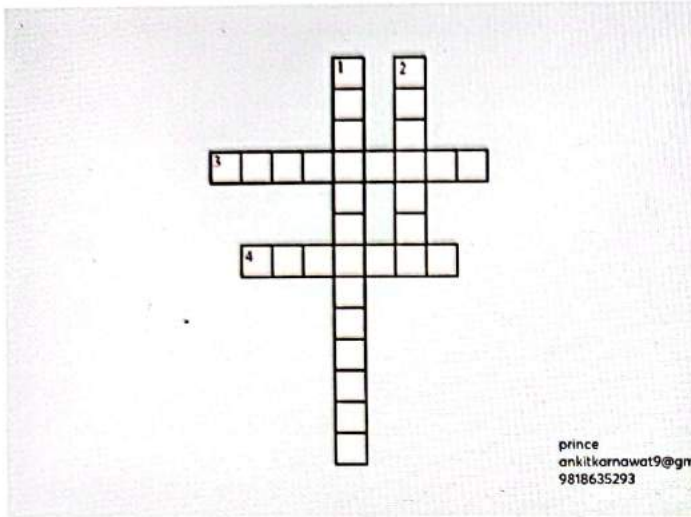
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Two-way or Socratic method of communication.
- 4. Theoretically, It is one-way or didactic.

Down

- 1. Two-way or Socratic communication
- 2. It can last for half day to a week.



PREVIOUS YEAR QUESTIONS



Q. Cafeteria approach is related with? (FMGE Jun 2018)

- A. Diet program
- B. Child and maternal health
- C. National vector-borne disease control program
- D. **Contraception**

Q. A doctor is teaching an Intern about Knee reflex demonstration. What type of learning is this? (FMGE Dec 2020)

- A. Cognitive Learning
- B. Affective Learning
- C. **Psychomotor Learning**
- D. None of the above

Q. On World Health Day, 4-8 people are sitting in front of an audience discussing a health topic. The Director of the hospital welcomes everyone, opens the meeting, and introduces speakers. He then introduces the topic briefly and invites speakers to present their points of view. This is a type of? (FMGE June 2022)

- A. SPIKES
- B. Symposium
- C. Focused group discussion
- D. **Panel discussion**

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HEALTH PLANNING AND PLANNING CYCLE



Health Planning

00:00:47

- It is an orderly process of defining community health problems.
- Identifying unmet needs.
- Surveying the resources to meet them.
- Establishing priority goals that are realistic.
- Projecting administrative action to accomplish the purpose of the proposed program.
- This is a **planning cycle**.
 - Resources mean manpower and money material.
 - It is important to know needs and then accordingly survey the resources.

Steps of Planning Cycle

00:02:39

- The cycle starts with A and ends with E.
- 1. Analysis of the health situation
- 2. Set Objectives and goals
- 3. Assessment of resources
- 4. Deciding priorities
- 5. Formulate plan
- 6. Programming and implementation
- 7. Monitoring
- 8. Evaluation

Analysis of The Health Situation

00:04:08

- Whenever one does an analysis of the health situation, the first **socio-demographic profiling of the community** should be done.
- Suppose a public health officer in PHC visits the community. He analyses the **community (community diagnosis)** and sees **Immunisation coverage is poor**. The data goes like this:
 - 0-5 years - 60% Vaccinated
 - 5-15 years - 62% Vaccinated
 - 10-15 years - 59% Vaccinated
 - 5-10 years - 58% Vaccinated
 This analysis shows that **Immunisation coverage** is very poor.

Set Objectives and Goals

00:05:39

- For example,
- One wants to decrease the mortality rate in the community.
- To do this, one needs to set up objectives:
- Objective: Increase the mortality rate.
- 0-5 years - increase by 40%
 - 5-15 years - increase by 38%
 - 10-15 years - increase by 41%
 - 5-10 years - increase by 42%

Resources

00:07:41

- Resources include 3M:
 - Manpower
 - Money
 - Material
- Technical expertise is also required.

Deciding Priorities

00:08:27

- According to the example given, the 0-5 age group should be given priority because it will also get political support.
- So, the immunization coverage should be increased in this age group.

Formulate Plan

00:09:18

- To achieve a goal, what things and how they need to be done.
- In this step, one must list down everything, such as:
 - Ordering of vaccines
 - Trained staffs
 - Organise health education sessions.

Program and Implementation

00:09:49

- All the formulated plans need to be put into action.

Monitoring

00:10:03

- It is an analysis of ongoing routine activity.
- It analyzes whether everyday activities achieved or not

Evaluation

00:10:52

- Evaluation is periodic assessment done at the end of planning cycle.
- Done by an external agency

Goal Vs Objective Vs Target

00:13:09

Goal

- Ultimate desired state towards which all objectives and resources are directed.
- **Not constrained by time and resources.**
- Follows- **all or none phenomenon** means either it can be achieved or cannot be achieved.

Objectives

00:15:18

- It is the **planned end point of all activities.**
- Objectives need to be SMART (mnemonic)
 - **S** - Specific
 - **M** - Measurable
 - **A** - Achievable
 - **R** - Realistic
 - **T** - Time-bound

- According to the example - the objective is to increase immunisation coverage by 60%.

Target

00:18:10

- It is a degree of achievement of objectives with time.
- To complete the objective, i.e., increase immunisation coverage by 60%. One needs to target conducting 1 health education session per week.

MCQ's

Q1. Planning cycle includes

- A. Analysis of situation
- B. Evaluation
- C. Resources assessment
- D. All of the above

Q2. Arrange the following steps of the Planning Cycle in the correct chronological sequence

1. Evaluation
2. Assessment of resources
3. Establishment of goals and objectives
4. Analysis of the health situation
5. Programming and implementation

- A. 4-3-2-5-1
- B. 1-4-2-3-5
- C. 4-3-2-1-5
- D. 3-4-1-2-5
- E. 3-2-4-5-1

Q3. Not used in Health Care Planning

- A. Increasing demands for resources
- B. To match with limited resources
- C. To plan the best course of action
- D. To decrease wastage

Q4. The correct sequence of cycles is

- A. Planning, Evaluation, Objective, Goal
- B. Planning, Objective, Goal, Evaluation
- C. Planning, Objective, Evaluation, Goal
- D. Planning, Goal, Evaluation, Objective

Q5. In management, "Goal" refers to:

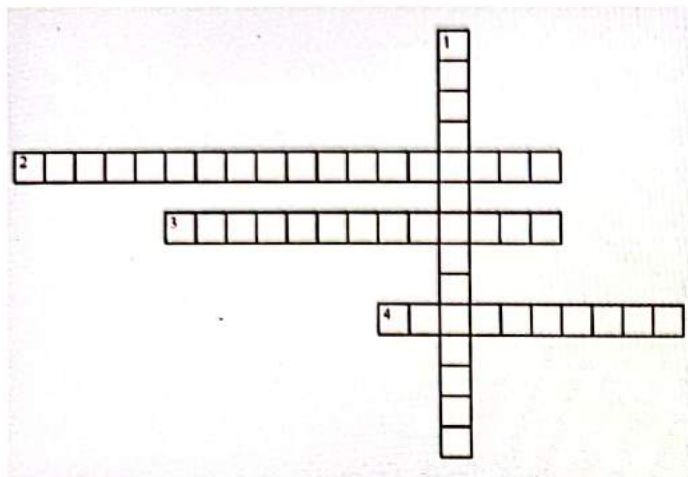
- A. Planned end point of all activity
- B. Discrete activity
- C. Ultimate desired state towards which objectives and resources are directed
- D. Analysis of the health situation



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Here, the 0-5 age group should be given priority. This because.
- 3. To achieve a goal, what things and how they need to be done.
- 4. As a medical student or any other student, one can monitor whether he has achieved the day's goal or not. If not, then why? What were the obstacles?

Down

- 1. It is an orderly process of defining community health problems.

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HEALTH PLANNING COMMITTEES NITI-AAYOG



Health planning committees

00:00:30

- Bhole committee
- Mudaliar committee
- Chaddha committee
- Mukharjee committee
- Jungalwallah committee
- Shrivastava committee
- Krishnan Committee
- Balwant rai committee
- High-level expert group

b) Long-term plan -

- First-tier - PHCs with 75-bed hospitals.
- Second tier - CHCs or sub-district hospitals with 650-bed hospitals.
- Third tier - 2500 beds

Bhole committee

00:02:02



- Provided by Sir Joseph Bhole
- In 1946
- Also known as the **health survey and development committee**
- Concepts
 1. Three months of training in PSM
 - Social physicians
 - School Health

Mudaliar committee

00:09:23

- Focused on Planning.
- Also called the health survey and planning committee
- **Strengthen** the existing facility.
- Proposed a **cadre of All India Health Services**.

Chaddha committee

00:10:50

- Target- Malaria vigilance and family planning activities.
- Focussed on **National Malaria eradication programme / Malaria control activities**.
- Proposed
 1. Concept of preparation malarial slides - **Malaria vigilance**
 2. **Family planning health assistance**.
 3. One basic health worker for every 10000 population.

Mukherjee Committee

00:12:48

- Proposed **Delink family planning activities from Malaria controlled activities**.
- Meaning we should have separate family planning programmes and Malaria-controlled programmes.

Jungalwalla Committee

00:13:20

- Committee on the **Integration of health services**.
- It is a **unified approach** to promotive, preventive, curative, and rehabilitative services.
- Provisions-
 - Equal pay for equal work
 - Special pay for specialised work.
 - No private practice allowed for doctors.

Kartar Singh Committee

00:15:40

- Kartar Singh provided the concept of:
 - Multiple Purpose workers
 - Both Male and female.
 - **1 PHC should be 50000 population.**

Shrivastava Committee

00:16:27

- Also known as the medical and health education committee scheme.
- Rural Health Services -
 - Proposed the concept of the creation of para-professional and semi-professional health workers (we must have health workers and also health assistants.)

Important Information

- Concept of School Health was **improvised by Renuka Roy**.
 - School health check-ups should be done every four years.
- Current guidelines - once every six months

2. Concept of **comprehensive healthcare**.
 - Promotive, Preventive and curative services should be provided at PHC (Primary health care).
3. He gave the **three million plan**
 - Plan was supposed to benefit three million people.
 - It has
 - a) Short-term plan
 - within 5-10 years
 - **1 PHC for 40000 population**

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- ROME: Reorient Medical Education
- Also, he spoke about Referral services.
- He also proposed the concept of a village health guide.

Krishnan Committee 00:19:20

- Targeted towards urban areas.
- Urban Revamping Scheme to provide health services in urban areas.

Bajaj Committee 00:19:41

- Dealing with health manpower planning, production, and management.

Balwant Rai Mehta Committee 00:20:02

- Panchayat Raj Institutions (PRI) was proposed in this committee.
- PRI is rural local self-government of the village to the district.
 - At the village level: gram sabha, gram panchayat, and nyaya panchayat.
 - At the block level: panchayat samiti
 - At the district level: jila parishad.

High-level expert group committee 00:22:07

- We do not have any of these existing committees.
- Set up by the planning commission in 2010.
- They have a responsibility to achieve universal health coverage in India.
- It also proposed a three-year course on BSc community health.

NITI Aayog 00:25:54



- Full form: National Institution for Transforming India.
- It replaced the planning commission.
- Formed on January 1, 2015.
- Responsible for framing all administrative policies.
- The chairperson of framing all administrative policies is Prime Minister.
- Other members: Lieutenant Governor and Chief Minister of the states

MCQ's

Q. "3-Million Plan" was proposed by?

- a. Kartar Singh committee
- b. Mudaliar committee
- c. Srivastava committee
- d. Bhore committee

Q. Multi-purpose worker scheme India was introduced following the recommendation of?

- a. Srivastava committee
- b. Bhore committee
- c. Kartar Singh committee
- d. Mudaliar committee

Q. Integration of health services was first proposed by?

- a. Bhore committee
- b. Jungalwalla committee
- c. Mudaliar committee
- d. Srivastava committee

Q. Rural health scheme introduced by?

- a. Bhore committee
- b. Mukherjee committee
- c. Shrivastava committee
- d. Mudaliar committee

Q. Universal health coverage in India was recently approved by which health committee?

- a. Medical education health group
- b. MPW in health and family planning
- c. High-level expert group
- d. Health survey and development committee

Q. A 3-year graduate MBBS program was suggested by which committee?

- a. Bhore committee
- b. Srivastava committee
- c. Expert-level committee on universal health coverage
- d. Krishnan committee

44

HEALTH MANAGEMENT TECHNIQUES & INVENTORY MANAGEMENT



- **Health management:** Effective use or management of resources.

Health Management Techniques

00:01:57

- Two types

1. Qualitative - based on behavioral sciences

- **Mnemonic:** POCIMON
- **P:** Personal management
- **O:** Organizational design
- **C:** Communication
- **I:** Information system
- **MO:** Management by objectives.

2. Quantitative

- Cost-benefit analysis
- Cost-effective analysis
- System analysis
- Cost accounting
- PPBS - Planning, Programming and Budgeting System
- Work sampling
- Network analysis
- Decision making
- Input-output analysis
- Model

Quantitative Management Methods

00:06:23

Cost-Benefit Analysis (CBA)

00:06:23

- Outcome of a program measured in **monetary terms**.
- Economic benefits are compared with the cost of the program.
- **Both input and output - Money.**
- Example: NACP saved 1 million USD this year.

Cost-Effective Analysis (CEA)

00:09:07

- Outcome of a program measured in **non monetary terms**.
- CEA is the **most used and most easy to interpret**.
- **Input:** Money
- **Output-**
 - Number of lives saved
 - Number of heart attacks avoided
 - Decreased incidence of disease
 - Quality-adjusted life years gained (QALY gained).

Input-Output Analysis

00:12:02

- An economic technique
- **Input - 3Ms**
 - Manpower
 - Money
 - Material

Output

- Number of patients attending the OPD.
- Number of immunizations done.
- Number of lives saved.

Cost Accounting

00:13:11

- Cost structure of a program.
 - Recurring cost structure
 - Non-recurring costs structure
- All expenses are considered
- **Purpose**
 - Helps to know the expenses to control cost.
 - Planning and allocation of resources.
 - Pricing of cost reimbursement.

System Analysis

00:14:04

- Helps to choose the **best alternative**.
- Deciding the best course based on cost-effectiveness.
- Example: For TB diagnosis, we can use both Sputum AFB and CB-NAAT. But the best cost-effective one is picked.

PPBS - Planning, Programming and Budgeting System

00:15:13

- Budget framework of a program.
- Example: The Indian Government allotted 20,000 crores as Covid-19 relief.
- PPBS analyzes the appropriateness of the current staff, job description, standardize performance, and determines manpower needs.
- **Program Budget**
 - Prepared specifically for a project
 - Includes both expenses and revenues
 - **Advantages**
 - Helps determine the priority of projects
 - Helps in planning and managing the delivery of services
 - Helps in spotting the areas where high funds are required
 - **Disadvantages**
 - If incorrect - increase in costs.
 - Needs a lot of information.
 - It takes more time to find exact financial resources.

Zero Base Budgeting

- Starting from a zero base of no funds.
- No new budget will be allocated until justification is provided for the prior budget.

Incremental Budgeting

- o Previous year's budget is used as a base for next year's budget.
- o Needs justification only for the increment budget required.

Decision Making

00:19:20

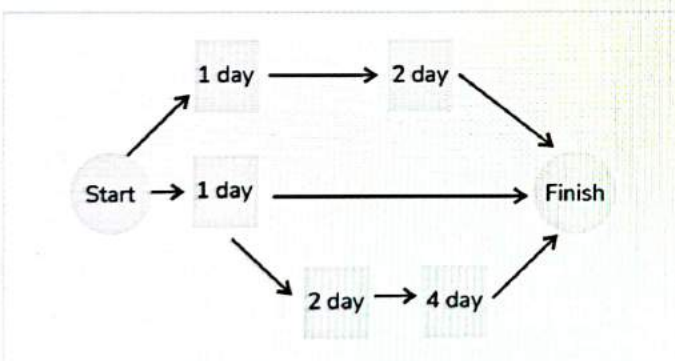
- Try to make the best decision.
- Should consider the lower-level needs and then make decisions.
- Example: Differential diagnosis in medical practice.

Network Analysis

00:19:50

- A **graphic plan** of all events to be completed in order to reach an end objective.
- Consists
 - o PERT - Program, Evaluation, and Review Technique
 - o CPM - Critical Path Method

PERT	CPM
Program, Evaluation, and Review Technique	Critical Path Method
Event sequencing	Event time sequencing
Probabilistic model	Deterministic model
Arrange all events in order to achieve objectives.	Calculate the time for each event
Comparatively shorter	CPM have long duration



- 1st route - 3 days
- 2nd route - 1 day
- 3rd route - 7 days - CPM (longest)

Work Sampling

00:26:32

- Systematic observation and recording of activities to increase the outcome.
- Used when the following are observed
 - o Doctors
 - o Nurses
 - o Lab techniques

- Can be done at both random and predetermined intervals.
- Helps in improving work effectiveness.

Important Points:

00:29:01

Cost-benefit	<ul style="list-style-type: none"> • Input - Money • Output - Money
Cost-effective	<ul style="list-style-type: none"> • Input - Money • Output - No of lives saved
Input-Output	<ul style="list-style-type: none"> • Input - Money, Manpower, Materials • Output - No of patients in OPD
System Analysis	Best alternative is selected based on cost effectiveness.
Cost Structure	Accounts: Recurring and non-recurring costs.
PPBS	<ul style="list-style-type: none"> • Zero Based - Justification of the previous budget. • Incremental - Justification only for increment budget.
Work Sampling	Systematic observation to record the time.
Network Analysis	<ul style="list-style-type: none"> • PERT - Logical sequencing • CPM - Time sequencing
Decision Making	Best decision to be made from ground level.

Qualitative Management Methods

Based on behavioral sciences: (POCIMON)

- **Personal management** - Skill full use of human resources like:
 - o Incentives
 - o Promotions
 - o Teams
- **Organizational design**
 - o Must meet demands of people
 - o Reviewed every year
- **Communication**
 - o Effective functioning of organization - about how info in reaching doctors, nurses, and other staff.
 - o Block exists at various levels
- **Information systems**
 - o Collection
 - o Classification
 - o Transmission
 - o Storage

- **Management by objectives**
 - Objectives are set forth - Based on roles
 - Helps in achieving results more effectively.

MCQs

- Q. All of the following are included in methods based on behavioral sciences except:
- A. Personal management
 - B. System analysis**
 - C. Management by objectives
 - D. Communication

- Q. A method which compares the benefits of a program without taking into account the cost of the program is called?
- A. Cost-benefit analysis
 - B. Cost-effective analysis**
 - C. Cost accounting
 - D. Input-output analysis

- Q. PERT is a technique for?
- A. Network analysis**
 - B. Cost-effective analysis
 - C. Input-output analysis
 - D. System analysis

- Q. True about 'zero base budgeting' is
- A. Relies on data of previous budget**
 - B. Proceeds from resources to target
 - C. Proceeds from target to resources
 - D. None of the above

- Q. Most comprehensive indicator of cost-effectiveness analysis is?
- A. No. of life years gained
 - B. No. of heart attacks avoided
 - C. QALY gained**
 - D. Cost per life year gained

- Q. Time taken for any project is estimated by?
- A. Work sampling
 - B. Input-output analysis
 - C. Network analysis**
 - D. Systems analysis

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- Q. The management technique which is the more promising tool for application in the health field is?
- A. Cost-effective analysis**
 - B. Cost-benefit analysis
 - C. Cost accounting
 - D. Input-output analysis

- Q. Economic/ monetary benefits of any programme are compared with costs incurred in?
- A. Cost-benefit analysis**
 - B. Cost-effective analysis
 - C. Cost accounting
 - D. Network analysis

- Q. All are true regarding critical path method (CPM) except?
- A. Is part of input-output analysis**
 - B. Visualized in the graphical representation of all events/ activities carried out
 - C. Is the longest part of method
 - D. Any delay in CPM delays the whole project

- Q. PERT & CPM are employed in?
- A. Community education
 - B. Health planning
 - C. Management**
 - D. Health survey

- Q. Critical path in network analysis is?
- A. Most expensive path in network
 - B. Congested path in a network
 - C. Shortest path in a network
 - D. Longest path in a network**

- Q. A study was conducted among nursing staff to find out the time taken in different aspects of patient care viz, bed preparation, monitoring of vital diagnosis, attending doctor rounds, blood sampling, drug sampling, drug administration. Which management technique would be applied for the analysis?
- A. Critical path method
 - B. Input-Output analysis
 - C. Systems analysis
 - D. Work sampling**

Methods for Stock Management

00:36:20

- Stocks can be a vaccine or drugs.
- **3 Principles**
 - **FIFO** - First in First Out
 - **GIGO** - Garbage in Garbage Out
 - **EFFO** - Expiry First, First Out

VED Analysis

00:37:26

- **Vital (10%)** - Life-saving drugs, no alternatives, can't afford to have out of stock.
- **Essential (40%)** - Absence can be tolerated for short stretches, and alternatives are available.
- **Desirable (50%)** - Absence can be tolerated for a longer period.

- Example- If ordered 100 items:
 - 10 are vital (more cost) - Anti Snake venom, adrenaline.
 - 40 are essential (less cost) - Clavam (absence can be tolerated).
 - 50 are desirable (least cost) - ORS as such.

ABC Classification

00:39:32

- Analysis of items by category
- Most often used with inventory control
- A - Extremely important (vital)
- B - Moderately important (essential)
- C - Relatively unimportant (desirable)

Category	Percentage of items	Percentage of overall value
Class-A	05-25%	40-80%
Class-B	20-40%	15-40%
Class-C	40-75%	05-20%

SDE Analysis

00:40:24

- **Scarce items:** Items in short supply (mostly imported items).
- **Difficult items:** Items that cannot be procured easily.
- **Easy items:** Items that are easily available in the market.

FSN Analysis

00:40:40

- **Fast moving:** ORS, PCM (desirable)
- **Slow moving:** Doxycycline (essential)
- **Non-moving:** Adrenaline (vital)

MCQ's

Q. In the management of stores, VED, D stands for?

- A. Discrete
- B. Desirable
- C. Decide
- D. Definite

Q. All of the following are included in methods based on behavioral sciences except:

- A. Personal management
- B. System analysis
- C. Management by objectives
- D. Communication

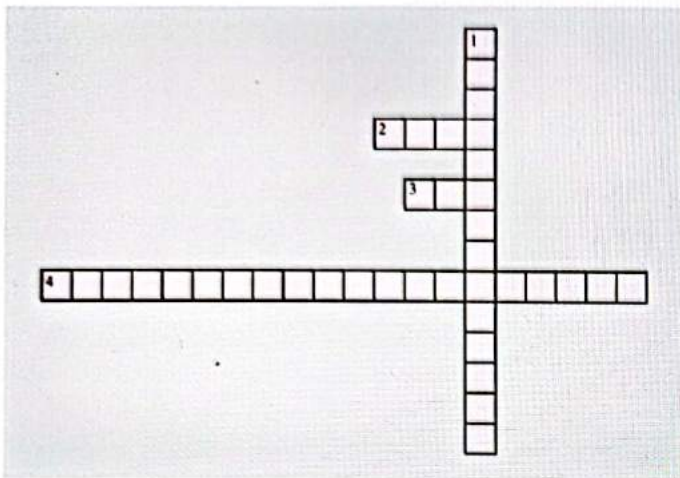
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Program, Evaluation, and Review Technique
- 3. Event time sequencing
- 4. Outcome of a program - monetary terms

Down

- 1. Helps to choose the best alternative.

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45

HEALTH CARE OF COMMUNITY



Health Care

00:00:59

- Multitudes of health services
- Provided to individuals and communities by health professionals or health organizations.
- **Purpose**
 - Promoting good health
 - Maintaining good health
 - Restoration of good health
- Fundamental right - provided by the government to individuals and communities.
- Not synonymous with medical care (directed only towards personal care).

Levels of Health Care

00:04:36

- 3 levels:
 - Primary level of care
 - Secondary level of care
 - Tertiary level of care

Refer Table 45.1

Changing Concepts

00:09:05

1. Comprehensive Health Care

- Proposed by **Sir Joseph Bohre**.
- Provides a range of essential health services:
 - Promotive
 - Preventive
 - Curative
 - Rehabilitative
- All the above services should be provided from womb to tomb.

2. Basic Health Services

- Coordinated, peripheral and intermediate health units should be available to promote health services.
- Should have a complete team of health workers.
 - Semi-professional workers
 - Para-professional workers
- Introduced in **1965** by **UNICEF and WHO**.

3. Primary Health Services

- Includes primary health care.
- These are essential health services or basic services.
- Should be available to all individuals or communities by the government at an affordable cost.



Important Information

Where was the concept of primary health care adopted?

- In September 1978, at the Alma Ata Conference in the USSR.
- Date: 6th to 12th September.
- Jointly organized by WHO and UNICEF.
- Signifies primary level of health care (first level of contact)

Health for All

00:17:20

- Proposed in **1977** by the **World Health Assembly**.
- Concept was adopted by the year 2000.
- Attainment of the level of health by all individuals enabling them to lead socially and economically productive lives.
- The concept was like a movement.

4 A of Primary Health Care

- **Availability** - Availability of essential health services to all.
- **Accessibility** - Accessible to everyone
- **Acceptability**
- **Affordability**

Elements or Components of Primary Health Care

00:21:43

- Includes the following:
 - Essential medicines (especially paracetamol)
 - Locally endemic diseases - prevention and control
 - Education on health or health education
 - Maternal, child health and family planning
 - EPI (Expanded Immunization Programme) now changed to UIP (Universal Immunization Programme)
 - Nutrition and food supply
 - Treatment of common ailments
 - Safe water supply and sanitation
 - **Mnemonic: ELEMENTS.**

4 Principles or Pillars of Primary Health Care

00:25:00

- 1. Equitable distribution-**
 - Equitable distribution of health services.
 - Irrespective of ability to pay, rich or poor, urban/rural etc.
- 2. Appropriate technology-**
 - Should be cost-effective.
 - Good quality services.

- Example:
 - ORS
 - VVM (Vaccine Vial Monitor) - heat sensitive label - if there is any damage to the vaccine by heat - indicated with color change.
 - Shakir tape - for grading malnutrition.
 - Kangaroo mother care - provides care for preterm babies

3. Community participation-

- Ensure the participation of individuals, families and communities.
- For the promotion and maintenance of their health.
- Examples:
 - ASHA workers, any grass root level worker.
 - These are residents of the same community.

4. Intersectoral coordination-

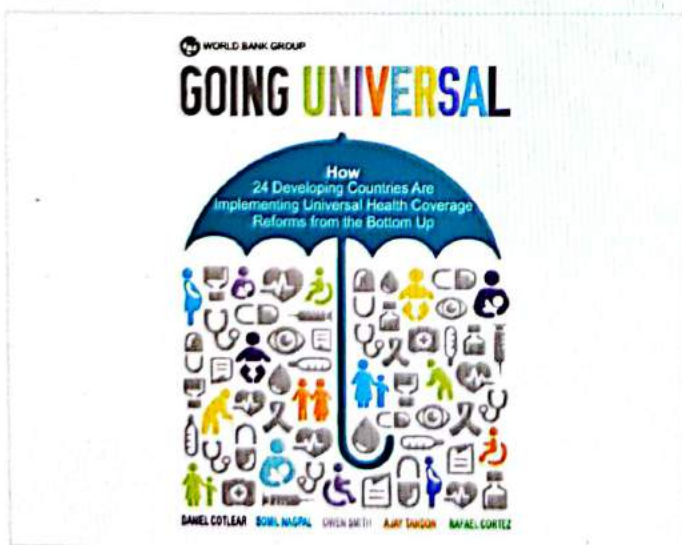
- Needs support from other sectors like agriculture, education, environmental sectors etc.
- Maintains good health.

Universal Health Coverage

00:32:59

- Includes essential good quality services - range of health services provided is broadened.
- Includes non-communicable diseases (NCDS) and AYUSH.
- Global programme.
- Includes financial protection - insurance coverage.
- The United States General Assembly gave the concept of UHC on 12th December 2012.
- Main aim - to provide good quality and affordable health services to everyone, everywhere without having to bear financial hardships.
- In 2017, 12th December is marked as International Universal Health Coverage Day.

Refer Diagram 45.1



- Initiative launched in India to achieve UHC - Ayushman Bharat or otherwise called Pradhan Mantri Jan Arogya Yojana.
- Provides all the elements, including NCDS, in primary care.
- Provides financial protection in secondary and tertiary care - ₹ 5 lakhs per family per year.
- No restriction on the number of family members.
- High-level expert group formed in the year 2000 - responsible for achieving UHC.

MCQs

Q.1: Elements of Primary health care include all of the following except?

- An adequate supply of safe water and basic sanitation
- Prevention and control of locally endemic diseases
- Providing employment to every youth
- Immunization against major infectious disease

Ans: (c) Providing employment to every youth

Q.2: All of the following are provisions made under primary health care according to the Alma Ata Declaration except?

- Adequate supply of safe drinking water
- Providing basic sanitation
- Nutrition
- Provision of free medicines

Ans: (d) Provision of free medicines

Q.3: Shakir's tape is an example of

- Community participation
- Intersectoral coordination
- Equitable distribution
- Appropriate technology

Ans: (d) Appropriate technology

Q.4: Definition of Primary health care includes all except

- Accessibility
- Affordability
- Availability
- Ambulatory

Ans: (d) Ambulatory

Q.5: All are principles of primary health care except?

- Appropriate technology
- Intersectoral coordination
- Community participation
- Universal Health Coverage

Ans: (d) Universal Health coverage

Q.6: Recruiting ASHA workers is an example of which principle of primary health care?

- a. Intersectoral coordination
- b. Equitable distribution
- c. Appropriate technology
- d. Community participation

Ans: (d) Community participation

Q.7: All are elements of primary health care except?

- a. Immunization
- b. Family Planning
- c. Nutrition
- d. Primary school education

Ans: (d) Primary school education

Q.8: Primary health care involves all except?

- a. Sanitation and water supply
- b. Sound referral centre
- c. Supply of essential drugs
- d. Health education

Ans: (b) Sound referral centre

Q.9: All are objectives of IPHS standards for Primary health centers except?

- a. Provision of comprehensive primary health care
- b. Availability and acceptability of health care
- c. Promoting community participation by making services more responsive to the needs of the community
- d. Provision of trauma and emergency care

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Ans: (d) Provision of trauma and emergency care

Q.10: Use of vaccine vial monitor (VVM) instead of lab testing of the potency of vaccine is an example of?

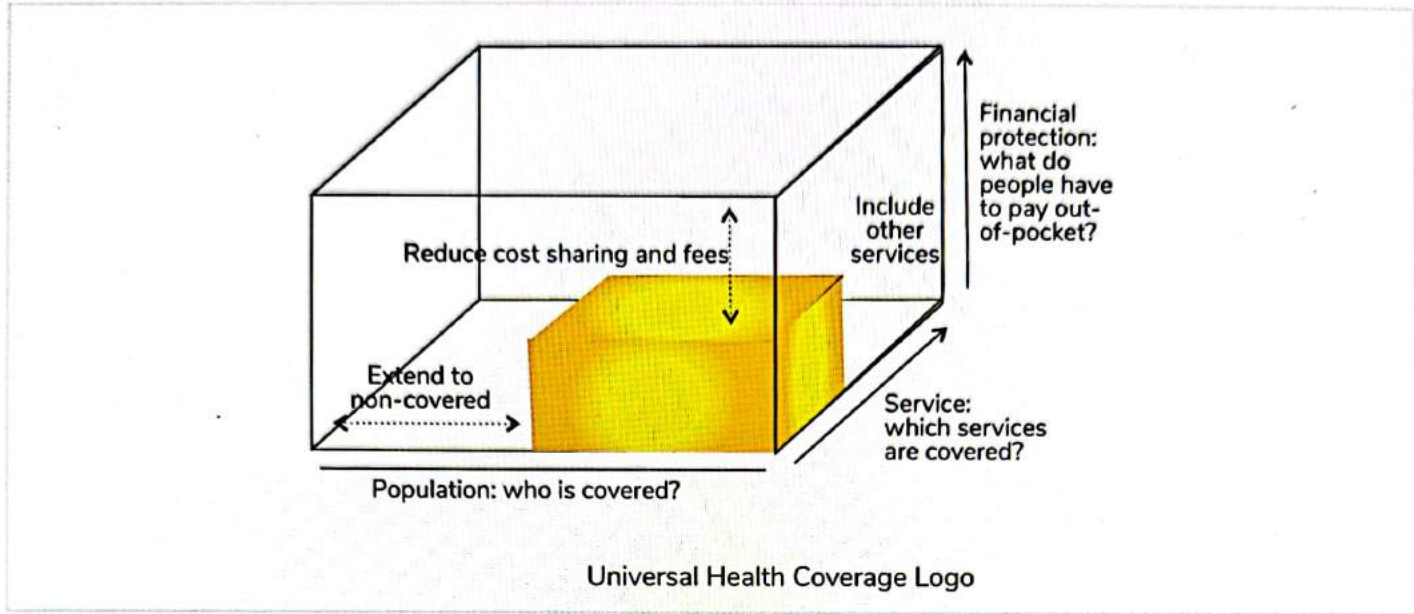
- a. Equitable distribution
- b. Community participation
- c. Intersectoral coordination
- d. Appropriate technology

Ans: (d) Appropriate technology

Table 45.1

Primary Level Care	Secondary Level Care	Tertiary Level Care
<ul style="list-style-type: none"> • 1st level of contact of individuals, families or communities with the health care system of India. • Includes grass root level workers <ul style="list-style-type: none"> ○ ASHA workers ○ Village Health Guides (VHG) ○ TBA • Subcenters and primary health centers are also included. 	<ul style="list-style-type: none"> • Get slightly more specialized services • First referral level • Includes: <ul style="list-style-type: none"> ○ Community Health Centers (CHC) ○ Sub-district hospitals ○ District hospitals 	<ul style="list-style-type: none"> • More specialized services are provided. • Includes: <ul style="list-style-type: none"> ○ Medical colleges ○ Superspeciality hospitals

Diagram 45.1

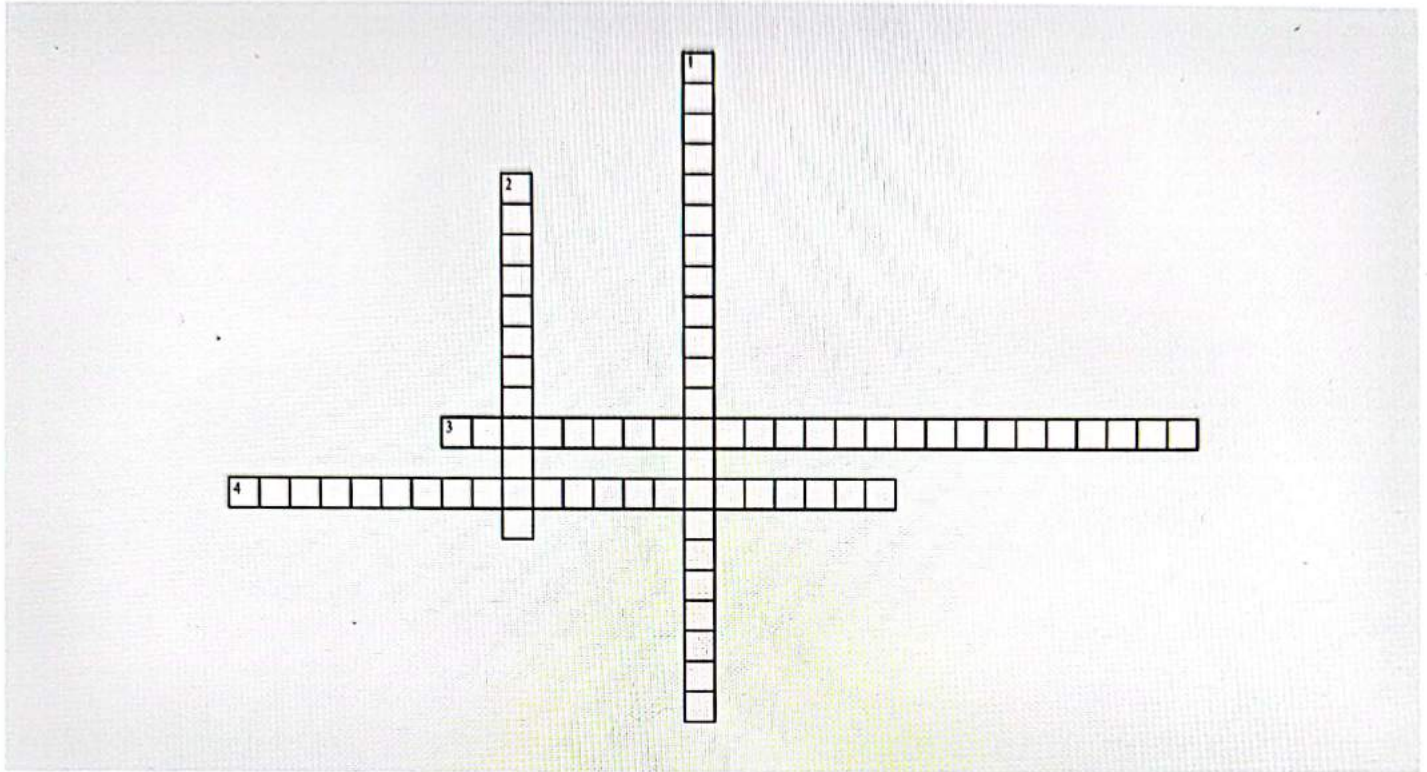




CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Needs support from other sectors like agriculture, education, environmental sectors etc.
- 4. Ensure the participation of individuals, families and communities.

Down

- 1. Equitable distribution of health services.
- 2. For grading malnutrition.

46

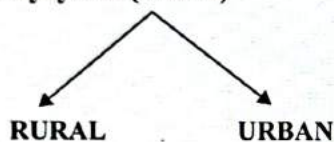
HEALTH CARE DELIVERY SYSTEM

Topics

00:00:10

- Health care delivery system in Rural areas
- Health care delivery system in Urban areas
- IPHS standards
- Functions of health care workers
- Grass root level workers
- ASHA workers
- Management of health care and systems in India
- Institution of local self government in Rural areas
- Institution of local self government in Urban areas
- Rogi Kalyan Samiti
- Village health Sanitation and Nutrition committee
- Free diagnostic and service initiative

Health care delivery system (0.01.18)



Level of health care delivery system	Rural	Urban
Tertiary Level of Health Care	<ul style="list-style-type: none"> • MC- Medical colleges • SSH - Superspeciality hospitals 	<ul style="list-style-type: none"> • Medical colleges • SSH - Superspeciality hospitals
Secondary Level of Health Care	<ul style="list-style-type: none"> • CHC- community health center • SDH- Sub District hospital • DH- District hospital 	<ul style="list-style-type: none"> • Urban CHC - u-CHC <ul style="list-style-type: none"> ○ Metro city ○ Non- metro city
Primary Level of Health Care	<ul style="list-style-type: none"> • SC- Sub centers • PHCs - primary health centers 	<ul style="list-style-type: none"> • Swasthya chowki • Urban PHC or Urban health center
Grass root level workers	<ul style="list-style-type: none"> • ASHA 	<ul style="list-style-type: none"> • USHA

Health Care Delivery Services In Rural Areas

00:05:12

- Primary Level - Sub center, PHC
- Secondary Level - CHC, SDH, DH
- Tertiary Level - MC, SSH
- Guidelines have been set up by **IPHS standard- Indian Public Health Standards**

	Sub-center	PHC	CHC
Population	<ul style="list-style-type: none"> • 1 / 5,000 in plain areas • 1/ 3,000 population in hilly areas 	<ul style="list-style-type: none"> • 1 / 30,000 in plain areas • 1/ 20,000 in hilly areas 	<ul style="list-style-type: none"> • 1/ 1,20,000 in plain areas • 1/ 80,000 in hilly areas
Level of health care	Primary	Primary	Secondary or First referral level
Categorizations	Type A <ul style="list-style-type: none"> • No delivery happens Type B	Type A <ul style="list-style-type: none"> • < 20 deliveries in a month Type B <ul style="list-style-type: none"> • ≥ 20 deliveries/month 	No categorization
Staff	3-4 <ul style="list-style-type: none"> • Type A - 3 • Type B - 4 	<ul style="list-style-type: none"> • Type A - 13-18 • Type B - 14-21 	46-52
Responsibility for maintenance	Central government	State government	State government
Number of villages supervised	4 villages	29 villages	158 villages
Number of beds	Type B -2	4- 6	30

Staff pattern in sub-center

00:13:45

- No medical officers in sub-center.
- A. Type A - 3 staff
 1. Multipurpose worker - MPW - male - Health worker male - HW

2. Multipurpose worker - MPW- female - health worker female- ANM
3. Safai karamchari



Important Information

Kartar Singh committee laid down the concept of multipurpose workers.

B. Type B - 4 staff

1. 1 Multipurpose worker - male - Health worker male
2. 2 Multipurpose worker female - Health worker female- ANM
3. 1 Safai karamchari

Staff pattern in PHC

00:17:20

- Medical officer (essential)
- AYUSH officer (desirable)
- Health assistant Male - HA
- Health assistant Female or LHV (lady health visitor)
- 1 Pharmacist (1/10,000 population)
- 1 Lab technician

Staff at CHC

00:19:21

- 1 MD physician
- 1 MS surgery
- 1 MS obs / gynae
- 1 MD pediatrics
- 1 MD anesthesia
- 1 Ophthalmologist
(1 ophthalmologist can visit 5 CHCs / 5 lac population)
- 1 ENT surgeon
- 1 dental surgeon
- 1 MD PSM
- 1 Medical officer
- 1 AYUSH officer
- Health supervisor Male
- Health supervisor Female
- Staff nurse - 10 or more
- Lab technician
- Pharmacist
- 1 Ophthalmic assistant-paramedical
- 1 radiographer
- Statistician
- Registration clerk

MCQs

Q. Functions of health worker female:

- a. Perform 50 % of deliveries
- b. Preparing malaria slides
- c. Chlorination of water
- d. Collectors of urine samples

Answer- (a) Perform 50 % of deliveries - posted in sub center

Job responsibilities of HW female / MPW female / ANM

00:25:04

1. Registers pregnant women.
2. Conducts deliveries.
3. Maintains special register - **eligible couple register**
4. Identifies high risk pregnancies and refer.
5. Performs hemoglobin and urine testing.

Job responsibilities of HW male / MPW male

00:27:55

1. Prepare malarial slides
 - Go house outhouse every fortnight of suspected cases
 - Active surveillance
2. Chlorination
3. Collects sputum samples

Responsibilities common to both MPW male and female

00:29:26

1. Distribute contraceptives.
2. Distribute ORS
3. Vaccination
4. Maintain vital records register.
5. Identify suspected cases of diseases like vector borne disease, NCDs, leprosy, TB

Grass root level workers / field level workers in rural areas

00:31:26

- ASHA
- AWW - Anganwadi worker
- VHG- Village Health Guide
- TBA - Trained Birth Attendant

	Sub-centre	PHC	CHC
Health workers	MPW-(M) / HW MPW (F)/ HW /ANM	HA -(M) HA - (F) / LHV	Health supervisor (M) Health supervisor (F)

ASHA	AWW
10th pass	10th pass
Existing Population norm - 1 ASHA / 1000 population Proposed - 2/1000	1 AWW- 400-800 - plain areas 300- 800 in hilly areas
23 days training	4 months training

TBA	VIIG
Trained Birth Attendant	Village Health Guide
1 / 1000 population	1 / 1000 population
No educational qualification needed	At least 6th pass
1 month training	3 months training
Should conduct at least 2 supervised deliveries during 1 month period of training	

ASHA worker

00:37:51

- Example of Community participation
- Local resident of the community
- Age - 25 -45 years
 - She is married / divorced / separated / widowed
 - Not an unmarried female (because women who are married might not open up to unmarried female)
- She is elected by village panchayat under supervision of medical officer.
- Accountability towards village panchayat
- Duration of training - 23 days by ANM or Anganwadi worker.
- Educational qualification - 10th pass
- Existing Population norm - 1 /1000 population
 - Proposed population norm - 2/ 1000 population
- Main function- mobilizer of the community
- She does not get salary. She gets incentive.

Roles and responsibilities of ASHA

- Identifies target beneficiaries and support ANM in conducting outreach sessions
- Promotes formation of women's health groups
- Provides information to the community
- Facilitates access to health and related services
- Accompanies pregnant women and children requiring treatment / admission
- Facilitates development of a comprehensive health plan
- Facilitates construction of a community / household toilets
- Acts as depot holder of things like ORS, contraceptives etc.
- Maintains necessary information and records

Things to remember-

- Village health plans are developed by - ASHA worker
- Chlorination of well - HW MALE
- Household toilet - ASHA
- ASHA - cannot conduct deliveries/ give vaccines

1. RMNCH+A

- Mobilizes ANC mother
- Mobilizes children for immunization
- Mobilizes couples for contraception
- Incentives are given if she can motivate
 - A newly married couple to delay the birth of 1st child by 2 years - ₹ 500
 - Couple to maintain a gap of 2 years between successive pregnancies - ₹ 500
 - To adopt a permanent method of family planning - ₹ 1000

2. JSY - JANANI SURAKSHA YOJANA

- Promotes institutional deliveries: Incentive of
 - Rural - ₹600
 - Urban - ₹400

3. JSSK - JANINAI SHISHU SURAKSHA KARYAKRAM

4. DOTS Provider

- On successful treatment completion of new and previously treated TB patients → ₹1000
- On successful treatment completion of MDR/XDR - TB → ₹5000
 - ₹2000- end of IP phase (intensive)
 - ₹3000 - end of CP phase (continuation phase)

5. Distribution of contraceptives

- Emergency contraceptives - ₹ 2
- OCPs/ condoms - ₹1

6. Leprosy

- If ASHA detects a case without a disability - ₹250
- If ASHA detects a case with a disability - ₹200
- If ASHA follows a paucibacillary leprosy case throughout the treatment course of 6-9 months - ₹400
- If ASHA follows a multibacillary leprosy case throughout the treatment course of 12- 18 months - ₹600

7. Incentives for accompanying client for

- Postpartum IUCD insertion - ₹150
- Motivation of male sterilization at the hospital - ₹300
- Motivation of female sterilization at the hospital - ₹200
- Home-based newborn care - after completing all the visits - ₹250

Health Care Delivery Services in Urban Areas

00:48:55

- Primary Level- urban-PHC / urban health center, Swasthya chowki
- Secondary Level - UCHC
 - Metro
 - Non-metro city
- Tertiary Level - MC, SSH

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Primary Level

00:50:08

1. U- PHC / urban health center

- 1/ 50,000 population
 - Within a slum or ½ km radius of the slum - 1/ 25,000-30,000 population
 - For very dense slum area - 1/75,000 population
 - For isolated slum clusters- 1/ 5,000-10,000 population

2. Swasthya chowki

- 1/10,000 population
- 1 urban ANM - 1/10,000 population
- 1 community health guide

Secondary Level

00:52:32

Urban CHC

- Can look after the work of 4-5 PHCs.

Urban CHC in Metrocity	Urban CHC in Non-metrocity
1/ 5 lac population	1 / 2.5 lac
100 beds	30-50 beds

Ground level worker in urban areas

00:54:01

• USHA - URBAN SOCIAL HEALTH ACTIVIST

- 1/ 1,000 - 2,500 population
- 1/ 250 - 500 households

Important Information

MAHILA AROGYA SAMITI – present in urban areas

- 1 / 250 - 500 population
- 1 / 50 - 100 households

Management of health care and systems in India

00:57:03

- Principal unit of administration in India - **District**
- Within each district, there are 6 types of administrative areas
 1. Sub-divisions - each under a sub-collector or assistant collector
 2. Tehsils / talukas - under a tehsildar
 - 1 tehsil comprises 200 - 600 villages
 3. Community development block - under a block development officer
 - For a population of 80,000 - 1,20,000 (~1 lac)
 - 1 / 100 villages
 4. Municipalities and corporations
 5. Villages
 6. Panchayat

Institution of local self-government in Rural areas

00:58:35

Panchayati Raj Institution



- Rural local self govt which links villages to the districts
- Given by Balwant Rai Mehta committee.
- 3 levels
 1. **Village level**
 - Gram sabha
 - Gram panchayat
 - Nyaya panchayat
 2. **Block level**
 - Panchayat samiti
 3. **District level**
 - Jilla parishad

Institution of local self-government in Urban areas

01:00:37

1. Town area committee - in areas with a population between 5000 - 10,000
2. Municipal boards –
 - In areas with a population between 10,000 - 2 lac
 - Headed by Chairman for 3- 5 years
3. Corporations –
 - Population > 2lac
 - Headed by Mayor

ROGI KALYAN SAMITI

- At PHC and CHC levels
- To support the functioning of health facilities

Village Health Nutrition And Sanitation Committee

- Formed at village level
- For local level community action
- Members- panchayat - ASHAs, AWWs, village members
- Responsible for framing village health action plan

MCQs

1. Which of the statement regarding PHC is correct
 - a. Provision of total beds at PHC is 4 - 6
 - b. 1 PHC covers a population of 3000 in hilly areas
 - c. Staff at PHC must have an obstetrician and gynecologist
 - d. PHC with > 10 deliveries are considered as type B PHCs

Ans – (a) Provision of total beds at PHC is 4 – 6.

2. One PHC supervises how many sub-centers

- a. 4
- b. 5
- c. 6
- d. 8

Ans- (c) 6 (1 sub-center for 5000 population: 1 PHC for 30,000)

3. The average number of villages covered under CHC is

- a. 50
- b. 111
- c. 158
- d. 210

Ans- (c) 158

4. Use of vaccine vial monitor (VVM) instead of lab testing of vaccine potency is an example of

- a. Equitable distribution
- b. Community participation
- c. Intersectoral coordination
- d. Appropriate technology

Ans- (d) Appropriate technology

5. A trained birth attendant is for

- a. 1000
- b. 3000
- c. 10,000
- d. 50,000

Ans- (a) 1000

6. A population of 1000 is covered by

- a. Anganwadi workers
- b. Health assistance
- c. Trained Dai
- d. Village health guide

Ans- (c) Trained Dai (trained birth attendant) and (d) village health guide

7. 1 lady health visitor is for a population of

- a. 5000
- b. 10000
- c. 30000
- d. 120000

Ans- (c) 30000

8. All of the following are grass root level workers except

- a. Anganwadi worker
- b. Trained birth attendant
- c. Multipurpose worker
- d. Health assistant

Ans- (d) Health Assistant

9. Maintenance of the sub-center is the responsibility of

- a. Central government
- b. State government
- c. Both
- d. None

Ans- (a) Central government

10. All are true about village health guide except

- a. One village health guide / 1000 population
- b. Training at PHC for 1-month
- c. Formal education up to 6th std
- d. Responsible for providing health education

Ans- (b) Training at PHC for 1 month (it is 3 months)

11. First referral unit (FRU)

- a. Sub-center
- b. PHC
- c. CHC
- d. Medical college and hospital

Ans- (c) CHC

12. Primary urban health center covers a population of

- a. 30000
- b. 50000
- c. 10000
- d. 120000

Ans- (b) 50000

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13. One USHA worker is proposed to work for a population of

- a. 1000-2500
- b. 2500-3500
- c. 4000-5000
- d. 5000-10000

Ans- (a) 1000-2500

14. One urban ANM will cover a population of

- a. 1000
- b. 25000
- c. 50000
- d. 80000
- e. 100000

Ans- (a) 1000

15. One eye surgeon is recommended for

- a. 1 CHC
- b. 2 CHC
- c. 3 CHC
- d. 5 CHC

Ans- (d) 5 CHC (WHO recommends one eye surgeon for 50,000)

16. Panchayati raj at village comprises of all except

- a. Nyaya panchayat
- b. Panchayat samiti
- c. Gram panchayat
- d. Gram sabha

Ans- (b) Panchayat samiti (block level)

17. Which conditions must be fulfilled for PHC to become a First Referral Unit?

- a. 4-6 beds
- b. 15 workers
- c. Emergency obstetric care
- d. Basic laboratory services

Ans- (c) Emergency obstetric care

18. Not a criteria for first referral unit

- a. Covers a population of 1 lac
- b. Provides secondary care
- c. Has 30 beds
- d. Community medical officer is a medical graduate or postgraduate

Ans- (d) A community medical officer is a medical graduate or postgraduate (BSc community health)

19. Which one of the following is the most important impact indicator to assess the performance of ASHA workers?

- a. No. of TB cases detected
- b. No. of leprosy cases detected
- c. Protein-energy malnutrition detected
- d. Reduction of IMR

Ans- (d) Reduction of IMR

20. One community development block caters to a population of

- a. 10000
- b. 30000
- c. 50000
- d. 100000

Ans- (d) 100000

21. Who looks after the work of Anganwadi workers?

- a. Auxiliary Nurse Midwife
- b. Village health guide
- c. ASHA
- d. Mukhya sevika

Ans- (d) mukhya sevika

22. Which is not a function of female health workers posted at the sub-center level?

- a. Condom distribution
- b. Malaria surveillance
- c. Conduct urine examination

d. Birth and death record keeping

Ans- (b) malaria surveillance

23. Which test is done at the sub-center during pregnancy?

- a. USG
- b. Hemoglobin
- c. OGTT
- d. Triple test

Ans- (b) hemoglobin

24. Health manpower indicated by which of the following?

- a. Doctor 1 per 3500 population
- b. ANM 1 per 1000 population
- c. Lab technician 1 per 10000 population
- d. Pharmacist 1 per 10000 population

Ans- (c) Lab technician 1 per 10000 population and (d) Pharmacist 1 per 10000 population

25. Under the free diagnostic services initiative of NHM, how many tests are available at sub-center



- a. 9
- b. 19
- c. 57
- d. 8

Ans- (a) 9

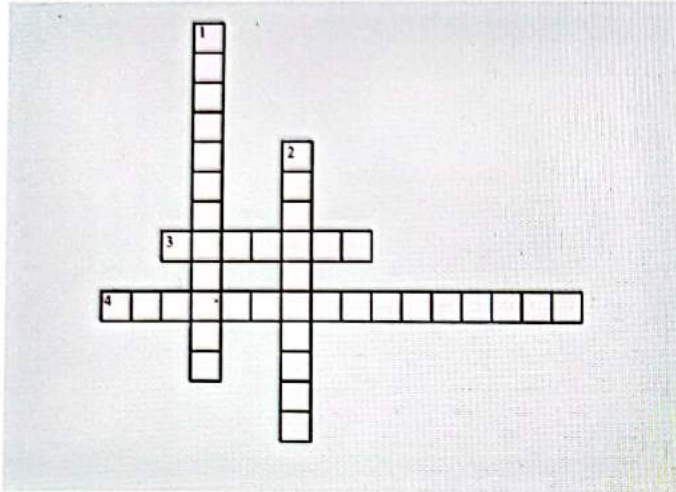
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. If ASHA detects a case without a disability - ₹250
- 4. At PHC and CHC levels to support the functioning of health facilities

Down

- 1. Looks after the work of Anganwadi workers
- 2. Test is done at the sub-center during pregnancy

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PREVIOUS YEAR QUESTIONS



Q. All of the following are the principles of primary health care except? (FMGE Aug 2020)

- A. Community participation
- B. **Appropriate policy**
- C. Intersectoral coordination
- D. Equitable distribution

Q. Health check-up in the village school is the responsibility of? (FMGE Jun 2021)

- A. Subcenters
- B. **PHC**
- C. CHC
- D. All of the above

Q. In villages, the first contact of people to medical health care is? (FMGE June 2022)

- A. Primary Health Centre
- B. CHC
- C. **Sub center**
- D. Multispecialty hospital

Q. All are true for PHC except?

- A. Covers 30,000 population
- B. **First referral center**
- C. Delivery facility available
- D. First contact for population

(FMGE June 2022)

Q. All are present at CHC except?

- A. Surgeon
- B. Blood storage
- C. **Intensive neonatal care**
- D. First referral level

(FMGE June 2022)

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INTERNATIONAL HEALTH



World Health Organisation

00:00:30



- It is a specialised agency of the United Nations.
- Headquarters - **Geneva**.
- Started on- **7th April 1948**.
- 7th April is celebrated as **World Health Day**.
- WHO has its own constitution governing body membership and budget.
- **Main Governing Body - World Health Assembly**.
- It has a secretary and executive body.
- It is part of the United Nations but not subordinate to the United Nations.
- The Constitution was drafted on - 1946.
- Came into force- 1948
- WHO has **194 member states and 2 associate members**.

Structural Organisation of WHO

00:02:45

3 principal organs:

- **World Health Assembly**
 - Supreme governing body.
- **Executive Board**
 - Takes decisions, formulates policies.
- **Secretariat**
 - Provides technical and managerial support to member countries for their national health programs.

Roles and Responsibilities of WHO

00:03:41

- Development of comprehensive health services.
- Prevention and control of specific communicable and non-communicable diseases.
- Environmental Health.
- Family Health.
- Health statistics.
- Bio-medical research.
- Health literature and information.

- Cooperation with other organisations.

WHO Regional Organisations

00:04:05

- There are **6 WHO specific regions**.
- India - South-east Asian region.

Region	Headquarter
South-east Asia	New Delhi
Africa	Brazzaville (Congo)
The Americas	Washington DC (USA)
Europe	Copenhagen (Denmark)
Eastern Mediterranean	Alexandria (Egypt)
Western Pacific	Manila (Philippines)

Members of South-east Asian Region

- India
- Bhutan prince ankitkarnawat9@gmail.com 9818635293
- Bangladesh
- Indonesia
- Korea (Democratic People's Republic)
- Maldives
- Myanmar
- Nepal
- Sri Lanka
- Thailand
- Timor-Leste

Theme of World Health Day

00:04:54

- 7th April - World Health Day.
- Latest theme of 2022 - **Our Planet, Our Health**.
- Expecting theme of 2023 - **Nurses and Midwives**.

Recap on WHO

- It is a specialised agency of the United Nations.
- Headquarters - Geneva.
- It came into existence on 7th April 1948.
- 7th April is celebrated as World Health Day.
- The World Health Assembly is the main governing body.
- India belongs to Southeast Asian Region.
 - Headquarters - New Delhi.

United Nations

00:06:27



- The United Nations framed the Sustainable Development Goals.

Important Information

- All organisations that start with "UN" have headquarters in New York.
 - Like:
 - UNDP
 - UNICEF
 - UNFPA
- However, one exception is UNAIDS, whose headquarters is in Geneva.

UNFPA

00:09:24



- UNFPA - United Nation Fund for Population Activity.
- It deals with manufacturing of new contraceptives, population control, health education etc.
- Headquarters - New York.
- Main Work - To control the population.
- Established in 1967.
- Subsidiary organ of the UN General Assembly that addresses population and development issues.
- Aimed at improving reproductive and maternal health worldwide.
- Develops national capability for manufacture of contraceptives.
- Develops population education programs.

United Nation Development Program (UNDP)

00:07:54



- UNDP framed Sustainable Development Goals (SDGs) along with the UN.
- Headquarters - New York.
- Established in 1966.
- Objective:
 - Helps poorer nations to develop their human and natural resources.
 - Provides technical assistance to nations

United Nations International Children's Emergency Fund

00:10:56



- UNICEF was founded before WHO.
- Headquarters - New York.
- Established in 1946.
- Specialized UN Agency to deal with rehabilitation of children in war ravaged countries.

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- Renamed as "UN Children's Fund" in 1953 but initials UNICEF retained.
- **GOBI - FFF campaign** was given by UNICEF.
 - G - Growth monitoring
 - O - ORS
 - B - Breastfeeding
 - I - Immunisation
 - F - Female literacy or education
 - F - Family planning
 - F - Food supplements

Services Provided by UNICEF

- Child Health
- Child Nutrition - Development of low-cost protein rich food mixtures.
- In collaboration with FAO, it provides aid to the "Applied Nutrition Programme" (helps rural population to grow and eat food required for better nutrition).
- Family and Child Welfare.
- Education (**formal and non-formal**).
- UNICEF promotes the concept of a whole child for their long-term development (personal as well as of country in which they live) - **Country Health Programming**.

Food and Agricultural Organisation

00:15:21



- FAO - Food and Agricultural Organisation.
- Headquarters - **Rome**.
- It has taken initiative for **3 F's**,
 - Farming
 - Forestry
 - Fisheries
- Established in 1945.
- Objective - Increase production of food to keep pace with growing world population.

International Labour Organisation

00:16:15



- Headquarters - **Geneva**.
- Established in **1919**.
- **Objective** - To improve working and living conditions of the working population all over the world.

World Bank

00:16:44



- Headquarters - **Washington**.
- **Objective** - Help less developed countries to raise living standards by **lending money**.

The Joint United Nations Programme on HIV/AIDS

00:17:13



- Headquarters - Geneva.
- The UNAIDS has set the policy to achieve 95-95-95-95 by 2024.
 - 95% PLHIV should know their HIV status.
 - 95% who know their HIV status should receive ART.
 - 95% who receive ART should undergo viral suppression.
 - 95% - Ensures the quality of life.

NACO

00:18:16



- Headquarters - New Delhi.
- Framed NACP

Health Work of Bilateral Agencies

00:18:49

- **Bilateral Agencies** - An agency formed between 2 countries.
 - Provides funds to developing countries.
 - Examples:
 - USAID
 - SIDA
 - DANIDA
- **Multilateral Agencies** - An agency formed between more than 2 countries.

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United States Agency for International Development

00:21:04



- Headquarters - Washington.
- Established in 1961
- Services in India:

- Malaria eradication
- Medical and nursing education
- Health education
- Water supply and sanitation
- Nutrition and Family Planning
- Control of Communicable Diseases

Swedish International Development Agency (SIDA) 00:21:51



- Headquarters - Sweden.
- Assisting the National TB Control Program since 1979
- SIDA assistance in procurement of equipment like X Ray Units, Microscopes, Anti-TB drugs.
- WHO funds for SIDA.

Danish International Development Agency (DANIDA)

00:22:35



- Headquarters - Denmark.
- Assisting the National Blindness Control Programme.

The Colombo Plan

00:23:09

- **Multilateral agency.**
- **Regional organisation that promotes the concept of collective intergovernmental effort to strengthen economic and social development of member countries in the Asia Pacific region.**
- **Membership - 20 developing countries.**
- **6 non regional members - Australia, Canada, Japan, New Zealand, UK, USA.**
- **AIIMS at New Delhi was established with financial assistance from New Zealand.**
- **Canada supplied Cobalt Therapy Units to Medical Institutions in India.**

4 permanent programmes by The Colombo Plan in India

- Long term Scholarships Program
- Drug Advisory Program
- Program for Private Sector Development
- Program for Public Administration and Environment

Non-Governmental and Other Agencies

00:25:13

- Rockefeller foundation.
- Ford foundation.
- CARE

Rockefeller Foundation

00:25:37



- **Headquarters - New York.**
- **Established in 1920.**
- **Work in India began in 1920 with a scheme for control of hookworm disease in Madras presidency**
- **Established All India Institute of Hygiene and Public Health at Kolkata**

Services

- **Training of competent teachers and research workers (via fellowships/travel grants).**
- **Sponsoring visits of medical specialists from the USA.**
- **Grants-in-aid to select institutions for research and development.**
- **Assistance to research projects and institutions (NIV Pune).**
- **Setting up of a field demonstration area (Ballabgarh - PSM department of AIIMS Delhi).**

Ford Foundation



- **Headquarters - New York.**
- **Active in the development of rural health services and family planning.**
- **Ford Foundation has helped India in the following projects:**
 - Rural Health.
 - Rural environment and sanitation
 - Establishment of National Institute of Health Administration and Education (NIHAE) at Delhi.
 - Kolkata water supply and drainage scheme.
 - Supporting research in reproductive biology and in family planning fellowship programs.

Cooperative for Assistance and Relief Everywhere (CARE)

00:28:28



- **Headquarters - Geneva.**
- **Founded in North America in 1945.**
- **Provides emergency aid and long-term development assistance**

Care-India

00:28:54

- **Provides assistance in;**
 - Integrated Nutrition and Health Project
 - Improving Women's Health Project
 - Anaemia Control Project
 - Improved Health Care for Adolescent Girl's Project Child Survival Project
 - Family Spacing Project
 - Konkan Integrated Development Project.

Important Information

- Rural Health - FORD.
- Training grants and research - Rockefeller Foundation.
- All India Institute of Hygiene Public Health - Rockefeller Foundation.
- NIHAЕ - FORD.

International Red Cross

00:29:35



- Founded in 1864 by Henry Durant.
- Non-political, nonofficial international humanitarian organisation devoted to the service of mankind in peace and war.
- In 1919, the League of Red Cross Society was created.
- **Services**
 - Armed forces and war veterans
 - First aid and nursing
 - Disaster management
 - Health education and maternity and child welfare services.

Important Information

- The logo of Suraksha Clinic was a white colour plus with a red dot.



Sexual and Reproductive Health Services

- For reproductive and sexual health services under NACP.

Indian Red Cross

00:30:50

- Established in 1920.
- **Objective - Improvement of health, Prevention of diseases and mitigation of suffering.**
- Red Cross Home at Bengaluru for disabled ex-servicemen

World Food Program

00:31:07



- World's largest international food organisation
- **Beneficiaries:** Poor women and children at risk, poor first dependent population.
- WFP developed India-mix - 40% maize, 40% wheat and 20% full fat soya bean fortified by micronutrients (iron, calcium, vitamin A) distributed through ICDS project.

Headquarters

00:32:44

- **New York** (All the organisations starting with UN except UNAID)
 - UN
 - UNDP
 - UNFPA
 - UNICEF
 - Rockefeller Foundation
 - FORD
- **Geneva**
 - UNAID (Exception)
 - WHO
 - International Labour Organization
 - International Red Cross
- **Washington**
 - World Bank
 - USAID
- **Rome**
 - FAO

Important Information

- UNESCO - Headquarters: Paris.

MCQ's

Q. Match list I (International health organisation) with list II (Program assisted) and select the correct answer using the codes given below:

List I (International health organisation)	List II (Program assisted)
A. SIDA	1. Midday Meal Program
B. DANIDA	2. Family Planning Program
C. Ford Foundation	3. National TB control Program
D. CARE	4. National Leprosy Control Program
	5. National Blindness Control Program

- A. A-5, B-3, C-2, D-1
- B. A-3, B-5, C-4, D-2
- C. A-5, B-3, C-4, D-2
- D. A-3, B-5, C-2, D-1

Q. Headquarters of FAO is at?

- A. New York
- B. Geneva
- C. San Francisco
- D. Rome

Q. The Red Cross was founded by?

- A. Hippocrates
- B. Jean Henry Dunant
- C. Galen
- D. Madam Curie

Q. The WHO was set up in?

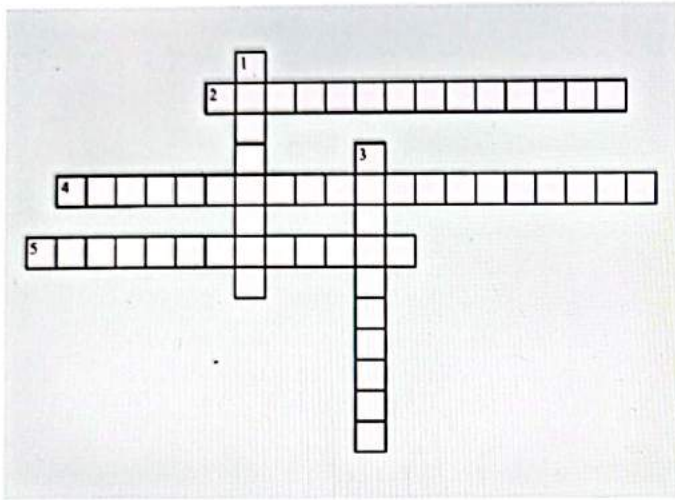
- A. 1929
- B. 1946
- C. 1948
- D. 1952



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. The Red Cross Society of India was established in 1920.
- 4. An agency formed between more than countries.
- 5. Poor women and children at risk, poor first dependent population

Down

- 1. 40% maize, 40% wheat and 20% full fat soya bean fortified by micronutrients (iron, calcium, vitamin A) distributed through ICDS project was developed by WFP.
- 3. Integrated Nutrition and Health Project

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SUSTAINABLE DEVELOPMENT GOALS AND MISCELLANEOUS



SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD



- United Nations (UN) and United Nations Development Program (UNDP) framed these 17 goals
- From 2015-2030
- The goals that have been set should be sustainable for all generations.
- 17 goals + 169 targets

SD Health Related Goal

00:01:25

- It is goal-03
- It has 13 targets
- It is direct health related

- 3.3 Reduce communicable disease
- 3.4 Reduce premature mortality due NCDs by 33%
- 3.5 Reduce addiction.
- 3.6 Reduce road traffic accidents
- 3.7 Reproduction
- 3.8 Achieve Universal Health Coverage

Trick to Remember

- 3.1 is about a mother, then that mother gives birth to a baby (3.2).
- Now that baby can get infected by any communicable disease (3.3).
- Then that baby can also get infected by non-communicable diseases (3.4).
- Now the baby is big so he gets addicted to drugs (3.5).
- Now that child has bad friends and gets into a road accident (3.6).
- Then the mother thinks now enough friends, let's make him ready for a marriage (reproduction 3.7).
- Now the child must get the UHC (3.8).



Important Information

- Indirectly health related goals: 1, 2, 3, 5 and 6
- Targets
 - 3.1 Reduce MMR < 70/100000 Life birth
 - 3.2 Reduce neonatal mortality rate to 12/1000 LB and to 25/1000 LB

Bioterrorism Agents

Category	A	B	C
Definition	Pose the highest risk to national security because they <ul style="list-style-type: none"> • Can be easily disseminated or transmitted from person to person • Result in high mortality rates • Have potential to cause public panic and social disruption • Require special preparedness action 	Pose the second highest risk because they <ul style="list-style-type: none"> • Are moderately easy to disseminate • Result in low mortality rates • Require enhancement of diagnostic and surveillance capability 	Emerging pathogens that could be engineered for mass dissemination because they <ul style="list-style-type: none"> • Are available • Are easily produced and disseminated • Have potential for high mortality rates

The Examples for the Categories

00:07:16

Category	A	B	C
Examples	<ul style="list-style-type: none"> • Anthrax • Botulism • Plague • Smallpox • Tularemia • Viral hemorrhagic fever (e.g., Ebola, Marburg) 	<ul style="list-style-type: none"> • West Nile Virus • Caliciviruses • Hepatitis A • Ricin toxin • Salmonella • Diarrheogenic E. Coli • Brucellosis • Psittacosis • Typhus fever 	<ul style="list-style-type: none"> • Nipah virus • Hanta virus



Important Information

- C - Cholera
- H - Human Influenza
- Y - Yellow fever
- P - Plague, Polio
- S - Sars, Smallpox

Diseases Under International Surveillance by WHO

00:09:29

- Louse borne typhus fever
- Relapsing fever
- Polio
- Human Influenza
- SARS
- Smallpox
- Ebola

Diseases Under International Health Regulations

00:08:02

- They are diseases that can cross the border and cause emergency, epidemics and public health emergency international concern.
- Must report within 24 hours.
- Diseases:
 - Cholera
 - Plague
 - Yellow Fever
 - Wild Polio
 - SARS
 - Smallpox
 - Human Influenza

Tropical Diseases Targeted by WHO for Research and Training

00:10:05

- Vector borne diseases
 - Malaria
 - Filariasis
 - Leishmaniasis
- Schistosomiasis
- Trypanosomiasis
- Leprosy

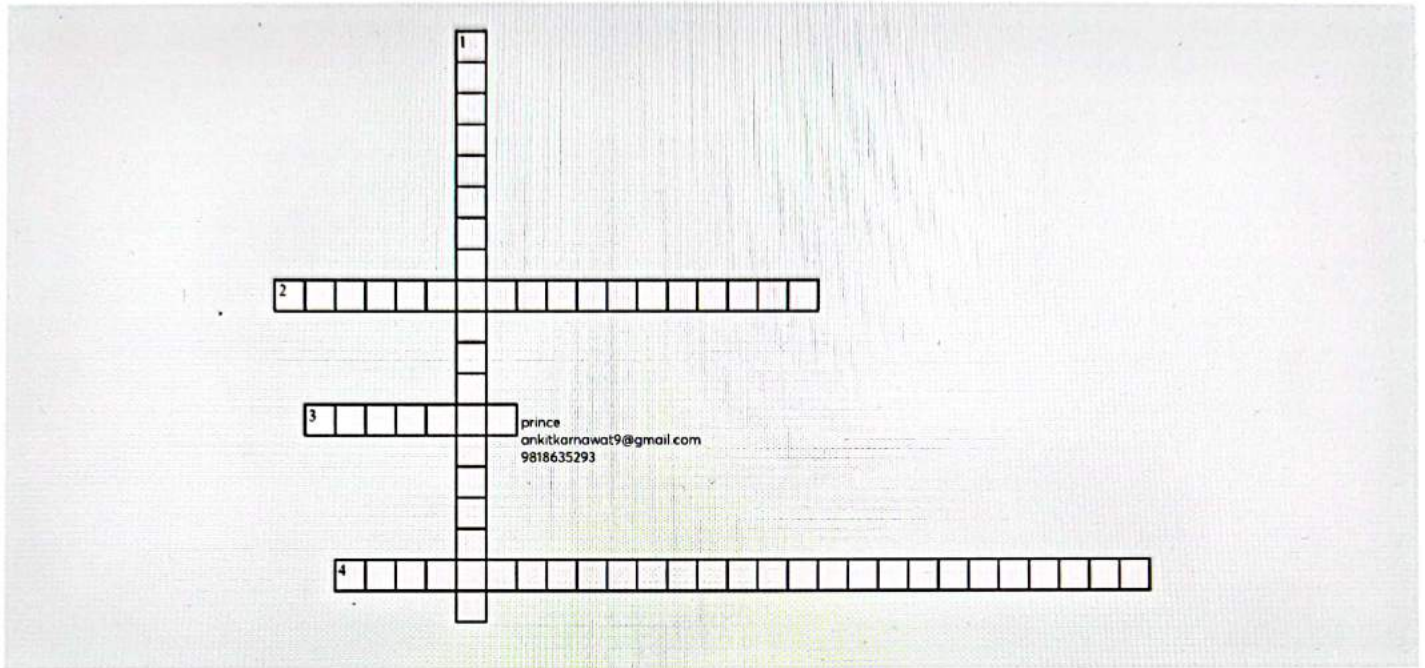
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Table: 06.27 The Categories of Bioterrorism Agents and their definitions.
- 3. Reduce MMR < 70/100000 Life birth
- 4. United Nations (UN) and United Nations Development Program (UNDP) framed these 17 goals

Down

- 1. Most important to remember



PREVIOUS YEAR QUESTIONS



Q. Sustainable development goals (SDGs) are under which health organization? (FMGE Jun 2020)

- A. UNICEF
- B. UNFPA
- C. UNDP
- D. WHO

Q. Type-A Bioterrorism agent include? (NEET 2020)

- A. Coxiella Brunetti
- B. **Bacillus anthracis**
- C. Clostridium perfringens
- D. Nipah Virus

Q. For applied nutrition program, seeds and manure supply under School health service has been done by? (NEET PG May 2022)

- A. WHO
- B. **UNICEF**
- C. CARE
- D. UNDP

Q. WHO stepwise approach include all EXCEPT? (NEET PG May 2022)

- A. Physical
- B. **Psychological**
- C. Behavioural
- D. Therapeutic

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OCCUPATIONAL HEALTH

Occupational Health 00.01.23
 • Aims to promote and maintain the highest level of occupational physical, mental, and social well-being of workers.

Occupational Environment 00.03.05
 • External conditions that prevail and are affect the health of the worker
 • Three types of interaction in the occupational environment
 1. Man with physical, chemical, and biological agents.
 2. Man with machine.
 3. Man with man.

Classification of Occupational Hazards 00.05.05

Diseases Due to Physical Agents/ physical hazards

- **Heat** - Heat pyrexia, hyperpyrexia, exhaustion, heat syncope
- **Cold** - Frostbite, chill blaze, trench foot
- **Light** - Occupational cataract, miners nystagmus
- **Radiation** - Develop cancer, leukemia.
- **Noise** - Auditory and non-auditory
- **Ionizing radiation** - Most common implicated source cobalt 60 and phosphorus 32

Chemical hazards - Inhalation of gases

- Gases
- Dust- Pneumoconiosis

Biological hazards - Animal products, Agricultural sector

- Leptospirosis, Anthrax, Brucellosis

Mechanical hazards Arises due to accidents

Occupational cancer Skin cancer, Leukemia

Occupational dermatosis Dermatitis, Eczema

Psychological hazards Depression, Anxiety

1. Heat Hazards 00.11.37

- Seen among
 - Soldiers
 - Security guards
 - Field workers

Heat stroke	Failure of heat regulating mechanism - exposed to 108-110 °F Can be treated by rapid cooling
Heat hyperpyrexia	Impairment of heat regulating mechanism - exposed to 104-106 °F Can be treated by rapid cooling
Heat exhaustion	Water-salt imbalance - water loss leads to dehydration - exposed to less than 102 °F
Heat cramps	Excessive salt loss - can rehydrate
Heat syncope	Vasodilation and pooling of blood in lower limbs with inadequate cardiac filling.

2. Cold Injuries 00.14.08

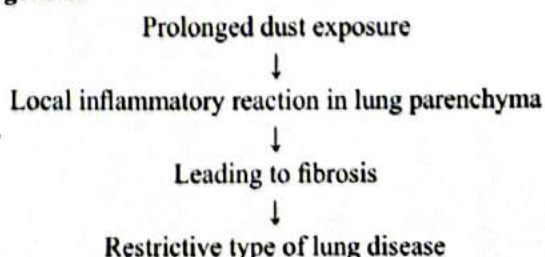
- **Treatment** - Rewarm the body parts at **40-42°C** for **15-20 mins.**

Trench foot	Immersion of foot in very cold water or ice - leads to vasospasm leading to swelling of legs
Frost bite	Crystallization of body fluids in extremities

3. Pneumoconiosis 00.15.08

- Occurs due to inhalation of dust particles
- **0.5-3 micron – most dangerous size – they go to the lower respiratory tract causing maximum damage**
- Causes- Restrictive lung diseases

Pathogenesis



Important Information

- Maximum radiological exposure that a person can tolerate in a year - **only 5 rem per year to the whole body.**

Particle Size and Behavior

Particle size	Behavior
>10 micron	Settle down by gravity
5-10 micron	Arrested in Upper Respiratory Tract
3-5 micron	Deposited in Mid-Respiratory Tract
1-3 micron	Enter Alveoli and Settles there
<1 micron	Brownian movement

Types of Pneumoconiosis

00.18.16

Pneumoconiosis	Dust particle (Inorganic Mineral Dust)
Asbestos	Asbestos fibers
Anthracosis	Coal dust
Aluminosis	Aluminium
Silicosis	Silica dust
Siderosis	Iron
Baritosis	Barium
Lithosis	Stone industry

Pneumoconiosis	Organic or soluble dust
Byssinosis	Cotton dust
Bagassosis	Sugar cane dust
Tobaccosis	Tobacco
Farmer's Lung	Moldy hay/ grain dust
Bird Fancier Lung	Bird droppings

SILICOSIS	Sandstone industry, granite industry, Pottery industry, ceramic industry, gold, mica and steel industry, glass factory, building and construction work, rock mining
ASBESTOSIS	Cement factory, fireproof industry, construction, airplanes
ANTHRACOSIS	Coal mines
BARITOSIS	Photography, printing, barium diagnostic works
BYSSINOSIS	Textile industry
BAGASSOSIS	Cane sugar factories, paper and cardboard factories- Fibrous residue from bagassiss used in paper factories
FARMER'S LUNG	Agricultural industry
SIDEROSIS	Iron mines, Iron, and steel industry

Factors Influencing Pneumoconiosis

00.23.24

- Composition of dust
- Concentration of dust
- Size of the dust particle
- Duration of exposure
- Individual susceptibility

X Ray Changes in Pneumoconiosis

00.23.48

- Ground glass - Seen in Asbestosis
- Black lung - Anthracosis
- Mottling - Bagassosis
- Fine nodular opacity - Farmer's lung
- Snowstorm - Silicosis

A. Silicosis

00.25.25

- Discovered in India in Kolar mines.
- Inhalation of silica dust
- Components of silica dust – free silica or silicon dioxide

Occupation	Sandblasting, Pottery, etc.
Time to Develop	Few months to 6 years for development
Diagnosis	X-ray appearance: Snowstorm
Portion of Lung Affected	Upper part of the lung
Fibrosis	Dense Nodular fibrosis

Clinical Symptoms

- First stage - Mild dyspnea on exertion, unproductive cough.
- Second stage - Marked dyspnea impaired patient's ability to work
- Third stage - Patient incapacitated with signs of right heart failure
- Silicosis is a **notifiable disease** - Under the factories act.
- Those who are occupationally exposed to silica dust - **Chance of developing the disease of silico-tuberculosis.**
 - Sputum will not show AFB bacilli
 - Postmortem will not show the presence of bacilli
- **Treatment** - No treatment

B. Asbestosis

00.31.13

Exposure	Asbestos fiber
Occupation	Cement industry
Time to Develop	5-10 years of exposure
Diagnosis	X-ray shows ground glass appearance , Sputum contains asbestos bodies (Asbestos fiber-coated fibroid)
Portion of lung affected	Basal portion of lung field
Fibrosis	Diffuse Fibrosis
Notifiable disease	Yes

- Asbestos fibers are of two types:
 - Serpentine or chrysolite variety - Hydrated magnesium silicate - **Most commonly implicated form - 95%: curly fibers**
 - Amphibole variety - **Dangerous form** - Needle-like - Less magnesium silicate

Most common manifestation	Plural plaques (thickening and calcification of parietal pleura)
Most common site of calcification	Along lower lung fields, diaphragm and cardiac border
Diseases caused	Asbestos may lead to pulmonary fibrosis, carcinoma of bronchus, mesothelioma of peritoneum and cancer of GIT
Most specific manifestation	Mesothelioma
Most common presentation	Adenocarcinoma of lungs
Symptoms	Dyspnea, Clubbing of fingers, cardiac distress and cyanosis, respiratory failure
Treatment	<ul style="list-style-type: none"> • Symptomatic management - Anti-asthmatic given. • Lung transplant

Difference between Silicosis and Asbestosis

00.38.02

Basis of difference	Silicosis	Asbestosis
Cause	Silica dust	Asbestos fibers
Portion of Lung Affected	Upper part of lung	Basal part of lung
X-Ray Appearance	Snowstorm appearance	Ground glass appearance
Fibrosis	Nodular fibrosis	Diffused fibrosis
Disease	Alveolitis	Bronchiolitis
Malignancy	Not pre-malignant	More malignant
Disease	Silico TB	Cancers and mesothelioma

C. Bagassosis

00.40.35

- Caused - Inhalation of sugar cane fibers, Cardboard industry and paper industry
- Infested by a fungus known **Thermoactinomyces sacchari**
- Reported in India by two people- Ganguly and Pal
- X-ray findings: **Mottling of lung fields**
- **Bagasse control: Keep the moisture content more than 20% and also spray the bagasse with 2% propionic acid.**

D. Byssinosis

00.43.03

- Caused: Inhalation of cotton fibers
- Jute and textile industry
- Affects the lower part of lungs.

E. Farmer's Lung

00.43.42

- Cause: Inhalation of moldy hay /grain dust
- Infested by fungus - **Thermophilic actinomycetes / Micropolyspora faeni**
- Occurs when the moisture content has been kept more than 30%

F. Caplan's Syndrome

00.46.18

- Combination of **rheumatoid arthritis and pneumoconiosis with intrapulmonary nodules**
- Miners working in mines, asbestosis, silicosis.
- Also associated with genetic predisposition and smoking

4. Lead Poisoning

00.47.06

- Most common route - **Inhalation**
- Most common route in **children** - **Ingestion**
- Other names: Plumbism, Saturnism, Painter's colic
- Sources:

Industrial	Non Industrial
<ul style="list-style-type: none"> Manufacturing storage batteries, printing, paint, ship building, lead pipes, dyes, glass manufacture, potteries 	<ul style="list-style-type: none"> Gasoline from automobile exhaust (most common), drinking water through lead pipes, ingestion of lead paints from wooden toys <p>price only by children 9818635293</p>



- Burtonian line indicates chronic lead poisoning
- Deposition of lead sulphite on the gums

Clinical Picture of Lead Poisoning

<p>Non-CNS effects - due to inorganic exposure</p> <p>A</p>	<ul style="list-style-type: none"> Anemia (facial pallor): Earliest and most consistent sign
<p>B</p>	<ul style="list-style-type: none"> Burtonian line
<p>C</p>	<ul style="list-style-type: none"> Basophilic stippling of RBCs
<p>CNS effect - due to organic exposure</p> <p>D</p>	<ul style="list-style-type: none"> Colic - Constipation / diarrhea can also occur
<p>E</p>	<ul style="list-style-type: none"> Wrist drop / foot drop
	<ul style="list-style-type: none"> Encephalopathy - due to organic lead exposure

Screening and Diagnose the Lead Poisoning

<p>Coproporphyrin levels in Urine (CPU)</p>	<p>Shows Lead exposure</p> <ul style="list-style-type: none"> >150 mcg/litre
<p>Aminolaevulinic acid in Urine (ALA)</p>	<p>More reliable - More specific and sensitivity</p> <ul style="list-style-type: none"> Normal: 1-6 mg/24 hours Plumbism: >70 mg/ 24 hours
<p>Lead in Urine</p>	<ul style="list-style-type: none"> Normal level - 0.2-0.8 mg >0.8mg/L: Lead exposure and absorption
<p>Confirmatory test</p>	<p>Lead levels in Blood</p> <ul style="list-style-type: none"> Normal blood lead level < 10 mcg/dl Occupational exposure 40 mcg/dl Treatment - @ 70 mcg/dl

Important Information

- Sensitive test for lead exposure: CPU
- Sensitive test for lead absorption: ALA
- Quantitative indicator for Lead exposure and absorption: Urine lead level
- Confirmatory test for lead exposure and absorption: Blood lead level
- Sensitive parameters for hematological response to lead levels and treatment: Basophilic stippling of RBCs

Treatment of lead poisoning:

- Chelating agents
 - EDTA
 - D-Penicillamine
 - Dimercaprol

5. Metal Fume Fever

00.57.05

- Temporary occupational disease
- Due to Inhalation of fresh metallic oxide fumes of zinc and magnesium
- Clinical Features:
 - Fever
 - Sweating
 - Chills
 - Dryness of throat
 - Cough
 - Breathlessness
- Does not cause permanent changes and recovery takes place within 24 hours

- People at risk: metal welders, galvanizing, heavy metal molting factories
- 6. Occupational Related Cancers 00.58.10
 - Most common - Skin cancer (Squamous cell carcinoma)
 - Bladder cancer
 - Exposure to dyes - β - naphthylamine, Auramine and magenta dyes and Benzidine
 - Benzidine leads to leukemia.
 - Most common presentation - Hematuria

Types of Carcinoma	Predisposing Occupational Exposure
Lung	Arsenic, beryllium, cadmium, chromium, asbestosis, silica, radon, nickel, aromatic hydrocarbons
Liver	Vinyl chloride, arsenic
Bladder	Benzidine, auramine, beta naphthylamine, paramino-diphenyl, magenta
Leukemia	Benzene, ethylene oxide, ionizing rays and radioactive substances
Skin	Arsenic, ionizing radiations, polycyclic aromatic hydrocarbons
Scrotum	Polycyclic aromatic hydrocarbons

Important Information

- Chimney sweepers cancer - Scrotum cancer
- Mule spinners cancer - Cancer scrotum (due to shale oil used in wool spinning)
- Non-occupational-related cancer are:
 - Bladder cancer: Due to Schistosoma haematobium
 - Dhoti cancer: Due to mechanical irritation of skin on waist due to dhoti cloth

Prevention of Occupational Diseases 01.03.00

- Ergonomics** • Application of psychological, medical and engineering principles for making the workplace more suitable for enhancing proficiency of workers and maintenance of health of workers (**put the right man in the right job**)
- Emporiatics** • Application Of psychological and medical understanding for protecting health and preventing disease in people with different external environments due to more than usual long distance traveling.

Medical	Engineering	Legislative
Pre-placement examination	User friendly machine	Factories act - Implementation
Post-placement examination	Ventilation should be adequate	ESI acts
Notification of disease (Bagassosis is not notifiable)	Housekeeping should be proper	
Maintaining health records	Protective equipment availability	

Sickness Absenteeism 01.06.27

- Reflects the State of health of workers.
- Sickness Absenteeism Rate
 $SAR = \frac{\text{Total number of workers remaining absent in a year}}{\text{total worker}} \times 100$
- High SAR: indicates low occupational health
- Rate of sickness absenteeism in India = 8-10 days/person/year
- Causes
 - Medical
 - Social
 - Economic

Pre-placement vs. Post-placement examination 01.08.17

Pre-placement	Post-placement
Before the person is employed	After the person is employed
<ul style="list-style-type: none"> • To see if the person is fit for the job 	<ul style="list-style-type: none"> • To see if the person is deviating from their health • To see if they are developing illness due to occupational exposure
Primary level of prevention	Secondary level of prevention
Done only once	Done periodically. <ul style="list-style-type: none"> • For most occupational exposures - done annually • For few occupational exposures - done monthly: <ul style="list-style-type: none"> ○ Lead exposure ○ Dye industries ○ Heavy chemical ○ Ionizing radiation ○ Radium • Daily examination - Dichromate industries



Important Information

Health professionals are at risk of:

- Hepatitis B, C, and HIV
- Needle prick injuries
- Musculoskeletal disorders
- UV Radiations
- Ionizing Radiations
- Occupational stress - violence, injuries

Apex Institute of Occupational health

- National institute of Occupational health in Ahmedabad

MCQs

Q. Respirable dust responsible for pneumoconiosis have a size limit of?

- A. >1 micron
- B. <5 microns**
- C. <10 microns
- D. <100 microns

Q. What particle size, if inhaled, causes damage?

- A. <0.5 microns
- B. 0.5-3 microns**
- C. 3-5 microns
- D. 5-10 microns

Q. Benzene occupational exposure may lead to?

- A. Lung cancer
- B. Leukemia**
- C. COPD
- D. Neurofibroma

Q. Snowstorm appearance is seen in?

- A. Anthracosis
- B. Silicosis**
- C. Byssinosis
- D. Bagassosis

Q. Silicosis was first reported in?

- A. USA
- B. Russia.
- C. Africa
- D. India**

Q. What is the most commonly implicated form of silica in silicosis?

- A. Amorphous
- B. Quartz**
- C. Cristobalite
- D. Tridymite

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Q. All are true about Silicotuberculosis except?

- A. Silicosis is more prone to pulmonary tuberculosis.
- B. Sputum in a slice - TB shows tubercle bacilli**
- C. Children and women of silicon TB do not develop tuberculosis
- D. Post mortem on silicotuberculosis failed to prove the existence of tuberculosis disease

Q. Byssinosis is seen in?

- A. Cement factories
- B. Textile industries**
- C. Iron factories
- D. Grain fields

Q. Asbestosis can lead to all except?

- A. Ca GIT
- B. Ca bronchus
- C. Cardiac Arrest**
- D. Mesothelioma of pleura

Q. Most common manifestation of asbestos exposure comprises of?

- A. Pleural plaques**
- B. Pulmonary fibrosis
- C. Pleural effusion
- D. Lung nodules

Q. Lead poisoning mostly occurs due because of?

- A. Inhalation**
- B. Ingestion
- C. Direct skin contact
- D. Any of the above

Q. What does sickness absenteeism predict in factories act?

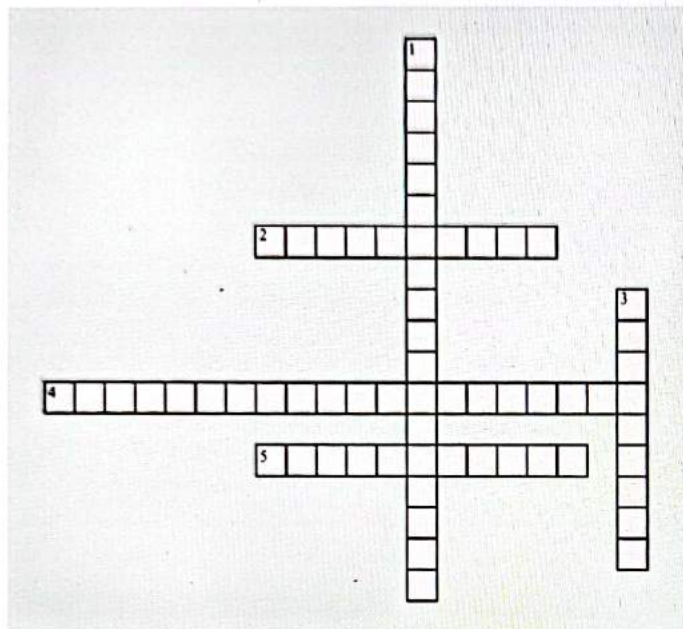
- A. State of the health of workers**
- B. Logical sequence of activities in a program
- C. Power and administrative function
- D. Relationships between employer and employee



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Failure of heat regulating mechanism — exposed to 108-110 °F
- 4. Depression, Anxiety, Affects mental level
- 5. Problem in foundry glass and steel industry: Radiant heat

Down

- 1. Skin cancer, Leukemia
- 3. Crystallization of body fluids in extremities

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Factory Act

00:00:15

- Established in 1948
- This act defines a factory as an establishment employing
 - 10 or more workers where power is used.
 - 20 or more than 20 workers where power is not used.
- Workers also include contract labor employed in manufacturing process.
- There is no distinction between perennial (running throughout the year) and seasonal factories.
- Prohibits employment of children less than 14 years.
- A child between 15 to 18 years must be certified as fit for work by a certified surgeon.
- **Hours of work:**
 - 48 hours per week or 9 hours per day.
 - 60 hours per week including overtime.
 - 4 and ½ hours per day for adolescents.
 - Women and adolescents can only be employed between 6 am and 7 pm.
- **Leave with wages:**
 - 1 day per 15 days of work for adolescents and 1 day per 30 days for adults
 - Leaves can be accumulated up to 40 days for adolescent and upto 30 days in adults.
- **Health, safety, and welfare recommendations:**
 - Minimum cubic feet per space: 500 cubic feet per space per worker.
 - 1 Safety officer: per 1000 workers
 - 1 Welfare officer: per 500 workers
 - 1 Canteen: per 250 workers
 - 1 Creche: per 30 women workers
 - Bagassosis is not notifiable under factory act.

- **Medical institutions** in a few states and UT, employing 20 or more workers.
- Salient features of this act:
 - Administration: **Autonomous body** (ESI Corporation)
 - Ministry of Labour: **Union minister of labor**
 - Eligibility criteria: **Employees earning up to Rs. 21000 / month** are eligible to avail benefits.
 - For **disabled people** - Employees earning up to 25,000/month are eligible.
- Employer contribution: 3.25% of the total wage bill.
Employee contribution: 0.75% of the total wage bill.
Total contribution: 4%
- Employees earning less than Rs 176 per day are exempted from making any contribution.
- State government contribution: 1/8th (12%) of the total cost of medical care.
- Central government contribution: 7/8th (88%) of the total cost of medical care.

ESI Act

00:07:25

- The Employees State Insurance (ESI) act was established in 1948.
- It an important measure of social security and health insurance in India
- Covers all the factories in India, excluding railways, defense, and mines.
- Applies to
 - All non-seasonal factories, employing 10 or more persons, for wages on any day in implemented areas.
 - All power-using factories employing 10 or more workers.
 - Shops, hotels and restaurants, cinemas and theaters
 - Road-motor transport establishments
 - Newspaper establishments

Benefits

00:16:12

- a) **Medical Benefit:**
 - Full medical care including hospitalization care, sickness care, maternity care, etc.
 - **Cashless benefit**
 - It is direct medical care- Provided by ESI hospitals,
 - 1000 employees are there- **full-time dispensaries**
 - Less than 750 employees - **part-time dispensaries**
 - If scattered employees (employees living in a widely distributed area)- **mobile dispensaries**
 - In indirect medical care- provided by private hospitals empanelled under ESI hospitals.
- b) **Sickness benefit:**
 - Offered for 91 days continuous at 70% wages.
- c) **Extended sickness benefit:**
 - Offered for 2 years at 80% of daily wages.
 - Provided for 34 diseases including TB, leprosy, HIV, mental illness etc.
- d) **Enhanced sickness benefit:**
 - Offered at 100% wages for 7 days in case of vasectomy.
 - 100% wages for 14 days in case of tubectomy
- e) **Maternity benefit:**
 - Offered at 100% wages for 26 weeks.
 - In the case of MTP- 100% wages for 6 weeks.
 - In case of pregnancy-induced confinement (sickness out of confinement), also offered at 100% wages for 4 weeks.

- f) Temporary disablement benefit:
- Offered at 90% wages till the patient recovers.
- g) Permanent disablement benefit:
- Minimally offered at 90% wages lifelong or the amount board decides.
- h) Dependent disablement:
- In case of the death of an insured person (employment-related death) under the ESI act, a pension at the rate of 90% of daily wages will be offered to the dependent of an insured person.
 - If the dependent is children, then the children of insured persons till they turn 18 years can avail of this benefit.
- i) Rehabilitation:
- On a monthly payment of Rs 10, the insured person and his family members continue to get medical treatment after permanent disablement or retirement.
- j) Funeral expenses: Rs 15,000 is provided under this act.

New Initiatives

00:31:24

- ESI news
- Launch of mobile app ESI 2.0
- Online availability of electronic health record of ESI beneficiaries **Abhiyan Indra Dhanush**
- Up-gradation of ESI dispensaries to 6 bedded hospitals
- Up-gradation of services: special OPD services for elderly

Abhiyan Indra Dhanush

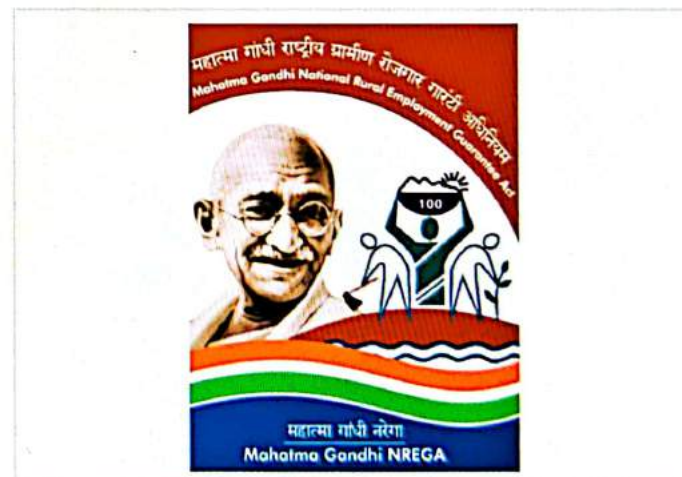
00:31:30



- Rainbow with a bed.
- Change of bed sheets according to the VIBGYOR pattern in ESIC hospitals to give more emphasis on hygiene and cleanliness in the hospitals.

Mahatma Gandhi National Rural Employment Guarantee Act (Mgnrega)

00:32:14



- In 2005 it was called NREGA, and in 2009 it was named MGNREGA.
- 100 days of guaranteed wage employment is being offered to every household in rural areas belonging to below the poverty line who agrees to unskilled manual work.
- Aim- to increase the livelihood of people living in rural areas.
- Within 15 days of applying, employment must be provided. Otherwise, the person becomes eligible for unemployment allowance.

Important Information

- Setting up of one doctor dispensary: ≥ 1000 family units
- Setting up of two doctor dispensaries: ≥ 2000 family units
- Setting up of diagnostic centers ≥ 5000 family units
- Setting up of 100 bedded hospital: ≥ 15000 family units
- National Programme for control and treatment of occupational diseases
 - Launched by the ministry of health and family welfare of the government of India.
 - The national institute of occupational health, Ahmedabad, is the nodal agency

Atal Beemit Vyakti Kalyan Yojana

00:29:40

- It is a welfare measure for employees covered under Section 2(9) of the ESI act, 1948, in the form of relief payment up to 90 days, once in a lifetime
- Introduced w.e.f. 01-07-2018 on a pilot basis for a period of two years initially
- Now been extended for another one year, i.e., from 1st July 2020 to 30th June 2021.
- The rate of unemployment relief - 50% of wages
- The Insured person should have been in insurable employment for a minimum period of two years immediately before her/his unemployment and should have contributed for not less than 78 days in the contribution period.
- Relief shall become due for payment after 30 days from date of unemployment and the claim can be submitted directly to the designated ESIC branch office by the worker.

MCQ's

Q. True about the ESI act 1948?

- a) **Applicable on educational institutions**
- b) Employer contribution is 1.7%
- c) Maternity benefit for 3 months
- d) Beneficiaries are those having income > 15000/month

Q. Following occupational diseases are notifiable under Indian factory act 1976 except?

- a) Silicosis
- b) Asbestosis
- c) Byssinosis
- d) **Bagassosis**

Q. The minimum air space per worker prescribed by the Indian factory amendment act 1987 is?

- a) 200 cu ft
- b) 300 cu ft
- c) **500 cu ft**
- d) 700 cu ft

Q. Sickness benefit under ESI act extended to?

- a) **91 days**
- b) 61 days
- c) 1 year
- d) 2 year

Q. Which of the following statements regarding the factory act is correct?

- a) Child age less than 18 years can be employed
- b) Child age less than 14 years cannot be employed in dangerous work
- c) **Working hours should not be more than 48 hours per week for adults**
- d) Working hours are 6 hours per day for children

Q. Which statement out of the following is correct?

- a) Funeral charges upto 50000
- b) **State government share is 1/8 and ESI corporation is 7/8**
- c) Employee contributes 8.75% and employee 3.75%
- d) Maximum limit for each family member is Rs 30000/-

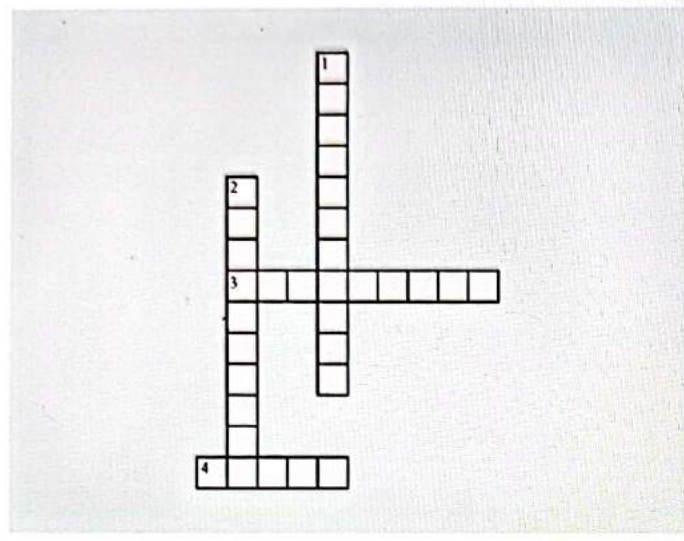
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CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. The National Institute of Occupational Health which is the nodal agency is located in which city?
- 4. The ESI Act covers all the factories in India, excluding railways, defense, and _____

Down

- 1. Mobile dispensaries will be there if employees are _____
- 2. Which occupational disease is not notifiable under Indian factory act 1976



51

DISASTER MANAGEMENT

Definition

00:00:31

- Given by WHO- Any occurrence that causes damage, ecological disruption, loss of human life, deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area.
- Help is required from outside the community area.
- Colin Grant's definition- Disaster is the occurrence of an unexpected event leading to injury or illness simultaneously to at least 30 people who will require emergency hospital treatment.



Classification of Disasters

00:02:57

Natural Disasters

- Geophysical: Earthquakes, Tsunamis, Volcanos
- Hydrological (Most common in India): Floods, Landslides
- Meteorological: Cyclones, storms
- Climatological: Drought
- Biological: Epidemics

Man-Made Disasters

- Man-made disasters are also called warfare.
- For example- Accidents, nuclear warfare, biological warfare, etc.

Bhopal Gas Tragedy

- Worst man-made disaster
- Gas leak of methyl isocyanate in a pesticide plant on 3rd Dec 1984.

Chernobyl tragedy

- Happened in the Soviet Union on 26th April 1986
- Gas leak of cesium and strontium from the nuclear power plant.

Effects of Disasters

00:09:18

- Injuries
- Emotional stress
- Epidemic of disease
- Increase in indigenous disease.

Disaster Management Cycle

00:09:40

- 3 fundamental aspects of Disaster Management:
 - Disaster impact
 - Disaster preparedness
 - Disaster mitigation

- After a disaster strikes (Post disaster), 3 R's are there to offer
 - Response
 - Rehabilitation
 - Reconstruction

Disaster Impact

00:11:20

a) Disaster Response-

- Search
- Rescue
- First aid

Triage

00:12:31

- Categorization of victims based on the severity of injuries and the likelihood of survival.
- Triage is done after tagging the victim.
- In tagging,
 - Name, Age
 - Place of origin
 - Triage category
 - Diagnosis, and
 - Initial treatment is mentioned
- Color coding:
 - Red color:
 - High priority
 - Victims must be helped within 0 to 6 hours.
 - Require immediate resuscitation or life-saving surgery.
 - E.g.- hemothorax or pneumothorax
 - Yellow or Blue:
 - Medium priority
 - Victims must be helped within 6 to 24 hours.
 - They can wait up to 24 hours.
 - Green:
 - Low priority
 - These victims are Ambulatory
 - They can move with minor injuries.

- o Black:
 - Least priority
 - They are either dead or moribund (likely to die)

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Types of Triage: 00:17:43

1. **Reverse triage:**
 - Used in wars and military settings.
 - Minor injuries are minor injuries given preference: Green colour
2. **Simple triage and rapid treatment: (S.T.A.R.T)**
 - Done in inaccessible areas or remote areas (difficult to reach areas).
 - Laymen can start providing triage before the rescue teams reach.
 - Example: Health workers, schoolteachers, Village panchayats.

(b) Disaster Relief 00:21:12

- Starts when assistance is received from outside.
- Divided into 3 stages.
 - 1) **1° phase-**
 - o lasts from 0 to 6 hours.
 - o Rescue, first aid, triage, and treatment are provided.
 - 2) **2° phase**
 - o lasts from 6 to 24 hours.
 - o Transport is provided to hospital.
 - o Sanitation and safe water supply is ensured.
 - o Prevention of communicable diseases is necessary.
 - 3) **3° phase**
 - o lasts from 1 to 60 days.
 - o Food, clothing, and shelter must be provided.
 - o Things like damaged places must be reconstructed.

Epidemiological Survey and Disease Control 00:24:33

- Due to poor sanitation and overcrowding- **respiratory diseases** are reported.
- Due to poor sanitation- **Gastrointestinal infections**
- Displacement of animals - **Zoonotic diseases.**
- Due to floods- **Leptospirosis** and **Rickettsia**
- Vector borne diseases do not develop immediately post disaster ...takes time to develop in post disaster phase
- Post-disaster-
 - o **Most common infection reported in Post Disaster Phase: Gastrointestinal infection**
 - o **Most common vitamin deficiency reported in post disaster phase: Vitamin A deficiency**

Vaccination Protocol

- All vaccines are contraindicated in post disaster phase except Measles vaccine
- **Measles** vaccine should be administered to children within 3 days of exposure.

- For health professionals working in disaster endemic zones - All vaccines can be given (typhoid, cholera, hepatitis) except Measles vaccine

Rehabilitation 00:36:46


- Restoring pre-disaster conditions.
- Mean energy requirement per person per day at times of disasters: **2100 Kcal**
- Most practical and effective strategy: **Ensure safe water supply and safe disposal of excreta.**

1. First Priority

- Safe water supply must be ensured by the **Chlorination** technique.
- Level of residual chlorine in the post-disaster phase is **>0.7mg/L** for 1 hour contact period.
- **Chlorine tablets** with **0.5gms** are sufficient to disinfect **20** liters of water.

2. Second Priority

- Must take care of Safe food supply and personal hygiene.
- Prevention of Vector-borne diseases by **indoor residual sprays.**
- To use control leptospirosis and rodenticides, **Zinc phosphide** must be sprayed.
- for controlling mosquitoes and sand flies in disaster: **Indoor residual spray.**
- **NGO** support to reintegrate members into society.

 **Important Information**

Post-disaster guidelines for accommodation:

- Shelter space per person: **3.4m²**
- Number of people per water point: **250**
- Distance to water point: **150m**
- Number of people per latrine: **20**
- Distance to latrine: **30m**
- Distance between water point and latrine: **100m**

Disaster Mitigation 00:42:43

- Preventing the hazard from becoming a disaster.
- Engineering modalities are used to prevent hazards.
- **Engineering Modalities**
 - o Proper land use
 - o Improve building codes- buildings should be earthquake resistant.
 - o Flood mitigation codes- dams should be flood resistant.

Disaster Preparedness 00:44:01

- Also called surge capacity.

- **Surge capacity** is the proper equipping of the country to manage disasters.
- **Overall capacity** of the country to manage disasters must be strengthened.
- Country must have enough resources like manpower, money, material, technical expertise to manage disasters

Components Focused on Disaster Preparedness

- Evaluate the risk of the country or any particular region to disaster.
- Adopt standards and regulations
- Organize communication, information, and warning systems.
- Ensure coordination and response mechanisms.
- Adopt measures to ensure that financial and other resources are available for increased readiness and can be mobilized in disaster situations
- Develop public education programmes.
- Coordinate information sessions with news media.
- Organize disaster simulation exercises that test response mechanisms.

Disaster Management in India

00:48:05

- **Disaster Management Act:** came into force in 2005.
- Setting up National Disaster Management Authority (NDMA) at the National level and State Disaster Management Authority (SDMA) at the state level.
- **World Disaster Reduction Day:** 2nd Wednesday of October.
- **Nodal Ministry of Disaster Response:** Responsible for overall coordination of disaster management.
 - Ministry of Home Affairs.
 - **Chairperson:** Prime Minister
- **National Disaster Management Authority:** prepares disaster management plans at the national level.
 - It is also responsible for the execution of disaster management functions at the national level.
- **National Institute of Disaster Management**
 - Headquarters is in New Delhi.
 - It is responsible for capacity building, training, research, and for building a national base.
- **State government** is responsible for the execution of relief work.
- **The Union government** has supportive roles.
- Calamity relief fund in each state: Contributions from Union and state governments is **3:1**.

International Agencies for Disaster Response

00:52:38

- OCHA: Office for the coordination of Humanitarian Affairs
- WHO
- UNICEF
- World food program
- FAO

- CARE
- International Committee of Red Cross
- International Council of Voluntary Agencies

MCQs

Q. During a disaster, what should be done first

- A. Triage
- B. Stabilisation of Victims
- C. **Search, rescue, first aid**
- D. Redistribution of patients to hospital if necessary

Q. Nodal center in case of disaster management

- A. PHC
- B. CHC
- C. Police control room
- D. **District**

Q. Which of the following is not included as fundamental aspects of disaster management?

- A. **Disaster prevention**
- B. Disaster response
- C. Disaster preparedness
- D. Disaster Mitigation

Q. Which of the following is not practiced in disaster?

- A. Rehabilitation
- B. **Mass vaccination**
- C. Triage
- D. Disaster response

Q. All of the following concerning disaster management are true except

- A. **Response is done in pre-disaster phase**
- B. Gastroenteritis is the most common infection post- disaster
- C. Yellow color triage is for medium priority
- D. Mitigation done in pre-disaster phase

Q. In disaster management, patients who need surgery within 24 hours are categorized under which color category of triage?

- A. Red
- B. Green
- C. **Yellow**
- D. Black

Q. Triage is done for?

- A. Treating the most serious case
- B. **Categorization of patients and treating them according to available resources**
- C. Giving emergency services to all patients
- D. Treating mentally ill patients

Q. World disaster reduction day is on?

- A. 2nd Wednesday of October
- B. 3rd Wednesday of October
- C. 4th Wednesday of October
- D. 1st Wednesday of November

Q. Most common disease after a disaster?

- A. Tetanus
- B. Leptospirosis
- C. Malaria
- D. Gastroenteritis

Q. Not true about disaster control after a disaster?

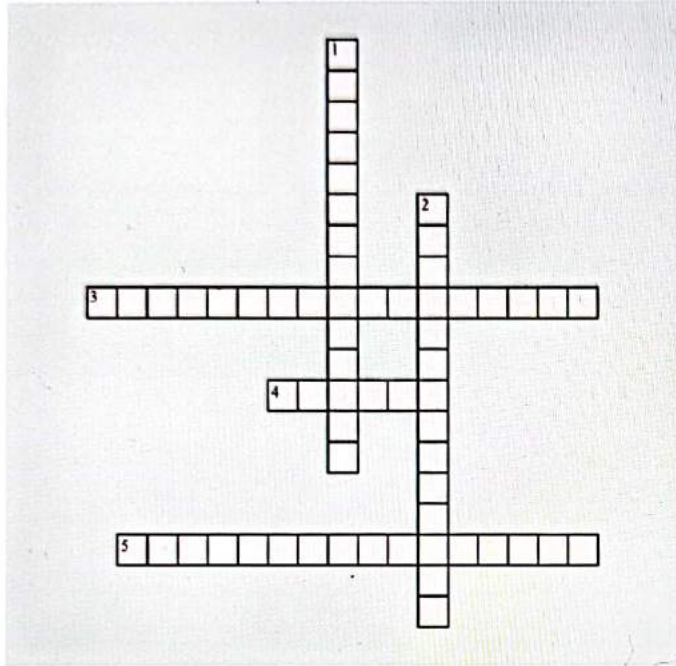
- A. Gastroenteritis is the most commonly reported disease in post-disaster phase
- B. Vector-borne diseases will not appear immediately but take several weeks for an epidemic
- C. Displacement of domesticated and wild animals increases the risk of transmitting zoonoses
- D. WHO recommends typhoid and cholera vaccine in routine use in endemic areas

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CROSS WORD PUZZLES

Crossword Puzzle



Across

- 3. In Bhopal, there was a gas leak of methyl isocyanate in a pesticide plant on 3rd Dec 1984. People said that it was man-made.
- 4. Basically, it categorizes victims based on the severity of injuries and the likelihood of survival.
- 5. Geophysical: Earthquakes, Tsunamis, Volcanos

Down

- 1. The worst man-made disaster: Bhopal Gas Tragedy
- 2. In disaster impact, we come across response and relief.

52

BIOMEDICAL WASTE MANAGEMENT



Definition of Biomedical Waste

- Any waste generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological.

Ministry Involved

- Ministry of Environment, Forestry and Climate Change.
- Roles of ministry:
 - Making policies.
 - Providing financial assistance for training/setting up of common biomedical waste treatment facility.
 - Operational research.
 - Notify standards or operating parameters.
- Role of Central Pollution Control Board (CPCB):
 - Prepares guidelines on biomedical waste management and submit to Ministry of Environment, Forestry and Climate Change.
- Quantity of waste generate in India is estimated as 1-2 kg/day/bed in a hospital and 600gm/day/bed in a clinic.

Healthcare Waste Generation

- General healthcare waste – 80%.
- Biomedical waste – 20%.
- Pathological and infectious waste – 15%.
- Sharp waste – 1%.
- Chemical and pharmacological waste – 3%.
- Radioactive/Cytotoxic waste, pressurized containers, broken thermometers, used batteries - <1%.

Logos

- Image 1. – Biomedical waste management
- Image 2 Radiation hazard logo.
- Image 3 and 4– Recycling logo.



Biomedical Waste Categories

Color	Waste type	Method of disposal
Yellow	<ul style="list-style-type: none"> Infectious. May or may not be pretreated. 	Incineration
Red	<ul style="list-style-type: none"> Infectious. Rubber, plastic, tube. No pretreatment. 	Recycling or reuse.
Blue	<ul style="list-style-type: none"> Glass and metallic implants. No pretreatment. 	Recycling or reuse.
White	<ul style="list-style-type: none"> Sharps. No pretreatment. 	Recycling or reuse after shredding.

- Black bag color is for general waste.

Yellow Non-chlorinated Plastic Bag

- Type of waste:
 - Human anatomical waste.
 - Animal anatomical waste.
 - Soiled waste.
 - Discarded or expired medicine.
 - Microbiology, biotechnology and other clinical laboratory waste.
 - Chemical waste.
 - Chemical liquid waste.

• **Examples of waste:**

- Placenta.
- Post-operative body parts.
- Plaster of Paris (POP).
- Pathological waste.
- Cotton waste.
- Dressing materials.
- Beddings.
- Body fluid contaminated paper and cloth.
- Face mask, cap, shoe cover and head cover.
- Cytotoxic, expired and discarded medicines.
- Microbiology and biotechnology lab waste.
- **Blood bag.**
- Blood samples.
- Vacutainers with blood.

Treatment and disposal

- Incineration.
- Plasma pyrolysis.
- Deep burial.

Red Bag



- Type of waste:
 - Contaminated waste that is recyclable.
- Examples of waste:
 - Syringe without needles.
 - Fixed needle syringes with their needle cut.
 - IV set.
 - Catheters.
 - Gloves (soiled or unsoiled).
 - **Urine bag.**
 - Dialysis kit.
 - IV bottles.
 - Tubing's.
 - Bottles.
 - Vacutainers with needle cut.
 - **Vacutainers without blood.**
 - ELISA plate and vials not containing blood samples.

Treatment and disposal

- Autoclaving or microwaving/hydroclaving followed by shredding or mutilation and waste set to registered recyclers or for energy recovery/road making.
- Plastic waste should not be sent to landfill sites.

White Bag

- Type of waste:
 - Sharps.
- Examples of waste:
 - Needles.
 - Syringes with fixed needles.
 - Blades.
 - Scalpels.
 - Trocar canula.
 - Insulin pen needle.

Treatment and disposal

- Puncture-proof, leak-proof, tamper-proof containers.
- Autoclaving or dry heat sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete.
- Can be sent for final disposal to iron foundries or sanitary landfill or designated concrete waste sharp pit.

Blue Bag



- Type of waste:
 - Glassware or metallic body implants.
- Examples of waste:
 - Includes broken or discarded glass and metallic objects that are contaminated.
- Glass:
 - Broken glass.
 - Ampoules.
 - Lab slides.
- Metals:
 - Nails.
 - Metallic body implants.
 - Scissors.
 - Artificial pacemakers.

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Treatment and disposal

- Cardboard boxes with blue colored marking or blue colored puncture-proof and tamper-proof containers.

- Disinfection (cleaning with detergent and soaking in sodium hypochlorite) or autoclaving or microwaving or hydroclaving and then sent for recycling.

- Urobag - RED COLOR BAG

00:16:14



- IV drip set - RED COLOR BAG

00:16:18



- Gloves - RED COLOR BAG

00:16:22



Important Information

Biomedical Waste Management Summary

- Fetus, organ, tissue, soiled cotton, gauze, dressings, bandages, casts, plasters, IUD, expired/discarded medicines, cytotoxic waste, body secretions e.g. sputum, pus, feces, X-ray developer fluids, disinfectants, linens, beddings, mattress, gowns, culture plates, blood bags, blood transfusion sets, live vaccine vial, blood products, masks, shoe cover, head cover: **Yellow bag for incineration, plasma pyrolysis and deep burial.**
- Recyclable plastics, tubes, vacutainers without blood, syringes without needles, urobags, catheters, ryles tubes, IV drip sets, face shields, goggles: **Red bag.**
- Sharps and other metals: **White bag.**
- Orthopedic implants, glassware, artificial pacemaker: **Blue bag.**

PPE

- Personal protective equipment (PPE) disposed in yellow bag.
- Shoe cover, head cover, disposable linen gowns and masks disposed in yellow bag.
- Face shields, goggles, gloves and hazmat suits disposed in red bag.

Relevant Images

- Catheter - RED COLOR BAG

00:16:00



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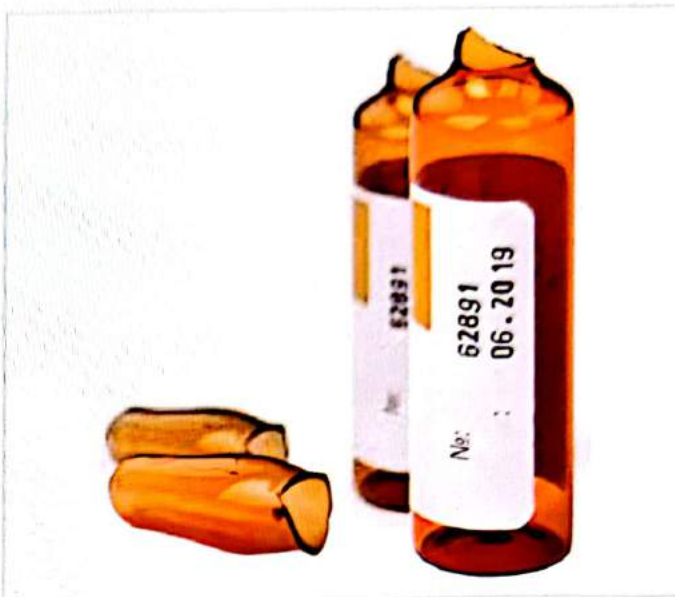
• Syringes without needles

00:16:25



• Broken glass - BLUE COLOR BAG

00:16:55



• Vacutainers without blood - RED COLOR BAG

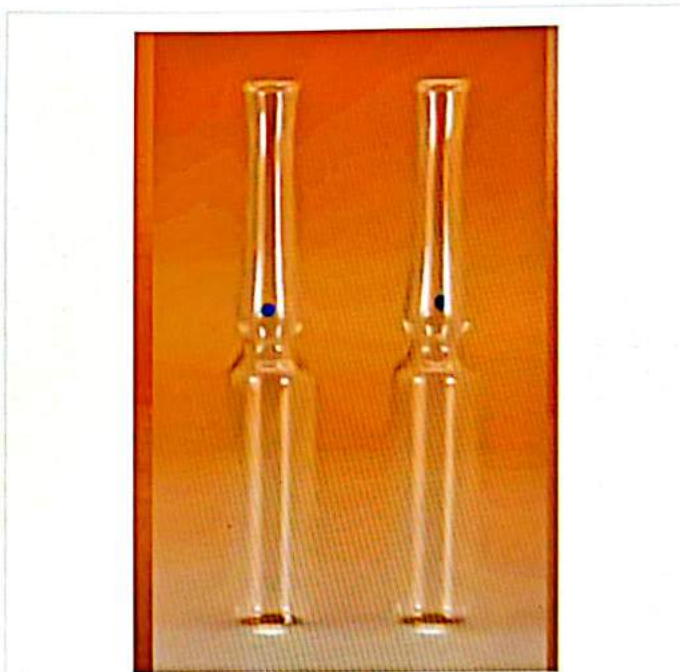
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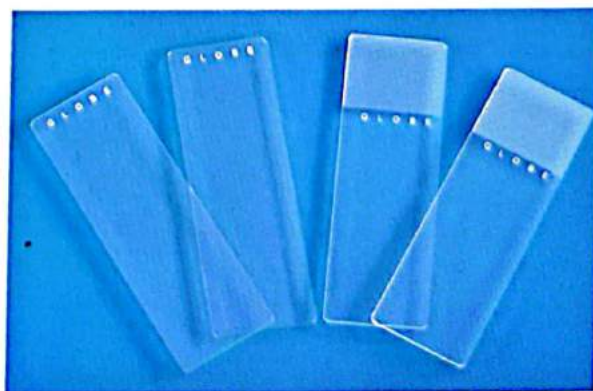
• Glass vials - BLUE COLOR BAG

00:17:06



• Ryles tube - RED COLOR BAG

00:16:50



• Orthopedic implants - BLUE COLOR BAG

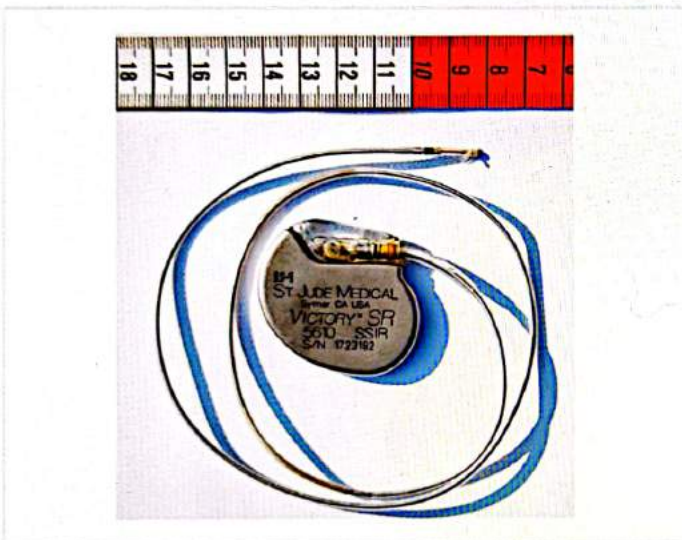
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• Pacemaker - BLUE COLOR BAG

00:17:31



• Scalpel - WHITE COLOR CONTAINER

00:17:47



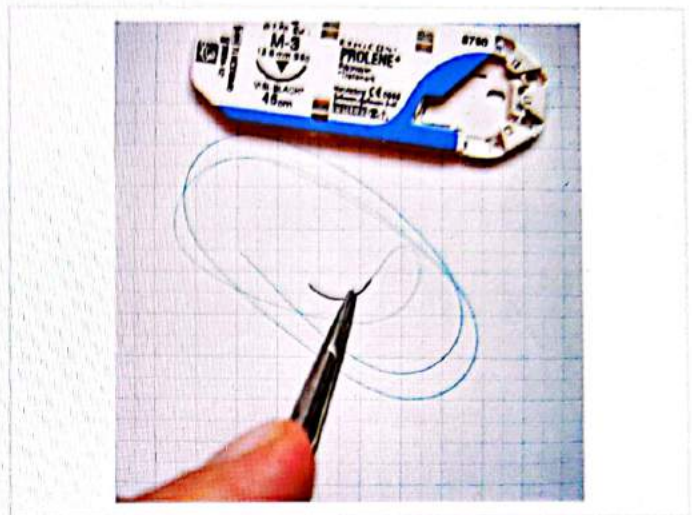
• Blade - WHITE COLOR CONTAINER

00:17:57



• Suture needle - WHITE COLOR CONTAINER

00:18:02



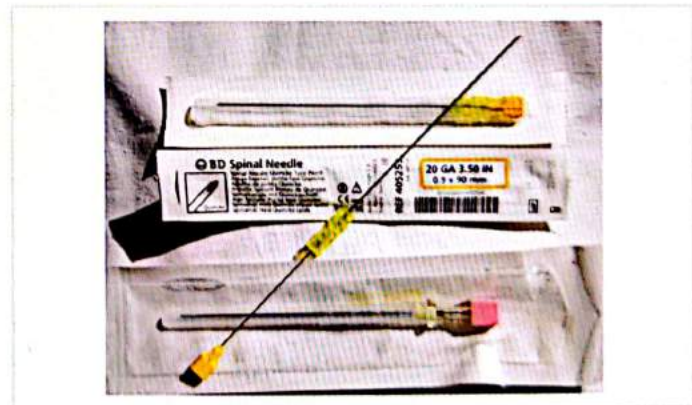
• Syringe with fixed needle - WHITE COLOR CONTAINER

00:18:09



• LuMbar puncture needle - WHITE COLOR CONTAINER

00:18:18



• Human anatomical waste - YELLOW COLOR BAG

00:18:25



- Soiled cotton, gauze piece, dressings, bandages - YELLOW COLOR BAG 00:18:34



- Blood soiled tissue paper, gauze piece and used dressing - YELLOW COLOR BAG 00:18:50



- Discarded/Expired medicines YELLOW COLOR BAG 00:19:02



- Blood bag including blood transfusion sets - YELLOW COLOR BAG 00:19:27



- Liquid chemical waste from lab including reagents and normal saline - YELLOW COLOR BAG 00:19:33



- Shoe cover - YELLOW COLOR BAG 00:19:42



Waste disposal techniques

Incineration

- Also known as mass burn technology.
- High temperature, dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter.

Advantages

- Reduction of waste volume (85-95%) and weight (30%).
- No pretreatment required.
- Has zero occupational hazard.

Incineration is not suitable for:

- Pressurized gas containers.
- Reactive chemicals (large amounts of cytotoxic drugs), silver salts and photographic/radiographic waste.
- Halogenated plastics (PVC).
- Waste with high mercury (broken thermometers) or cadmium content (used batteries, lead-lined wooden panels).
- Sealed ampoules containing heavy metals and sharps.

Important Information

Management of mercury spill

- Switch off fans.
- Remove anything metallic from one's body.
- Wear PPE.
- Never broom.
- Use 2 X-ray films or 2 cardboard pieces to collect the mercury.
- Put mercury in a tube half-filled with water.
- Send the tube back to the manufacturer.
- Clean floor with **sodium thiosulphate**.

Dual Chamber Incinerator

Dual chamber incinerator

00:23:11



- Temperature: 800-1100°C.
- Discarded or expired meds are incinerated at >1200°C.

Plasma Pyrolysis/Gasification

- Combustion efficacy shall be at least 99.99%.
- Temperature of combustion chamber after plasma gasification shall be 1050 +/- 50°C with gas residence time of at least 2 seconds, with minimum 3% oxygen in the stack gas.
- Stack height should be minimum 30 meters above ground level.

Deep Burial

- No common biomedical waste treatment facility (CBWTF) available within 75 km.
- 2 meters deep.
- Common practice in **PHCs**.

Guidelines for sharp disposal in health facility without biomedical treatment facility

- Healthcare facilities where no CBWTF is available at a

distance of 75km and also not within feasible coverage area of any nearby CBWTF.

- The treatment and disposal of biomedical waste can be carried out in secured deep burial pits and sharp pits as per authorization of PCB.
- Disinfect using 0.5-1% hypochlorite solution for 15-20 hours and put into pit e.g. needles, sharps, vials, syringes.
- **Sharp pit must be 1mX1mX1m concrete lined protected pit with a cemented lid.**
- Disposal of sharp containers needs to be done by discarding the **containers into the sharp pits**.

Important Information

Body spill management

- 0.1% sodium hypochlorite solution used.
- 10% sodium hypochlorite solution used for larger spills.

Autoclaving

Temperature	Pressure	Time
Not less than 121°C	15 pounds/square inch	60 minutes
Not less than 135°C	31 pounds/square inch	45 minutes
Not less than 149°C	52 pounds/square inch	30 minutes

- Autoclave

00:26:03



Inertization

- **Pharmaceutical waste.**
- **Mixing waste with cement and other substances before disposal.**
- Mixture includes:
 - 65% pharmaceutical work.

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- 15% lime.
- 15% cement.
- 5% water.

Screw Feed Technique

- **Biomedical waste + Auger + Heat + Rotate.**
- Weight reduced 20-25%.
- Volume reduced 80%.
- Used for infectious waste and sharp waste.
- Contraindicated for radiological waste, cytological waste and pathological waste.

Key Waste

- Tuberculosis sputum.
 - Incineration.
 - Burning.
 - Boiling.
 - Autoclave.
 - 5% cresol solution.
 - **The best way to dispose sputum is incineration.**
- Mercury disposal.
 - Sent back to manufacturer.
- e-Waste disposal.
 - Sent back to manufacturer.
- **Contents of red bag should not be incinerated as they contain cadmium that is explosive.**

COVID-19

- Used masks, tissues and toiletries of COVID-19 patient shall become biomedical waste and shall be segregated in yellow bag.
- Used rapid COVID-19 antigen test kits segregated in red bag.
- Pre-treat cartridges of gene expert, chips and microtubes of CBNAAT and the same segregated in red bag.
- Retractable safety syringes used in immunization program or as injections segregated in red bag.
- Segregation of biomedical waste and general solid waste should be done at the point of generation in wards or isolation rooms.
- There should be no segregation of biomedical waste and solid waste at temporary waste collection or storage area of healthcare facility to ensure occupational safety.

COVID-19 biomedical waste management in quarantine

- COVID-19 patient quarantined at home with two colored bags only.
- These bags are black and yellow.
- **Black bag for general waste.**
- **Yellow bag for all biomedical waste.**
- Different from hospital management where all 4 colored bags are available.

MCQs

Q. Used masks are disposed in which color bag?



- A. Red.
- B. White.
- C. **Yellow.**
- D. Blue.

Q. Plastic covers used to pack foley catheter is disposed in?

- A. Yellow.
- B. White.
- C. **Black.**
- D. Red.

Examples of general waste:

- Plastic covers.
- Wrapper/cover of a syringe.
- Carton for drug storage.

Q. Incineration is:

- A. High temperature reduction process.
- B. Low temperature reduction process.
- C. **High temperature oxidation process.**
- D. Low temperature oxidation process.

Q. Cytotoxic and expired drug disposal done by?

- A. Dumping.
- B. Autoclave.
- C. Landfill.
- D. **Incineration.**

Q. Human anatomical waste disposed in?

- A. **Yellow.**
- B. Red.
- C. Black.
- D. Blue.

Q. All are incinerated except?

- A. Human anatomical waste.
- B. Animal waste.

- C. Infected soiled waste.
- D. Broken thermometer.

Q. Disposal of glass vaccine vials as biomedical wastes is done by?

- A. Incineration.
- B. Autoclaving the landfill.
- C. Disinfection then recycling.
- D. Encapsulation.

Q. Expired medicines are discarded in which bag?

- A. White.
- B. Yellow.
- C. Red.
- D. Black.

Q. Which color bag should be used for disposal of N95 masks, head cover, head cap, disposable linen gown and shoe cover according to COVID-19 biomedical waste guidelines?

- A. Yellow bag.
- B. Red bag.
- C. Blue bag.
- D. White containers.

Q. Which color bag should be used for disposal of goggles, face shields, hazmat suits, plastic overall and nitrile gloves according to COVID-19 biomedical waste guidelines?

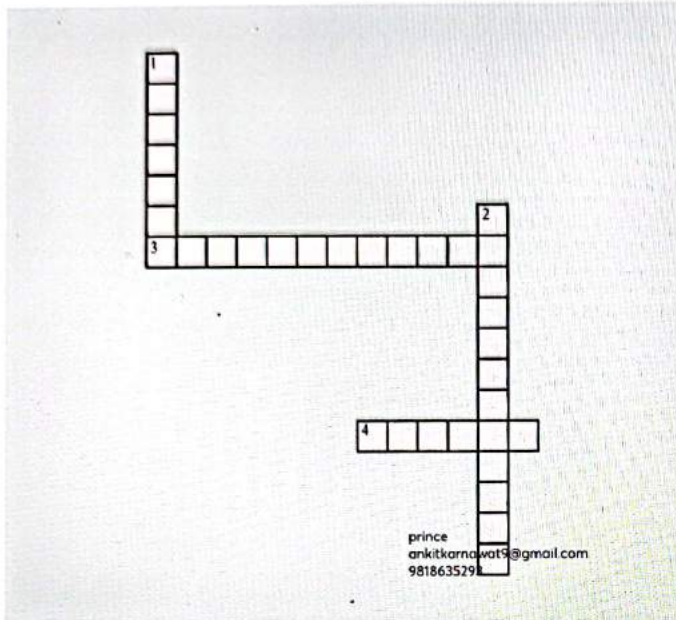
- A. Yellow bag.
- B. Red bag.
- C. Blue bag.
- D. White containers.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Combustion efficacy shall be at least 99.99%.
- 4. Contaminated waste that is recyclable

Down

- 1. Glassware or metallic body implants
- 2. Treatment and disposal

53

GENETICS



Genetics: Definitions

- **Genome:** the total genetic information of an individual which is encoded in the structure of DNA
- **Genomics** is the study of the **Human Genome**.
- **Gene therapy:** introduction of a gene sequence into a cell to modify its behaviour
- **DNA technology:** development of new diagnostic techniques such as **restriction enzymes**

Eugenics

- Deals with genetics manipulation
- Term given by Sir Francis Galton
- A **social philosophy** that advocates the improvement of human hereditary traits through **various forms of intervention** (genetic manipulation)
- There are two types of eugenics
 - **Negative eugenics:** is aimed at **lowering fertility** among the **genetically disadvantaged**.
 - Abortions
 - Sterilizations
 - Other methods of family planning
 - **Positive eugenics:** is aimed at **encouraging reproduction** among the **genetically advantaged**.
 - Financial and political stimuli
 - Targeted demographic analyses
 - In vitro fertilization
 - Egg transplants
 - Gene cloning

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Euthenics

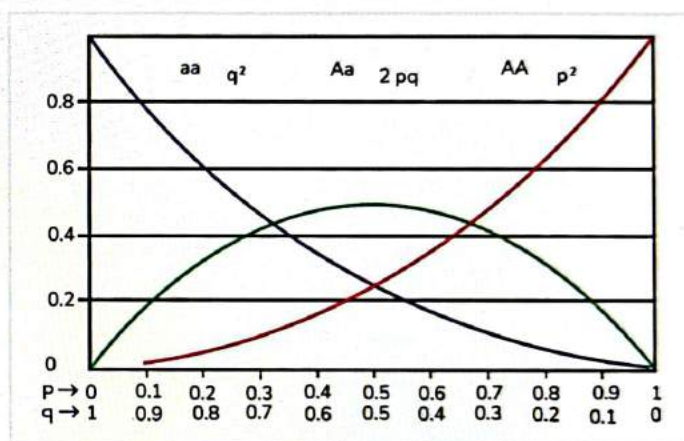
- Improving human race via environmental manipulation
- Deals with human improvement through altering external factors
 - Like education and the controllable environment, including preventing and removing contagious diseases and parasites, environmental, educational regarding home economics, sanitation and housing (environmental manipulation).

Hardy Weinberg Law

- The law states that the **genotype frequencies** in a **population remain constant** or are in equilibrium from generation to generation unless **specific disturbing influences** are introduced.
 - Migration is an example of a specific disturbance
- Genetic equilibrium (HW law) is a **basic principle of population genetics**; the entire principle is based on mendelian genetics
- HW law assumes that the human population is static.

- **Deviations in HW law:** this law fails to apply in
 - Non-random mating (assortative mating)
 - New mutations
 - Genetic drift
 - Gene flow
 - Natural selection - mortality selection, fecundity selection
 - Small population
 - Migration
 - Dynamic populations
- HW law assumes that the human population is static, large and has random mating.

HW law



Hardy Weinberg principle

$$p^2 + 2pq + q^2 = 1$$

- Frequency of homozygous dominant genotype + frequency of homozygous recessive genotype + frequency of heterozygous genotype

Hardy Weinberg is only applicable for

- Infinitely large population
- Random mating populations
- Static populations

Hardy Weinberg fails if

- Small populations
- Dynamic populations
- Non-random mating
- Assortative mating
- Mutations
- Natural selection
- Gene flow
- Genetic drift
- Migration

MCQs

Q. Environmental manipulation which enables genes to express themselves readily is known as?

- A. Positive eugenics
- B. Negative eugenics
- C. **Euthenics**
- D. Genetic counselling

Q. The primary goal of the human genome project has been?

- A. Introduction of a gene sequence into a cell to modify its behaviour
- B. Development of new diagnostic techniques such as restriction enzymes
- C. **Identify genes and sequence of base pairs in DNA of human genome**
- D. Confirmation of Hardy Weinberg law

Human genome project

- An international research project
- Primary goals were to determine the sequence of chemical base pairs which make up DNA and to identify the approximately 25,000 genes of the human genome
- They also want to understand it and complete a map of all their findings
- The project began in 1990 initially headed by James D. Watson

Q. Marriage between two heterozygous individuals for the same disorder is prevented by?

- A. Retrospective genetic counselling
- B. **Prospective genetic counselling**
- C. Legislation
- D. Mass health education

Genetic counselling

- Two types of counselling

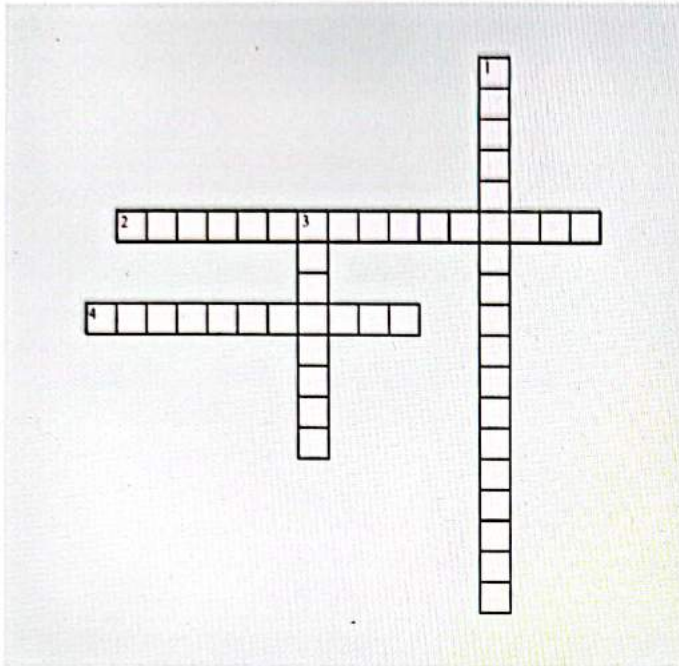
Prospective genetic counselling	Retrospective genetic counselling
<ul style="list-style-type: none">• Identify heterozygous individuals for any particular defect through screening	<ul style="list-style-type: none">• Seeking genetic advice after the hereditary disorder has already occurred in family
<ul style="list-style-type: none">• Explain the risk of having affected children if they marry another heterozygous for the same gene	<ul style="list-style-type: none">• Congenital anomalies, mental retardation, psychiatric illness, inborn errors of metabolism
<ul style="list-style-type: none">• Sickle cell anemia and thalassemia	<ul style="list-style-type: none">• Most common



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Law states that the genotype frequencies in a population remain constant
- 4. Genetic disorder

Down

- 1. An international research project
- 3. Deals with genetics manipulation

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PREVIOUS YEAR QUESTIONS

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- Q. Training is given to ANM workers. Now you have to check her ability to do immunization. You are a medical officer. She is having cotton, lunch box and a syringe-needle after immunization of a child. Which of the following is true?
(FMGE Dec 2020)
- A. Syringe with a needle in a translucent white container.
B. Use vial in a translucent white container.
C. **Cotton swab in yellow bag**
D. Food waste in the blue box.
- Q. Which of the following is not a health worker at the village level?
(FMGE June 2022)
- A. ANM
B. AWW
C. ASHA
D. TBA
- Q. Inertization is? (FMGE June 2018)
- A. Reducing organic, combustible waste to inorganic waste
B. Burning biomedical waste
C. **Biomedical waste converted into harmless waste**
D. To avoid water contamination
- Q. A person with a history of 30 years working in the cardboard manufacturing industry, develops breathlessness and cough. X-ray shows mottling in the lungs. The Disease most likely is?
(FMGE June 2021)
- A. **Bagasse's**
B. Asbestosis
C. Byssinosis
D. Nasopharyngeal carcinoma
- Q. Maximum working hours duration including overtime for a person working in a Factory, as per the factory Act 1948 is?
(NEET 2020)
- A. 100
B. **60**
C. 48
D. 72
- Q. Under the ESI, after certification by medical officer, beneficiaries get 70% wages for 3 months under?
(FMGE Dec 2020)
- A. Medical benefit
B. **Sickness benefit**
C. Disablement benefit
D. Dependents benefit
- Q. Which vaccine is effective for mass vaccination post-disaster?
(INICET Nov 2019)
- A. Cholera
B. Typhoid
C. **Measles**
D. Scrub typhus
- Q. Green color in Triage signifies? (NEET PG May 2022)
- A. Dead patients
B. High priority patients
C. **Ambulatory patients**
D. Moderate priority patients
- Q. Blood bag should be deposited in which category bag?
(FMGE June 2022)
- A. **Yellow**
B. Red
C. Blue
D. White
- Q. Patient presented with blue lines on gums, abdominal pain, constipation. How will you manage the patient?
(FMGE June 2022)
- A. Atropine
B. **EDTA + Dimercaprol**
C. Deferoxamine
D. Acetyl Cystine
- Q. Under Biomedical waste management guidelines, following could be used for Blood spillage:
(FMGE June 2022)
- A. **Sodium hypochlorite**
B. Hydrogen peroxide
C. Phenol
D. Cresol
- Q. Broken glass vaccine vials at the Vaccination center are supposed to be disposed in which container
(NEET PG May 2022)
- A. Yellow bag
B. Red bag
C. Sharps container
D. **Blue puncture proof container**



54

BIOSTATISTICS

Biostatistics

- **Biostatics** is the processing and analyzing of information.
- In biostatistics, there is variable and data.
- Variable is anything which can take up a value.
 - E.g., Gender, area of residence, smoking, alcoholism
- Data is the numbers that variables take (data is the raw number/valuable).
- Biostatistics is the application of statistics in the field of medicine.
- Relevance/Importance of biostatistics: Whatever information is collected must be processed and further analyzed.

Classification of variables

00:08:00

1. Quantitative vs Qualitative variables
2. Continuous vs Discrete
3. Dichotomous vs Polytomous

Quantitative Vs Qualitative Variables

Quantitative Variables	Qualitative Variables
<ul style="list-style-type: none"> • Can be measured (it has a unit) • Can be compared 	<ul style="list-style-type: none"> • Cannot be measured (it has no unit) • Cannot be compared
<p>E.g.,</p> <ul style="list-style-type: none"> • Weight; can be measured in a unit, can be compared <ul style="list-style-type: none"> ◦ Unit can be kg, gm. • Height can be measured in feet, cm. • Hemoglobin can be measured in gm/dl. • Blood parameters-LDL, HDL. • Age can be measured in years and months. 	<p>E.g.,</p> <ul style="list-style-type: none"> • Gender <ul style="list-style-type: none"> ◦ There is no unit to measure gender and it cannot be compared. ◦ E.g., If 10 boys and 10 girls are sitting in class, then 10 is the frequency but not unit for gender. • Religion • Blood group • Rh status • Anemia

Continuous Vs Discrete Variables

Continuous Variables	Discrete Variables
Variables which can take up many possible values and in between values.	Variable which can take up few values and no between values.
They can be expressed in decimals.	They cannot be expressed in decimals.
All the quantitative variables are continuous.	All qualitative variables are discrete.

E.g.,

- Weight
- Height
- Hemoglobin
- Blood parameters - LDL, HDL
- Age in years and months (E.g., 25.2 years or 30.1 year)

E.g.,

- Gender
- Religion
- Blood group
 - Either a person is A+ or B+ or AB+, they cannot lie in between.
- Rh status: Rh+ or Rh-
- Age group (15-20 years or 21-25 years).

Dichotomous Vs Polytomous Variables

Dichotomous Variables	Polytomous Variables
It can take up two values.	It can take up more than 2 values.
<p>E.g.,</p> <ul style="list-style-type: none"> • Presence/absence of disease (It can be either yes or no) • Presence or absence of anemia • Rh status (Rh+ or Rh-) • 2 age groups (15-20 years or 21-25 years). 	<p>E.g.,</p> <ul style="list-style-type: none"> • Gender (Male, Female or Transgender). • Types of anemia • Blood group (A+, B+, AB+ etc.) • Age in years and months

MCQ's

00:25:49

Q. Blood pressure is which type of variable?

- Nominal
- Qualitative
- Discrete
- Continuous**

Q. Which of the following is a continuous variable?

- Blood group
- Weight**
- Religion
- Sex

• **Pulse rate**

- It can be measured in units (beats/min).
- It can be compared.
- So, it is a quantitative variable.
- E.g., Count the pulse rate for 2 min and it comes out 165beats in 2min so in 1 min it will be 165/2 i.e., 82.5 beats.
- So, it can be expressed in decimals hence it is continuous variable.

- o Also, ICU monitors report pulse rate in decimals.
- o Pulse rate can take up so many values hence it is polytomous.
- **Presence / absence of hypertension**
 - o Qualitative: It can not be measured in unit, either a person is hypertensive or not.
 - o Discrete
 - o Dichotomous

- **Guttman scale give answers in yes or no.**
 - o So, it is not ordinal.

Dimensional or metric scale of measurement

Interval scale

- Metric data without an absolute zero and no start point.

Examples

- Temperature in Celsius.
- Temperature in Fahrenheit.

Ratio scale

- Metric data with an absolute zero.

Examples

- LDL, HDL
- Weight, height
- Temperature in kelyin units.

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Scales of measurement

00:30:39

1. Categorical scale of measurement

- a. Nominal scale
- b. Ordinal scale

2. Dimensional or metric scale of measurement

- a. Interval scale
- b. Ratio scale

- All quantitative variables will be measured in dimensional or metric scale.
- All qualitative variables will be measured in categorical scale.

Nominal scale	Ordinal scale
<ul style="list-style-type: none"> • It can be expressed in names. • E.g., If there are a greater number of boys in class or a greater number of girls in the class. • It occurs most commonly. 	<ul style="list-style-type: none"> • It can be arranged in order.

Examples

- Presence/absence of hypertension
- Gender
- Type of delivery done
- o E.g., How many women get vaginal delivery or C-section done or how many have breech delivery.
- Religion
- Blood group

Examples

- Stage of cancer (Stage I, or Stage II etc.)
- Severity of anemia (Mild, moderate or severe)
- Grading of Hypertension
 - o Grade I, II or III
 - o Mild, moderate or severe
- APGAR Score
- Child Pugh score
- Glasgow Coma Scale
- Likert scale: Sense of satisfaction is measured.
 - o E.g., Satisfaction of student with their performance in exams can be graded.
 1. Extremely dissatisfied
 2. Dissatisfied
 3. Neutral
 4. Satisfied
 5. Extremely satisfied

Important Information

- Qualitative variable can be ordinal or nominal.
- All the quantitative variables can be interval or ratio.
- In interval except temperature in Celsius or Fahrenheit rest all is quantitative variable.

MCQs

00:39:30

Q. In a study following interpretations are obtained: Satisfied, very satisfied, dissatisfied. Which type of scale is this?

- A. Nominal
- B. Ordinal**
- C. Interval
- D. Ratio

Q. An investigator studies into the life expectancy of IV drug abusers divides a sample of patients into HIV positive and HIV negative groups. What type of data does this division constitute?

- A. Nominal**
- B. Ordinal
- C. Interval
- D. Ratio

Q. A study wishes to assess birth characteristics in a population. Which of the following describes the appropriate measurement scale or type?

- Continuous
- Ordinal
- Nominal
- Dichotomous



- A. ----- birthweight in grams
- B. ----- birthweight classified as low, medium, high
- C. ----- birthweight classified as low, not low
- D. ----- Delivery type classified as cesarean, natural, induced

Q. Which scale of measurement best represents central tendency?

- Mean: Dimensional or metric scale.
- Median: Ordinal scale
- Mode: Nominal scale

Ans.

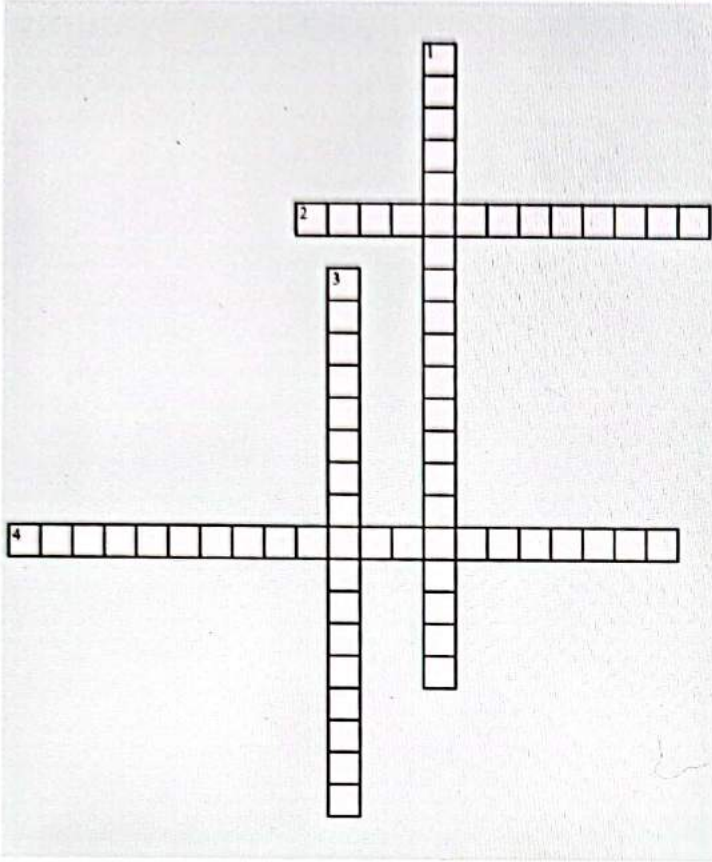
- A. Birthweight in grams: Continuous
- B. Birthweight classified as low, medium, high: Ordinal
- C. Birthweight classified as low, not low: Dichotomous
- D. Delivery type classified as cesarean, natural, induced: Nominal



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 2. Information collected has to be processed and analyzed further.
- 4. Can be measured Has a unit

Down

- 1. Cannot be measured Has no unit
- 3. Can take up few values and no between values

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Central Tendency

00:00:49

- **Central value:** The value which is most representative for any data set.
- **Example:** There are 100 students in class i.e., $N=100$, Weight of 100 students in a class
 - $n_1, n_2, n_3, n_4, \dots, n_{100}$, Weight = 50kg, 56kgs, 54kgs, 60kgs, 68kgs.
 - That one weight which would be most representative of all other individual weights of students in class will be the central value.

• Central value depending on the type of variable can be

- Mean
- Median
- Mode

• Mean is the quantitative measure.

• **Median and Mode** - qualitative measure.

Mean

• Sum of observations divided by total number of observations.

$$\text{Mean} = \frac{\text{Sum of the observations}}{\text{No. of observations}}$$

• **Example:** A data set containing the following observations: 4, 1, 2, 3, 5

$$\text{Mean} = \frac{4 + 1 + 2 + 3 + 5}{5} = \frac{15}{5} = 3$$

• 3 is the most representative weight of the entire data set.

Median

• It is the middle value of data set arranged in ascending order or descending order.

Example-1: Data set - 2, 1, 3, 1, 4 (odd observations). Calculate median.

- Arrange in ascending order: 1, 1, 2, 3, 4.
- Median = 2 (middle value).

Example-2: Data set - 2, 1, 3, 1, 2, 4 (even observations)

- Arrange in ascending order: 1, 1, 2, 2, 3, 4.
- For even observation, Median = Average of two middle values.

$$\text{Median} = \frac{2 + 2}{2} = 2$$

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• Therefore, the median is 2.



Important Information

- $N = \text{Odd observations}$: Median is the middle value when data arranged in ascending order or descending order.
- $N = \text{Even observations}$: Median is the average of two middle values when data is arranged in ascending order or descending order.

• **If $N = \text{odd observations}$**

- Median = $\left(\frac{n+1}{2}\right)^{\text{th}}$ value.

Example: Data set - 2, 1, 3, 1, 4 (odd observation)

• According to formula,

- Median = $\left(\frac{5+1}{2}\right)^{\text{th}}$ observation = $6/2 = 3^{\text{rd}}$ observation.

- Arrange in ascending order = 1, 1, 2, 3, 4

- Median = 2.

• **If $N = \text{even observations}$**

- Median = $\left(\frac{\left(\frac{n}{2}\right)^{\text{th}} + \left(\frac{n}{2} + 1\right)^{\text{th}}}{2}\right)$

Example: Data set - 2, 1, 3, 1, 2, 4 (even observation)

• Arrange in ascending order - 1, 1, 2, 2, 3, 4

• According to formula,

- Median = $\frac{\left(\frac{6}{2}\right)^{\text{th}} + \left(\frac{6}{2} + 1\right)^{\text{th}}}{2} = \frac{3^{\text{rd}} + 4^{\text{th}} \text{ value}}{2} = \frac{2+2}{2} = 4/2 = 2.$

- Median = 2.

Mode

- It is the most repeated or frequently occurring value in a data set.
- If 2 values are repeated in a data set then it is bimodal.

Example: 2, 1, 2, 1, 3

- Mode = 1, 2, it is bimodal
- To convert bimodal into unimodal - average of two values is taken

- Mode = $\frac{1+2}{2} = 3/2 = 1.5$

• Question: data set - 2, 1, 2, 1, 3. Find mode.

• Options are:

- A. (1, 2)
- B. (1.5)

• Always mark the option with bimodal over unimodal.

- Q. Out of the three, which measure of Central Tendency is the best?
- Statistically, mean is the best measure of Central Tendency.
 - Because it covers all the observations.

MCQs 00:24:07

Q1: 18, 20, 22, 24, 26, 28 and 30. Best Central Tendency is determined by

- A. Mean
- B. Median
- C. Mode
- D. Range

Explanation:

- All observations are of two digits.
- No outliers are present.
- Outliers are extreme values in a data set (too high or too low values).
- Outliers makes the data set skewed.
- In this data set there is no outlier, so this data set is not skewed i.e., this is normal data distribution.
- So "mean" is the best measure of central tendency.

Q2: The number of malaria cases reported during the last 10 years in a town is given below, 250, 320, 190, 300, 5000, 100, 260, 350, 320, and 160. The epidemiologist wants to find out the average number of malaria cases reported in that town during the last 10 years. The most appropriate measure of average for this data will be

- A. Arithmetic mean
- B. Mode
- C. Median
- D. Geometric mean

Explanation:

- Data has outliers making it skewed.
- The outlier here is 5000 which may have been mistaken with 500.
- If the mean is calculated using 5000 value, we get an exaggerated value.
- If the median is calculated, arrange in ascending order i.e., 100, 160, 190, 250, 260, 300, 320, 320, 350, 5000 (even observation)
- Median = average of two middle value = $260 = 300/2 = 280$.
- The outlier 5000 doesn't interfere with the result.
- **When outliers are present (too high or too low values), it makes the data skewed so the best measure of central tendency is Median.**

Golden Points 00:33:29

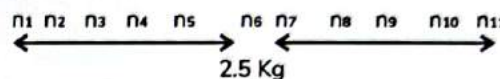
- Statistically best measure of CT: **Mean**.
- The best measure of CT for skewed observations (outliers present): **Median**.
- The most affected measure of CT for skewed observations: **Mean**.

- The best measure of CT when there is a wide range of data sets: **Median**.
- Statistical tests to detect outliers:
 - Grubbs test
 - Dixon Q test
- Mode = 3 median - 2 mean

Q3: Out of 11 births in a hospital, 5 babies weighed over 2.5kgs and 5 weighed less than 2.5kg. What value does 2.5 represent?

- A. Geometric average
- B. Arithmetic average
- C. Median
- D. Mode

Explanation:



- 11 observations are present.
- 5 babies weighed over 2.5 and 5 below 2.5.
- So, 2.5 is the middle value which is median.

Q4: Bimodal distribution is represented by

- A. Mode = 3 median + 2 mean
- B. **Mode = 3 median - 2 mean**
- C. Mode = 2 median + 2 mean
- D. Mode = 2 median - 2 mean

Keynote

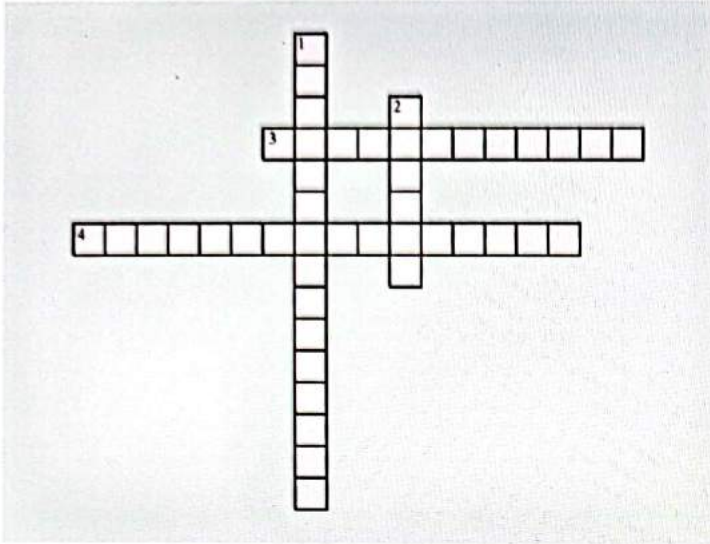
- CT is the most represented value.
- CT can be
 - Mean
 - Mean = $\frac{\text{Sum of the observations}}{\text{No. of observations}}$
 - Statistically the best as it includes all the observations.
 - Median
 - Middle value when data is arranged in ascending or descending order.
 - For odd observation, Median - Middle value.
 - For even observation, Median - Average of 2 middle values.
 - Mode: Most repeated value in the data set.
- Central value: Most representative value of data set.
- Skewed observations mean it has outliers.
 - Terms
 - Extremely high
 - Extremely low
 - Too high
 - Too low
 - The best measure of central tendency in that case is Median.
 - Most affected value is Mean.



CROSS WORD PUZZLES



Crossword Puzzle



Across

- 3. Statistically best measure of CT: Mean.
- 4. Median is the average of two middle values

Down

- 1. Median is the middle value.
- 2. Middle value of data set arranged in ascending order or descending order.

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MEASURES OF DISPERSION



Measure of central tendency 00:00:34

- Central value: That value which is most representative for any data.
- Example: 50 students in a class (μ) -with different weights
- $N_1 \dots n_{50}, \mu = 50, 56, 62, 68 \dots$
- μ = mean weight - sum of all weights in a class/ no. of students
- E.g., Mean weight of 100 students in class is 50kg.
- 50 kg- central value i.e., it is the most representative weight of 100 students.
- Individual weights of students are dispersed/scattered around the mean weight.
- How much is the spread/variability (how far, how close) individual value are to the mean weight i.e., **How much is the spread of individual weight around the central value -This spread is known as Dispersion.**
- **Measures of dispersion:** Spread of value in a data set around the central value.
- These measured values can be closer to the central value, or they could be far away from the central value.
- **Measures of dispersion = measures of variability = measures of the spread of data**
- **Various measures of dispersion:**
 - Range
 - Mean deviation
 - Standard deviation
 - Variance
 - Coefficient of Variation
 - Standard error of mean
 - Standard error of proportion

Range 00:08:52

- Q.** What is the range?
Ans. It is a measure of dispersion.
- Range = Maximum value - Minimum value
 - E.g., There is a class of 100 students. Maximum weight of student in class is 100kg. Minimum weight of student in class is 50 kg. Calculate the range of weights of students in the class.
 - Range = Maximum value- Minimum value
 - Max value = 100 kg
 - Minimum value = 50 kg
 - Range = 100-50 = 50 kg
 - Interpretation: There are no two students in class between whom the difference of weight is more than 50 kg.

Mean deviation and Standard Deviation 00:12:52

- **Mean deviation** = $\sum X - \bar{x} / N$
- **Average of the deviation from the arithmetic mean**
- X = Observed value
- \bar{x} = Mean value
- N = Sample size

Standard Deviation

- It is the most commonly used measure of dispersion.
- Standard deviation is meant for individual observations.
- E.g., There 50 students in class and mean weight is 50 (μ)
- Now $\mu_i = 50, 58, 62, 60 \dots$
- $\mu = 50$ kgs
- Standard deviation tells how these individual values are dispersed around the μ
- μ_i is observed value and μ is mean value.

Number of individuals	μ_i (weight of students)	μ (mean value)	$\mu_i - \mu$
1	50	50	0
2	58	50	8
3	62	50	12
4	60	50	10
5	52	50	2
6	48	50	-2

- All positives would cancel all negatives hence $\sum (\mu_i - \mu) = 0$
- To remove the effect of all positives and negatives, square the $(\mu_i - \mu)^2$
- For final formula, the effect of square needs to be removed.
- $SD = \sqrt{\sum (\mu_i - \mu)^2 / N}$
- **The standard deviation is the root mean square of the deviation.**

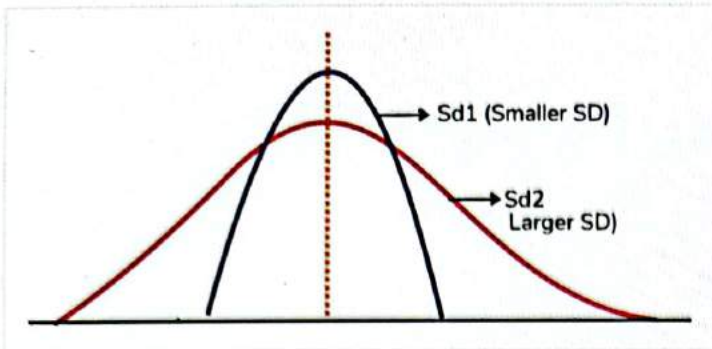
Q. If the sample size is less than 30 ($N < 30$), what is the formula for the standard deviation?

- Ans:** $SD = \sqrt{\sum (\mu_i - \mu)^2 / N - 1}$
- μ_i - individual value
 - μ - mean value

Interpretation:

- Q.** In a class of 100 students, mean weight is 50 kg. Standard deviation is 5. So what does this mean?
- N = 100 students
 - $\mu = 50$ kgs
 - Standard deviation = 5 kg

Ans: Weight of 100 students in the class lie between 50 +/- 5 kgs i.e., 45-55 kg.



- Smaller deviation- less dispersion- Sd_1
- Larger standard deviation-larger dispersion- Sd_2
- More the standard deviation, more is the spread of value in the data set -It becomes less reliable.
- If there is lower standard deviation, less is the spread of values in the data set-it becomes more reliable.
- According to this graph, first set is more reliable than the second set.

Variance and Coefficient of Variation

00:26:47

Coefficient of variation: Used to compare the spread or variability of any two data sets.

Data A	Data B
N = 100 students	N = 100 students
μ_1 weight = 50 kg	μ_2 weight = 60 kg
$\sigma_1 = 5$ kgs	$\sigma_2 = 3$ kgs

Q. Which data set is more reliable?

- Reliability depends upon the spread of data set.
- The more is data spread, less reliable it is.
- $COV_A = \sigma / \text{mean} \times 100$
- $COV_A = 5/50 \times 100 = 10\%$
- $COV_B = 3/60 \times 100 = 5\%$
- **More COV=more dispersed / more spread of data- which means it is less reliable**
- Therefore, data set A is less reliable than data set B since COV is more of the data set of A than that of data set B.
- Standard deviation is more in set A, hence more spread the values are making it less reliable.
- **Variance= σ^2**
- $\text{Variance}_A = 5 \times 5 = 25$
- $\text{Variance}_B = 3 \times 3 = 9$
- The variance for data set A is more than data set B hence more the spread for Data Set A making it is less reliable.
- **High yield point:** More the values of dispersion (higher standard deviation, variance, or COV), more is the spread of data hence less reliability.
- How to make it more reliable?
 - Lower the values of measures of dispersion i.e., less is the spread of data hence more reliable.

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- How can we lower the value of measures of SD variation?
 - Increase the sample size: Value of measures of dispersion will decrease - reliability of data set will increase.

Standard Error

00:34:58

- Standard error: Standard deviation of sample means.
- E.g., In Population of 10,000 people, calculate the mean hemoglobin?
- It is not possible to take sample of 10,000 people so take out a small sample like 500 people
- So, in this sample of 500 people mean hemoglobin is calculated, this is the sample mean.

Q. How sample means are dispersed around the population mean?

Ans: Standard error - sample observation

- Standard deviation means for individual observation i.e., how individual values are spread around the mean value.
- **Example:** N= 100 students, Mean Hb = 12gm/dl, SD = 3 gm/dl. Calculate SE of Mean
- $SE_{\text{mean}} = \sigma / \sqrt{N} = 3 / \sqrt{100} = 3/10 = 0.3$
- $SE_{\text{proportion}} = \sqrt{pq/N}$
- **Example:** N= 100 students, Mean weight = 50 kgs, Prevalence of obesity = 10%. Calculate $SE_{\text{proportion}}$.
- $SE_{\text{proportion}} = \sqrt{pq/N}$
- p= prevalence = 10
- q= 100 - p = 100-10=90
- $SE_{\text{proportion}} = \sqrt{10 \times 90 / 100} = \sqrt{900/100} = \sqrt{9} = 3$

Standard deviation	Standard error
Individual observation	Sample observation
SD means how individual values are dispersed around the mean value.	SE means how sample means are dispersed around population mean.
$SD = \sqrt{\sum (\mu_i - \mu)^2 / N}$ If sample size <30, $SD = \sqrt{\sum (\mu_i - \mu)^2 / N - 1}$	$SE = \sigma / \sqrt{N}$ $SE_{\text{proportion}} = \sqrt{pq/N}$

- Standard error of the difference between 2 Means
 - $SE = \sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}$
- SE of difference between 2 proportion
 - $SE = \sqrt{p_1q_1/n_1 + p_2q_2/n_2}$

MCQs

00:44:58

- Q. Most common deviation used in social medicine is
- Mean
 - Range
 - Variance
 - Standard deviation

Q. Is it possible to measure variation between two different units of the data set?

- A. Variance
- B. Coefficient of variation
- C. Standard deviation
- D. Range

Ans: Coefficient of variation = $\sigma / \text{mean} * 100$

Q. True statements regarding standard deviation is/are:

- A. 1 SD covers 95% value in a distribution
- B. It indicates the distribution of variables
- C. It is most commonly used method of dispersion
- D. Applicable only for normal distribution
- E. It is a better indicator of the variance than the range

Ans: It indicates the distribution of variables

It is most commonly used method of dispersion.

- Mean +/- 1SD = 68%
- Mean +/- 2SD = 95%
- Mean +/- 3SD = 99%

Q. There are 50 individuals in a population, and they all have the same hemoglobin level of 14g/dl. As there is no variability, the standard deviation will be:

- A. 0
- B. 1, -1
- C. 0, 1
- D. +2
- E. -2

n_i	μ_i	$\mu = \sum 50 \times 14 / 50 = 14$	$\mu_i - \mu$	$(\mu_i - \mu)^2$
n1	14	14	0	0
n2	14	14	0	0
n3	14	14	0	0
n4	14	14	0	0

$SD = \sqrt{\sum (\mu_i - \mu)^2 / N} = 0$

Q. When a relationship between the heart rate and Valsalva ratio is studied mean is useful but the dispersion of the data is also very useful. Which method of spread will be more useful in this?

- A. Range
- B. Standard deviation
- C. Coefficient of variance
- D. Percentage
- E. Interquartile range

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Explanation: There are 2 data sets i.e., heart rate and Valsalva that is compared so whenever spread of 2 data is compared, COV is used.

Q. Village 1 has a population of 1000, and the mean age of the population is 20 years and SD 2 years.

Village 2 has a population of 2000, and mean age of 40 years and an SD 1 year.

- A. Variation in village 1 is 10.
- B. Variation in village 2 is 2.5.
- C. Village 1 has a higher variation.
- D. Village 2 has a higher variation.

Use the following key to mark the correct answer

- a) A, B, C are correct
- b) A and C are correct
- c) B and C are correct
- d) If all four options are correct

The correct answer = a

- Village 1 - SD - 2 years and mean = 20 so $COV = 2/20 \times 100 = 10\%$
- Village 2 - SD - 1 year and mean = 40 so $COV = 1/40 \times 100 = 2.5\%$

Q. Whose data set is more reliable-village 1 or village 2?

Ans. COV-10% for village 1 and village 2 is 2.5, so COV is more for village 1 than village 2 hence village 1 is less reliable.

- More COV = More spread = Less reliability

Q. If the birth weight of each of 10 babies born in a hospital in a day is found to be 2.8 kgs, then the standard deviation of this sample will be

- A. 2.8
- B. 0
- C. 1
- D. .28

Relative Deviate (Z score)

00:55:37

- It tells within how many standard deviation, an individual value is dispersed around the mean value.
- Example: Mean value = 50 kgs, A person weight is 48 kgs.
- So, this individual weight which lies within how many standard deviations of the mean weight is Z score.
- Any individual value which lies within two SD of the mean value is considered normal.

Q. N= 100, Mean weight = 60 kg, SD = 2.5 kg. Weight follows a normal distribution. What is the relative deviation of a student whose weight is 62.5 kg?

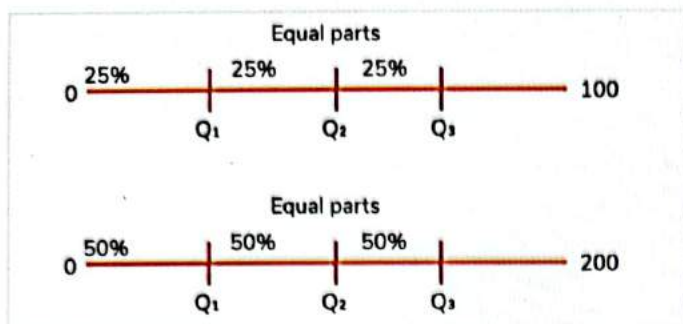
Ans. Z-score or relative deviate = $\mu_i - \mu / \sigma = (62.5 - 60) / 2.5 = 2.5 / 2.5 = 1SD$

- The student's weight lies within 1 SD of the mean weight.

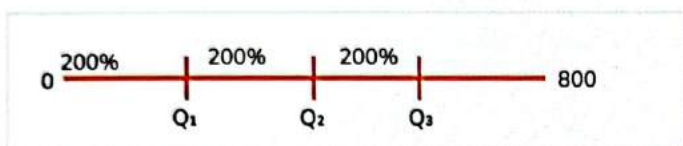
Measures of Location

01:00:51

- Quartiles divides data set into 4 equal parts.



- For data set 0-100 - Each part is divided into 25%.
- For data set 0-200 - Each part is divided into 50%.

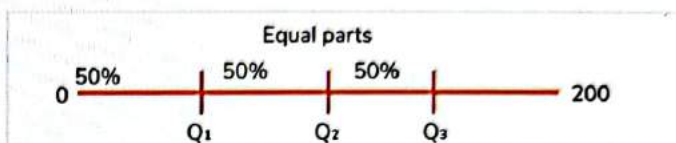


- Example: Data set of 800
- It will be divided into 4 equal parts of 200%
- First Quartile Q_1 divides data set - 1:3
 - One part is below, Three parts are above i.e., 25% value is below, and 75% value is always above.
- Q_2 divides your data set - 1:1
 - Two part is below, Two parts are above i.e., 50% is below, and 50% is always above.

- Q_3 divides your data set - 3:1
 - Three part is below, one part is above i.e., 75% is below, and 25% is above.

Q. 200 people had their blood pressure measured. The first quartile BP was 94 mm Hg, and the third quartile BP was 110 mm Hg. How many persons will have a BP between the 3rd and the 4th quartile?

- A. 100
- B. 50
- C. 25
- D. 150



Explanation: $Q_1 - 94, Q_3 - 110$

Each part will be 25% of 200 = 50

- How many people have BP below 110 mmHg?
- Ans. = 150
- $Q_3 = 3:1 = 75\%$ of 200 = 150

Q. How many people have BP above 94 mmHg?

Ans: 150

- $Q_1 = 1:3 = 75\%$ of 200 = 150

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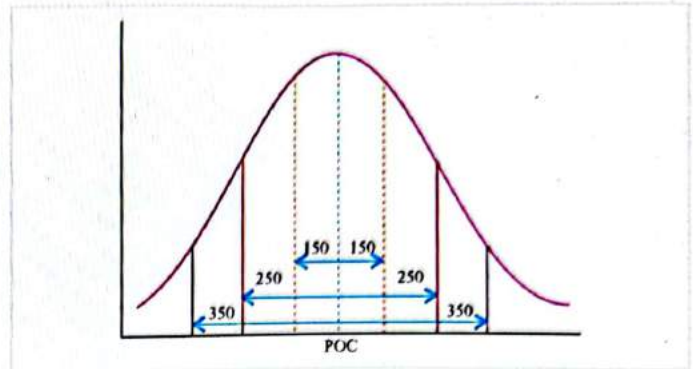


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TYPES OF DISTRIBUTION

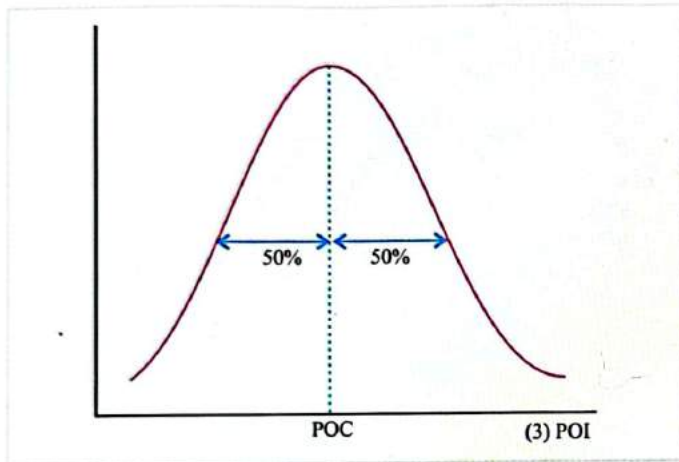
2 Types:

- Normal distribution
 - No outlier
 - Mentioned in the measures of central tendency
- Skewed distribution
 - Outliers present (extremely high or low values or too high or two low values)
 - Wide range of values



Normal Distribution

00:01:49



- Other name: **Gaussian distribution**
- Shape: Bell shaped curve
- It is bilaterally symmetrical
 - Both sides are mirror images of each other
 - If we draw a perpendicular it is going to cut the base at exactly two halves (50% observation above and 50% (0.5) observation below)
- **POC:**
 - Point of coincidence (**mean = median = mode**)
 - In some conditions, mean = median = mode=0 (standard normal distribution)

Normal distribution	Standard normal distribution
Mean= Median= Mode	Mean= Median= Mode=0

- **Total dispersion:** $0.5 + 0.5 = 1$
 - Measure: Standard deviation = 1
- For a normal distribution curve, correct representation is **mean = 0, SD = 1**
- **Total area under the curve is = 1**

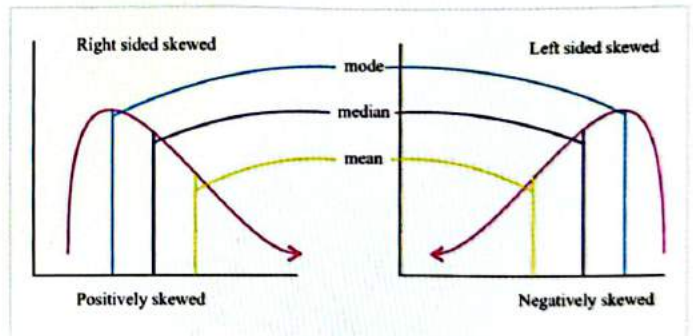
Explanation for Curve

- Orange line cuts base at a distance of 1 standard deviation on either side
- Red line - 2 standard deviation on either side.
- Pink line- 3 standard deviation 3 on either side
- Mean \pm 1SD = 68% of observations
- Mean \pm 1.64 SD = 90% of observations
- Mean \pm 2SD = 95% of observations
- Mean \pm 3SD = 99% of observations
- Mean \pm infinity SD = 100% of observations
- Tale of the curve never touch the base line

Skewed Distribution

00:15:11

- Outliers are present.
- **Mean, median, and mode are not equal at the POC (not going to lie in a same line)**



Explanation of the Curve

- Decide the skewness by looking at the direction of the tail
- **Curve A:** Tail of the curve is pointing towards the **right side** (right sided skews)
 - It is also known as positively skewed (**mean > median > mode**)
- **Curve B:** Tail of the curve is pointing towards the **left side** (left sided skews)
 - It is also known as negatively skewed (**mean < median < mode**)

- Pink color of the graph is median (middle value)
- Most affected central tendency (orange line) is mean: lowermost
- Least affected (green line): Mode (top)

- Q. Not true about standard normal curve
- Equal distribution on either side of the curve
 - The total area under the curve is 2**
 - It's mean is zero
 - Standard deviation is 1

Q. A study had a normal distribution with a median value of 200 and a standard deviation of 20. 68% will fall between:

- 160-240
- 170-230
- 180-220**
- 190-210

Explanation:

$$\text{Mean} \pm 1 \times \text{SD} = 68\%$$

Q. A nutritional research team followed serum levels of vitamin B12 in 120 children for three years to determine the association between cyanocobalamin deficiency and the subsequent risk of developing Megaloblastic anemia. The results were as follows:

VITAMIN B12 LEVELS

Mean = 260 pg/mL

Median = 226 pg/mL

Mode = 194 pg/MI

From the data, it can be concluded that this distribution is:

- Normal
- Negatively
- Positively skewed**
- Any of the above

Q: In a group of 100 children, the mean weight of children is 15kg. The standard deviation is 1.5kg. Which one of the following is true?

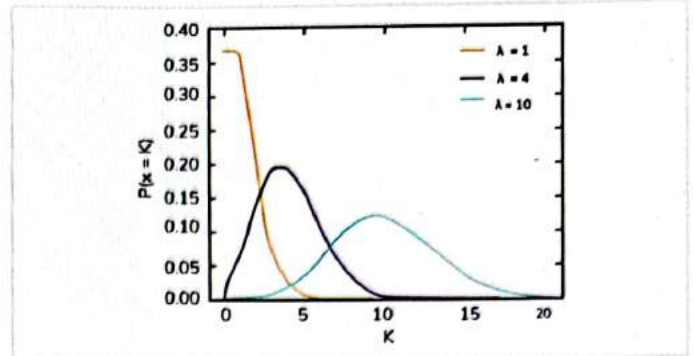
- 95% of all children weigh between 12 and 18 kg**
- 95% of all children weigh between 13.5 and 16.5 kg
- 99% of all children weigh between 12 and 18 kg
- 99% of all ren weigh between 13.5 and 16.5 kg

Explanation:

$$\text{Mean} \pm 2 \times 1.5 = 95\%$$

Poisson's Distribution

00:25:05



Lambda: Average rate of the event distribution

- Probability distribution of discrete data or events
- **Example:**
 - A restaurant owner, on average, has 20 customers in a week; the probability of getting the maximum number of customers (day) is mainly calculated by Poisson's distribution
 - On average, every 100 years a meteorite is striking the earth, based on the Poisson's distribution we can estimate when the meteorite is striking the earth.

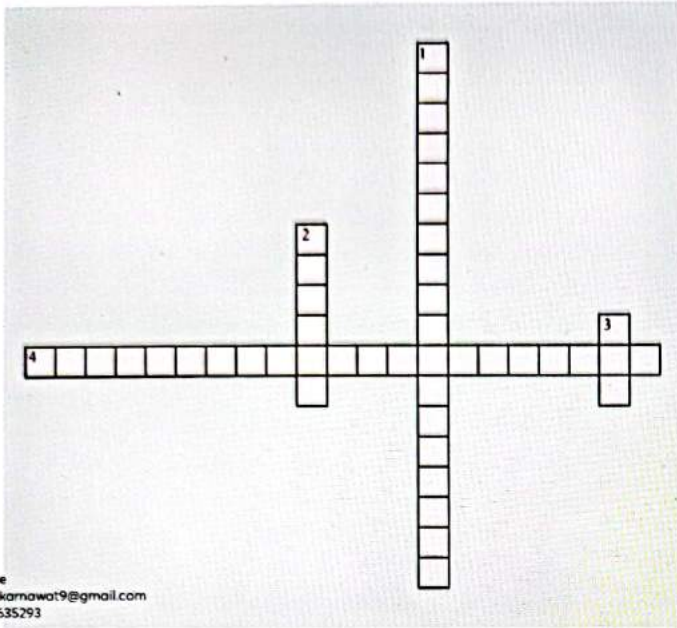
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CROSS WORD PUZZLES



Crossword Puzzle



Across

4. On average, every 100 years a meteorite is striking the earth, based on the Poisson's distribution we can estimate when the meteorite is striking the earth.

Down

- 1. It is bilaterally symmetrical
- 2. Average rate of the event distribution
- 3. Point of coincidence (mean= median= mode)



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TYPES OF ERRORS

Types of Errors

00:01:09

- Type 1 error vs Type 2 error
- Random error vs non-random error

Type 1 Error vs Type 2 Error

- Scenario: If a new drug is made and the manufacturer claims it to be better than the existing drug in the market.
- Set a hypothesis—It is an assumption yet to be verified
 - H_0 — null hypothesis— there is no difference in the treatment of the disease between a new drug and an old drug/already existing drug
 - H_A — alternate hypothesis— other than a null hypothesis— the new drug is better than already existing drug for the treatment of disease
- As a researcher, whenever we talk about a result—
 - Expressed in a null hypothesis—
 - It will be either accepted or rejected.
- Never say accepting or rejecting an alternate hypothesis.
- Result: Always a null hypothesis
 - Accepted or rejected

Conceptual understanding

- Always a reality — H_0

Based on a result of clinical trial	True	False
Rejected	Type 1 error (serious error)	No error
Accepted	No error	

- Based on clinical trial it can be either rejected or accepted
- Situation 1) In reality H_0 —no difference in the treatment of the disease between the two drugs— but based on clinical trial— rejected the true H_0
 - Based on the clinical trial
 - New drug is better than a existing drug
 - drug launched in the market based on the result
 - In reality, it is not better than the existing drug
 - Creating Type 1 error
 - Showed your drug is good but in reality it's not good

Type 1 Error

00:12:42

- Also known as α error
- H_0 true but rejected
- T for Type 1 error
- Shown a false positive trial
- Serious type of error

Type 2 Error

- Situation 2
 - False but accepted error in reality
 - H_0 is false
 - Means the new drug is actually better
 - Based on result of a clinical trial we have accepted a false H_0
 - It implies the new drug – better than existing drug - is not launched in market due to clinical trial
 - Also known as β error
 - False negative trial— H_0 is false but accepted

Types of Error encountered

00:18:19

Type 1 error	Type 2 error
<ul style="list-style-type: none"> • α error <small>ankitkarnawat9@gmail.com 9818635293</small> • True – buzzword • H_0 – true but rejected • New drug launched in market – not better than existing drug • False positive trial • Serious error 	<ul style="list-style-type: none"> • β error • False – buzz word • H_0 is false but accepted • New drug which is actually better than existing – not launched in market • False negative trial • No difference

MCQs

Q. Type 1 statistical error is said to have occurred if:

- A. Null hypothesis is true and is accepted
- B. Null hypothesis is false but is accepted
- C. Null hypothesis is true but is rejected
- D. Null hypothesis is false and is rejected

Q. A randomized trial comparing the efficacy of two drugs showed a difference between the two ($p < 0.05$). Assume that in reality, however, the two drugs do not differ. This is, therefore, an example of

- A. Type I error,
- B. Type II error,
- C. 1- alpha
- D. 1- beta

Random vs Non-Random Errors

00:25:48

Random Errors	Non-Random Errors
Sampling errors	Non-sampling error—systematic error
Happens related to chance	<ul style="list-style-type: none"> Does not happen due to chance <ul style="list-style-type: none"> Error commission Mistake committed Happens because Error during design conduct or analysis of the study Less sample Wrong usage of methods
Can be eliminated by the increase in sample size	<ul style="list-style-type: none"> Can not be eliminated by increase in sample size <ul style="list-style-type: none"> Due to defect in design conduct or analysis
Less serious	More serious

Systematic error

00:30:32

In the design analyzes the study which creates a faulty association between exposure and outcome creating a BIAS.

- P value
- Alpha level of significance
- power of test

Recap: Type 1 error (α error) is more serious than Type 2 (β error)

p Value

- p-value is the probability of committing a Type 1 error
 - It tells how many times one can reject the true null hypothesis— H_0
 - The max threshold for committing a Type 1 error is set at 5% known as the α level of significance
 - Which means in a study of 100 times, less than 5 times error is committed.
 - p-value has to be less than α , ($p < 0.05$) (mcq) when the p-value is less than α it is statistically significant
- Suppose there are three researchers-

Researcher 1	Researcher 2	Researcher 3
$p = 0.08$	$p = 0.05$	$p = 0.02$
Whose result is statistically significant? $p < 0.05$		
Not significant	Not significant	Significant Because the p-value is less than 0.05

Point to be noted:

- In any study, the p-value can be
 - $\rightarrow p < \alpha$
 - $\rightarrow p = \alpha$
 - $\rightarrow p > \alpha$
- $p = 0.02$, which means $p < 0.05$ = Statistically significant
- It favours alternate hypothesis
- Implying new drug is good
- Conceptually, it means if a study is repeated 100 times then only two times we are rejecting a true H_0 (that could happen by chance)
- Rest 98 times, the result is statistically significant

Quick points

00:40:58

- P value is the probability of committing type 1 error
- $p < 0.05$
 - Statistically significant means it favors alternate hypothesis
 - Implies new drug is good

MCQs

Q. When the standard for accepting the difference was at a p-value of 0.05, and the calculated value was at 0.01, the null hypothesis was rejected by the researcher. What do you think of the results?

- Wrongly rejected
- Significant difference
- No difference
- The alternate hypothesis is the wrong
- The sample size was small

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Q. In 95% confidence interval, the level of significance (α)

- 0.01
- 0.05
- 0.1
- None of these

Q. Which of the following results gives the reader the most information concerning the statistical significance, sample size, and strength of association?

- A. A relative risk of 2.5 with a 95% CI of 2.0 to 3.1
- B. A p-value of 0.4 and a relative risk of 0.6
- C. A relative risk of 5.0 with a 95% CI of 0.1 to 9.8
- D. A p-value of <0.5 and a relative risk of 2.5.

Q. p-value is defined as

- A. Probability of declaring a significant difference when actually it is not present
- B. Probability of declaring a significant difference when actually it is present
- C. Probability of not declaring a significant difference when actually it is not current
- D. Probability of not declaring a significant difference when actually it is present

p-value is:

- Probability of committing a Type I error
- Type I error is null hypothesis is true but rejected

Q. The p-value of a randomized controlled trial comparing operation X which is a new procedure and operation Y which is gold standard procedure is 0.04, the conclusion from the following is:

- A. The investigator can be 96% sure that the result is obtained by chance
- B. The probability of a false positive conclusion that operation X is better than operation Y when the truth is it is not is 4%
- C. Type II error is small, and we can accept the findings of this study
- D. The power of the study to detect a difference between operations X and Y is 96%.

Type II error can not be calculated with p-value.

Power of a Test

00:48:18

- It is given by $(1-\beta)$
- Ability of a statistical test to show a significant difference if it exists
- Why $(1-\beta)$?
 - Beta error is Type II error
 - False
- H_0 is false but accepted
- New drug is good but could not be shown
- Minimum power for any test is 80% (statistical test)
- Power of the test Can be increased by decreasing the β error
- β error can be decreased by increasing sample size

Confidence Interval and Confidence Level

00:51:15

- Scenario: for a population of 10,000, find out the mean of their hemoglobin?
 - Take a sample of 500 people.
 - Calculate the mean (μ) of these 500
 - We will use the mean hemoglobin of this sample to estimate the mean hemoglobin of the population from which this sample was drawn.

Q. How confident the researcher is that the mean hemoglobin calculation for the population using the sample mean will lie in that particular range?

- Minimum 95% is confident for the result
- α was 5%, so $100-5\%$ is 95% hence the confidence level

Two things:

- 95% Confidence interval for mean = mean \pm 2 * standard error of mean
- 95% Confidence interval for proportion = $p \pm$ 2 * standard error of proportion

Q. Intraocular pressure was measured in 400 people. The mean was found to be 25mm, and the standard deviation was recorded as 10 mm Hg. 95%. The confidence interval would be-

- A. 22-28
- B. 23-27
- C. 24-26
- D. 21-29

Solution:

95% confident that the mean intraocular pressure of the population from which the sample was taken will lie between 24-26mm

$$\begin{aligned} CI_{\text{mean}} &= \text{mean} \pm 2SE_{\text{mean}} \\ &= 25 \pm 2(\sigma) / \sqrt{N} \\ &= 25 \pm 2(10) / \sqrt{400} \\ &= 25 \pm 1 = 24 \text{ to } 26 \end{aligned}$$

Note:

- Calculate 99% for this question
- $CI_{\text{mean}} = \text{mean} \pm 3SE_{\text{mean}}$
- 3 because its 99%

Q. What will be the 95% confidence interval in a study estimated prevalence of 10% and 100 is their sample size?

- A. 4-16
- B. 2-18
- C. Inadequate information to calculate 95% of CI
- D. 7-13

$$CI_{\text{proportion}} = p \pm 2SE_{\text{proportion}}$$

$$= p \pm 2 \sqrt{pq/N}$$

p = prevalence 10

Q 100-p = 90

Keeping the values,

$$CI_{\text{proportion}} = 10 \pm 2 \sqrt{10 \cdot 90/100}$$

$$= 10 \pm 2 \cdot 3$$

$$= 10 \pm 6 = 4-16$$

Which means 95% confident that prevalence of population lies between 4-16%

Golden Points

01:02:00

1. Type 1 Error: alpha error (true null hypothesis is true but rejected)
2. Type 1 error: false negative trial
3. Type 2 error: beta error – false (null hypothesis is false but accepted)
4. Type 2 error false negative trial
5. Type 1 error more serious than type 2 error
6. P value the probability of Type 1 error – how much Type 1 error is allowed
7. $p < 0.05$ implies statistically significant – favors alternate hypothesis
8. Power = $(1 - \beta)$ - increase power by increasing sample size
9. $CI_{\text{mean}} = \text{mean} \pm 2SE_{\text{mean}}$
10. $CI_{\text{proportion}} = p \pm 2SE_{\text{proportion}}$



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TEST OF STATISTICAL SIGNIFICANCE

Test of statistical significance

00:00:53

- The **mathematical tool** used to **measure comparative data** between 2 or more groups.
- It is divided into **2 types**:
 1. Parametric tests
 2. Non-parametric tests.

Parametric tests	Non-parametric tests
It is used when quantitative variables are used.	It is used when qualitative variables have been used.
Compares means and standard deviations	Compares percentages and proportions
Normal distributions	Skewed distributions
More powerful	Less powerful

2. Unpaired non-parametric tests:

- Wilcoxon Rank Sum test
- Mann Whitney U test.
- Chi-square test.

3. Analysis of variance test:

- Chi-square test
- Kruskal Wallis Test
- Friedman Test

4. Spearman correlation coefficient.

5. Fischer's test: It is used in place of the Chi-Square test when the sample size is **less than 30**, and the expected frequency in any one cell is **less than 5**

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Questions:

00:15:40

Q. If we have to compare mean hemoglobin in a group of 20 individuals before giving iron supplements and after giving iron supplements, which test will be used?

Ans: As we are comparing only one group of 20 individuals, it is an example of a paired T-test.

Q. We have to compare mean hemoglobin in a group of malaria patients before and after treatment.

Ans: Here we will use a paired T test.

Q. Mean hemoglobin in 20 individuals. Out of these, 10 individuals were given IFA supplements, and another 10 individuals were given dietary supplements.

Ans: As we are comparing the mean hemoglobin in two groups, we will use the Unpaired T-Test.

Q. Compare mean hemoglobin in a Group of malaria patients and dengue patients

Ans: Here also, we are comparing between 2 groups. Therefore we will use an unpaired T-test

Q. Compare mean hemoglobin in a group of malaria patients, dengue patients, and Chikungunya patients.

Ans. As we have 3 groups over here, we will use ANOVA.

Q. On campaigning the mean blood pressure in 3 communities:

- Community 1 is on dietary supplements
- Community 2 is on medical treatment
- Community 3 is on exercise

Ans. As we have 3 groups over here, we will use ANOVA.

Q. Which statistical test are you going to use when we have to study the association between OCP use and breast cancer?



Important Information

- In biostatistics, there are 2 types of variables:
 - Quantitative variables: These cannot be measured or compared.
 - Qualitative variables: These can be measured and compared. For comparison, they have assorted measuring units.

Types of parametric tests

00:06:55

- Parametric tests are mostly associated with alphabets.
 1. **Student's T test:** These are also further classified into 2 groups:
 - a. Paired: These are used for **single** groups.
 - b. Unpaired: These are used when there are **2 groups**.
 2. **ANOVA:**
 - Analysis of variance.
 - It is used when you have **more than 2 groups**.
 3. **Pearson's Correlation Coefficient**
 4. **Z-Test:**
 - It is used in place of the T-test when the sample size is greater than 30, i.e., **N > 30**.

Types of non-parametric tests

1. **Paired non-parametric test:**
 - Wilcoxon Signed Rank Test
 - McNemar test.

Ans. As breast cancer is a qualitative variable, we will use a non-parametric test. Hence, we will use the Chi-Square Test.

Q. Compare the prevalence of obesity in a group of 20 women before a dietary regime and after the dietary regime.

Ans. As it is for one group, we can use a Wilcoxon Signed Rank Test or McNemar test. However, most commonly Wilcoxon signed rank test is used.

Q. Compare mean blood pressure in a group of 20 women before and after a dietary regime.

Ans. Paired T-Test.



Important Information

- Quantitative variables: Mean and SD
- Qualitative variables: Percentage and Proportions
- 1 group: Paired Test
- 2 groups: unpaired test
- More than 2 groups: ANOVA

MCQs:

Q. All of the following are non-parametric tests except?

- Chi-square test
- Z test
- Wilcoxon rank sum test
- Kruskal Wallis H test

Q. A study to compare the hemoglobin level was conducted on alcoholics before and after consumption. The statistical method used to find significance is?

- Chi-square test
- Unpaired T test
- Paired T-test
- Mann Whitney test

Q. The test used to compare two qualitative data is?

- Paired T-test
- Unpaired T test
- Chi-square test
- Anova

Q. All of the following can be analyzed using the chi-square test except?

- Sex and stage of cancer
- Heart rate/min and age
- Benign or malignant, and Type of surgery
- Age group and cancer stage

Q. The appropriate statistical test to find out if obesity is a significant risk factor for breast cancer is?

- Students paired T-test
- Students unpaired T-test
- Chi-square test
- Wilcoxon signed-rank test

Q. Three groups of subjects were followed over the course of two years to compare treatments for sideroblastic anemia. The most appropriate statistical analysis to determine the quantitative serologic differences resulting from these treatments would be

- Regression analysis
- ANOVA
- Correlation analysis
- Chi-square test
- T-test

Q. The weight of the group of 50 boys aged 12 years was 35+5 kg & 40 girls the same age was 32kg+3 kg. Test applicable to test statistical significance difference in weight

- Chi-square test
- Z test
- T
- ANOVA

Q. Match the following

A. Survival analysis.	1. Independent sample t-test
B. Comparing 2 groups with non-parametric data.	2. Kolmogorov Smirnov analysis
C. Check for the level of agreement between groups.	3. Wilcoxon rank sum test
D. Comparing independent groups with ordinal qualitative data.	4. Chi-square test
	5. Kaplan Meier curve
	6. Kappa statistical analysis

- A2, B5, C1, D3
- A6, B4, C2, B5
- A3, B5, C1, D2
- A5, B4, C6, D3
- A5, B4, C6, D3

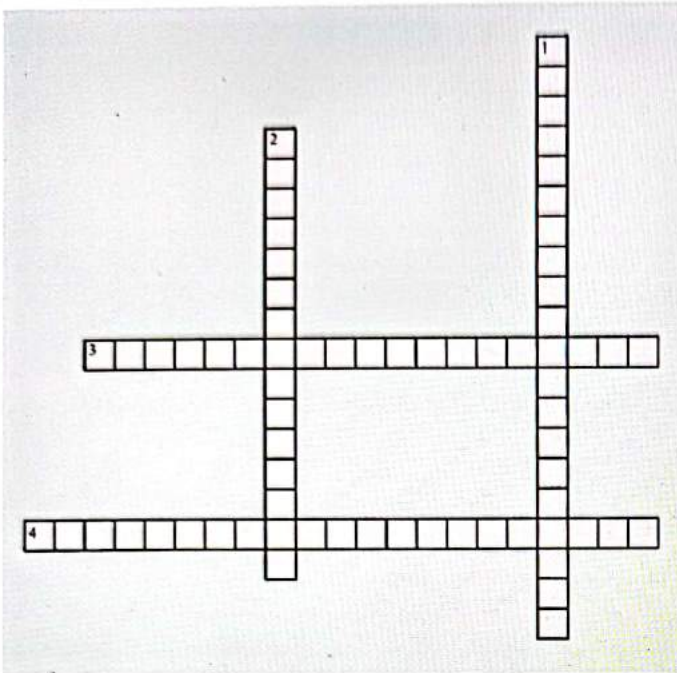


CROSS WORD PUZZLES

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Crossword Puzzle



Across

- 3. It is used when qualitative variables have been used.
- 4. These cannot be measured or compared.

Down

- 1. These can be measured and compared. For comparison, they have assorted measuring units.
- 2. It is used when quantitative variables are used.

60

GRAPHICAL REPRESENTATION OF DATA



Graphical Representation of the Data is based on the

Quantitative variables

- Histogram
- Frequency polygon
- Line chart or diagram
- Cumulative frequency curve (Ogive)
- Scatter diagram
- Box and whisker plot

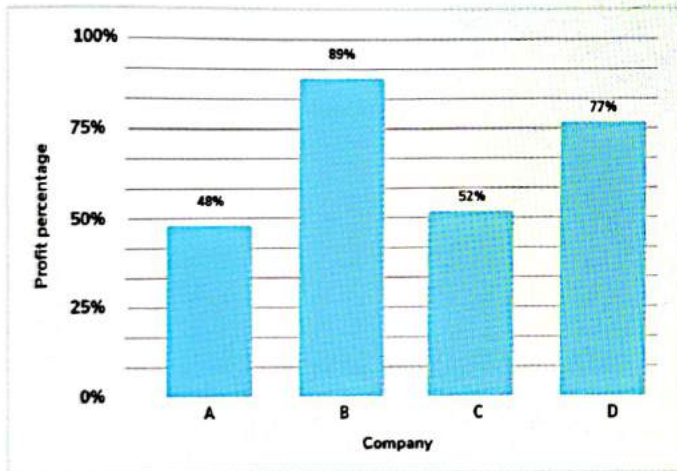
Qualitative variables

- Bar diagram
- Pie chart
- Pictogram
- Venn diagram
- Spot maps

Qualitative Data Representation

00:03:00

Bar Graph



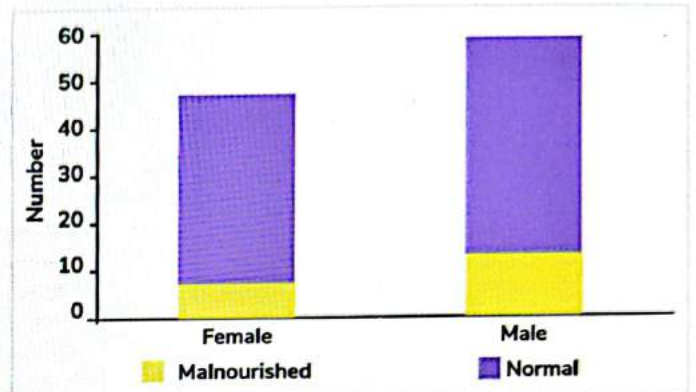
- Simple bar diagrams will represent the frequency of discrete variables like gender.
- **Discrete variables:** These variables take fewer values and no in between values.
 - Examples: Religion, Blood groups
 - These variables are represented in the form of bar diagrams.
 - These are not represented in decimals so there is gaps.
- Bar diagrams are of **two types**
 - Simple bar diagram
 - Multiple bar diagram (Compound bar diagram)
 - Component bar diagram

Refer Table 60.1

Q. Identify the graph?

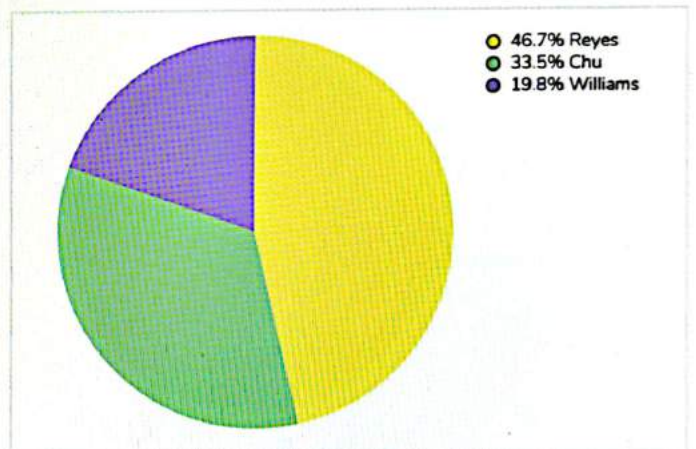
- A. Histogram
- B. Simple bar chart
- C. Multiple bar chart
- D. **Component bar chart**

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Pie Chart

00:08:05



- It is used to represent variables in percentages and proportion.
- It represents qualitative variables.
- Entire pie chart is 100%
- Maximum divisions: 6 - 7 parts

Q. There is a community, we need to tell them about the relevance of a balanced diet. Which is the best statistical diagram to draw?

- Proteins: 10-15%
- Fats: 15-30%
- Carbohydrates: 50-70%

Ans: Pie chart

Pictogram



- It is used to teach something to a layman (illiterate).
- E.g., It can be used to teach a girl of 5 years for addition and subtraction. She is not illiterate but her age is < 7.

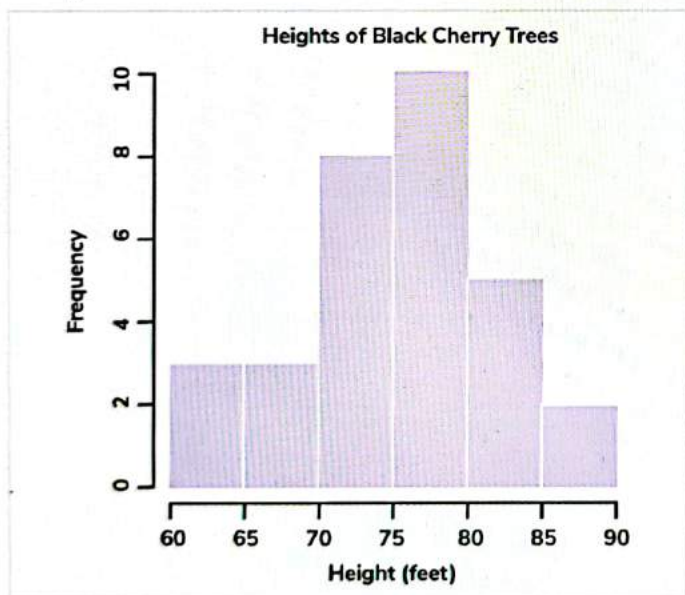
Q. A popular method of presenting data to the man in the street and those who cannot understand orthodox charts is?

- A. Histogram
- B. Frequency polygon
- C. Line Diagram
- D. Pictogram

Quantitative Variables

00:10:40

Histogram

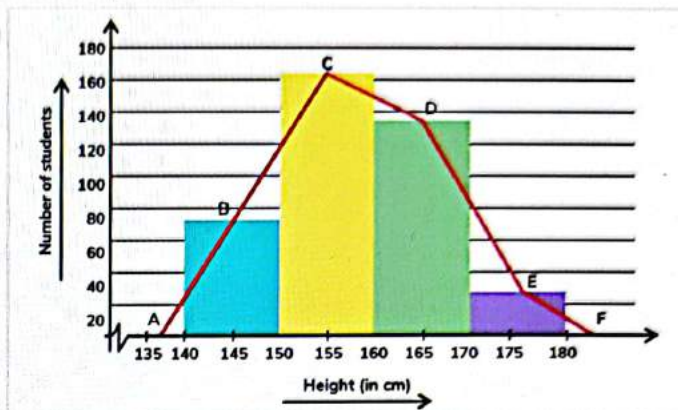


- Height is a quantitative or continuous variable (can take many possible values and also in between values)
- It can be express in decimals and there is no gap in between.
- **Histogram** represents frequency of continuous variables or quantitative variable.

Q. Frequency of quantitative data is represented by?

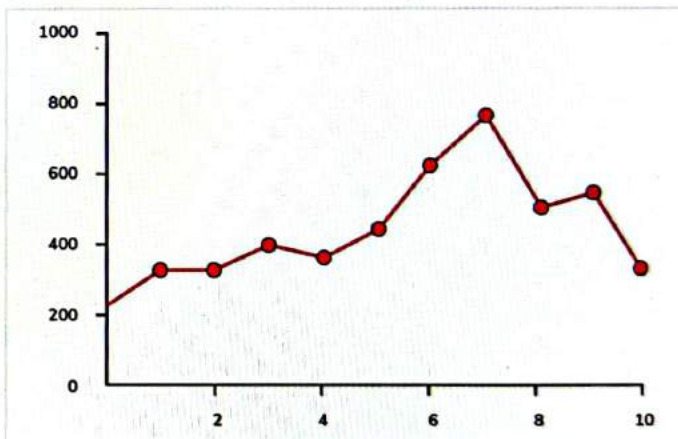
- A. Histogram
- B. Scatter diagram
- C. Line diagram
- D. Frequency curve
- Scatter diagram is used to represent correlation between two continuous variables.

Frequency Polygon



- It is drawn above a histogram.
- Midpoints are joined by a straight line (frequency polygon).
- Height is continuous (quantitative data).
- If the number of observations is very large and group intervals are reduced, then frequency polygon loses its angulature and becomes a curve i.e., frequency curve.

Line chart/ Line diagram



- It represents the trends of an event or incidence of cases with time.
- It has both rise and fall.

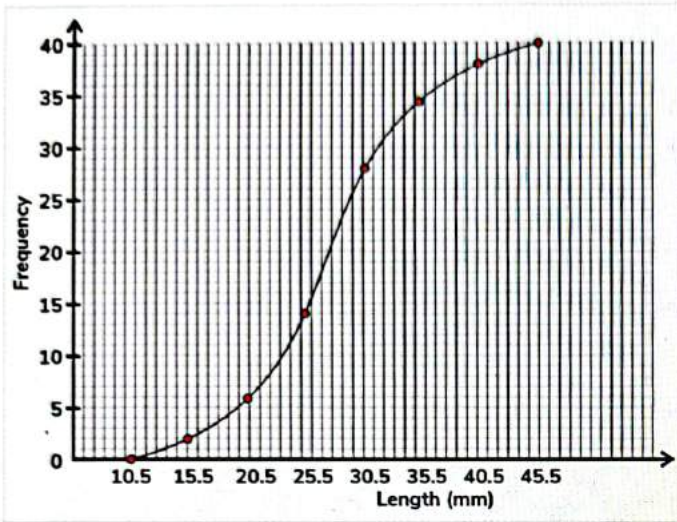
Q. Best way to plot the change of incidence of disease over time is called

- A. Histogram
- B. Line chart
- C. Scatter diagram
- D. Ogive

Q. Best chart to represent Incidence of disease over a period of time?

- A. Histogram
- B. Bar chart
- C. Scatterplot
- D. Line diagram

Cumulative Frequency Curve (Ogive)



- There is no dip or no fall of the curve.
- Cases are constantly increasing e.g., Recurrent cases.
- E.g., in 2021 from January 2021 to May 2021 cases of covid were constantly increasing, cumulative frequency curve or ogive can be used there.

Scatter Diagram

- It represents correlation between two continuous variables i.e., association and direction of association.
- It is represented by correlation coefficient 'r'.
- Value of 'r' ranges from: $-1 < 0 < 1$

Refer Table 60.2

- When $r=0$, no association
- When relative risk = 1: No association

Possible values of r

- $r = +1$ (perfectly positive)
- $r \geq 0.7$ (Strong positive)
- $r = 0.4$ to 0.6 (moderate positive)
- $r \leq 0.3$ (weak positive)
- $r = -1$ (perfectly negative)
- $r \geq -0.7$ (Strong negative)
- $r = -0.4$ to -0.6 (moderate negative)
- $r \leq -0.3$ (weak negative)

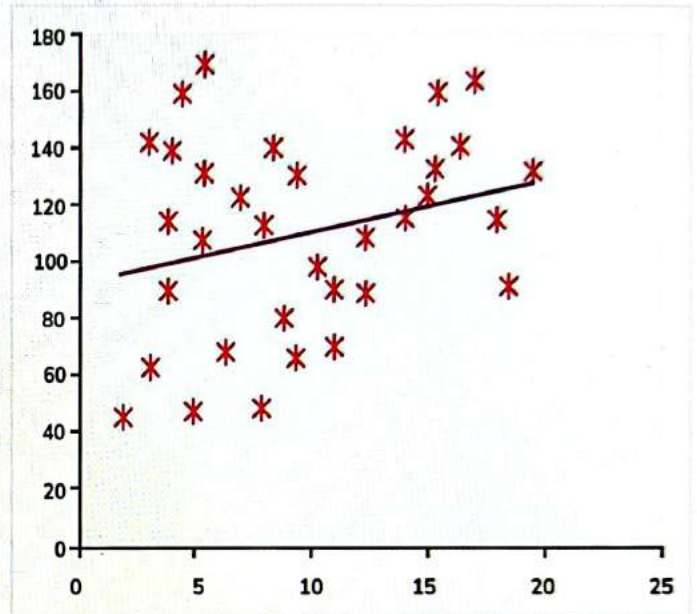
Q. Graph to correlate two quantitative data is

- A. Histogram
- B. Scatter diagram
- C. Line diagram
- D. Frequency curve

Q. A coefficient correlation value of $r = -0.8$ indicates

- A. Strong positive relationship between two variables
- B. Strong relationship between two variables.
- C. An insignificant association between two variables.
- D. One variable is the cause of other variable.
- E. Weak negative relationship between two variables

Q. The following scatter plot of four different samples shows the correlation between weight and height in the samples. What will be the approximate net correlation coefficient as from the image given below. What will be the net correlation coefficient?

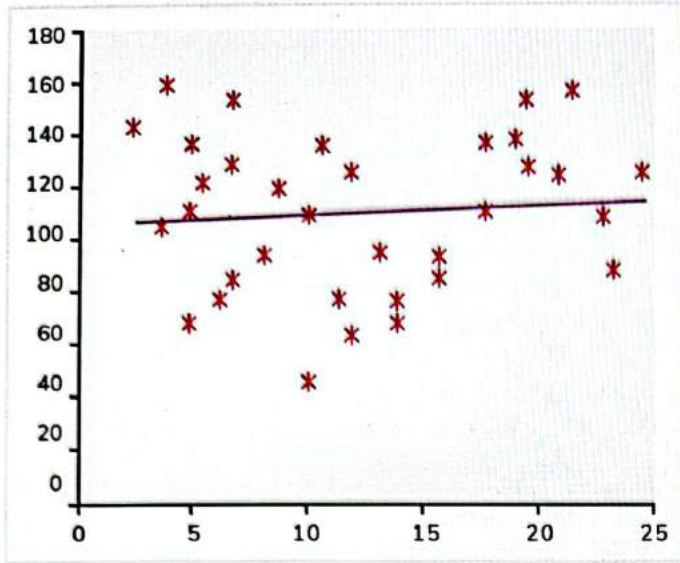


- A. +1
- B. +0.25
- C. -1.5
- D. +1.5

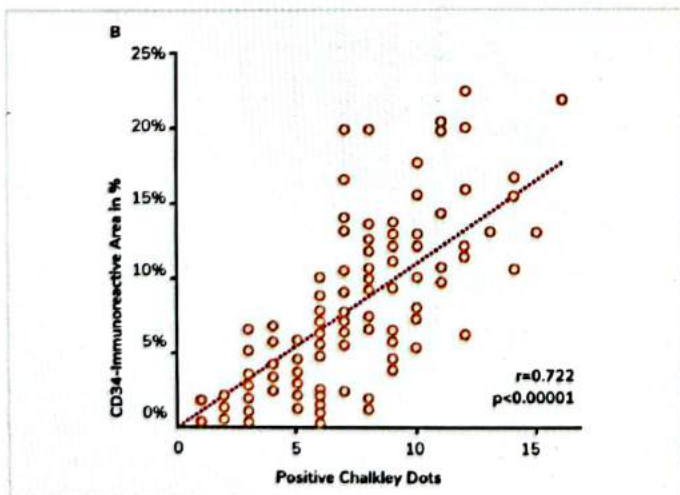
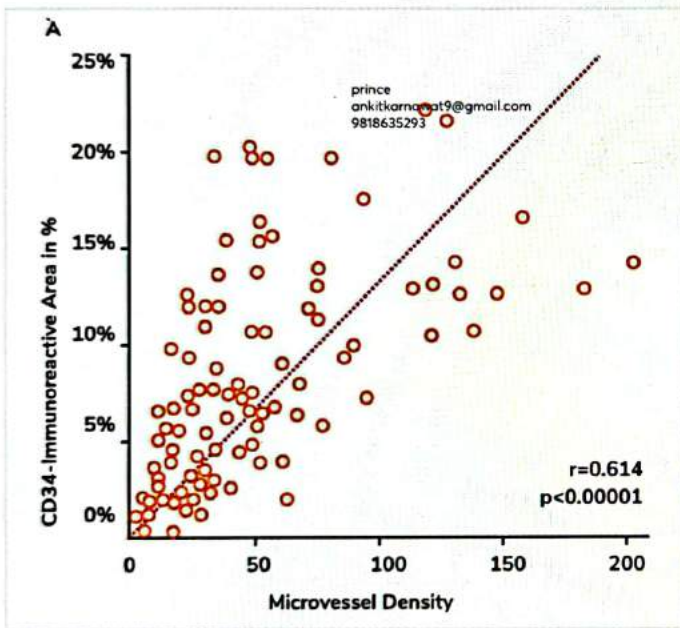
• It shows a weak positive relationship as slope is slanted.

Q. The following scatter plot of four different samples shows the correlation between weight and height in the samples. What will be the approximate net correlation coefficient as from the image given below? What will be the net correlation coefficient?

- A. +1
- B. +0.25
- C. -1.5
- D. +1.5
- E. +0.10



Q. Which graph denotes the relationship between the two graphs appropriately?



- A. Strength of relation is same in A and B
- B. Strength of relation is more in A than B
- C. Strength of relation is more in B than A
- D. Variation is more with A than with B

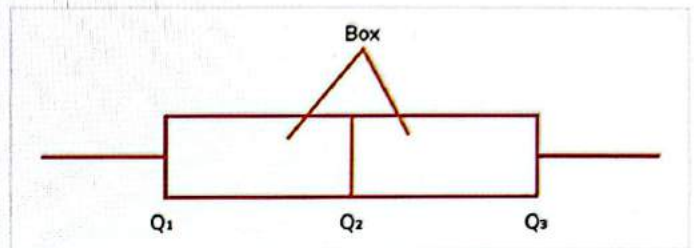
Explanation:

- Dots are haphazard/ not uniform (fig 1).
- Dots are uniform (fig 2).

Box and Whisker Plot

00:32:06

- It is a method of quantitative data representation.
- It is used to represent quartiles.

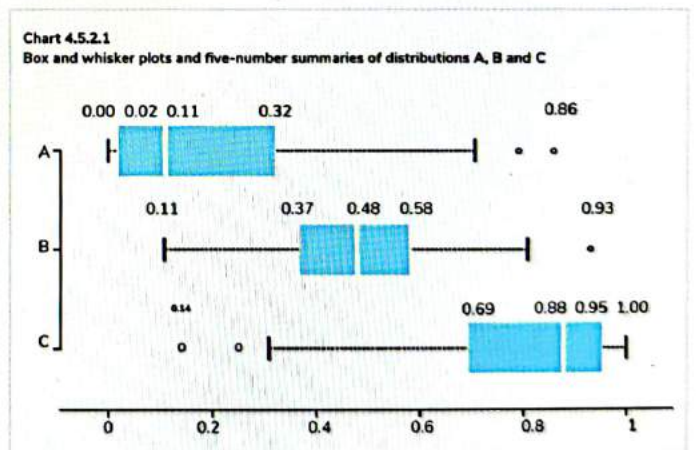


- It comments on the type of distribution i.e., normal or skewed.
- There is equal distribution on both sides (no outliers).
- It is a normal distribution.
- Tails are also equally distributed.

Example

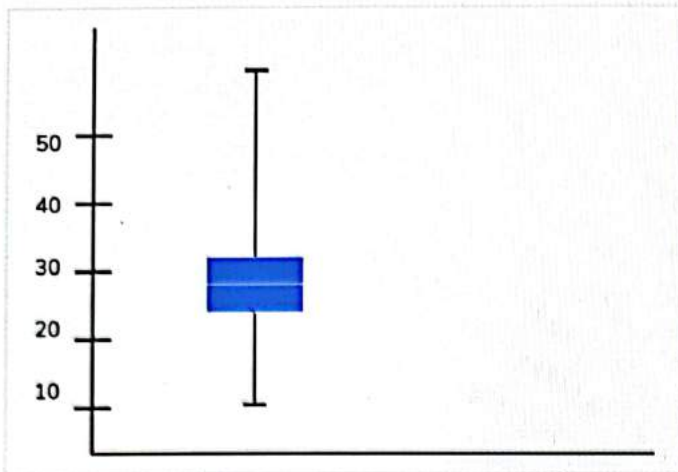
Refer Table 60.3

Q. Box and whisker plots and five-number summaries of distributions A, B and C



- A: Right sided skewness
- B: Normal
- C: Left sided skewness

Q. Which of the following related to the image is correct?

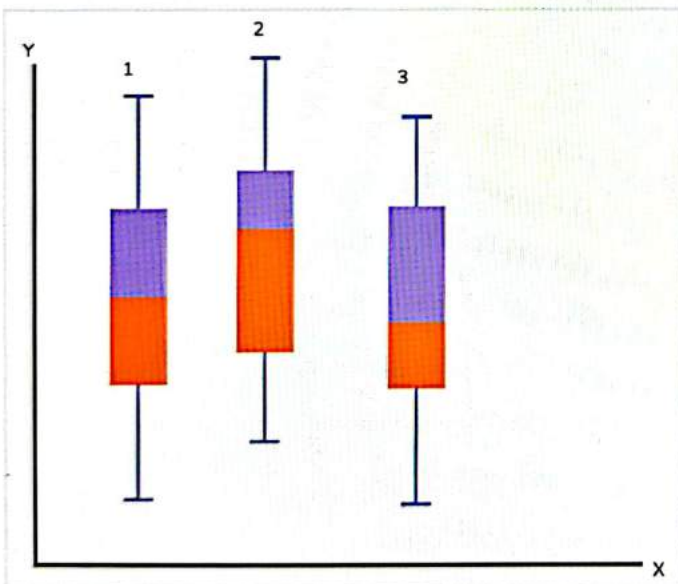


- A. Negatively skewed
- B. Positively skewed
- C. 75% values are above 25 mg
- D. Median is 50 mg

Explanation

- Rotate in clockwise direction
- Q2 is lying in around 25mg: Median
- Q2 = 1:1 ratio
- So, 50% values above median not 75%

Q. Identify the correct sequence of inference from box plots shown in the figure

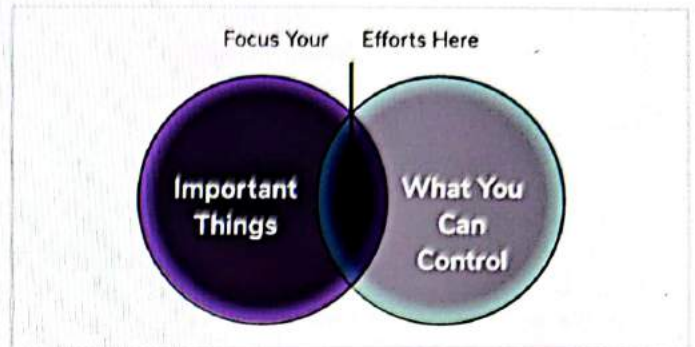


- A. 1-Normal distribution, 2-positive skewed, 3-negative skewed
- B. 1-Normal distribution, 2-negative skewed, 3-positive skewed
- C. 1-Negative skewed, 2-positive skewed, 3-normal distribution
- D. 1-Positive skewed, 2-normal distribution, 3-negative skewed
- Rotate the image clockwise (for vertical image).

Venn Diagram

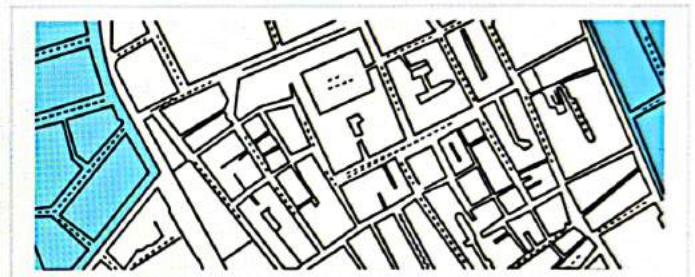
00:43:05

- It is the display of discrete as well as continuous data occasionally.
- Trend of data spread with respect to variables.



- Venn diagram is a qualitative data.
- Overlapping portion represents what should be done.

Spot Map



- It is Used for qualitative data distribution/representation or variable representation.
- It was drawn by: John Snow (Father of modern epidemiology)
- He used it to find the potential source of infection.
- It represents the local distribution of cases.

Q. The data description shown below is referred to as?

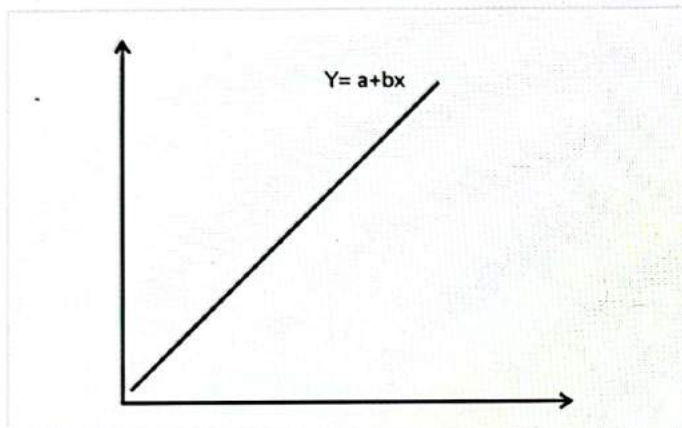
5	3				
6	8	9	5		
7	9	2	0	2	
8	4	7	9	5	3
9	0	4			

- A. Stem and leaf diagram
- B. Box whisker plot
- C. Forest plot
- D. Funnel plot
- Used for quantitative data

Regression

00:45:39

- Correlation is association between two continuous variables.
- Regression represents the unitary change.
- Regression Analysis is a **mathematical model** to describe the effect of ≥ 1 independent variable on a dependent variable.
- If the variable on x-axis increases by one unit, then what is the unitary change for the variable on the y-axis is given by regression.
- Equation: $y = a + bx$
 - y = dependent variable
 - a = Constant
 - b = regression coefficient
 - x = independent variable
- E.g., blood pressure is a continuous variable, it can be affected by age, cholesterol.



- Equations are of different types:
 - $y = a + bx_1$ - Simple linear equation
 - $y = a + bx_1 + bx_2 + bx_3$ - Multiple linear equation
 - $y = a + bx_1^2 + bx_2^3 + bx_3^4$ - Multiple curvilinear regression
 - $y = a + bx_1^2$ - Simple curvilinear regression
- One independent variable: Simple
- More than one independent variable: Multiple
- Independent variable not raised to power: Linear
- Independent variable raised to some power: Curvilinear

Q. $BP = a + b(\text{age})^2 + b(\text{cholesterol})^3$

Ans: Multiple Curvilinear regression

- Studying of two independent variables and raised to some power

Q. $BP = a + b(\text{age})^1$

Ans: Simple Linear regression

Logistic Regression

- It is used whenever the dependent variable is a discrete variable i.e., it is either yes or no.

Q. An investigator finds out that 5 independent factors influence the occurrence of a disease. Comparison of multiple factors responsible for a disease can be assessed by

A. Multiple linear regression

B. ANOVA

C. Chi square test

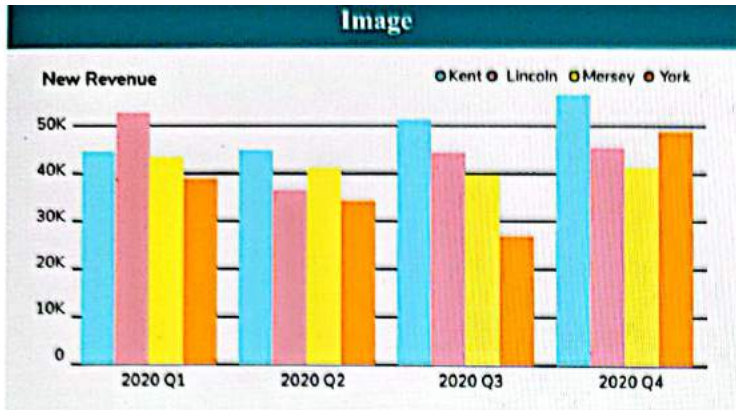
D. Multiple Logistic Regression

Explanation:

- ANOVA, Chi square test are statistical variables
- Occurrence of a disease is present, it is a discrete variable
- When a dependent variable is a discrete variable
- It is Multiple Logistic Regression

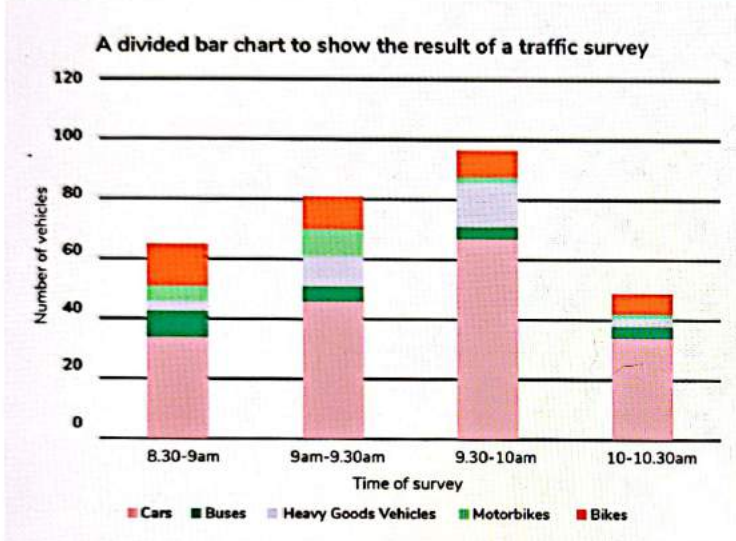
Summary

- Regression is used to study the effect of **independent variables**.
- Linear Regression describes the effect of **one independent variable** on a dependent variable ($y = a + bx_1$).
- Multiple Linear Regression describes the effect of two or more independent variables on a dependent variable ($y = a + bx_1 + bx_2$).
- Non-Linear Regression involves more complex mathematical forms, including logarithmic functions.
- Logistic Regression describes the **effect of multiple independent** (Qualitative, Quantitative or Mixed) variables on dichotomous qualitative variables (discrete i.e., yes or no).
- Regression coefficient is average change in dependent variable for each unit of independent variable.
 - Unitary change in one variable by another - regression
 - **Simple**: One independent variable
 - **Multiple**: One or two
 - If it is not raised to power: **Linear**
 - If it is raised to power: **Curvilinear**

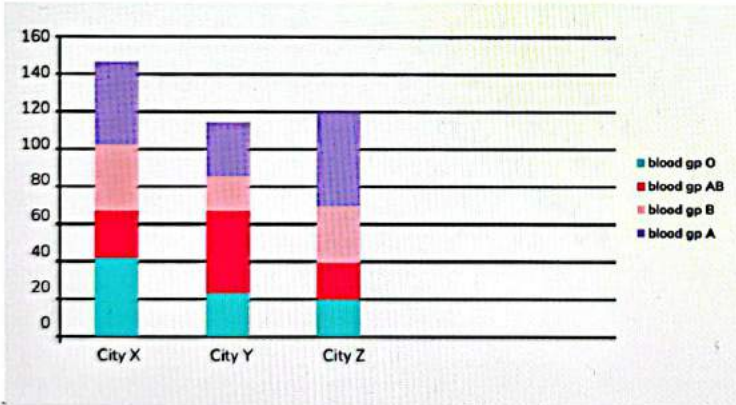


Explanation

- There are gaps (discrete data) represented with multiple bars.
- It is qualitative in first quarter.
- It is a multiple bar diagram/ compound bar diagram.



- Same bar has been divided into different components and each component represents its frequency.
- It is known as component bar diagram.
- It is a frequency of discrete variable.



- Different Blood groups are represented and blood groups are discrete variable.
- Each bar is divided into different components, it is known as component bar diagram.

Table 60.2

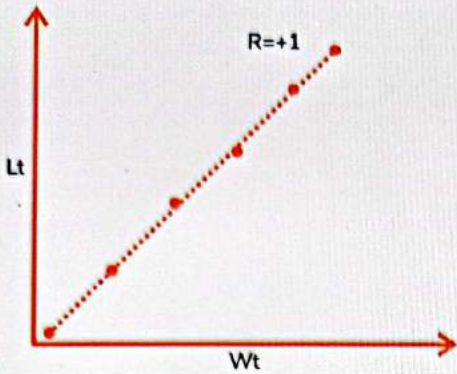
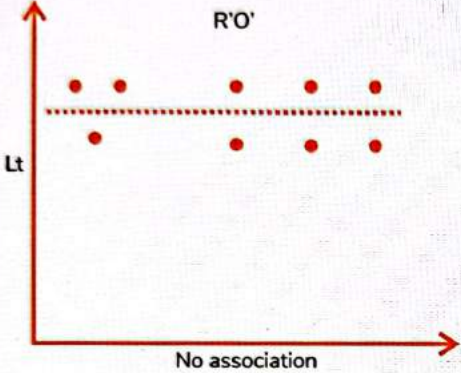
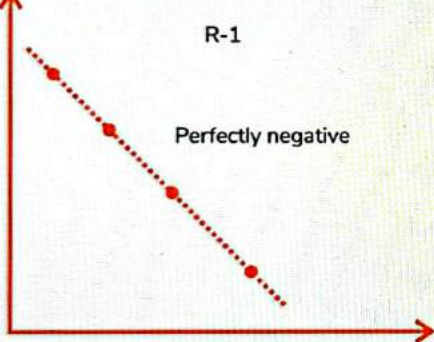
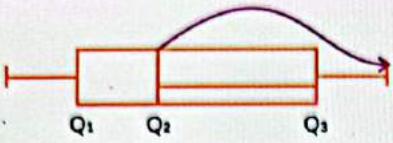
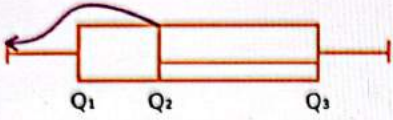
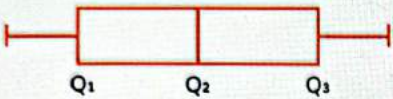
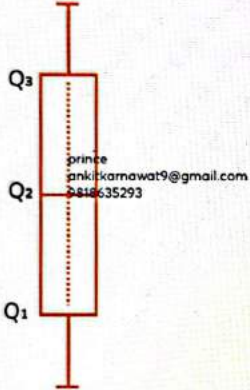
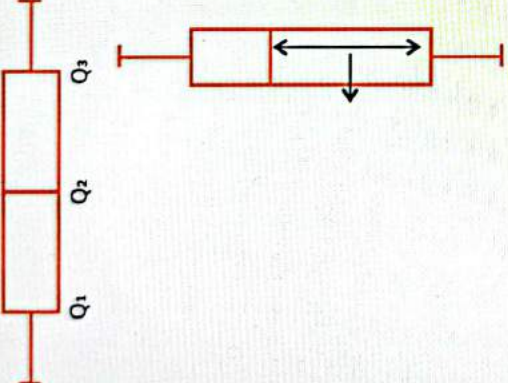
Diagrams	Explanation
 <p>A scatter plot with 'Lt' on the vertical axis and 'Wt' on the horizontal axis. Five red dots are plotted, connected by a dotted line that slopes upwards from left to right. The text 'R=+1' is written in the upper right area of the plot.</p>	<ul style="list-style-type: none"> • Weight is increasing with the increase in height (perfectly linear association) • Perfectly positive ($r = +1$) <p><small>prince ankitkarnawat9@gmail.com 9818635293</small></p>
 <p>A scatter plot with 'Lt' on the vertical axis and 'Wt' on the horizontal axis. Five red dots are scattered randomly above and below a horizontal dotted line. The text 'R=0' is written at the top, and 'No association' is written at the bottom.</p>	<ul style="list-style-type: none"> • No association between x-axis and y-axis • $r=0$
 <p>A scatter plot with 'Lt' on the vertical axis and 'Wt' on the horizontal axis. Five red dots are plotted, connected by a dotted line that slopes downwards from left to right. The text 'R=-1' is written at the top, and 'Perfectly negative' is written in the middle.</p>	<ul style="list-style-type: none"> • Variables on x-axis increases with decreasing in the variables on y-axis. • Perfectly linear association • Perfectly negative • $r = -1$

Table 60.3

Image	Explanation
	<ul style="list-style-type: none"> • Gap is more on the right side (outliers are more on right side). • So, it is Right sided skewness or positive skewed.
	<ul style="list-style-type: none"> • Gap is more on left side (outliers on left side) • So, it is left sided skewness or negative skewed. • Mean < median < mode.
	<ul style="list-style-type: none"> • Box is normal (no outliers) • Tail is elongated more on the left side. • Left sided skewness
 <p style="font-size: small; text-align: center;">prince ankitkarnawat9@gmail.com 9818635293</p>	<ul style="list-style-type: none"> • Vertical box: Gap is equal on both sides (no outliers) • Normal distribution
	<ul style="list-style-type: none"> • Rotate the image clockwise. • Gap is more on the right side (right sided skewness)

61

SAMPLING AND PROBABILITY



Sampling

00:00:11

- Done when the population is large.
- The sample should be representative of the entire population.

Types of Sampling

00:00:52

1. Random-Probability (every participant will get an equal and known chance)

- Simple random sampling
- Systematic random sampling
- Stratified random sampling
- Cluster random sampling
- Multi stage sampling
- Multi phase sampling

2. Non-Random - Non Probability

- **Convenient sampling**
 - It is suitable for you/ convenient to you.
 - Selected for your convenience
 - Source of **Selection bias**
 - **Ex:** If there are 200 students, we need 10 students selected, we select students sitting in the front row because it is convenient to us.

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- **Purposive sampling**
 - Hidden intention.
 - Purposefully we select.
 - **Ex:** Selecting houses in a village where a pneumonia case was found.

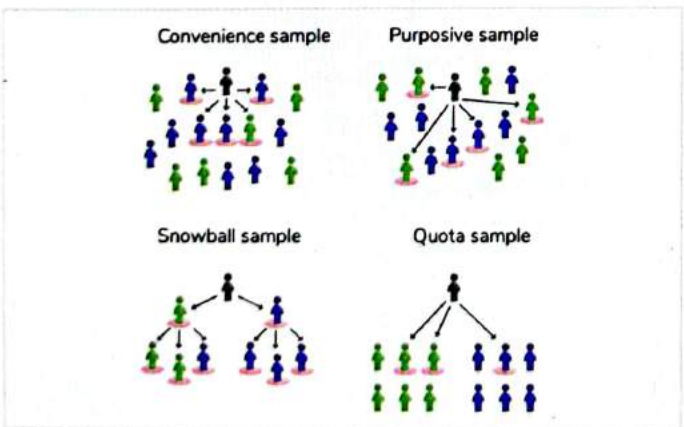
00:04:06

- **Quota sampling**
 - Like a strata.
 - **Ex:** If there are 200 students we need 10 students selected, we separated them into 2 sets (left and right).

00:05:22

- **Snowball sampling**
 - This is done for the hidden population (Difficult to catch)
 - **Ex:** Commercial sex workers, Homeless people, Migrants.

00:06:49



Random sampling Methods

00:08:36

- Every participant will get an equal and known chance

1. Simple Random Sampling

- **Randomly selected** from an entire list.
- Using a randomization technique like lottery, flipping a coin, a chit method or table of random numbers
- Most commonly adopted method.
- **Best method**- table of random numbers.

2. Systematic Random Sampling

- Adopted for a **heterogeneous population**.

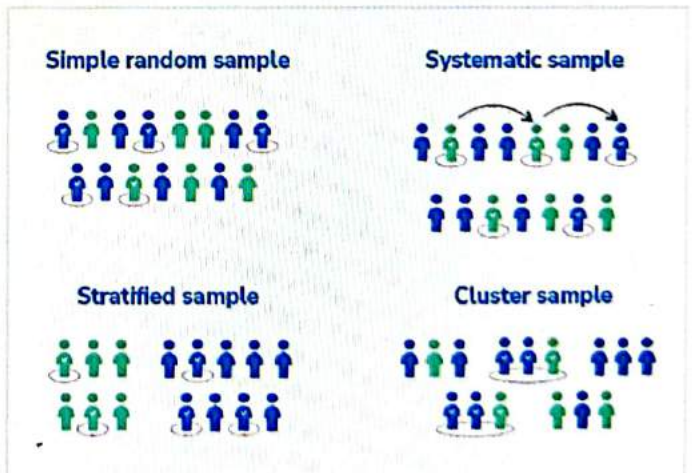
Example: Newborn care practices in a slum of Delhi. Newborns will be born for the reproductive age group but we don't have that list. So we will calculate a k^{th} interval.

$$k^{th} \text{ interval} = \frac{\text{Total population}}{\text{Sample size}}$$

Let's say $k^{th} \text{ interval} = \frac{10000}{1000} = 10$.

That means every 10th house we are going to check.

- Based on **sampling interval technique**- K^{th} or n^{th} interval.
- or interval.
- After enumerating the units, they are selected at a predetermined interval.
- Simple and convenient
- Need less time and work.
- Easily administered.
- Population is large and scattered.
- **No sampling frame is required.**



1. Stratified Random Sampling

- Strata based on a **predetermined criteria**.

Example: let us assume that we need to do a study on diabetes or TB of a certain population. , So we divide the entire population to

- Lower socio economic class
- Middle socio economic class
- Higher socio economic class

- Here we are converting a heterogeneous population to homogeneous.
- Within a strata we use simple random techniques which is based on **PPS** (Probability proportional to sample size)

PPS Example: Let's say there are 2 groups of people. One with 6 people and 9 people respectively. Then we select them in a ratio of 2:3.

- Gives different population subgroups an equal chance of being selected.
- Prespecified number of individuals is given adequate representation (reduces bias and none is under or over reported)
- Best done for **non homogeneous population**
- Ideal for heterogeneous populations with respect to,
 - Characteristic under study
 - Characteristics influenced by different sections of population.
- **Ex:** Religion and age groups

4. Cluster Random Sampling

00:19:42

- **Naturally created groups**
- Clusters can differ among themselves
- But we have to remove heterogeneity among clusters
- Done for evaluation of health care services.
- **Ex:** Control evaluation of Immunization service or antenatal coverage etc.
- Population divided into **already existing groups**
- Then a sample is selected in a random manner from the cluster
- **Natural heterogeneous clusters:** Between 2 clusters we should remove inter cluster variation by using Design Effect
- **2 stages**
 - **1st stage:** Clusters selected
 - **2nd stage:** Households within the clusters selected by a random technique.
- **Sampling frame** is a list of clusters with size of population
- **Advantages**
 - Easy
 - Cheap
 - Rapid
 - Simple
- **Disadvantages**
 - High sampling error
- **Uses**
 - Evaluation of immunization coverage
 - Diarrheal disease survey
 - Leprosy elimination monitoring service

Q. What is the best for Evaluation of immunization coverage?

Answer: Cluster

Sample Size Calculation

00:23:42

- Sample size = $\frac{4pq}{d^2}$
 - 4 = 95% CI (confidence interval)
 - p = prevalence given
 - q = 100-p
 - d or l = absolute error

Q. What is the sample size that you are going to select to do a study on hypertension in an urban slum considering 50% prevalence from previous research studies?

- Absolute error is 5
- Sample size = $\frac{4pq}{d^2}$
- $S_s = \frac{4 \times 50 \times 50}{5 \times 5} = 400$

Q. What is the sample size you would take to find out about diabetes considering the prevalence of previous research study to be 50%. Relative precision/ error as 10%.

- Absolute error = 10% of p = 10% of 50 = $\frac{10}{100} \times 50 = 5$
- Sample size = $\frac{4pq}{d^2} = \frac{4 \times 50 \times 50}{5 \times 5} = 400$

Q. In the WHO recommended EPI cluster sampling for assessing primary immunization coverage, the age group of children to be surveyed is

- a. 0-12 months
- b. 6-12 months
- c. 9-12 months
- d. 12-23 months

Answer: 12-23 months

Q. Simple random sampling ideal for?

- a. Vaccinated people
- b. Heterogeneous population
- c. Homogeneous population
- d. All of the above

Answer: Homogeneous population

Probability

00:28:30

- **Probability:** Chance of an event to happen $\frac{1}{6}$
- **Odds:** Chance of an event to not to happen $\frac{5}{6}$
- **Example:**
 - **Probability:** Chance of 6 by rolling a die first time:
 - **Odds:** Chance of not getting 6 on first time:
- Given by $p/1-p$



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Rule of Multiplication

Q. What is chance to find 2 individuals and both of them with blood group B

Ans.: Probability of finding 2 persons both with blood group B is $P(B) \times P(B)$

Rule of Addition

Q. What is the chance to find 2 people with blood group A and B

Ans.: Now in this case, events are mutually exclusive. This means that there is no chance that both can occur in the same individual. So chance of finding 2 persons with blood group A and B is $P(A) + P(B)$

Trick to Remember

- **Both, And - Rule of Multiplication**
- **Or, Either - Rule of addition**

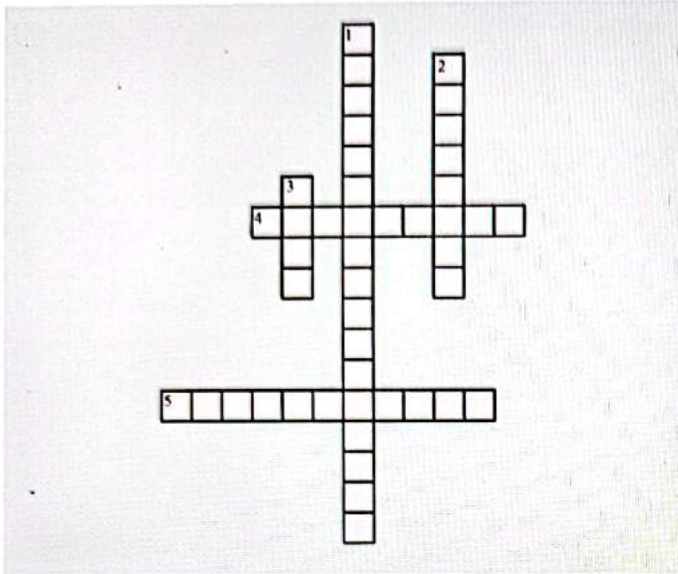


CROSS WORD PUZZLES

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Crossword Puzzle



Across

- 4. Hidden intention. Purposefully we select.
- 5. It is suitable for you/ convenient to you.

Down

- 1. Simple random sampling
- 2. When we consider the population, it is huge. So we take a sample of that.
- 3. If there are 200 students we need 10 students selected, we separated them into 2 sets (left and right).



PREVIOUS YEAR QUESTIONS



Q. Trend Diarrhoeal diseases can be plotted on?

(FMGE June 2022)

- A. Histogram
- B. Bar graph
- C. Line chart
- D. Ogive

Q. If a wide range of values represents a community, then the best measure of central tendency will be?

(FMGE June 2022)

- A. Mean
- B. Median
- C. Mode
- D. SD