نو باتوں کا حکم

حضرت ابو ہریرہؓ کہتے ہیں کہ رسول اللہ نے ارشاد فرمایا۔

"میرے رب نے مجھے نو باتوں کا حکم دیا ہے۔

1۔ کھلے اور چھپے ہر حال میں اللہ سے ڈروں۔

2۔ کسی پر مہربان ہو یا کسی کے خلاف غصے میں ہو دونوں حالتوں میں انصاف کی بات کہو۔

3۔ راستی و اعتدال پر قائم رہوں چاہے امیر ہو یا فقیر۔

4۔ جو مجھ سے کٹے میں اُس سے جڑوں۔

5۔ جو مجھے محروم کردے میں اُسے دوں۔

6۔ جو مجھ سے زیادتی کرے میں اُسے معاف کروں۔

7۔ میری خاموشی غور و فکر کی خاموشی ہو۔

8۔ میری نگاہ عبرت کی نگاہ ہو۔

9۔ میری گفتگو ذکر الٰہی کی گفتگو ہو"

اس کے لئے آپ ﷺ نے فرمایا کہ:۔

"نیکی کا حکم دو اور بدی سے روکو" (مشکوۃ)

اسلامی جمیعیت طلبہ خیبر میڈیکل کالج پشاور۔

SAFE

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CHAPTER – 1

FORENSIC MEDICINE AND LAW RELATED TO MEDICAL MAN

FORENSIC MEDICINE:

Forensic medicine is that branch of medical science which deals with the application of medical knowledge to the administration of the law and for furthering of justice.

Medical aspect of law also known as Forensic Medicine involves application of medical knowledge to solve legal issues. Here medicine comes to the rescue of law. To this aspect, there are two prerequisites, which are complementary to each other, one is the basic medical knowledge imparted by specialist and the second, the skill to apply that knowledge to solve legal problems. This skill is acquired during training in the subject of forensic medicine e.g. personal identity, accidental and criminal trauma including death, criminal, sexual problems, pregnancy, abortion and forensic aspects of toxicology.

MEDICAL JURISPRUDENCE:

Medical Jurisprudence deals with the legal relation of medical man and moral obligations which rest on him. OR

It deals with the relation of medical man with law, patients, colleagues and as a whole with the society.

Legal aspects of medical practice including medical ethics also known as medical jurisprudence deal with the impact of law on medical practice. It is important for medical man to known laws that are relevant to his profession, to understand his position in relation to the state, patient; colleagues and others, so that he practices his profession according to the legal dictates. Knowledge of law makes him a better medical practitioner and a better citizen to safeguard both his interest and the interest of the public. Medical jurisprudence thus encompasses: -

a. Doctor- patient relationship.
b. Doctor- doctor relationship.
c. Doctor -state relationship.
d. Medical ethics.

PILLARS OF FORENSIC MEDICINE

a. Basic Medical Knowledge.
b. Law relevant to medical man/legal framework of country.
c. Medical ethics.

MEDICOLEGAL ISSUE:

Any medical opinion or technique becomes medico-legal if it is utilized in law enforcement and any judicial interpretation of law becomes medico-legal when it involves medical issues.

LAW:

Law is defined as a rule of conduct enforced by states, society or customs on the basis of reasons as quoted, ***Law is nothing but reason and that what is not reason is not law.***

TYPES OF LAW:

Depending upon origin, law is divided into two types:

A. Common law
B. Statute law

A. Common law: it is conduct of individuals enforced by the community in which we live. It is unwritten and is based on the immemorial usage of conventions or customs of the community e.g. Jirga system in FATA.

It is universally applicable.

B. Statute law: It is written law in which the rule of conduct is defined, codified in relations and made law by the parliament in relation to change in the circumstances of

that community e.g. Englishman invaded India and brought their law e.g. PPC, CRPC, CPC.

The statute law is of two types;

1. Criminal law
2. Civil law

1. **Criminal Law:** It is the rule of conduct, which is to be observed by all. There is prohibition of commission of some act or even omission (not to do something, which should be done) of some act and is enforced by punishment e.g. nobody should commit murder or to cause road accidents, sexual assault, murder etc. We can say that criminal law is for a better law and order situation or better government with in a country.

2. **Civil law:** It deals with the rights of the individuals and provides remedies for personal sufferings e.g. land lord and tenants' dispute, divorce cases etc.

TYPES OF COURTS IN PAKISTAN

Courts:

It means a place where justice is judicially administered or a place where people bring their grievances against others to seek remedies.

Types:

There are generally two types of courts namely criminal and civil courts. Both civil and criminal courts have three levels.

1. Court of first instance
2. Court of second instance
3. Court of third instance

1. **Court of first instance** has a small jurisdiction consisting of an illaqa and hears cases, which are of ordinary nature. Such court is presided over by a magistrate for the criminal cases and a civil judge for the civil cases.

2. **Court of second instance** is the court above the court of first instance and has a wider jurisdiction spread over the whole district. It is presided over by the district and session judge for cases both of civil and criminal nature, which are far more serious and important as compared to the cases of the court of first instance. Additionally it hears appeals against the decisions of the court below it.

3. **Court of third instance** is the High Court, the highest in the province and is presided over by Judge of the High Court. This court has both criminal and civil jurisdictions and hears mainly the appeals against the decisions of court lower to it.

Supreme Court: It is the highest court of appeal. It supervises all courts in Pakistan. Laws declared by this court are binding on all courts and administrative departments in Pakistan. It can pass any sentence. It is located in Islamabad.

Shariat Court: It gives justice according to Islamic law and is located in Islamabad.

Special Courts: Antiterrorist courts, Banking Courts, Accountability Courts, Anti-narcotic Courts, Military, Courts and Drug courts.

QISAS AND DIYAT ORDINANCE 1990

Promulgated on: 5th September, 1990.

Enforced on: 12 Rabi-ul-Awal, 1411 Hijri (3rd October, 1990).

Qisas: Not defined in the ordinance.

It means:

1. To pay the other similarly.
2. Tit for tat or equal punishment e.g. eye for eye, hand for hand and life for life.

OR

Punishment by causing similar hurt at same part of the body of convict as he has caused to the victim or by causing his death if he has committed Qatl-i-Amd in exercise of right, of a Wali.

DIYAT (Section-299E)

Compensation for causing death specified in section 323 payable to the heirs of the victim by the offender not less than the value of 30630 gms of silver. It depends upon the following factors.

1. Financial Position of Convict.
2. Financial Position of Heirs of Victim.
3. On 1st July every year 30630 gms of silver.

ARSH (Section-299B)

Compensation for causing hurt specified in the ordinance to be paid to the victim or his heirs by the offender.

Value of ARSH

It will be assessed at certain percentage indicated in various provision of value of Diyat i.e. court will work out the value of Arsh on percentage value of Diyat.

1. Paid in lumsum or in three installments, for which a time period is fixed.
2. If offender dies Arsh is recovered from his property.

DAMAN (Section-299D)
Compensation determined by the court for causing hurt not liable to Arsh and to be paid by the offender to the victim or his heirs
Value Not Fixed But Determined By Court
1. Expenses on the treatment incurred by victim.
2. Anguish suffered by the victim.
3. Loss or disability caused in functioning or power of any organ.

WALI:
Person entitled to claim Qisas.

LAW RELATING TO EXECUTION OF QISAS

A. QATL

Wavier of Qisas: (Section-309)
Any adult sane wali may at any time and without compensation wave his right of Qisas.

Compounding of Qisas: (Section-310)
An adult sane Wali at anytime in accepting badal-i-sulh, compound his right of Qisas and the value of badal-i-sulh shall not be less than the value of Diyat Badal-i-sulh means the mutually agreed compensation according to shariah to be paid in cash, in kind or any form of property (movable or immovable).

Execution of Qisas: (Section-314)
It shall be executed by a functionary of the Govt., causing death of the convict, as the court may direct in the presence of wali or his authorized representative.

B. HURT

Executable
The Qisas shall be executed in the public by authorized medical officer, with due care that execution does not cause death or exceed the hurt caused to victim.

Non-executable
By payment of compensation that is Arsh or Daman (according to the principles of equality in accordance with injunction of Islam).

Hurt not Liable to Qisas:
1. When an offender is minor or insane.
2. When an offender at the instance of victim causes hurt to him.
3. When the offender has caused itlaf-i-udw of physically imperfect organ of victim and the convict does not suffer from similar physical imperfection of such organ.
4. When the organ of the offender, liable for Qisas is missing.

LAW RELATING TO DEATH
Killing of human fetus is called miscarriage, of self suicide and of other homicide and they have been differentiated for purposes of punishment.

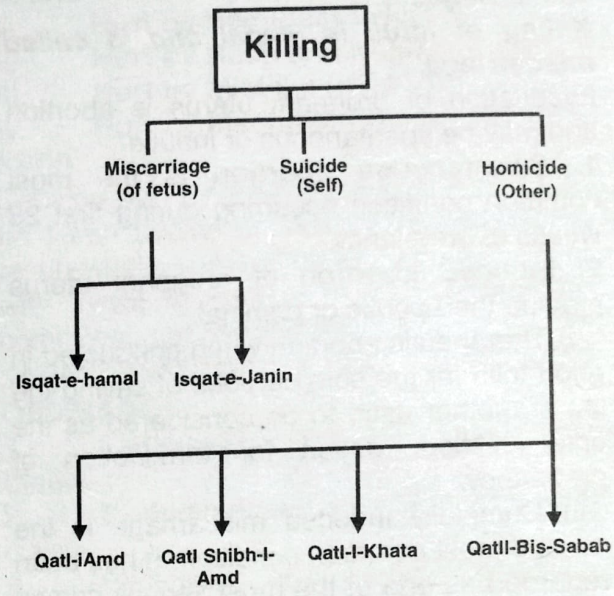


Figure: Classification of Killing

HOMICIDE (QATL)
Causing death of a human being by other human being.

Homicide is of two types:

A. Culpable

1. Qatl-i-Amd (Section 300): Killing with intentions and knowledge of causing death of specific person / any person (preplanned death).

2. Qatl-Shibh-i-Amd (Section 315): Killing with intention only to harm, but death occurs which is unlikely.

3. Qatl-i-Khata (Section 318): Killing without intention to cause death or harm but death occurs by mistake of act or fact.

4. Qatl – Bis Sabab (Section 321): Killing without intention to cause death or harm but death occurs during the course of an unlawful act.

B. Non Culpable

a. **Justifiable Homicide:** Causing death in pursuance of orders of the law of courts and also killing by police during law enforcement such as during suppression of riots.

b. **Excusable Homicide:** It is infact causing death in excusable circumstances like the one which occurs in self defense.

LAW RELATING TO CHILD AND BIRTH

Miscarriage:

Killing of fetus is illegal and is called miscarriage.

Evacuation of pregnant uterus is abortion and may be spontaneous or induce.

1. **Spontaneous abortion** is the most common condition occurring during first 28 weeks of pregnancy.
2. **Induced abortion** of pregnant uterus may be therapeutic or criminal.

i) Therapeutic abortion when conducted in good faith for the sole purpose of saving the life of mother used to be considered as the only justified reason for termination of pregnancy.

ii) Criminally induced miscarriage is the second most common condition. It has been regarded as one of the most serious crimes in the early medico-legal codes.

The period of gestation is, now, an important deciding factor. The attitude of society towards therapeutic abortion is dramatically changing. Extent of provision of abortion services in the western countries is now considered as an index of community's state of civilization.

Period of Gestation

Trimester	Period	Authority for decision
First	First 12 weeks	Pregnant woman and her physician.
Second	13 weeks to viability	Physician, in the health of pregnant woman.
Third	After viability	Physician, only to preserve the life of the pregnant woman.

The statute law of miscarriage in Pakistan takes into consideration stages of gestation making the offence more serious if it is done at a later stage of pregnancy. Thus distinguishes **Isqat-e-Haml** from **Isqat-e-Janin.**

Classification of Criminal Miscarriage

Type	Definition
Isqat-e-Haml (Section-338A)	Causing a woman with child whose organs have not been formed, to miscarry, without good faith for the purpose of saving life of the woman or providing necessary treatment.
Isqat-e-Janin (Section-338B)	Causing a woman with child some of whose limbs or organs have been formed to miscarry without good faith for the purpose of saving the life of the mother.

Suicide:(Section-325) Killing of self is called **suicide**. It is an act of taking one's own life voluntarily and intentionally. The term **attempted-suicide** is used when any person attempts to take or has a tendency to take his own life. Other terms such as **partial-suicide** for self-mutilation, and **chronic-suicide** for habitual behavior patterns injurious to life, such as alcohol or drug addiction have been used.

HURT (Section- 332): Causing pain, harm, disease, infirmity, injury or impairing, disabling, dismembering any organ of the body or part there for without causing death.

MEDICOLEGAL CLASSIFICATION OF HURT

(According to Qisas and Diyat Ordinance)

There are two classifications of hurts and they are based on:

- Part of body involved
- Manner of infliction of hurt
- Each of this classification has four types and the former has further subtypes.

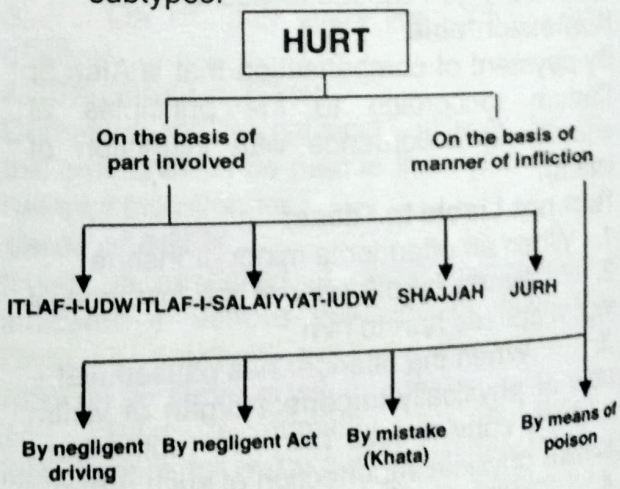


Figure: Medicolegal Classification of HURT

A. CLASSIFICATION OF HURT ON THE BASIS OF PART INVOLVED

I. ITLAF-I-UDW (SEC 333): Causing dismembering, amputation, severing of any limb or organ of the body.

II. ITLAF-I-SALAHIYYAT-I-UDW (SEC 335): Destroying or permanently impairing the functioning power or capacity of any organ of the body or causing permanent disfigurement.

III. SHAJJAH (SEC 337A): Hurt on the head or face which does not amount to italf-l-udw or itlaf-l-salahiyyat-udw.

Kinds of Shajjah

Shajjah-l-Khafifah: Hurt without exposing bone.

Shajjah-l-Mudihah: Exposing bone with out fracture.

Shajjah-l-Hashima: Fracture of bone without displacement.

Shajjah-l-Munaqqilah: Fracture with displacement of bone.

Shajjah-l-Ammah: Fracture skull and wound touches membrane of brain.

Shajjah-l-Damighah: Fracture skull, rupture of membrane and damage of brain.

IV. JURH (SEC 337B): Hurt on any part of the body other than head or face which leave a mark of wound temporary or permanent.

Kinds of Jurh

Jurh Jaifah: Injury extending to the body cavity of the trunk.

Jurh Ghayr Jaifah: Jurh not amounting to Jaifah.

1. **J-G-J-Damiyah:** Rupturing of skin with bleeding.
2. **J-G-J-Badiah:** Cutting of flesh without exposing bone.
3. **J-G-J-Mutalahimah:** Laceration of flesh.
4. **J-G-J-Mudihah:** Exposing the bone.
5. **J-G-J-Hashimah:** Fracture of bone without displacement.
6. **J-G-J-Munaqillah:** Fracture with displacement of bone.

V. MISCELLANEOUS (SEC 337-L):

Section 337-L1: Who so ever causes hurt not mentioned here in before, which endangers life of a person or causes the sufferer to remain in severe bodily pain for 20 days or more or renders him enable to follow ordinary pursuits for 20 days or more. e.g. hematoma, dislocation etc.

Section 337-L2: Who so ever causes hurt not covered in L1. e.g. bruise.

B. CLASSIFICATION OF HURT ON BASIS OF MANNER OF INFLICTION

i. Hurt by Negligent Driving

ii. Hurt by Rash and Negligent Act

iii. Hurt by Mistake (KHATA)

iv. Hurt by Means of Poison:(Section-337J)

Causing hurt by administering or causing to be taken poison or stupefying, intoxicating or un-whole some drug or any other thing with intent to commit or to facilitate the commission of an offence.

SALIENT FEATURES OF QISAS AND DIYAT ORDINANCE

1. Elaborated and simplified QATL with Clarity.
2. Elaborated and simplified hurt with clarity.
3. Elaborated and simplified abortion with clarity.
4. Introduced a special section for child protection.
5. Introduced a special section for rash/negligent driving/act.
6. Offence of theft, robbery, dacoity, zina, qazaf (untruly blaming a person) cannot be pardoned or compromised on.
7. State has moved to a lower position in QATL and HURT cases, its position is only of an execution agency, Victim or Wali has risen to a higher position.
8. Power/Duties of authorized Medical Officers have increased. Earlier he was only a certificate giving authority, now he will also assess:
   a. The loss occurred.
   b. Loss of future earning capacity.
   c. Calculate the possible QISAS.
   d. Execute QISAS on orders of court (the doctor will cut the hand, limb, fingers of the convict with his own hands).
9. When QATL is not traced the law is silent while SHARIAT compels the state to pay QISAS in such situations.
10. The law provides no remedy for such a situation in which the offender has nothing to pay for QISAS but the victim or WALI demand payment.

EVIDENCE

"All legal means (material or statement) presented in the court of law during the judicial proceeding to prove or disprove an allegation." OR "Any material (except arguments) presented in the court of law to prove or disprove the matter of fact."

PRINCIPLES FOR PRODUCTION OF EVIDENCE / ADMISSIBILITY OF EVIDENCE

1. It must be a simple description of truth so transparently honest in its deduction that its integrity is beyond doubt.
2. It must be clear, concise, factual and relevant.
3. It must be confined to the matter in issue.
4. It must be given by person, orally and on oath in the presence of accused with an opportunity of cross examination.

Hear say evidence is not admissible except:

i. When the evidence is non-controversial.
ii. When it is impossible to produce the witness .e.g. dying declaration.

Classification of evidence:

1. Direct Evidence
2. Indirect Evidence
3. Circumstantial Evidence
4. Trace Evidence or Contact Trace Evidence

1. Direct Evidence

It means the person who is giving evidence has perceived the evidence by his senses.

This may be:

i. Oral or verbal evidence (oath is taken)
ii. Documentary or written evidence (medical, birth and age certificates)

2. Indirect Evidence

It means that the person has not seen or perceived the evidence and is forwarding some other person's evidence.

3. Circumstantial Evidence

The facts which can be known from the study of the circumstances.

OR

When circumstances are in the form of evidence.

Example: A person having injuries is lying dead on a road and there are some broken wind screen pieces nearby and two tyre marks. The circumstances suggest road accident.

Circumstantial evidence has no legal value.

4. Trace Evidence or Contact Trace Evidence

Any material left behind at the site of occurrence (scene of crime) or on the body of victim or assailant, which helps objectively in identification or investigation, is called trace evidence.

Types of Trace Evidence

A i. Fixed trace evidence (Which cannot be separated easily).

ii. Loose trace evidence (Which can be separated easily).

B. i. Biological

a. Fluids: Blood, semen, urine, saliva, excreta, vomitus, stomach contents etc.

b. Others: Hair, nail clippings, nails scrapping, and finger prints, teeth marks, pieces of skin etc.

ii. Non-Biological

a. Belongings: Cloths, socks, gloves, rings, pens, keys, chains, purse, handkerchief, smoked cigarettes etc.

b. Implements: Bullet, instruments, bottles, weapons, injections, syringes, bullet case, knives etc.

iii. Environmental

Mud, sand, grass, air sticks, seeds and fruits etc.

DYING DEPOSITION:

It is the **written statement** of a seriously ill person **on oath** in the presence of accused with an opportunity to cross examination in judicial proceedings.

When an important witness is suffering from serious illness, unable to come to the court of law to record his evidence, court of law will go to him to record his evidence as **dying deposition.** All conditions of deposition will be fulfilled at the place where the witness is lying, may it be his house or hospital. It can be taken in every case when the witness is critically ill.

DYING DECLARATION:

It is the **written or verbal statement** of a person whose death is imminent regarding the circumstances relating to his condition.

Any credible person can write down his evidence, about circumstances leading to his condition, as a dying declaration.

Medical practitioner, being in charge of the patient would be the logical choice. He should not shrink from this legal duty. He

being the best judge about the physical health and mental condition ought to know what to do in such a situation. Admissibility of dying declaration is subject to the condition that victim is the only witness, if dead, cannot subsequently be produced in the court of law. Further, there is an assumption that impending death compels the injured to speak the truth. Dying declaration is valid only after the death of the victim. It is recorded only in homicide cases.

DIFFERENCE BETWEEN DYING DEPOSITION AND DYING DECLARATION

Dying deposition	Dying declaration
Presence of accused is necessary.	Presence of accused is not necessary
It is on oath.	It is not on oath.
It is always taken down in writing.	It may be verbal or written.
A justice of peace can only record it.	It can be recorded by any credible person even the attending medical practitioner.
Leading questions are allowed.	Not so.
Carries more weight than dying declaration. Because it retains full legal value even if the victim survives.	Carries less weight than dying deposition. Because it has no legal value if the victim survives.
It can be taken in any case when the witness is critically ill.	It must be taken in criminal case of homicide

RECORDING OF EVIDENCE: (Testimony)

Evidence is recorded in the court of law in the following three stages:

1. Examination-in-chief
2. Cross-examination
3. Re-examination

1. **Examination-in-chief** is the first and main component of evidence. The party who produces the witness conducts it. The facts deposed to in this examination must be within the memory and recollection of the witness. Only scientific witnesses like medical practitioners or ballistic experts are allowed to refer to their written notes. Leading questions are not permitted.

2. **Cross-examination** is the second part of the evidence, which is conducted by the party who defends the case. It is required to test credibility of the witness, accuracy of the evidence and willful omission of facts. Leading questions are allowed.

3. **Re-examination** is the third stage providing an opportunity to rectify discrepancies that may have occurred due to cross-examination.

The court may ask questions during any stage of examination to certify the facts.

CONSENT:

It is a mutual agreement between two parties on a same point for a specific period.

ROLE OF CONSENT

Permission of the patient before the start of medical treatment is important.

A patient is not obliged to submit to medical treatment, until and unless, he is involved in some contagious disease or dangerous to other members of society. Consent or permission is necessary for all medical procedures, whether undertaken for purpose of diagnosis or physical treatment. Permission doesn't absolve the medical practitioner from applying a reasonable degree of carefulness towards the patient. Consent should be both free and full.

TYPES OF CONSENT

The type of consent depends upon the current situation. There are two situations, usually faced by a practitioner.

1. An emergency situation
2. Other situations

1. CONSENT IN EMERGENCY OR IMPLIED CONSENT

It is applied in emergency. It is that consent, which is given by patient demeanour, gestures, or presentation at the time of arrival to the practitioner. e.g. a patient with serious injury comes to hospital, his condition demands an immediate treatment without any wastage of time. Such conditions imply that patient has already consented and law takes no cognizance, if consent procedure is not adopted.

2. OTHER SITUATIONS

EXPRESSED CONSENT

It should be taken from all, except emergency patients. In this type of consent, the nature, purpose and inherent risks involved in treatment are explained to the patient. After that the consent is taken.

Types: Expressed consent may be

i. Oral
ii. Written

Both forms of consent are valid in law, but for evidential purpose, written consent is necessary, which is also called informed consent.

INFORMED CONSENT

It is that type of expressed consent, in which the patient having full knowledge about medical treatment agrees to take it in **written form.** It is taken before:

a. Operations
b. All medico legal cases
c. General anesthesia

Blanket Consent

It is the most frequently practiced consent in our hospitals. It is the one that is obtained without fully explaining about the proposed treatment.

Age of Consent

For the consent, the patient should be a major (18 years for male and 16 years for female).

In case of children under age of majority and in those patients who are unable to consent due to unconsciousness or mental sickness, consent should be taken from parent, near relative or guardian.

PROCEDURE OF CONSENT

A. Standard Procedure of Consent

It is that the medical practitioner tells his patient the nature of treatment and its possible risks in simple language and gets his permission before actually starting the treatment.

B. Modified Procedure

This procedure of consent may have to be adopted on certain occasions because of the position of the patient and circumstances of the case. A few examples are:

1. Muslims refuse medical preparations containing alcohol and morphine, being prohibited in Islam.
2. Christians of the sect belonging to Jehovah's witness object to blood transfusion.
3. Similarly there are medical treatments for which the patient alone may not have the sole authority to consent like the use of contraceptive drugs or sterilization in married patients.

In all such situations, the medical practitioner has a duty to save the patient and he should follow the dictates of professional ethics.

SAMPLE OF INFORMED CONSENT

I, _____(name of consentee)_____ NIC number _____(of the consentee)_____, do hereby consent to _____(my own / relationship with the patient)_____ undergo the operation of _____(name of the operation)_____ under _____(type of anesthesia)_____ anesthesia. I have been explained fully the nature, purpose and inherent risks involved in this surgery and the type of anesthesia by Dr. _____(name of the doctor taking consent)_____. No assurance has been given to me that any particular surgeon will perform the operation.

Signature of the Patient _____

Date_____

I confirm that all relevant detail in respect of the above-referred operation and anesthesia have been fully explained to the consentee who has signed this form.

Signature of the doctor taking consent

Date_____

CONDITIONS IN WHICH CONSENT IS NOT NECESSARY

i. Prisoners
ii. Immigrants at ports to exclude infectious diseases
iii. Insane
iv. Persons suffering from modifiable disease
v. Suicidal poisoning
vi. PM examination for medico legal purposes.

NEGLIGENCE (Act of Omission/Act of Commision)

The omission to do something which a reasonable person would do, or doing

something which a reasonable person would not do.

MEDICAL NEGLIGENCE

It is the failure to perform the duty, to exercise a reasonable degree of skill and care in the treatment of the patient.

It is the duty of a doctor to treat the patient properly. If there is some failure to deliver standard care to the patient, due to which patient suffers from some injury, the doctor is responsible for this. In such cases, the compensation should be brought against the doctor. However, it should be proved that the injury was due to direct, indirect or proximate conduct of the doctor. Burden of proof of negligence of the medical practitioner normally rests on the patient. Extent of damage in such claims is not limited to the physical injury alone. The patient is entitled to recover the damages for physical injury, pain and mental suffering along with any loss of earning capacity associated with the injury. This is why the claims awarded are generally very extensive.

Essential Elements of Medical Negligence------(4D's)

1. Duty 2. Dereliction (Breech of duty)
3. Direct causation 4. Damage

TYPES OF NEGLIGENCE

1. Civil Negligence

It results from lack of carefulness in the administration of treatment.

Examples:

i. Extraction of healthy tooth instead of diseased one.

ii. Failure to X-ray fractured part.

iii. Failure to give anti-tetanus vaccine following injury.

Such a case is brought before a civil court for compensation in terms of money.

2. Criminal Negligence

It results from gross and wicked recklessness on the part of medical practitioner showing absolutely no regard for the safety of the patient's life and in such cases, the patient usually dies. In such a situation, the state punishes the wrongdoer and the medical practitioner is charged under criminal law with man slaughter.

Examples:

Over anesthetizing of the patient by an addicted anesthetist solely to satisfy himself. or leaving of the patient unattended after opening the abdomen by a surgeon to meet a friend or a relative of patient to negotiate fee are examples of criminal negligence.

3. Third Party Negligence

It is defined as, carelessness on the part of Para-medical staff working in a hospital may damage the patient and this type of negligence is called Negligence of the third party.

4. Contributory Negligence

In this case, the patient becomes negligent and doesn't carry out the medical instructions, and thus contribute to the results. It is then referred to as contributory negligence.

Res IPSa Loquitur: It is a legal term meaning **"the thing speak for itself"**, e.g. if after surgery, a saw or scissor or some other operating material is left out in the abdominal cavity, so it implies negligence on the part of surgeon, and the burden of proof lies on medical practitioner.

PROFESSIONAL SECRECY

Any information received by a medical practitioner during the doctor-patient relationship is a sacred trust with the doctor and it should not be disclosed to a third party without the consent of the patient.

Conditions where professional secrecy can not be maintained;

A public interest: these may be circumstances in which the doctor may think that public interest should be preferred on his ethical obligation to maintain professional secrecy.

Example:

He may think that, he should disclose to the licensing authority the physical and mental condition of his/her patient, if he/she considers the patient unsafe for driving.

Conditions, where professional secrecy should be maintained

Example: Less serious suicidal cases.

PROFESSIONAL MIS-CONDUCT

If the medical man in the pursuit of his profession has done something, which is reasonably regarded as disgraceful or dishonorable by his fellow professional brothers of good repute and competency, then it is open to medical council to say that he has been guilty of professional misconduct.

TYPES OF ABUSE IN PROFESSIONAL MISCONDUCT-----(5A's)

a. Abuse of doctors privileges

1. To issue false medical certificates
2. Prescription of drugs to addicts
3. Disclosure of Patients secrets

b. Abuse of doctor patient relationship

1. Indecent assault / adultery
2. Adultery
3. Black mailing

c. Abuse of professional knowledge

1. Criminal abortion.

d. Association with unqualified persons

It means referring the patient to clinics of under trained and unqualified person, just to get shares.

e. Advertisement

(Only limited advertisement is allowed)

1. Unusual big name plates

(Standard size is 3 x 2ft or 36 inches x 24inches)

c. To Prescribe Minimum Qualifications of Medical Teachers

The counsel sends the inspection committees to evaluate the teaching facility and the examination arrangements of the medical institution for purposes of its recognition. The council is fully empowered to grant recognition to a medical institution.

2. MAINTENANCE OF MEDICAL REGISTER

Medical register is the register that contains the names of all the available medical practitioners in the country and its preparation and keeping it up to date is an important duty of the council.

Portions of Medical Register

The medical register has two portions:

a. First Portion: It contains the names of medical practitioners who possesses only the basic medical qualification i.e. MBBS. These are ordinary medical practitioners.

b. Second Portion: It contains the names of medical practitioners who have also acquired additional medical qualification after attaining the basic medical qualification. They are the specialists, as they possess qualifications in the field of their specialization.

Procedure for Medical Registration

The medical registration can be obtained by submitting an application supported with a requisite fee, moral character certificate of medical proficiency and citizenship. Registration to practice medicine, once granted is not to be taken away unless the medical practitioner is found guilty of moral turpitude. Medical practitioners name may also be removed from the register due to non-payment of maintenance fee.

Privileges of RMP

Registration with the council grants RMP three privileges of

1. Seeking of employment against job or permission for independent practice.
2. Issuing of medical certificate for administrative and judicial purposes.
3. Charging fees for medical services rendered.

Obligations of RMP

1. To notify to the council, change of address on transfer with in a period of 30 days of change.
2. Not using any name, title, description or abbreviation indicating that he possesses an additional qualification, which is not conferred on him. Common example is that of writing RMP after the basic medical qualification.

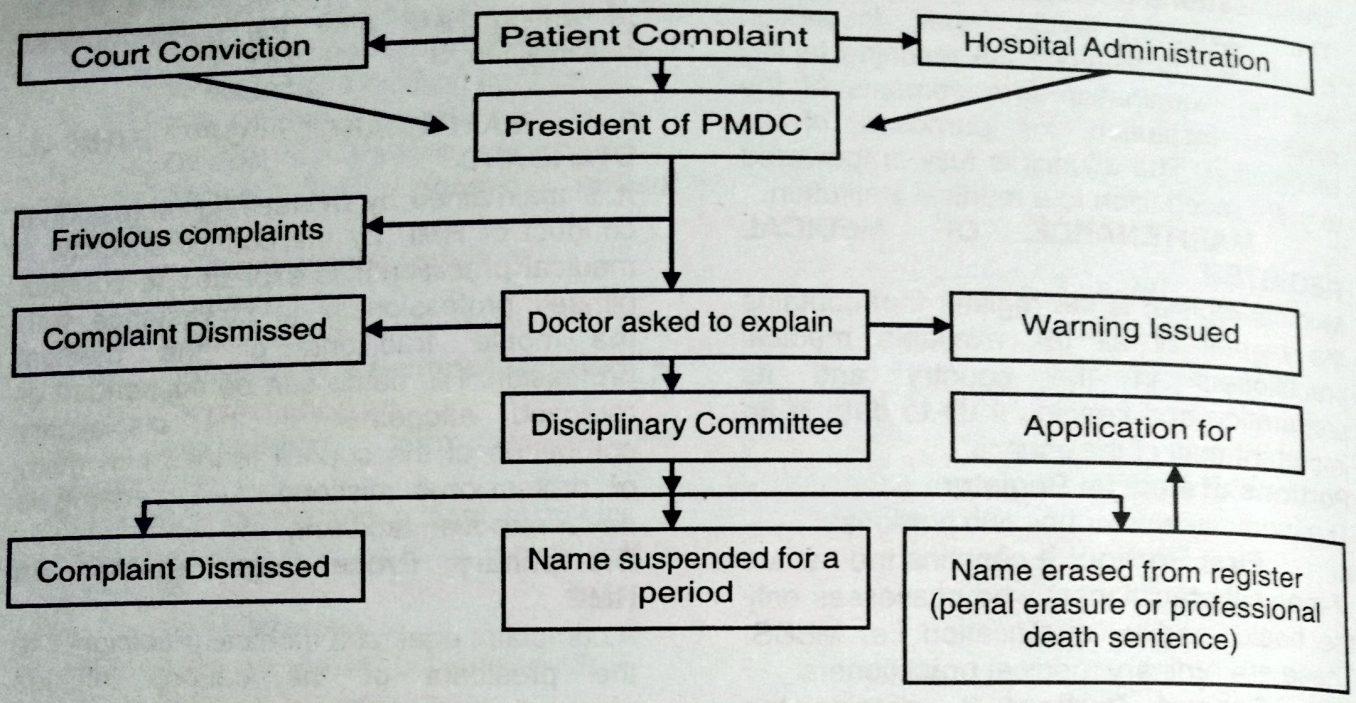
3. MAINTENANCE OF ETHICAL STANDARD

It is maintained by overseeing professional conduct of RMP by the council critically. A medical practitioner is expected to conduct himself professionally in consistence with the noble traditions of the medical profession. His name can be suspended or removed altogether if the disciplinary committee of the council founds him guilty of professional misconduct. The name is never removed arbitrarily.

Disciplinary Proceedings against an RMP

A complaint against a medical practitioner to the president of the council initiates proceedings against the medical practitioner. On receipt of a complaint against a RMP, a notice is given to him to explain his position. If the president considers the complaint frivolous, it is filed. But if there is any substance with concern, he receives a warning with an advice to improve himself. His name may be suspended or removed from the register if the charge against him is serious which is called **Penal Erasure or Professional death sentence**. He can make appeal against the decision.

DISCIPLINARY PROCEEDINGS



PRIVILEGED COMMUNICATION

It is the disclosure of patient's secret to agencies or persons, who qualifies to receive it having an interest in it or in reference to which the doctor has a duty to disclose.

It is considered justified in the eyes of law provided it is made in good faith in the course of legal or social duty.

Examples:

1. To give information to the higher authorities about a cook in a hostel who is suffering from infectious disease.
2. To inform higher authorities about a driver who is suffering from colour blindness.

EUTHANASIA OR MERCY KILLING

"The act of taking life to relieve suffering is known as euthanasia"

i. In **voluntary euthanasia**, the sufferer asks for measures to be taken to end his life.

Active steps may accomplish this usually with the administration of a drug or by **passive** euthanasia, the deliberate withdrawing of treatment.

ii. In **compulsory euthanasia**, the society or person acting as authority gives instructions to terminate the life of a person such as an infant who cannot express his wishes.

Voluntary or compulsory euthanasia is illegal in all countries. Although, many societies exist to promote the cause of voluntary euthanasia.

MEDICAL ETHICS

It is defined as

"A code of behavior or morals accepted voluntarily within the medical profession as apposed to statutes and regulations imposed by official legislation". OR "Study of morality,moral problems and moral judgements." OR "Morality in Medical Profession."

The practice of medicine is such that its numerous aspects will continue to fall outside official legislation nevertheless they are relative to doctor's behavior and his conscious. The matters are peculiar to medical profession. The following examples will crystallize the issue further

i. History taking and physical examination are pre-requisites to the prescription of appropriate treatment.

ii. History taking means taking out secrets of the patient on many occasions.

iii. Physical examination means manipulation of any part of the body and introduction of instruments in any opening (even private parts of body).

iv. Prescription of appropriate treatment includes administration of drugs even poisons, alcohol etc. and treatment such as, IUD (intra-uterine device), ligation, curatage and leprotomy etc.

All legislations will protect the right of a doctor during pursuits of noble profession. They possibly cannot regulate his behavior on moral side. The working of doctor would continue to fall outside official legislation, how extensive one may wish to formulate.

Those aspects of medical behaviors which fall outside formal legislation or cannot be brought under legislation are left largely to the conscious of individual doctor but the limits may be set by the profession.

In case of violation, the wrong doer may be declared unfit for the profession. Much of the ethics of medical profession represents purely the inter professional code of conduct. Ethics in relation to patient has one special significance having primary consideration not to take advantage of doctor's privilege in view of his special training or position as a professional man.

Medical ethics is also necessary to express the independence of individual practitioner to offer his services as he sees fit in accordance with the request for demands of his patients. or even employ.

Code of Medical Ethics in Pakistan

The PMDC has adopted slight modifications in the "International Code of Medical Ethics" for the administration to the medical graduates of this country at the time of their passing out:

"In the name of Allah, Most Gracious and Merciful.

I solemnly pledge that I shall abide by the principles laid down in the Code of Medical Ethics of the Pakistan Medical and Dental Council. I further make solemn declaration that:

- I consecrate my life to the service of humanity.
- I will give to my teachers the respect and gratitude which is their due.
- I will practice my profession with conscience dignity and fear of God.
- The health of any patient will be my first consideration.
- I will respect the secrets, which are confided in me.
- I will maintain by all the means in my power, the honor and the noble traditions of the medical profession.
- My colleagues will be my brothers and sisters.
- I will not permit consideration of religion, nationality, race, party politics, social standings to intervene between my duty and my patient.
- I will maintain the utmost respect, for human life, from the time of conception; even under threat, and will not use my medical knowledge contrary to the laws of humanity.

I make these promises solemnly, free and upon my honour".

IMPORTANT LEGAL DEFINITIONS

Judge

A person who is officially designated or empowered by law to give, in any legal proceeding civil or criminal, a definitive judgement.

Oath

A solemn affirmation specified by law, to be made before a public servant for the purpose of proof, whether in a court of justice or not.

Summon

Written, signed and stamped direction of a court to a witness, accused or a juror to attend the court at the notified time, date and place.

Warant of arrest

Written, signed and stamped authority to arrest a person, which shall remain in force till its execution or cancellation.

Affidavit

A written statement given on oath before any person authorized to administer an oath (oath commissioner).

Chapter – 2
EXAMINATION OF HAIR, BLOOD, SEMEN AND SALIVA

HAIR

Hair is an unbranched pigmented horny fibrous filament growing from hair follicle, present in the dermis and consisting of:

1. **Root**; lies in the dermis.
2. **Shaft**; projects outside the skin.
3. **Tip**; is the distal end of shaft

Zones / Layers of Hair

1. Cuticle
2. Cortex
3. Medulla

1. Cuticle

It is outer zone, consisting of keratin. This zone has a characteristic pattern for every hairy organism.

2. Cortex

It is middle zone consisting of longitudinal keratin fibers and pigment which gives the hair its color. In humans only cortex is pigmented.

3. Medulla

It is inner zone. It is also known as the medullary canal or the central shaft. In humans medulla is narrow, absent or fragmented.

Medullary Index

It is the ratio of the diameter of medulla to the diameter of the shaft.

MEDICOLEGAL ASPECTS OF HAIR

Hair serves the following purposes:

1. Identification.
2. Investigation of crime.
3. Time since death

Hair examination:

First wash the hair in a mixture of equal parts of ether + rectified spirit + benzol mounted in Canada balsam on slides examine under microscope after 24 hours.

Rough Test of Hair

On burning, hair burns with difficulty and with a disagreeable odour (due to its sulphur content) and fuses to a rounded bead like end.

1. IDENTIFICATION

A. Source of hair
B. Identification from hair

A. Source of Hair

	Humanhair	Animal hair
TEXTURE	Fine and thin	Coarse and thick
CUTICLE	Scales are small, Flattened (type VII) Serrated and surround the shaft completely	Scales are large, polyhedral (Type I to VI) wavy, don't surround the shaft completely
MEDULLA	Thin, may be absent fragmented or discontinuous	Broad, always present and continuous
CORTEX	Thick, 4-10 times as broad as medulla	Thin
PIGMENT	More towards the periphery of cortex	Uniform
PRECIPITIN TEST	Specific for human	Specific for animals

B. Identification from Hair

a.	Race	Hair Type
1.	Pakistani	Black, Fine
2.	Chinese	Dark Black, Coarse, Thick
3.	Negroes	Wooly Fine
4.	Europeans	Brown, Fine
b.	**Age**	**Hair Type**
1.	New Born	Fine, Soft, Downy, Non-

		Pigmented, Non-Medullated
2.	Puberty	Coarse, Pigmented, Medullated
c.	**Sex**	**Hair Type**
1.	Male	Male hairs are generally thick, coarse and dark.
2.	Female	Female hairs are generally thin, fine and light. (Sexing of Human hair is possible by studying the sex chromatin (X and Y Bodies) from root hair cells of the scalp)
d.	**Hair Position**	**Hair Type**
1.	Scalp Hair	Long with tapering ends, constant pigment distribution, dyed stained hair also suggestive of being scalp hair, on cross section appear oval or circular.
2.	Pubic and Axillary Hair	Short, stout, curly, uneven-pigment distribution.
3.	Beard Hair	Coarse, curved
4.	Moustache Hair	Nearly triangular on cross-section.
5.	Limb Hair	Taper from base to tip with granular medulla.
6.	Eyebrow, Eyelid, Nose, Ear Hair	Short, stubby with a wide medulla.
e.	**Special Features**	**Hair type**
		ABO blood group and other blood group systems as PGM, ESE and Gloi can be determined from single hair from any part of the body and this may prove vital in identification. Elemental composition of hair is determined by neuron activation analysis, which has shown the presence of at least 29 elements in hair.

2. EVIDENCE ABOUT CRIME

EDMOND Locard (1877-1966) introduced the concept of use of the trace evidence as means of personal identification on scientific lines.

According to Locard's Principle of Exchange: When two objects come in contact with each other, there is always some transfer of material from one to the other. Such transfer may or may not be visible to the naked eye. This law is applicable in criminal and sexual offences, when finding of foreign hairs, dirt fibers, pieces of clothes etc. provide corroborative proof.

Presence and Condition of Evidence about Crime

PRESENCE OF		CONDITION
A.	Animal Hair on Human body or vice versa	Bestiality
B.	Pubic hair of Assailant on Victim's body or vice versa	Rape or other sexual offences
C.	Assailant's hair firmly clutched in deceased's hand	Homicide
D.	Hair on vehicle involved in accidents (RTA)	Creates a link between vehicle and victim
E.	Mud stains on hair	Struggle is indicated
F.	Seminal stains on hair	Sexual offence
G.	Bloodstains	Injury or sexual offence
H.	Saliva Stains	Asphyxial Death
I.	Traces of poison	Metallic poisoning

INJURY TO HAIR

INJURY TYPE		CONDITION
A.	Natural Fall	Atrophied hair root,absent root sheath.
B.	Blunt injury	Ruptured cortex
C.	Forcible extraction	Irregular hair bulb
D.	Burning /	

	Singeing	Swollen,black,fragile.end twisted.peculiar smell
E.	Sharp weapon cut	Squre end with projecting cuticle

POISONING

In metallic poisoning if person has not died in acute stage, hair retains traces of poison for a considerable time. Chemical examination in such cases would reveal the presence of poison in the living cells as well as in exhumed bodies.

3. TIME SINCE DEATH

i. Hair ceases to grow after death but due to shrinkage of skin, there is an apparent growth of hair on face, the rate of growth of hair is about 0.4 mm/day. Approximate idea of the time of death may be obtained from this, if the time of last shave is known.

ii. Loosening of hair occurs due to putrefaction-of skin in 48-72 hours after death, this also provides some idea about the time of death.

SEMEN

Semen is a Latin word meaning SEED. Seminal fluid is the secretion from male reproductive organs and is secreted in the form of ejaculation. A single ejaculation has a volume of 2-5ml and contains the secretion of:

i. Seminal vesicles = Secretes choline and lecithin.

ii. Prostrate =Secretes acid phosphates,phosphorus and spermine.

iii. Testis = Produce spermatozoa and epithelial cells. In an ejaculate there are 200-500 million-sperms, of which 80% are

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CHAPTER – 3
PERSONAL IDENTITY

PERSONAL IDENTITY :

Identity is the determination of the individuality of a person who may be living or dead. It is based on certain physical characteristics unique to that person or individual. Identity may be complete or partial.

I. COMPLETE IDENTITY

It is the absolute fixation of the individuality of a person and determination of the exact place in community occupied by that person.

II. PARTIAL IDENTITY

It is ascertainment of some facts about the identity, while some remain unknown.

DETERMINATION OF PERSONAL IDENTITY: (METHODS)

Depending upon the circumstances of the case, the following three methods can be applied.

1. Third Party Method:

Identification by the person other than examiner and examinee is called third party identification.

This is the most commonly used and reliable method in which personal identity of the examinee is verified by his relatives or friends, and his name, his NIC No. and relationship with the examinee are entered in the medical certificate of the examiner.

2. Subjective Method:

When third party is absent, personal identity can be established by collecting morphological data of the examinee. Basic information collected during this examination comprises of description of physical characters of body of the examinee, especially facial features, other specified characteristics like height and weight ,gait,voice and webbed fingers etc.

3. Objective Method:

This method utilizes morphological and belongings data(like wrist watch,ring,cap,spectacles etc.) Investigating agencies utilize this data to isolate an individual-specific identity clue or character, which acts as a lead to personal identity. The examination is based on the theory that a character having intimate association to a person, may be in the body of person or his belonging is sufficient to establish his identity. For example the fattest, the shortest or the tallest boy in a class does not require additional characteristics, even facial, for his recognition. This information is published in press, radio or television.

This method may be useful in cases of decomposed or mutilated remains as these materials lack facial identity and so an essential part of subjective identification data is available.

A. IDENTIFICATION IN DEAD

Identification may not be a problem in fresh dead body because the person's relatives may identify him. But it is a problem to identify the decomposed, mutilated body or to identify a person from skeletal remains. In the later case when identification becomes difficult then a forensic pathologist is needed. Such problems arise in:

i. Fires (Burns)
ii. Explosions
iii. Mass disasters
iv. Bodies recovered from river, seas and canals
v. Decomposed bodies

In above mentioned cases since identification marks are lost, features are

bloatted, so even the nearest relative may not be able to identify the dead body.

PARAMETERS OF IDENTIFICATION IN DEAD

1. Features
2. Clothes
3. Secondary sexual characteristics
4. Finger printing
5. Hair
6. Serology
7. Skeletal method
8. Dental method
9. Radiology
10. Postmortem examination

1. Features

Features are important because they give us information regarding the age, sex, race, stature etc. of the person.

2. Clothes

They tell about the sex of an individual by the manner, he or she dresses up, and also about the race, culture, social status and religion of the person. Majority of the problems of the identification are solved when the clothes or personal effects are present.

Clothes if in unsatisfactory condition are washed and handed over to the relatives for identification, laundry marks, tailor's marks or dyer's marks are noted. In rare instances of crime, the person is deliberately clothed in borrowed garments or second hand clothes to mislead.

3. Finger Printing or Galton's Method

Finger prints are the impressions, made by the ball of fingers and is a parameter of identification. Finger prints are classified on the basis of ridges. Patterns are the following;

Types of finger prints:

1. Arch. 2. Loops 3. Whorl

4. Compound (Composite)

1. Arch Pattern (6-7%)

Ridges run from one side of the print to the other in an arch like fashion.

2. Loop Pattern (67%)

Ridges about the center of the print arrange themselves in somewhat HAIR PIN fashion, the edges of which point in a more or less slanting direction and there are two fixed points.

(a) Delta (b) Core

These are utilized in classification of fingerprints.

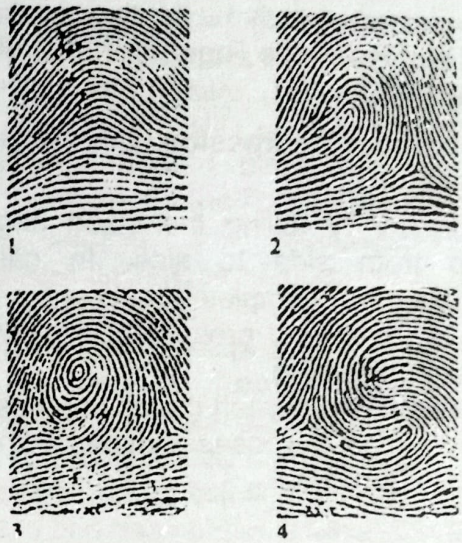


Figure: The four primary types of fingerprints.

3. Whorl Pattern (25%)

Ridges are arranged in circular design making clockwise or anti clock wise turns. There are usually two deltas and one core. Which are utilized in classification of fingerprints.

4. Compound Pattern (1-2%)/Composite Pattern

It consists of two or more than two preceding patterns. There are usually two deltas but sometimes three or sometimes even four are observed.

Note:

Fingers prints are not taken in.

i. Lepers (patients of leprosy).
ii. Infectious disease cases.

Advantages of Finger Printings

i. Applicable to persons of all ages.
ii. Prints can be obtained even from the putrefied bodies.
iii. Absolute identification is possible.
iv. No special training or expensive instruments are needed.

Method

Fingers are washed and dried to ensure clear print. The print is taken with printer's ink on unglazed white paper. Impression can be

A. Plain Impression (Partial impression)

It is obtained directly by lightly pressing the inked surface of the finger or thumb directly on paper.

B. Rolled Impression (Complete impression)

It is taken by rolling the inked finger or thumb from side to side. In case of criminals, the complete impression of all digits is taken and preserved by police for future identification.

In Pakistan, usually left thumb impression is taken for legal purposes in males and right thumb in females.

Medico-legal Value

Finger printing is important in:

1. Recognition of chance impressions left at the scene of crime.
2. Identification of the weapon used
3. Identification of the habitual criminals
4. Identification of decomposed or mummified bodies of unknown persons
5. Prevention of impersonation
6. As an extra precaution on cheques and notes.

4. Secondary Sexual Characteristics

These are beard, mustaches, breasts, buttocks and help in determination of sex and also identification after puberty.

5. Hair

This can help us in the determination of age, sex, race and blood groups.

6. Serology

It helps us in determination of blood groups of a person; also whether he or she is Rh positive or negative and so helps in determination of individuality of a person.

7. Skeletal Method

Study of bones gives us information about age, race, sex and height of a person. Also if old features are present, we can identify the individual.

8. Dental Method

This helps us in the study of age, sex, race, sometimes occupation and habits (taking, paan, cocaine etc). Any feature like missing teeth, distinction of teeth, prostheses, restoration etc. helps us in the identification of a person.

9. Radiology

X-Rays of bones give us a clue about the age of a person, sex of a person and X-Rays of frontal sinuses help us in determining the individuality of a person.

10. Postmortem Examination

When all the methods of identification are considered together in one examination after death, it is called postmortem examination.

B. IDENTIFICATION IN LIVING

Identification of living is not a problem if person is conscious, in a state of sound mind or does not want to hide his identity. However, problems of identity of person arise, when the person is unconscious, insane, has lost his memory or purposefully demises his identity.

Identification is done both in civil and criminal courts. In civil courts, it is required in cases of:

1. Insurance
2. Pension
3. Inheritance
4. Claims
5. Marriage
6. Disputed sex
7. Missing person

In criminal courts, it is done in following cases.

1. Criminals
2. Absconders
3. Impersonation
4. Rape
5. Sodomy
6. Murder
7. Inter change of newborns in maternity hospitals

Parameters of Identification or Yard Sticks of Identification

1.	Sex	2.	Age
3.	Race	4.	Stature
5.	Diseases	6.	Dental data
7.	Religion	8.	Hair
9.	Species	10.	Blood Grouping
11.	Congenital features		
	Anthropometric measurements i. Dactylographs and optometry and DNA typing ii. Footprints, lip prints iii. Congenital malformations iv. Personal appearances a. Personal effects, belonging and possession b. Speech c. Gait and gestures d. Habits e. Memory v. Identity marks like mole, birth marks, cleft lip and palate		
12.	Acquired peculiarities		
	a. Occupational stigmas b. Tattoos marks c. Scars, injection marks d. Acquired malformations		
13.	X-rays		
14.	Miscellaneous data (photographs)		
15.	Trace evidence		
16.	Special techniques (hand writing and photo fit)		

SPECIES "HUMAN REMAINS"

Mostly large amounts of the tissue and most often the whole of the body is sent for identification and here it is very easy to ascertain that whether remains are of human or not. However, when only parts of body are represented, the question of whether the remains are human or not, also become a problem. The forensic pathologists have found the answer to this in the form of two tests.

A. Precipitin Test

Anti-Human serum is prepared in this test as follow.

"Human blood serum is injected into an animal e.g., rabbit, subcutaneously, I/V or I/M or intraperitoneally. The serum of rabbit after sometime will contain antibodies against the human blood. The specific foreign proteins of the human blood serum, which caused the development of antibodies in rabbit blood, are called **"precipitinogens"**.

The antibodies developed in the rabbit blood are known as **precipitins**. Now, if suitable concentration of human clear tissue extract is added to the above prepared standard solution of anti human serum, a fine base of flocculation develops at the junction of two fluids. The test being highly sensitive provides a reliable measure of whether the remains are of human or not.

B. Antiglobulin Inhibitor Test

It is a highly sensitive test and depends upon the power of human globulin to protect the body against sensitized human cells from agglutination. The test requires great skill and is not in common use.

RACE

It is a yard stick or parameter of identification. There are three main races in the world.

1. Caucasians
2. Mongolians
3. Negroes

The question of determination of race arises in:

a. Cities where different races live together.

b. When unclaimed, unidentified bodies are found in Air crashes or railway accidents.

c. Bodies recovered from wells, tanks, canals and rivers.

Race can be determined from

(i) External Appearance,
(ii) Bones

(iii) Cephalic index

I. EXTERNAL APPEARANCE

This includes:

A. Clothes

Different races wear different clothes, but nowadays, due to education and development, this difference is disappearing.

Example:

i. Indian ladies mostly wear → Sari
ii. Pakistanis wear → Shalwar Kurta
iii. Japanese wear → Kinano
iv. Scottish wear → Kilt

B. COMPLEXION

This is of little value since decomposition produce changes in the external appearance. But classically the:

1. Negroes are black
2. Eastern people are brown
3. Europeans are fair

C. HAIR

It is often possible to infer the race by colour, arrangement, length and appearance of hair.

a. Pakistanis / Indians → long, black; fine

b. Chinese / Japanese → long, black and thick

c. Europeans → Short, fine light brown or reddish

D. EYES

- Pakistanis and Indians → brown to black iris
  - White Europeans → Grey, blue or green iris.

E. LIPS

- Lips are usually thick and everted in Negroes

ii. Bones

Skeleton	Caucasian	Mongolian	Negroes
Skull	Rounded	Square	Narrow and elongated
Forehead	Raised	Inclined	Small and compressed
Face	Proportionately small	Large and prominent, molar bones prominent	Large; molar bones and Jaw projecting; teeth set obliquely
Upper extremity	Normal	Small	Long in proportion to the body, forearm large in proportion to arm; hands small
Lower extremity	Normal	Small	Legs large in proportion to thighs, feet wide and flat, heel bones projecting backward
Orbital openings	Triangular	Round	Square
Nasal openings	Narrow and elongated	Round	Broad
Palate	Triangular	Round or horse shoe shaped	Rectangu-lar

Skeleton	Caucasoid	Negroid
Skull Height	High	Low
Face height	High	Low
Facial profile	Straight	Downward slant
Radio-Humeral index	Below 75	Above 75
Tibio-Fibular index	Below 83	Above 83

iii. CEPHALIC INDEX OR INDEX OF BREADTH

It is the most important test for determining the race. It is obtained by multiplying the maximum breadth of the skull (measured transversely), with 100 and dividing it by

the maximum length (measured before backwards) i.e.

$$\text{Cephalic index} = \frac{Maximum\ Breadth \times 100}{Maximum\ Length}$$

i. Dolico Cephalic (long headed)	(C.I) 70-74.5	Earliest inhabitants like Aborigine and Aryans, Negroids
ii. Mesati Cephalic (medium headed)	(C.I) 75-79.9	Europeans (white Caucasians) and Chinese
iii. Brachy Cephalic (short headed)	(C.I) 80-84.9	Mongolians

RELIGION:

This may be very difficult to ascertain a dead body but traditionally speaking religious markings or dress may distinguish them.

However, these differences are quickly disappearing. Before independence the Muslims and Hindus were the main populations living together in Indo-Pak. The following criteria distinguish the two:

Hindu Males:

Not circumcised, sacred thread, wooden beads, necklace, religious marks on forehead, dress is of some help.

Hindu Females:

Put on SARI; paint the vermilion on forehead, nose ring in the left ala of the nose, fewer openings on the helix for ear rings and silver ornaments too.

Muslim Males:

They are usually circumcised with corns and callosities on the lateral aspects of the foot and knee.

Muslim Females:

They wear shalwar and do not paint vermilion on the forehead. They wear a nose ring in the septum and several openings in the helix of ear.

SEX

In the civil law, sex has importance in relation to the rights and duties reserved to one sex.

The determination of sex from external examination is easy but in cases of hermaphroditism, concealed sex determination, decomposed bodies, in a child with undescended testis, difficulty may arise.

Determination of sex may be required in living or dead body.

A. Determination of sex in living body:

Sex in living can be determined by the:

1. Most certain evidence
2. Highly probable evidence (These are revealed by physical examination of breasts, genitals and other organs)
3. Presumptive evidence (Includes nature of clothes, facial appearance, general built and secondary sexual characters)

1. Most Certain Signs

Male	Female
Presence of testicles which results in emission of semen. Presence of prostrate, penis and seminal vesicles	A functioning ovary with periodic menstrual discharge. Presence of uterus, vagina, fallopian tubes.
Nuclear sexing = Chromatin negative	Nuclear sexing = Chromatin positive

2. Highly Probable Evidence

	Male	Female
i.	Shoulders broader than hips	Hips broader than shoulders
ii.	Breasts not developed	Breasts developed
iii.	Pubic hair are thick and extends up to navel	Pubic hair horizontal and covers pubic region only.
iv.	Adams apple developed	Adams apple not

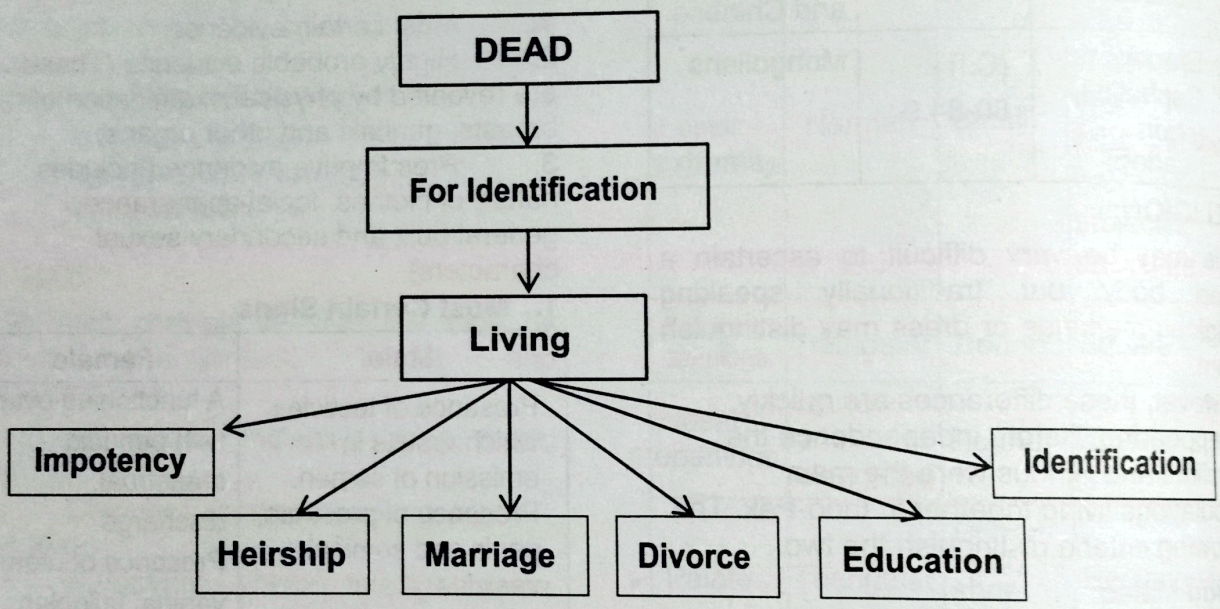
		developed
v.	Deeper voice	Voice is soft
vi.	Linea Albicans not developed	Linea albicans present on breast and abdomen. If pregnancy has occurred

3. Presumptive Evidence

	Male	Female
i.	Presence of hair on the face and chest	Nil
ii.	Evidence of shaving	Nil
iii.	Scalp hair not long	Scalp hair may be long
iv.	Dress, habits, inclinations	Dress, habits, inclinations

INTER-SEX STATES

These are conditions in which male and female characters (for example, gonads, external genitalia), physical form and sexual characters co-exist to a varying proportion in the same individual.



CAUSES

Variations from distinctly male or female sex are due to faulty development of a group of cells from which sex organs of both sexes are derived. This may result in the development of certain male and female structures in the same individual or imperfect differentiation of certain male and female external genitalia and so these are inter sex states.

CHIEF HOMOLOGOUS STRUCTURES

	Male	Female
1.	Glans Penis	Clitoris
2.	Prepuce	Labia minora
3.	Gubernaculum testis	Round Ligament
4.	Testicles	Ovary

KINDS OF INTER SEX

Following kinds of inter sex are known

1. True Hermaphrodites: Bisexuality

Both ovaries and testis are present, either separately or combined together as ovotestis. In this condition, the external genitalia are of both sexes. Nuclear chromatin may be female or male.
This is also called "Double Sex".

2. Pseudohermaphrodites

In this condition, there is clear cut lack of differentiation of external genitalia, while the internal reproductive organs are asexual. They are classified as male or female according to the presence of ovaries or testis even though the external genitalia may be reversed.
Medicolegal complications created by hermaphroditism pertain chiefly to marriage, inheritance and civil rights.

I. Male Inter Sex "Andro-Gynoid"

Testis is present with female external genitalia. Axillary and pubic hair scanty. They are chromatin negative. Rarely, a, uterus may be present. In this case tissues fail to respond to circulating androgens.

II. Female Intersex "Gyna-Android"

In this case ovaries are present but external genitalia resemble those of a male. They are chromatin positive. This may be due to the defective biosynthesis of fetal adrenocorticosteroids or excessive maternal androgenic influence on the fetus.

3. Gonadal Agenesis

In this condition, the sexual organs have never developed i.e. ovary and testis. The abnormality is detected in early fetal life Person is chromatin negative.

4. Gonadal Dysgensis

In this condition, the external sexual structures are present but ovaries and testis fail to develop at puberty. The most important examples of such conditions are:

I. Klinefelter's Syndrome

In this case boy grows and develops normally but puberty is delayed. On examination one of the 3 classical features of syndrome become apparent.

a. Small or hyalinised testis with apparent aspermia.
b. Gynecomastia
c. Eunuchoidism ----- which is characterized by scanty pubic hair, poor or no beard growth and is sterile. Person is chromatin positive. His sex chromosome pattern is XXY (47 chromosomes)

II. Turner's Syndrome

Female is chromatin negative. The sex chromosome pattern is XO (45 chromosomes). Three principle features are:

a. Sexual infantilism

This includes amenorrhea, lack of breast development, wide spaced nipples, hypo plastic areola, scanty pubic hair, infantile external genitalia, streak ovaries containing only fibrous tissue, no ovarian follicle.

b. Short stature
c. Congenital anomalies

Urinary gonadotropin levels are increased. Female is sterile and cannot bear a child.

5. Transvestite

Transvestite is the one who is obsessed with the clothing of the opposite sex having compulsion to cross-dress whereas a **Transsexual** has a dominant wish to identify with the opposite sex as completely as possible discarding forever his or her own anatomical sex.

CONCEALED SEX

Criminals may attempt to conceal their sex by change of dress or other methods to avoid detection or for social reasons respectively. A well known example of concealing sex is Dr. James Barty inspector general of hospital. He practiced fraud till his death at the age of 80 years. On autopsy it was discovered that he was really a female.

Sex Determination in Doubtful Cases

In doubtful cases, sex is determined from:

a. External examination
b. Internal examination (done on body for the presence of prostrate or non gravid uterus)
c. Gonadal biopsy
d. Nuclear sexing
   - Barr body
   - Davidson's body

Nuclear Sexing

Determination of sex on the basis of presence or absence of DAVIDSON'S and Barr bodies in cell is called Nuclear Sexing. It is helpful in determining sex in doubtful cases, in mutilated bodies and fragmentary remains.
It is based upon the difference of nuclear chromatin in both sexes. In undividing female cells, the inner surface of nuclear

membrane shows minute condensations called BARR BODIES. These cells showing condensation are spoken as "Chromatin positive". Barr bodies are absent in male cells.

The nuclear sexing can be done from buccal mucosal cells, a skin material, smooth muscles, cartilage, root of hair, suprarenal cortex etc.

Most important of these is the **Hair Root** because:

a. Hair resists autolytic changes.
b. No special technique is required.
c. Hair root cells are especially important because both the Barr body and sex chromosomes can be determined in them.

The polymorphonuclear cells in female have a drum stick like projection of the nucleus called Davidson's body. The cells showing these bodies are chromatin positive. The polymorphonuclear cells of males do not show DAVIDSON'S BODY and are chromatin negative.

B. SEX DETERMINATION IN DEAD OR DECOMPOSED BODY

It is important if:

1. Body is highly decomposed so that the external and internal sex organs have disappeared either from attack of animals, exposure to air, water or burial ground.
2. Body is mutilated.
3. There is deliberate attempt to destroy sex.
4. Only some portions of body are available for examination.
5. Identification of sex from skeletal remains.

Sex determination in dead is done in following ways:

a. We look for specific sex organs which resist putrefaction to maximum. These are non gravid uteri in females and prostate in males, so this can be of help in sex determination.
b. Hair distribution gives us important information.
c. Adams apple is well developed in males while not in females.
d. Nuclear sexing: The nuclear features may persist for 2-3 weeks
e. Sex determination from bones.

SEX FROM SKELETON:

In relation to sex, skeletal data is of value only after puberty. The sexual characters of the bones do not manifest themselves until puberty is reached.

DIFFERENCES AT PUBERTY:

Differences at puberty in both sexes can be studied in the following bones:

Skull
Sternum
Mandible
Pelvis
Innominate bone
Sacrum
Long bones
Humerus
Femur

DEGREE OF SEXING ACCURACY

Whole skeleton	100%
Skull alone	90%
Pelvis alone	95%
Skull and pelvis	98%
Pelvis + long bones	98%
Long bones alone	80%

PATTERN OF STUDY OF:
Sex differentiation of skull

	Male	Female
1.	Skull is bigger, heavy and much more rugged.	Skull is smaller, lighter and much less rugged.
2.	Cranial capacity is almost 10% more.	Cranial capacity is almost 10% less.
3.	Frontal sinuses more developed.	Frontal sinuses less developed.
4.	Orbits are square with thick rounded margins.	Orbits round with sharp thin margins.
5.	Parietal eminence large.	Parietal eminence small.
6.	Occipital condyles and occipital protuberances are large.	Occipital condyles and occipital protuberances are small.
7.	Frontal eminence is small.	Frontal eminence is large.
8.	Foreman magnum large due to large skull.	Foramen magnum is small.

9.	Breadth of C1 = 83mm.	Breadth of C1 = 72mm.
10.	Forehead sloping.	Forehead vertical.
11.	Mastoid process large, rough, blunt, surface area is much more.	Mastoid process is small, smooth and pointed.
12.	Muscle markings are prominent.	Muscle markings are not prominent.
13.	Palate large, U-shaped.	Palate small, parabola shaped.
14.	Frontonasal angulation is distinct.	Frontonasal angulations are not prominent.
15.	Facial bones more massive and not delicate in texture.	Facial bones less massive and delicate in texture.

Sex differentiation of Mandible

	Male	Female
1.	Chin square	Chin rounded
2.	Ramus more broad	Ramus less broad
3.	Angle everted	Angle inverted
4.	Lower jaw more massive	Lower jaw less massive
5.	Symphyseal height more	Symphyseal height less

SEX DIFFERENTIATION OF PELVIS

S.No.	Male	Female
1.	Body of pubis is triangular. Sub public angle is less than 90^0 (70^0)	Body of pubis is rectangular. Sub pubic angle greater than 90^o (120^o)
2.	Subpubic arch is inverted V-shaped	Subpubic arch is broad and U-shaped
3.	Ischiopubic ramus slightly inverted and convex above	Ischiopubic ramus is more everted and is concave above
4.	Symphysis is high (bigger).	Symphysis is low (smaller).
5.	Obturator foramen is large and oval	Obturator foramen small and triangular
6.	Acetabulum large	Acetabulum small
7.	Greater sciatic notch is narrow and deep	Greater sciatic notch is shallow and wide
8.	Ilia high and more upright	Ilia lower and inclined
9.	Sacroiliac joint is large	Sacroiliac joint is small and more oblique
10.	Pre-auricular sulcus infrequent	Pre-auricular sulcus is prominent and more developed
11.	Pelvic brim is heart shaped	Pelvic brim is rounded
12.	Sacrum is high, narrow, uniformly curved, may have more than five segments	Sacrum is shorter, broader and less curved in upper portion. Sacrovertebral angle is more prominent and has 5 segments
13.	Pelvis as a whole is strong, heavy and muscular	Pelvis as a whole is less massive and smooth
14.	Ischial spines are inverted	Ischial spines are everted
15.	Sacral promontory well marked	Sacral promontory not well marked
16.	Ala of sacrum not wide	Ala of sacrum is wide

Ischiopubic Index (I.P.I)

It is the ratio of ischial length (mm) and pubic length (mm) multiplied by 100. The length is measured from the point where they meet in acetabulum (the point being marked by a notch)

$$|PI| = \frac{Ischial\ Length\ (mm)}{Pubic\ Length\ (mm)} x\ 100$$

IPI for males = 73-94
IPI for females = 91-115

IPI in caucasian

Males < 90
Females > 90

Sacral Index "SI"

It is the ratio of breadth of the base of sacrum to its anterior length multiplied by 100.

$$SI = \frac{\text{Breadth of Base of Sacrum}}{\text{anterior length of Sacrum}} \text{ x } 100$$

SI for males = 112
SI for female = 116

Sex differentiation of sternum

Male	Female
Longer and narrow.	Shorter and wider.
Length of body of sternum is twice the length of manubrium sterni.	Length of the body of sternum less than twice the length of manubrium sterni.
Upper border is generally in level with lower border of body of 2nd thoracic vertebra.	Upper border is generally in level with lower border of 3rd thoracic vertebra

Sex differentiation of Femur

Male	Female
Head of femur is larger and is almost 2/3 of sphere.	Head of femur is smaller and is less than 2/3 of sphere
Due to narrow pelvis, the neck of the femur forms an obtuse angle with shaft of femur (more)	Due to wide pelvis, neck of femur makes right angle or acute angle with shaft of femur (less)
Mean length of femur = 491 mm.	Mean length of femur = 434 mm.
Mean transverse diameter of femur is 44.66 mm	Mean transverse diameter of femur (less)
Mean vertical diameter of femur is 48.76 mm.	Mean vertical diameter of femur is 42.67 mm.

AGE

Determintion of age requires understanding of the life span of human beings. Age span has three phases.

1. Proliferative phase
2. Static phase
3. Retrogressive phase

1. Proliferative phase

It is the biologically active phase, from conception to 25 years, during which developments occur in human body.

2. Static phase

It is the biologically inactive phase from 25 to about 44 years, during which no change occurs in human body.

3. Retrogressive phase (Degenerative phase)

It is also the biologically active period from 44 years onwards, during which degenerative changes occur in almost every part of the body.

Ages of medicolegal importance

Medicolegally important ages are:
A. Intra–Uterine Age
B. Extra–Uterine Age

A. INTRAUTERINE AGE

Intrauterine age is divided into three stages.

1. Pre-embryonic stage (1 to 3 weeks)
2. Embryonic stage (4 to 8 weeks)
3. Fetal stage (9 weeks to birth)

Estimation of Intrauterine Life or Age

Age in intra-uterine life can be estimated by
1. Height and weight of fetus
2. Appearance of ossification centers
3. Teeth
4. Placenta
5. By external features

1. Height and weight of fetus

Height and weight of fetus have definite relationship with age in intrauterine life.

Hess's Rule

Square root of length in centimeter gives age in months up to 5 months.

Suppose height of fetus is 25cm, then square root of = 5, so age of fetus is 5 months.
Beyond 5 months, the height is divided by 5 if taken in cm and by 2 if taken in inches.

Age	Length	Features
1st month	1.25 cm	Embryo formed showing limb buds
2nd month	2.5 cm	Head formed showing ears and hands
3rd month	9 cm	Placenta formed. Nails appearing
4th month	15 cm	Sex clear. Hairs appearing on head.
5th month	25 cm	Fetus, 350-450g weight
6th month	30 cm	Fetus, 700-900g weight
7th month	35 cm	Fetus, 1.2-1.4 kg weight
8th month	40 cm	Fetus, 1.5-2 kg weight
9th month	50 cm	Fetus, 2.5-3.5 kg weight

2. Appearance of ossification centers

Appearance of ossification centers in different bones of the body also helps in assessing the age during intrauterine life as shown in table.

Age	Bone
5th week or 6th week	Clavicle (Primary ossification center)
2nd month	Appearance of primary ossification center in almost all long bones
3rd month	Ileum, ischium
4th month	Pubis
5th month	Calcaneous, manubrium
6th month	Sacrum
7th month	Talus, sternum (1st part / segment)
8th month	Sternum (last part / segment)
9th month	Cuboid & femur (lower end)

3. Teeth

The teeth make their appearance in the form of dental buds at 24-28th week of intrauterine life.

4. Placenta

If placenta is available and fetus is missing, then the age of fetus can be calculated from placenta.
Primary chorionic villi appear at the second week.
Secondary & tertiary chorionic villi appear at the end of third week.
Full term placenta has

Thickness	=	3cm
Diameter	=	15-25cm
Cotyledons	=	15-20
Weight	=	500-600gm

5. By external features

No. of somites:
1 to 4 somites are present at the end of third week. After this 3 pairs of somites are formed daily.
Similarly, appearance of nails, lanugo hair (present upto three months), villus hair (appears after three months and present till puberty), development of face, sex differentiation, eye lashes, descent of testies etc. all help in determination of age.

B. EXTRA–UTERINE AGE

Extra-uterine age can be determined by the following:

1. Umbilical cord
2. Height and weight
3. Teeth
4. Skeleton
5. Miscellaneous data
   a. Birth records
   b. Changes at puberty
   c. Changes due to old age

1. Umbilical Cord

Umbilical cord has dusky red colour in first 24-Hr, and red colour in 24-48 Hr. it dries in 3 days and falls in 5 days. Whole process occurs in 7-8 days.

2. Height and Weight

Age	Height	Weight
Birth	45-50cm	2.5-3.5kg
6 months	60 cm	(5-6kg) Double of Birth Weight
1 year	67 cm	(7.5-9kg) 3 times of BW

Heights and weights indicate in a general way the rate of growth but the individual variations are so great that they are of little value from medico-legal point of view for fixing the age.

3. Teeth

For age estimation from teeth, it is necessary to know:

a. The difference between temporary and permanent teeth
b. The time of their eruption
c. The period when their root calcification is completed, and this can be ascertained on x-ray examination.

a. Difference between Temporary and Permanent Teeth

	Temporary teeth	Permanent teeth
i.	20 in number.	32 in number.
ii.	Small, narrow, light and delicate except temporary molars which are longer than permanent premolars replacing them,	Big, broad, heavy and strong except permanent pre molars replacing temporary molars.
iii.	Crown china white in colour. Junction of crown with the fang often marked by a ridge.	Crowns white in colour. Junction of crown with the fang not so marked.
iv.	Neck more constricted.	Neck less constricted.
v.	Edges serrated.	Edges not serrated.
vi.	Anterior teeth vertical.	Anterior teeth usually inclined somewhat forward.
vii.	Molar are larger. Their crowns are flat and their roots are smaller and more divergent.	Molars are tricuspid. Their crowns have cusps and roots are bigger and relatively straight.

b. The time of eruption of teeth:

The time of eruption of teeth gives a good indication of age up to 18 to 25 years but there are variations depending upon dietetic, geographic and other factors.

Temporary teeth eruption

Maxillary	
Tooth	**Months**
C1	7
L1	8
C2	15-20
M1	12-15
M2	20-30

There are 20 temporary teeth in all, 10 in upper jaw and 10 in lower jaw.
In each jaw there are:

2 Central incisors (C_1)
2 Lateral incisors (L)
2 Canine (C_2)
4 Molar (M)

Permanent Teeth

Time of eruption in years:

Tooth		Year
C 1	——>	7
L 1	——>	8
C	——>	11
PM 1	——>	9
PM 2	——>	10
M 1	——>	6
M 2	——>	12-13
M 3	——>	18-25

There are 32 permanent teeth in all, 16 in upper jaw and 16 in lower jaw.
Each jaw contains:

2 Central incisors(C_1)
2 Lateral incisor(L_1)
2 Canine or cuspids(C)

4 Premolar or bicuspids(PM)
6 Molar or tricuspids(M)

Wisdom Tooth

The wisdom tooth usually erupts between 18-25 years of age. After 12 years the lengthening of the ramus behind 2nd molar would be looked for.
Presence of all the molars including wisdom tooth indicates that the age is probably above 25 years.
Absence of wisdom tooth does not signify that the age is less than 25 years because they may be:

a. Retained, extracted or interrupted

b. Behind the 2nd molar, so cannot be erupted

In such cases we look for

a. Calcification or degree of calcification of root.

b. Lengthening of ramus of mandible: Fully erupted 2nd molar and no space behind it, indicates age is between 14-15 years. Full space behind fully erupted 2nd molar and no evidence of 3rd molar age(**spacing of jaw**) is above 15 and below 16 year.

c. Time of root calcification

DECIDUOUS (TEMPORARY)

Maxillary Center*	
Tooth	Yrs
C1	1 ½ - 2
L	1 ½ -2
C2	2 ½ - 3
M1	2 – 2 ½
M2	3

PERMANENT

Maxillary and Mandibular	
Tooth	**Yrs**
C1	10
L1	11
C	14-15
PM1	12-13
PM2	13-14
M_1	9-10
M_2	15-16
M_3	18-25

Boyde's Incremental Lines

The materialization of primary teeth and 1st molar starts at 28th week (7 month) of Intra-uterine Life
Materialization occurs in the form of incremental lines called Boyde's incremental lines. These lines are formed in diagonal rhythm, each day a new incremental line is added.
The formation of incremental lines is affected by changes in the environment. When the baby is born, the environment is changed, the surroundings are changed and due to this first stress of life, a thick incremental line is deposited, called the Neonatal line. So, by taking the longitudinal section of teeth and seeing it under the microscope we determine not only the fact that whether the child was born alive or dead but also the fact that he lived for how many days by counting incremental lines after the neonatal line.

Gustafson's Method

Gustafson said that the age can be estimated by the changes that occur in the teeth due to process of aging.
These changes are:

i. Attrition or wearing out of teeth
ii. Obliteration of pulp canal or secondary dentine formation.
iii. Root resorption:
iv. Translucency of root
v. Cementum deposition (Increase in tissue holding root in place)
vi. Periodentosis or loosening of teeth or apical migration of the periodontal membrane.

Gustafson's method consists of microscopic examination of longitudinal section of central part of tooth, to assess these changes. By this method age can be estimated between 25-60 years.

4. Skeleton

Skeletal Age can be estimated from: Length of bones.

Appearance of ossification centers.(Krogman's classification)
Vertebral ossification.
Epiphyseal union.
Closure of sutures.
Changes in pubic symphysis
Carpal bones.
Changes in spine.
Changes in Skull.
Mandible.
Deciduous teeth.
Permanent teeth.

i. length of bones

Increase in length of long bones is proportionate to increase in height and advancement of age upto the attainment of age of maturity. Therefore, length of long bones by itself can be used as an indication of age. Femur is the most useful. Before the age of union of the epiphysis, maximum length of femur without epiphysis is taken and compared with standards. This method is useful when the estimation of the age of an immature skeleton without skull or dental data, becomes necessary.

ii. Appearance of ossification center (krogman's classification)

Krogman has divided skeletal developmental changes for the estimation of age into seven periods:

1) **Period 1** is from Birth to 5 (five) years and age estimation during this period depends on centers of ossification that appear after birth.

2) **Period 2** is from 5-12 years. The age estimation during this period depends upon growth of the above center of ossification and appearance of additional secondary centers. The size of the center indicates the age.

3) **Period 3** is from 12-20 years. During this period, the union of epiphysis with their shafts in most of the long bones is an indicator for estimation of age.

4) **Period 4** is from 20-25 years. By this time, nearly all the epiphysis in the body have united, except the center in the medial end of the clavicle which is extremely variable both in its appearance and union.

5) **Period 5** ranges from 25-36 years. In this period, skull sutures begin to close and the extent of their closure is helpful. Important sutures, which close during this period are coronal, sagittal and lambdoid. The union starts from inner aspect and obliteration of the suture of skull sets in a little later and proceeds more slowly in females than in males.

6) **Period 6** is from 36-50 years. Further progress, in the period takes place about closure of sutures and early degenerative changes of age occur in articular surfaces of the long bones in the joints such as lipping of ends, loss of joint spaces and pressure of punched out areas of osteoporosis. These changes can easily be seen by X-ray examination.

7 **Period 7** is from 50 year onwards. The process of the closure of sutures and joint change proceeds further, along with calcificaiton of laryngeal and costal cartilage are indications for estimation of age. The prominent feature of this period is pathological changes in the skeleton.

Besides the longs bones, the bones of the skull also help in the determination of age. The skull bones are separated by sutures which are analogous to epiphyseo-diaphyseal planes in the long bones. Both are loci of growth, begins centrally and proceeds peripherally and have a sequence and timing of union.

iii. Vertebral ossification

1st cervical: When secondary dentition is complete
2nd cervical: 6th year
Lumber: 6th year
Sacrum: 22-24 years

iv. Epiphyseal Union

Appearance of ossification center and epiphyseal union occurs ahead in females as compared to males. It also occurs one year earlier in hot climate as compared to cold climate. Similarly, radiological union of bones is an year earlier as compared to actual union.

The most reliable epiphyseal union is:

Elbow joint	13-14 years (female) and 14-15 (in males)
Wrist joint	14-15 years (female) and 15-16 (male)

Shoulder joint	16-17 years (female) and 17-18 years (male)

The rule is that, take the age of the epiphyseal union of middle of the arm and then add to it 1-2 years. This would be the epiphyseal union down. Then add 1-2 years in the lower down epiphyseal union; this would give epiphyseal union higher above the middle of arm. e.g.

E.U. of elbow joint = 14-15 years
E.U. of wrist joint = 14-15 + 1-2 year = 15-16 years
E.U. of shoulder joint = 15-16+1-2 years = 17-18 years

Same rule is applied for lower limbs i.e., Knee Joint, Ankle Joint, Hip Joint. In X-Rays: - the bone is radio-opaque while the cartilage is shown by dark shadow, so if there is partial epiphyseal union; then there would be half black shadow or black line.

v. Closure of Sutures

Closure of sutures on inner aspect proceeds the closure of sutures on the outer aspect.

Sutures	Age of Closure
Basi-Sphenoid	18-22 years
Sagital	30-35 years
Coronoid	35-40 years
Lambdoid	45-50 years
Parieto-mastoid	55-60 years
Squamous	55-60 years
Spheno-parietal	65-70 years

vi. Changes in Pubic symphysis

- At age less than 20 years, layer of compact bone is near the symphyseal surface.
- At 20 years, the symphyseal surface is marked uneven with wavy ridges running transversely (Billowing)
- At 30 years, irregularity is much less obvious
- At 50 years, the symphyseal surface is replaced by surface having granular appearance.
- When proper techniques are used, the symphyseal changes are more reliable, dependable and accurate than any other change, when unknown skeletal remains are available for estimation of age.

vii. Carpal Bones

Age can also be estimated by the carpal bones. The number of carpal bones indicates age in the years upto six years.

1 carpal bone = age is 1 year
2 carpal bone = age is 2 year
and so on.

viii. Changes in spine

Radial markings on the upper and lower surfaces of the vertebral bodies are present.	Below 10 years (youth)
Radial markings are pronounced	At 10 years
Radial markings fade and disappear	At 30 years
Lipping of bones especially lumber vertebrae and joints of extremities	After 40 years
Atrophic changes in the disc	40 – 45 years

ix. Changes in Skull

Parietal thinning due to senile osteoporosis when present can be taken as reliable sign of that age is not under 60 years. Its absence is without significance.

x. Changes in Mandible

I. In Infancy

1 Short ramus.
2 Ramus makes obtuse angle with body.
3 Condylar process projects above the coronoid process.
4 Mental foramen near the lower margin.

II. In Adult Age

1. Ramus is long
2. Ramus makes right angle with body
3. Condylar process projects beyond coronoid process.
4. Mental foramen near the middle.

III. In Old Age

1. Ramus in short
2. Ramus makes obtuse angle with body
3. Coronoid process projects above the condylar process.

Mental foramen appears to be shifted near the alveolar margin, but actually due to

wear and tear of the alveolar margin, it looks like so.

5. MISCELLANEOUS DATA

Includes

a. Birth records.
b. Changes occurring at puberty.
C. Changes due to old age.

a. Birth Records

The record of birth provides legal proof of identity, age, nationality, parentage and civil status of individual.

b. Changes at Puberty

Appearance of pubic hair in males	14 years
Appearance of pubic hair in females	13 years
Appearance of Axillary hair in males	15 years
Appearance of Axillary hair in females	14 years
Appearance of hair on upper lip and chin in male	16-18 years
Breast development in females	13-14 years
Menstruation in females	13-14 years

c. Changes Due to Old Age

Wrinkling on face	After 40 years
Arcus senilis	After 40 years
Hair on auditory meatus	After 50 years
Greying of hair	After 40 years
Cataract	After 80 years

Arcus Senillis

This condition appears after the age of 40 years and is an opaque line around the cornea due to fatty degeneration. It has no effect on vision. It may appear earlier in people with defective, fat metabolism.

AGES OF MEDICOLEGAL IMPORTANCE

0-1 years	Infant killing
2-5 years	Battering, school going
7-12 years	Diminishedcriminal responsibility
12 years	Consent for ordinary purposes (routine medical checkup)
Below 14 years	Cannot be allowed to work in a factory
14 years (male)	Kidnapping
16 years (female)	Kidnapping, rape
16 years (male)	Abduction
18 years (female)	Abduction+Vote casting
16 years (female)	Contract marriage
18 years (male)	Contract marriage+Vote casting
1 8 years	Age of major consent for medicolegal purposes + light living
18-25 years	Ordinary service
21 years	Heavy driving license
25 years	Election
25-35 years	Health services
45 years	Menopause
+45 years	No colipping
60 years	Retirement

FACTORY ACT 1948

Child	Below 15 years
Adolescent	15-18 years
Adult	Above 18 years
Below 14 years is not allowed to work in a factory.	
Below 15 years is not allowed to work in mines.	

IMPORTANCE OF AGE DETERMINATION / AGE CERTIFICATE

1. Infanticide or Infant Killing

The newborn having passed period of viability (7 months or 210 days) is called infant and his killing is called infanticide.

2. Battered baby syndrome or Caffey syndrome

The battered baby syndrome is a term used to define a clinical condition in young children usually under three years of age, who have received non-accidental violence or injury, on one or more occasions, at the hands of an adult responsible for the child's welfare. Six patterns of child above are recognized:

i. Physical abuse
ii. Nutritional deprivation
iii. Sexual abuse
iv. Intentional drugging
v. Neglect of medical care or safety.
vi. Emotional abuse

The victim is often an unwanted child, an illegitimate child, or a child whose father's paternity is doubted.

3. Criminal Responsibility

A child below the age of 7 years is incapable of committing an offence and so he is not punished.

A child-between 8-12 years is punished, presumed, to be capable of committing an offence if he has attained sufficient maturity of understanding, to judge nature of, and consequences of his conduct on that occasion. However the child cannot be given severe punishment for this. He may be sent to the reformatory school.

A child below the age of 12 years cannot give a valid consent to suffer any harm which can occur from an act done in good faith or for his benefit, as for example consent for surgical operations.

4. Kidnapping

If is defined as, carrying away a person from lawful guardianship by illegal means. Offence of kidnapping consists of taking a minor under the age of 14 years if male and less than 16 years if female from lawful guardianship without consent of such guardians with bad intentions.

Kidnapping a person under the age of 10 years with intentions of taking dishonestly any movable property of the person is a Crime Of Kidnapping and in this case punishment is enhanced.

5. Rape

Sexual intercourse by a man with a girl under 16 years of age, even if she be his wife, or any other girl under 16 years of age even with her consent, constitutes the offence of rape.

6. Attainment of Maturity/Majority

A person is deemed to have attained maturity on completion of 18 years. Now he assumes full civil rights and the responsibilities. When the minor is under the guardianship of wards of court or is under the guardian appointed by the court he is not deemed to attain his majority until he is 21 years of age. After the attainment of majority the person can sell his property, give valid consent, and serve on a jury.

7. Competency as witness

No age limit is laid down for this purpose. Every person is competent to testify provided he is able to understand the question put on him by the court.

8. Eligibility for Employment

For ordinary government services 18-25 years and for health services are 25-35 years.

A child below the age of 14 is not allowed to work in factory. A child below 15 years of age is not allowed to work in mines because he is more prone to occupational diseases. If the child is allowed to work then he is given compensation to take rest.

9. Consent

Consent for ordinary purposes is 12 years. Consent for medicolegal purpose is 18 years.

10. Retirement

Age of retirement for government service is 60 years.

11. Contract Marriage

A girl under the age of 1 6 years and a boy under the age of 18 years cannot do contract marriage.

12. Judicial Punishment

Juvenile offenders, that is children below 10 years of age who have committed crimes are trialed by Juvenile courts and are entrusted to parents or guardian for care or sent to reformatory school where they are trained in some occupation and they are not kept there after the age of 18 years.

Murderers under the age of 18 years cannot be sentenced to death, similarly

whipping is not allowed on female or males after the age of 45 years.

13. Identification

The determination of age is an important parameter of identification of an individual, living or dead. When a person suddenly appears after many years or when dead body is produced as that of the missing person, complete identification becomes absolutely necessary. The approximate age is an important link to a chain of "identity data".

STATURE

(If complete skeleton is available)

i. Stature is determined by the length of the skeleton + 2.5 cm (for thickness of soft parts)

(If the body is mutilated, its approximate stature is determined from the following data)

ii. The stature of an individual is equal to the length measured from the tip of the middle finger to the tip of the opposite middle finger when the arms are fully extended.

iii. The symphysis pubis normally forms the centre of the body from 20^{th} or 25^{th} year onward. Accordingly, stature is twice the length from the vertex (top of the head) or heel to the top of symphysis pubis.

iv. The height can be ascertained from one arm by multiplying its length by two and adding 30cm for the two clavicles and 4cm for the sternum.

v. The length of forearm measured from the tip of the olecranon process to the tip of the middle finger is equal to 5/19 of stature;

vi. The length from the sternal notch to pubic symphysis is 1/3 of stature

vii. The vertical distance from the top of head to the tip of the chin is about 1/7 of stature.

viii. The length of the skull is approximately 1/8 of stature of the person.

In general, the humerus represents 20%, tibia 22%, femur 27%, and vertebral column 35% of the suture.

MATHEMATICAL FORMULA

Average length of the body = multiplication factor x length of the bone

Multiplication factor of different bones

Humerus	5.3
Radius	6.7
Ulna	6.0
Femur	3.82
Tibia	4.4
Fibula	4.4

TATTOO MARKS

These are the designs, effected by multiple small puncture wounds made through the skin with needles or similar penetrating tool dipped in a dye. **(Tattoo means To mark)** Design found on any part of the body and variety of pattern reflects individual's intentions.

Permanency of tattoo marks depends on.

1. Type of dye used: Black red and blue dyes are commonly used because they are durable and permanent.
2. Depth of penetration: The optimum depth of penetration is up to the superficial layers of the dermis.
3. Part of body tattooed: Common sites are chest, back, shoulders, arms and forearms.

MEDICO LEGAL IMPORTANCE OF TATTOO MARKS

i. Identification
ii. Personal events of life
iii. Profession
iv. Behaviors
v. Social status
vi. Political convictions etc.
vii. Religion
viii. Race

REMOVAL OF TATTOO MARKS

Various artificial means are used for elimination:

i. Dermabrasion
ii. Application of caustic substances or CO_2 snow
iii. Electrolysis
iv. Surgery
v. Exposure to laser beams

The former 4 methods would leave scar but there will be no scar in case of laser beam.

SCARS:

"A scar is a fibrous tissue covered by epithelium, formed as a result of healing process of a wound or injury when there has been a breach of continuity in tissues."
OR "A product of healing of a wound by fibrosis and cicatrisation."
It has no hair follicles or sweat glands but it is slightly vascular, owing to presence of a few capillaries.

CHARACTETRISTICS OF SCARS

In general it resembles the shape of wound e.g.

1. In incised wound, it is linear and triangular. It is straight if the wound has healed by first intention. If the wound has healed by granulation, then scar is wide and thicker.
2. If incised wound is on loose skin such as scrotum etc. scar will be irregular and may be smaller than original wound.
3. In lacerated wound, scar is broad and irregular.
4. In extensive burns, scar is large, irregular and keloidal.
5. In bullet wounds, scar of entrance is small than that of exit and is irregular.
6. In stabbing, scar is triangular and smaller in size than the blade of weapon.

APPEARANCE OF SCARS

Appearance of scars depends upon nature, size of wound, vascularity of the part, method of healing of wound, age and health of the person.

TIME OF APPEARANCE OF SCAR

In superficial cuts, scar is formed in 4-5 days. In clean surgical wounds,14 days. In suppuration wounds,from 2 weeks to 2-3 months.

AGE OF SCAR

It is difficult to tell.
First it is red, tender, covered by scab, then it turns brown and later white and glistening (due to obliteration of capillaries) in 3-4 months. It remains permanently there onwards.

GROWTH OF SCAR

Those produced in childhood grow with age especially those of chest and limbs.

MEDICOLEGAL IMPORTANCE OF SCARS

1. Helps in identification
2. Identification of weapon causing wound
3. Time of occurrence of event (crime)

DNA Profiling

This is useful, if suitable tissue (blood, semen stored in bank) is available. If no such tissue is available. The DNA profile of autopsy derived tissue should be compared by single probe analysis with that of parents, children, siblings, and if necessary other relatives. This is now used worldwide in aircraft and other major accidents.

magnesium and the volume of cerebrospinal fluid soon after death is about 150 ml. After twenty-four hours, it gradually disappears.

Mason, Klyne and Lennon (1951) investigated the postmortem rise in potassium and other consistuents over about 60 hours. Diffusion of constituents like lactic acid, non-protein nitrogen and amino acids were non-specific.

❖ SUDDEN DEATH:

Sudden death is the type of death in which medical certification of its cause cannot be done with confidence by medical practitioner either due to few clinical symptoms or insufficient medical supervision.

The cause of death in such cases can only be determined following an autopsy examination.

Sudden death, whether natural or unnatural, must be investigated to determine its cause before its disposal. Natural deaths are generally about 80% of all deaths in a community, which is a significant portion of the total mortality.

Natural death is uncommon between the ages of one thirty. The most common causes of such deaths are clinically silent degenerative disease, fulminating infection or malignant growth in almost every organ system. Men greatly out-number women as the victim of this type of demise.

Unnatural deaths constitute a lesser proportion of the total number of deaths occurring in a community and according to the World Health Organization, they are the 5th largest group of causes of death. The greatest percentage of natural causes follows the involvement of the cardiovascular system. The mechanisms of death in this system in order of increasing suddenness are hemorrhage from a vessel, peripheral blockage of a vessel, and inhibition of the action of the heart. The extent of hemorrhage from a vessel depends upon the two factors, namely the size of the bleeding vessel and the ability of the area involved to tolerate the accumulation of blood. With smaller vessels, the effect is less but given the same size in the cranial or the pericardial cavity, the lethal effect may be because of concurrent effect on the functioning of these organs.

COMMON NATURAL CAUSES OF SUDDEN DEATH

Cardio-vascular System		
	Heart	Coronary artery disease, hypertensive heart diseases, aortic stenosis, cardiomyopathies.
	Great blood vessels	Atheromatous and dissecting aneurysms.
Nervous system		Sub-arachnoid and cerebral hemorrhages, epilepsy.
Respiratory system		Pulmonary embolism, tumor, TB, asthma and viral pneumonia
Gastro-intestinal system		Perforated viscus, mesenteric thromboembolism, G.I hermorrhages
Uro-genital system		Tumors of testis, ovary, uterus and cervix, abortion, ruptured ectopic pregnancy.

MEDICOLEGAL IMPORTANCE:

i. It is important to determine whether any violence has played some part in the death.

ii. Insurance claims or civil suits based on allegation that death resulted from accidental injuries may arise.

iii. The question of "workman's compensation" may be raised if death occurs at work and if there is possibility of industrial disease or accident.

iv. The possibility of death from poisoning may be there.

v. The investigation is important if a communicable or epidemic disease is detected.

PRESUMPTION OF DEATH:

If an individual is away from his home or he is working in armed forces and is missing or he just leaves his home without any information, the question arises of claim of insurance and distribution of property. If an individual is missing for 7 years, the law presumes that the individual is dead and this is called "Presumption of Death".

PRESUMPTION OF SURVIVAL SHIP:

When two natural heirs of each other or relatives die in a common accident e.g. earthquakes, air crashes, battles etc. the question of distribution of property arises after death. As there is no witness at the scene of death to declare who died first, it is presumed that the following factors on consideration will help in determining the question of survival and death. These factors are as follow,

1. Age:

The newborns, infants, children and old people will die earlier as compared to an adult on account of his greater resisting power.

2. Sex:

Females are weaker and die earlier than males. A strong energetic female may live longer than a weak emaciated male.

3. Post Mortem Changes:

Depending on the appearance of changes, time of death can be presumed.

4. Injuries:

The individual receiving more injuries on vital organs like heart, lungs etc. will die quickly.

5. General Physique:

A healthy individual survives longer than a weaker one.

Mode of Death:

eans proximate cause of death.

Parturition:

her lives longer than the child except n death is not due to hemorrhage.

Asphyxia:

ales consume less oxygen than males n conditions where O_2 is less, they live

er. People having muscular work as in s, will die quickly due to exhaustion, in arthquake, survival will depend upon the nt of injuries caused by debris from e fall and also by the depth to which s buried i.e. deep people die first.

Child Birth:

g parturition, the baby dies first use of low resistance. Difficult labor, ses of placenta and strangulation with mbilical cord will cause death of the first.

Temperature:

ld and heat, children and old will die

Burns:

t of part of the-body burnt is more tant than the depth and severity. Burns ead, trunk and genitals are more erous than on other parts. Old people children will die first as compared to because of:

Initial shock.

Secondary complications of burns.

Starvation:

les will live longer than males because

Less food consumption.

Being more fatty.

resumption of survival ship is important use if Mr. A, under a will leaves his erty to Mr. B and both of them die in the disaster. The heirs of Mr. B will get the erty only if Mr. B survived or Mr. A dies r than Mr. B. If Mr. B dies earlier, legally as died before acquiring the property.

about the time of death and survival as discussed above.

DEATH CERTIFICATE:

A legal document issued by a register medical practitioner stating that the individual is dead is called Death Certificate. This is issued for:

i. Tissue transplantation.

ii. Disposal of the dead body.

Individual is first identified with his name, age, sex, and father's name and after, that death certificate is given. Afterwards doctor has to write his name and his registration number.

Death Certificate

The following is the specimen of the certificate of the cause of death.

To: The Municipal Commissioner, Peshawar.

I do hereby certify that I attended the deceased (full name) ..... aged about ..... residing at .....during his last illness and that to the best of my belief, the cause of death at (time) ..... on (date) ..... was as stated below:

Cause of death		Approximate interval between onset and death
1. Disease or condition directly leading to death.	a. ..... (due to or as consequence of)	Years/ Days Months/ Hours
Antecedent cause: morbid conditions, if any, giving rise to the above cause, stating the underlying condition last	b. ..... (due to or as consequence of)	Years/ Days Months/ Hours
2. Other significant conditions	c.	Years/ Days Months/ Hour

contributing to..... s
the death but
not related to
the disease or
condition
causing it.

Address or rubber stamp of the institution

Signature, designation of the medical officer

EXAMINATION OF A PERSON AFTER DEATH:

There are 3 different fields of examination of dead bodies,

1. Examination at the scene of crime or place of death.
2. Transient of the dead' body from scene of crime to mortuary.
3. Examination in the mortuary.

1. Examination at the scene of crime or place of death:

Procedure:

Authority from the police or magistrate must be obtained for examination at the scene.
If death is un-natural, there is no need of consent from relatives.
It is teamwork. The team includes doctors police investigators; trace evidence experts, finger print experts and photographers (duty of police at the scene is to keep law and order only)
On arrival at the scene do not touch any thing and ask the photographer to take photographs from different

2. Keep
ears open. If
your hands in
3. See w
or not, if he is
4. If he i
declaration.
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(Intrarectal a
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Chapter – 15
GENERAL TOXICOLOGY

TOXICOLOGY
(Toxic–Greek word for Arrow)
Toxicology is a branch of medical science which deals with sources, properties, actions ,symptoms, diagnosis and management of poisons.

FORENSIC TOXICOLOGY
Forensic Toxicology is the branch of Toxicology which deals with law. It is the Detection of Criminal poisoning by Chemical Analysis.

CLASSIFICATION OF TOXICOLOGY

A. General Toxicology:
It deals with general aspects of poisons i.e. routes of entry of poison, channels of excretion, factors modifying the action of poisons and duty of doctor in dealing with a case of poisoning.

B. Special Toxicology:
It deals with the individual poison like source of poison, properties, signs and symptoms, treatment, autopsy findings and medicolegal aspects of a poison.

C. Analytical Toxicology:
It deals with the procedures and methods used for qualitative and quantitative analysis of different poisons.

POISON:
There are 3 definitions of poison i.e. Sub-continental, American, Pakistani.

1. Sub-Continental:
Any substance administered in whatever way produces ill health or death is called a poison.

2. American:
A poison is a substance which acts on body chemically, physiologically in toxic doses consistently causes a disturbance of functions which may result in illness or death. This is the most accepted Definition.

3. Pakistani:
Any substance in any form, taken or given by any route, in a quantity which effects the anatomy, physiology and biochemistry of individual leading to ill health, disease or death is called poison.

CLASSIFICATION OF POISONS

A. According to field or Trade:
- Industrial poisons
- Agricultural poisons
- Domestic poisons
- Therapeutic poisons

B. According To Manner Of Poisoning:
- Homicidal poisons
- Suicidal poisons
- Accidental poisons
- Stupefying poisons

C. According to Source of Poisons:
- Animal poisons
- Vegetable poisons
- Synthetic poisons
- Mineral poisons

D. According to chief symptoms produced by poisons:

1. Corrosive
2. Irritants
3. Neurotics
4. Cardiac poisons
5. Asphyxiants
6. Miscellaneous

1. Corrosives

A. STRONG ACIDS

i. Mineral Acids
H_2SO_4, HCl, HNO_3

ii. Organic Acids
Oxalic acid, Acetic acid, Carbolic acid.

B. STRONG ALKALIS
- Caustic soda
- Caustic Potash.
- Sodium Carbonate
- Potassium Carbonate
- Ammonium Carbonate

iii. Vegetable Acids
Hydro cyanic acid

2. Irritants

A. Inorganic Irritants

i. Metallic
Arsenic,Antimony, Lead
Copper, Zinc, Mercury
Radio isotopes

ii. Non metallic
Chlorine, Bromine
Iodine,Phosphorus.

B. Organic irritants

i. Animal poisons
Snakes, Scorpions, Poisonous insects

ii. Vegetable Poisons
Castor oil seeds, Croton Oil, Capsicum

C.Mechanical poisons
Powdered glass
Diamond dust

3. Neurotics

A. Cerebral Poisons

i. Somniferous Poisons
Opium, Morphine, Heroin

ii. Inebriants
Alcohols, Hypnotics, Fuels
Insecticides, Anesthetics

iii. Deliriant poisons
Dhatura, Itropa belladonna, Hyoscyamus, Cannabis, Cocaine.

B. Spinal Poisons
Strychnine and Gelsemiun

C. Peripheral
Tubocurarine and Conium

4. Cardiac Poisons
Digitalis, Aconite, Tobacco, Oleander

5. Asphyxiants
CO, CO_2, War gases

6. Miscellaneous
a. Analgesics ——— Aspirin,Paracetamol
b. Anti-histamines ——— H1 Blockers, H_2 Blockers
C. Tranquillizers ——— Diazepam
d. Antidepressants ——— Tricyclic Compounds
e. Hallucinogens ——— L.S.D

E. Medico legal Classification

Common Suicidal Poisons
- Barbiturates, $CuSo_4$, Opium

Homicidal Poisons
- Arsenic
- Arsenic Cyanide., Arsenic
- Mercury
- Insecticides, DDT
- Aconite
- Kerosene Oil, Powdered Glass
- Strychnine

ROUTES OF ENTRY OF POISONS

1. Inhalation
2. I/V
3. I/M
4. Subcutaneous
5. Through mouth and sub lingual route
6. Through open wounds
7. Through serous membranes
8. Through mucus membrane
9. Through cellular tissues
10. Through urethra
11. Through vagina
12. Intrathecal
13. Through intact skin

ROUTES OF EXCRETION

1. Urinary route
2. Fecal route (Through Bile)
3. Dermal route
4. Through sweat, milk, saliva and tears
5. Through Intact Skin.

FATE OF POISON AFTER ABSORPTION:

After absorption, poison stays in blood or body for a period after which it is chemically and biochemically changed and this is called bio-transformation and during this poison may be

1. Detoxified
2. Poisonous elements may be eliminated from the poison
3. It may be eliminated as such
4. It may accumulate in different organs and this is called **accumulation of poison.**

SITE OF ACTION OF POISON:

1. Local action
2. Remote action
3. Local + Remote action
4. Systemic action
5. Generalized action

1. Local Action:

It means direct action at the site of impact e.g. when acids are taken there is corrosion of mucus membrane of mouth and stomach etc.

2. Remote Action:

It means that after absorption,, poison may act on kidneys, liver or any other organ.

3. Local + Remote action:

Certain poisons produce both local and remote actions e.g. Oxalic acid and Carbolic acid.

4. Systemic Action:

Poisons which act on a single physiological system are said to be having systemic action e.g. emetics

5. Generalized Action:

When two or more than two physiological systems are involved, the poison is said to have generalized action.

FACTORS AFFECTING THE ACTION OF POISON:

1. Quantity of poison (Dose)
2. Form of poison
3. Mode of administration
4. General condition of body.

1. Quantity of Poison:

As a general rule, small doses produce therapeutic action, and large doses produce toxic action. However, there are certain exceptions to this general rule. These are

- Idiosyncrasy
- Allergy
- Habituation and Dependency.
- Synergism
- Inhibition

Some Common examples are:

a. If $CuSO_4$ is taken in larger quantity in place of shock (because of its emetic action) there will be emesis and whole of the poison will be vomited out before it starts its action ($CuSO_4$ is an exhibitional poison).

b. Arsenic in larger quantity will produce shock without producing any symptoms, but in smaller quantity, it is used as a drug.

c. If oxalic acid is taken in concentrated form and in larger quantity, it acts as corrosive and death is sudden and quick because of pain and shock etc, but in smaller doses its mechanism is changed and it acts through heart. In very small doses it acts through nervous system.

2. Form of Poison:

It is divided into

i. Physical state:

If a poison is in gas or vapour form, then its action is quick.

ii. Chemical Combination:

It Interferes with the activity of poison by forming soluble and insoluble salts e.g. if $AgNO_3$ and HCl are given separate they are poison but when given together there is a chemical reaction which leads to formation of $AgCl_2$ which is harmless.

Similarly if acids and alkalies are given together, they neutralize each other and there is no action, but separately they cause damage.

iii. Mechanical Combination:

1. If mineral acids are given as such they are poisonous but when mechanically combined with H_2O, their toxicity is decreased.
2. If Arsenic is given in water it will settle down at the bottom, that's why Arsenic is mixed in liquid of specific gravity equal to Arsenic e.g. milk, coffee, and coke.
3. If alkaloids are given with charcoal there is no toxicity.

3. Mode of administration:

In chronological order, routes on the basis of action are:

1. Inhalation
2. I/V
3. Intramuscular
4. Subcutaneous
5. Oral
6. Through open wounds
7. Through serous surface
8. Injecting in cellular tissue
9. Through mucous surfaces
10. Through intact skin

Certain poisons act differently when they are introduced through different routes. Snake venom is highly toxic when injected but is harmless when ingested. Cocaine acts as a local anesthetic when injected and is a deliriant and convulsant when ingested.

4. General condition of the body :

In this we include

A. Age
B. State of health
C. Sleep and intoxication

A. Age:

In two extreme of ages, infancy and old age, action is quicker and severe as compared to young adults because of low resistance. Certain poisons are tolerated by infants e.g., balladona and is not tolerated by an adult.

B. State of health:

Persons of poor health are more susceptible to poisons e.g. a 30% conc. of CO in blood may kill a person suffering from coronary heart disease. In certain diseases, the tolerance of the body to certain drugs is increased e.g. hypnotics and opiates in mania or delirium tremens, and strychnine in paralysis.

C. Sleep and Intoxication:

Soon after taking the drug, if person goes to sleep, absorption and action is slow and signs and symptoms are not marked. In case of opium if he is awakened, there is remission of sign and symptoms. This is because during sleep absorption is slow. If poison is given to intoxicated person, the action is slow.

WHY POISONING IS COMMON IN OUR COUNTRY ?

1. Easy availability of these poisons.
2. Cheapness of the poisons
3. Rules and regulations are not properly implemented which are framed by the. government. Majority of the poisons are openly sold in shops, in drug stores, even in small shops of villages. One can get pethidine, barbiturates, morphine, tranquilizers, sedatives, hypnotics,: anesthetics from any drug store without any prescription of doctor.
4. No implementation of drug rules and dangerous Drug Rules.
5. Increase use of these drugs in industries, agriculture, domestic and in therapeutics.
6. Unawareness and illiteracy of community. Tremendous use of the drugs like opium, cocaine, dhatura, strychnine for aphrodisiac action is also a major factor.
7. Resemblance of certain vegetables and fruit to poisons like dhatura and there is accidental poisoning.

CHARACTERISTICS OF POISONS:

1. Suicidal Poisons:

i. Easily available
ii. Cheap
iii. A small dose is enough
iv. Less agony or pain and sufferings after taking poison
v. Good in taste

Examples: Barbiturates, opium, insecticides, DDT etc.

2. Homicidal Poisons:

i. Colorless, tasteless and odorless
ii. Action is not quick
iii. Usually can not be detected in chemical analysis
iv. Resemble food, fruit and edibles.
v. Usually used in small doses

Examples: Arsenic, Mercury, strychnine etc.

3. Exhibitional Poisons:

i. Have color and smell
ii. Easily available
iii. Cheap
iv. Fatal dose is well established among general community

Examples: copper sulphate, diazepam etc.

4. Stupefying Pisons:

i. Colorless and tasteless
ii. Given in small doses
iii. In form of fruit, food and edibles.

Examples: Atropa Belladonna,Dhatura.

Duties of a doctor in case of poisoning:

There are three duties of a doctor,

A. Duties towards patient.
B. Ethical duties
C. Legal duties

(PPP)

P → Preserve life of patient
P → Protect yourself from law
P → Preserve evidence

A. Duties towards patient:

1. In all cases of poisoning the doctor must record the preliminary particulars which are Name, father name, Age, sex, caste, occupation, address, date, time and place of examination, brought by whom and history.
2. After arrival of the patient, the first duty of doctor is to save the life of the patient i.e. Remove unabsorbed poison, give antidotes, remove absorbed poison from body and symptomatic treatment.
3. Inform his relatives so that they should be present at the scene.
4. A proper chart must be prepared in which identity of individual, the History of the case, sign and symptoms and general condition of the patient must be mentioned

B. Ethical Duties:

In accidental cases if there is any indication of damages to public health as e.g. from food poisoning or contamination of public drinking H O, doctor must notify the public-
2
health authorities

C. Legal Duties:

1. If the patient is dying, arrange for dying declaration.
2. Once homicidal poisoning is suspected, it is advisable to consult another practitioner
3. Also in homicidal cases, it is his duty to inform the police in order to protect society
4. If homicidal poisoning is suspected then the doctor should take every precaution to prevent possibility of further administration of poison to patient. The best way is to shift the patient to hospital and arrange two nurses.
5. The doctor must collect and preserve all the samples including tablets, bottles, piece of paper in which powder may be wrapped, food or drink lying near the patient vomitus, urine, blood, feces: etc.
6. If the individual dies, the doctor must not issue death certificate but immediately inform the police.

DIAGNOSIS OF POISONING:

It is divided into two main types

1. Diagnosis In living
2. Diagnosis In dead

Each is further divided into two

- Diagnosis of acute poisoning
- Diagnosis of Chronic poisoning

DIAGNOSIS OF ACUTE POISONING IN LIVING

It is discussed under the following headings

1. Preliminaries
2. History of case
3. Signs and symptoms
4. Laboratory examination

1. Preliminaries:

It Includes:

– Consent, – Identification
– Identification mark, – Identified by.....
– Brought by whom? –Date,time and place of examination

2. History of case:

History of the case should be taken as a medicolegal case, taking care that relatives and patients will not tell the truth and keeping the threshold of suspicion low. Ask for

1) Quality of poison
2) Quantity of poison
3) Route and form of poison
4) signs and symptoms after poisoning.
5) How much time has passed between taking poison and appearance of symptoms
6) What sort of treatment was given at home

3. Signs and Symptoms:

Following signs and symptoms may be seen;

CNS	Delusion,hallucinations, convulsions, incoordination of movements, coma
EYE	Dilation or constriction of pupils and congested eyes.
Respiratory System	Dyspnoea
GIT	Nausea; vomiting, diarrhea or constipation, sometimes abdominal cramps, hepatocellular failure lead to jaundice
URINARY SYSTEM	Electrolyte imbalance, dysuria, hematuria
OTHERS	Cold skin, sometimes sweating in certain poisons. Dry hot skin, like in dhatura poisoning in which temp is upto 106- 108 °F. In Phosphorus poisoning congested face and Corrosion around the lips occurs.

In acute poisoning there is sudden appearance of signs and symptoms (with in 1/2-1 Hour) in a normal person after taking food, drinks or drug, but sometimes it may be quick if other routes like I/V, inhalation are used. .

These symptoms are uniform in character and increase in severity in the beginning and it will either lead to death or in early recovery. Poison in the beginning may have less action as in sleep and there is remition after sleep.

4. Laboratory examination or chemical analysis:

Diagnosis of a poison is never complete and should never be reported in medico-legal case unless it is confirmed by chemical analysis. In this we collect:

- Routine samples
- Choice samples
- Undiagnosed samples.

All these will be discussed later.

They should be taken, preserved, sealed, labeled and immediately handed over to the concerned people for analysis. If laboratory is in the town, immediately send it but if sample is sent to the other town it must be a registered parcel.

DIAGNOSIS OF CHRONIC POISONING IN LIVING:

1. Preliminaries:

As mentioned for acute poisoning.

2. History of Case:

It is common in industries i.e. from dust in unventilated room.It may be given by wife or servant.

3. Signs and symptoms:

- Nausea, vomiting, pain in abdomen, anemia, pallor will be observed after taking meal. Others are:
- Loss of weight
- Weakness
- Tremors in fingers
- Anorexia
- Depression
- Wrist drop
- Foot drop
- Apologia
- Pigmentation of skin
- Women may complain of repeated abortions and loss of sexual power.

4. Chemical Analysis:

Diagnosis:

For diagnosis isolate the person in home, arrange for two nurses and give the control of every eadable food, drinks etc in hands of nurses, even daughter or wife is not allowed. If signs symptoms are controlled then definitely it goes in favour of chronic poisoning.

In case of hospital, isolate the patient, arrange trained nurses, control diet and check symptoms for every 24-48 hrs for 3 - 4 days. Also collect urine, feces and blood for chemical analysis.

If symptoms are controlled, it is a case of chronic poisoning and if not, it is a disease.

DIAGNOSIS OF POISONING IN DEAD:

There are four principles for diagnosis of poisoning in dead i.e.

A. Autopsy findings
B. Chemical analysis
C. Experiments on animals
D. Moral and Circumstantial evidence

A. Autopsy Findings:

All precautions of autopsy have to be followed with special obligations. Before starting 'autopsy' a thorough review of police documents or history and information from relatives must be obtained

Questions from relatives are as follow:

1) Quality and quantity of a poison
2) signs and symptoms which appeared
3) Time between taking of poison and appearance of first symptom
4) Treatment given
5) Duration of illness
6) Time between death and post mortem

All these questions will tell which group of poison is given. Never give your opinion in written or report form unless autopsy findings are confirmed by chemical examiner report. Then prepare report as early as possible and hand it over to the police.

PROCEDURE OF AUTOPSY :

1) Autopsy number
2) Authority
3) Identification
4) Identified by whom
5) Brought by whom
6) Date, time and place of examination
7) Time of arrival
8) Information furnished by relatives or police
9) Examination of clothes

Look for any stain due to feces, urine, blood or even poison itself. Collect the cloth and preserve for chemical analysis. Seal and label it

10) External Examination

After removing the clothes look for stains on the body in the form of feces, urine, vomitus or stains of poison Look for discharge from natural orifices i.e. mouth, nose, urethra, vagina, rectum, which may be blood stained incase of organophosphorous poisoning, dry oronasal blood stained froth is seen. Sometimes poison can be collected from these orifices. Color of skin must be noted e.g.

- CO will exhibit cherry red color if it is more than 30% in blood.
- Cyanide will exhibit Pink color.
- Phosphorous will give Jaundice color.
- Acute copper poisoning will give Yellow color.

Look for, injection marks on the body. Never use disinfectant on body which covers the smell of poisons like opium, chloroform, ether, hydro cyanic and carbolic acid.

11) Internal Examination

There are two groups of poisons

i. Strong corrosives
ii. Strong irritants

Which produce changes in the body especially in stomach which can be seen on autopsy.

Changes in Stomach:

These are,

i Hyperemia or redness
ii. Softening of mucous membrane .
iii. Ulcers
iv. Perforations

a. Hyperemia:

Appears in strong irritants. Common areas involved are cardiac end and greater curvature. These are in form patches. It may involve the whole stomach and give it velvety appearance as in cases of Arsenic poisoning. In certain conditions surfaces of stomach shows different color e.g.

1) In H_2SO_4, the color is black
2) In Cu, color is blue or green
3) In nitric acid, it is yellow.

The gastric juice gives its own color to stomach but it can be differentiated from poison in that there is no vital reaction. The normal color of mucus membrane of stomach is pale or white and if death is during digestion, it shows red color. In asphyxial death, stomach may become red. In case of disease, redness of stomach is generalized. If it is localized, it is seen at cardiac end of stomach and if this redness is due to PM lividly, it is on posterior wall of

stomach i.e. dependent parts, with no vital reaction.

b. Softening:

In strong corrosives mainly alkaline, mucus membrane of mouth, throat, esophagus and stomach becomes soft (if poisoning is due to carbolic acid, there is no softening but hardening and shrinkage of mucus membrane). The Soft portions of stomach later on become red.

If softening is due to disease, it will be localized to stomach usually in cardiac end.

c. Ulcers:

It is commonly seen in corrosives and strong irritants. These may be present at cardiac end and greater curvature of stomach. The ulcers exhibit thin fragile margins, surrounded by redness and inflammation of mucus membranes.

If ulcer is due to disease, they are seen at lesser curvature of stomach with well defined hard margins and redness is limited to the surroundings of ulcers but in poisoning the redness may spread upto the duodenum and to other parts of stomach.

d. Perforation:

In diseases perforation will be oval in shape with thick well defined margins and redness surrounding the aperture. In PM autolysis perforations appears at end and greater curvature. Redness and inflammation are absent and there is no blackening in stomach.

Other organs to be examined:

Lungs, liver, kidneys and membranes for congestion.

B. Chemical Examination:

Diagnosis of; poisoning is never complete until and unless we receive results from the laboratory after analyzing the poison.

PRECAUTIONS OR PRINCIPLES:

1. **Collection:** Source of sample should be about any suspicion and keep your threshold of suspicion low.
2. **Containers:** Of different sizes should be available and these containers should be chemically clean and sterilized. It is better that they are of white glass. Collect too much than too little because there are many tests to be performed in laboratory for diagnosis of poison. Both qualitative and quantitative analysis is done.
3. Site and number of sample should be correct.
4. After collection, the sample should be immediately preserved by adding preservatives.
5. Immediately seal the sample to avoid any substitution or addition.
6. Label the sample
7. If it is a single sample, hand it over to the police. If there are more than one sample, pack them in viscera box. Care should be taken to avoid any leakage and breakage etc.
8. If laboratory is in the same city, immediately arrange for transit to laboratory. Usually a police man will take the sample to laboratory. Always take a receipt from police or any person to whom you are handling the sample.
9. If sample is sent by post office, then a registered parcel must be sent.
10. If you want to store it, store in deep freezer which should be locked and keys should be with Medical Officer.
11. Along with sample you must send
    - Sample of preservative
    - Sample of seal which you have used.
    - Autopsy report
    - Copy of police document
    - Copy of magistrate order

PROCEDURE FOR COLLECTION OF SAMPLES:

It is sub-classified into

1) What to be collected?
2) How much should be collected?
3) How should be collected?
4) What should be done after collection?

1. What to be collected:

It needs special knowledge of toxicology i.e. one should know the route of administration of poisons, fate of poisons, route of metabolism, channel of excretion and mechanism of action etc.

There are 3 types of samples:

a) Routine sample
b) Choice sample
c) Undiagnosed sample

A. Routine Sample:

Taken in cases of trauma or violent death and include

1. Stomach along with contents
2. Blood
3. Urine
4. Half of each kidney (Longitudinal section)
5. 400 g of liver.
6. Vomitus.
7. Bottles, tablets, utensils, piece of paper having poison, vomitus on floor of the room and feces.

B. Choice Sample:

If we know the cause of death then collect, whatever is needed e.g. if death is due to CO poisoning then collect heart, lungs and blood.

C. Undiagnosed Sample:

In this the type of Poison and its site of action is unknown. The sample taken in this case is undiagnosed Sample. In this different parts of the body are taken for chemical analysis. One should know how much should be taken in an Undiagnosed Sample.

2. How much should be collected:

1. Half of cerebral hemisphere and hind brain
2. One lung
3. Heart
4. Stomach along with contents
5. Intestine 5-6 feet along with contents
6. Gall bladder along with contents
7. Liver not less than 500g
8. Pancreas
9. Spleen
10. Half of each kidney
11. Urinary bladder along with contents
12. Blood (not less than 100cc), never collect blood from cavities but collect it from peripheral veins.
13. Urine = 100 cc
14. CSF = 50-100 cc
15. Hair from scalp and pubic area. Never shave the. hair but pluck hair from roots
16. Portion of skin i.e. 2 sq. inch is sufficient
17. Nails from both hands
18. Bone = 5-6 inches of femur
19. Intercostals or quadriceps muscle 5-6 cm from front or back of thigh.

3. How to Collect:

1. **Stomach:** Ligature is applied on part of stomach above the diaphragm and also at the first part of duodenum and then dissect and remove it along with the contents.
2. **Small intestine:** 5-6 feet of small intestine must be taken by applying ligature at a distance of 1 foot.
3. **Blood:** It should be collected from periphery with the help of syringe i.e. limbs or neck. Never collect the blood from body cavity because of chances of contamination, if blood has to be collected from heart, then collect it from both chambers separately. For preservation of blood add 1 % NaF to it.
4. **CSF:** Remove the frontal lobe and with the help of pipette take 50-100 ml of CSF.
5. **Urine:** It is better to collect the urine through catheter but you can open the bladder and can collect the urine
6. **Hair:** Pluck the hair and never shave the hair. Usual site of hair collection are scalp and pubic area.
7. **Nail:** Spencer's Will forcep is used. Place it under the nail, twist it and pull it out. All the nails should be removed.
8. **Bone:** Remove the muscles from thigh and then cut the bone with saw.
9. **Skin:** should be collected from back (control sample).
10. **Muscle:** Quadriceps and intercostals muscles.

Lung, liver spleen and gall bladder should be collected

4. What should be done after collection?

After collection we do

a. Preservation
b. Sealing
c. Labeling
d. Packing
e. Storage
f. Transport

a. Preservation:

Common preservatives which are used are as follow:

Saturated solution of NaCl or common salt is most important because it is used for majority of organs and most of the poisons including carbolic acid.

Rectified spirit is used only for acids except carbolic acid

1% NaF is used for preservation of blood because it act as anticoagulant and inactivate the enzyme system and thus avoid fermentation.

10% formalin is used for preservation of body tissues for histopathology. Never use formalin for preservation of body tissue for chemical analysis because there is a chemical reaction and it will give false results.

How to preserve:

i. Proper and specific preservatives should be used

ii. Tissue to be preserved must be completely immersed in preservative, otherwise it will decompose.

iii. A free space should be allowed between the level of preservative and cap which will avoid breakage of container due to gas accumulation.

b. Sealing:

Put the sample after putting preservatives in proper place in container. Take a cloth, wrap around the neck of the container and bring two ends together. Then melt the wax and apply it all over the area of cloth and then apply seal over wax at different places. Cellophane tape is also used and where the two ends of the tape joins each other, initial is at this site.

c. Labeling:

Identification:
Name:
Autopsy No:
Date, time and place of collection of sample:
Name of sample and quantity (weight or length):
Examination which is wanted,
Histopathology or chemical analysis:
Name, designation and registration number of M.O:

d. Packing:

If it is a single sample, hand it over to the concerned people (i.e. police) and take receipt from them, but if it is more than two, then prepare a list of samples on paper stating number of samples and nature of samples along with weights. Pack samples in viscera box. During packing care is taken to avoid breakage. Apply wax and seal lock. Send the sample of seal, and the preservative along with the original sample to the chemical analysis laboratory.

e. Storage:

If sample is needed to be stored, it is stored in refrigerator at proper temperature. Refrigerator is locked and keys should be with M.O

f. Transport:

If sample has to be posted to other city, it must be a registered parcel. Never forget to take', a written receipt to whom you are handling the sample. Each sample must accompany autopsy report, order. of magistrate and police report.

C. EXPERIMENTS ON ANIMALS:

The poisons collected from vomitus, bottles or poison extracted from tissue is given to animal like cats, dogs, and then animals are examined for signs and symptoms of poisons if they are positive we can diagnose type of poison. This procedure is not acceptable in some countries.

D. MORAL AND CIRCUMSTANTIAL EVIDENCE:

Clues regarding the recent purchase of poison by the victim or accused, his behaviour, the conduct of those looking after the victim, suicide note and history or of quarrel or financial problems may also provide variable information. The body may be disposed of clandestinely or hastily.

Missing Sample:

When a doctor is sure about certain findings of poison and he receives negative results from laboratory. Then these samples are called missing sample.

Conditions in which missing samples come across.

1. Poison may have been completely vomited out or completely purgated or completely exhaled.
2. Site of sample is not correct.
3. Technique of collection is wrong.
4. Number of samples may be les
5. Preservation may not be proper
6. On the way to the laboratory there may be addition, substitution or removal of tissue.

7. Techniques adapted by laboratory technician may be wrong.
8. When poison is ingested it may be completely oxidized or detoxified. There are certain vegetable poisons which don't have confirmatory tests. Certain poisons are destroyed by putrefaction and are not found.

What the judge has to do in missing sample:

If sample is missing then judge has to give decision on the basis of signs and symptoms exhibited by patient before death, autopsy findings and circumstantial evidence.

Requirements in treatment of acute poisoning in casualty and clinics:

1. A doctor must be equipped with knowledge of toxicology.
2. Each clinic or casualty must have a chart of different poisons with their signs and symptoms and treatment.
3. Different Antidotes must be available such as:

Anti-snake, atropine, physostigmine, mechanical and chemical antidotes, physiological antidotes, specific antidotes like nalorphine and naloxone, Pamigride (For barbiturates) and universal antidotes.

1. Lubricants (sweat edible oils are best)
2. Sterilized stomach wash tube
3. Catheters of different Sizes
4. Levine tube for stomach wash
5. O_2 cylinder with catheter and mask
6. Instruments for tracheostomy, mouth gag.
7. Drugs like Anti convulsants, sedatives and adrenaline
8. Containers of different sizes, preservatives, syringes, ligating material, sucker.
9. Emetics like ipecanchoana, apomorphine.

TREATMENT OF ACUTE POISONING:

There are 4 basic principles:

1. Removal of unabsorbed poison from body
2. Use of antidotes
3. Removal of absorbed poison from body
4. Symptomatic treatment

1. REMOVAL OF UNABSORBED POISON FROM BODY:

It depends upon route of entry of poison.

Inhaled Poisons:

If poison is inhaled;

1. Immediately remove the patient from source of poison to open air.
2. Remove obstruction to respiratory tract by opening the collar and garments and if there is mucus collection or exudation, clear airways by using finger or sucker.
3. Artificial respiration and O_2 inhalation.

Contact Poinons:

If poison is in the form of strong acids or alkalis and is thrown on the surface of body or on face eyes or if it is instilled in vagina, urethra or rectum or in open wounds, we do external lavage of area with plenty of tap water or normal saline and neutralize the area with neutralizing agent.

Injected Poisons:

If poison is injected subcutaneously or snake bite, then first immobilize the site of injection which serves two purposes.

i. It relieves pain.
ii. Avoid spread of poison

Then apply ligature proximal to the site of injection, preferably at single bone area. Take care that pulse distal to the ligature should not disappear. No throbbing sensation should be present at the tip of fingers. Slight venous congestion may be present distal to ligature. On the way to hospital remove the ligature after every 15-20 minutes for 30-40 sec to relieve anoxia and for dilution of poison. Apply an incision obliquely slightly above or below the site of injection, taking care not to injure underlying tendon, nerves and blood vessels. Squeeze the site, if sucker is available, suck the poison if you do not have sucker, suck the poison by mouth because snake venom is not absorbed from mucus membrane but care is taken that there is no abrasion or ulcer in your mouth.

Ingested Poisons:

If poison is ingested or taken by mouth we remove the poison by

1. Emesis.
2. Gastric wash or Gastric Lavage.

Emesis:

It is a life saving procedure. If the patient is conscious and cooperative, and vomiting is not contraindicated (corrosives, strychnine, coma and severe cardiac or respiratory diseases), it should be induced either by tickling the fauces or by the use of emetics. Household emetics such as warm water, one table spoon full of mustard powder(15gms) or two table spoon full of common salt in a tumbler full (200 ml) of tepid water, readily available in every household, may be used in an emergency. Ipecac 1-2 gm or Ipecac syrup and a dose of 30 ml act as an emetic in about 20-30 minutes. The dose may be repeated any time.

Apomorphine HCl is most potent emetic, given in 3-6 mg hypodermically and emesis starts with in 3-4 min and patient is dehydrated, but it is not used because it will lead to hypovolemic shock.

Contraindications:

Emesis is contraindicated in unconscious, comatosed and in case of convulsions, because there are chances of aspiration of contents into respiratory tract leading to complications like asphyxia, pneumonia etc. Emesis is also contraindicated in corrosives like H_2SO_4, HNO_3 and in children.

GASTRIC LAVAGE OR STOMACH WASH:

It can be studied under following headings

A. Structure of gastric lavage tube
B. Precautions which are to be adopted before, during, and after the gastric Lavage.
C. Method or procedure of gastric lavage
D. Contraindications and indications
E. Complications or Hazards of gastric lavage

A. Structure of Stomach Wash Tube:

It is made up of soft non collapsible rubber, 50 inches in length and 1/2 inch in diameter. Proximal end has a funnel which may be of glass or rubber. Terminal end is blunt, having a hole in center and another hole 1 cm above the terminal end on side of tube. There is a bulb in middle of the tube called suction bulb. An imaginary "20 inch" mark from terminal end is present which indicates length between mouth and stomach in adult. In children small tube is used which is known as Ryle's tube.

Mouth Gag:

It is of two types, one is wooden and other is of steel. Its function is to keep the mouth open, so that the rubber tube should not be bitten by teeth. Insert mouth gag from angle of mouth.

B. Precautions of Gastric Lavage:

1. Stomach wash tube must be sterilized.
2. Lubricate terminal end of tube with edible oils
3. Remove dentures or artificial teeth before starting in order to avoid entry of foreign particles to respiratory tract..
4. Well trained assistant should be present to hold the head of patient in proper position during gastric levage.
5. Proper position of patient while passing the tube to avoid entrance into respiratory tract
6. Before starting the wash, a doctor must be sure that tube is in the stomach and not the respiratory tract It is a precaution in unconscious patients. In conscious patients there will be reflex cough.
7. Specific solution with proper amount must be used for stomach wash.
8. It is of prime importance to perform first wash with water or normal saline and collect it in a chemically clean container, preserve it, seal and label it and send to chemical examiner for results.Avoid first wash with chemical substance as it will lead to false result due to chemical reaction and change in nature of poison.
9. Avoid excessive levage because it may lead to electrolyte imbalance and may push the poison into duodenum.

C. Procedure of Gastric Lavage:

1. Patient should be in semi-prone position to the left side and head tilted and brought to the edge of bed and should be at lower level from stomach. Assistant should hold the patient in proper position. Press the tongue with thumb of left hand and hold the tube in right hand.
2. Keeping all the precautions in mind, pass the tube over the tongue backwards and then downwards through esophagus till

It reaches the stomach which is indicated by 20 inch mark.

3. When you are sure that tube is in stomach, raise the funnel end of tube 2-3 feet above the stomach and pass the desired fluid with which you wash the stomach.

4. When funnel has a little fluid, press lower end of tube between index finger and thumb, bring it below the level of stomach and release the pressure and solution will rush from stomach by Syphon action.

5. If Syphon action fails for first 10 minutes then aspecto irritating syringe should be used.

Stomach wash has a tremendous value when it is done in first half an hour to 2-3 hours, but there are certain poisons in which stomach wash is done after 7-9 hours. Stomach wash tube is never used in children. In children we use French catheter numbering 8-12 or **Ryle's tube.**

In emergency we can use any tube but it should be sterilized and lubricated and its numbering caliber should be the same.

D. Contraindications and Indications

Contra Indications:

Absolute Contra Indications =Corrosives
Relative Contra Indications = Coma, unconsciousness and convulsions.

1. Strong corrosives like mineral acids, and strong alkalies cause softening and ulceration of esophagus and stomach so perforation may occur with the tube. If Levine tube is available we can wash the stomach even in corrosive but as early as possible (30-40 min) to avoid complication.

2 In unconscious, comatosed and convulsions, as such stomach wash is contra-indicated because in first two conditions you may pass to respiratory tract un-noticed but if one can pass intubations tube into the respiratory tract and pack the surroundings which will avoid aspiration of fluid into the respiratory tract, one can perform stomach wash.

3 In convulsions as in strychnine, it is contraindicated as such but if you can control convulsions by giving IV barbiturates, you can wash the stomach.

4 In kerosene oil, channel of excretion are lungs. It is contra indicated but under certain precautions you can do stomach wash.

Indications:

In all other poisons taken by mouth & digested in stomach, stomach wash is indicated.

E. Hazards or Complications of Stomach Wash:

1. If tube is not sterilized, chances of infections are more.

2. If tube is not lubricated properly, it will lead to injuries of esophagus and stomach in the form of bruises, abrasions and even perforations.

3. If artificial teeth or dentures are not removed, foreign body may enter into respiratory tract leading to choking.

4. If position is not proper, the tube may pass into the respiratory tract again leading to choking, suffocation and asphyxia.

5. If tube is in lungs and one start washing, he will push whole fluid into lungs leading to edema, pneumunitis and asphyxia.

6. First wash should be done with H_2O or normal saline; otherwise a chemical reaction will take place leading to wrong positive or negative results.

7. If excessive lavage is done, electrolyte imbalance may occurs and it will lead to shock.

8. Repeate lavage may push the poison into the duodenum which is then difficult to wash.

Note:

Mouth gag is passed in condition where patient is not co-operative, un-conscious, comatosed. In convulsions it is passed through angle of mouth and it keeps the mouth open. How would you know that tube is in trachea?

a. If little air is forced down the tube, one should be able to hear bubbling sound through stethoscope applied over the stomach.

b. Funnel end of tube is put near the ear, hissing sound is heard if tube is in trachea.

c. Dip funnel end in H20. Bubbles of air come out of the tube if it is in trachea.

2. USE OF ANTIDOTES:

Antidote:

Antidotes are the substances which counteract or neutralize all the evil effects of poison by its mechanical, chemical, physiological or specific action.

Classification of Antidotes:

A. Mechanical antidotes
B. Chemical antidotes
C. Physiological antidotes
D. Specific antidotes
E. Chelating agents
F. Universal antidotes

A. Mechanical Antidotes:(Physical Antidotes)

It counteracts the evil effects of poison by its mechanical action e.g. charcoal which mechanically adsorb poison and make these poisons harmless. Other mechanical antidotes are fats, oil and albumin of egg which form coating over the mucus membrane of the stomach and thus act mechanically to prevent action of poisons. If diamond or powdered glass is taken we give bulky food in which these particles are entailed like banana.

B. Chemical Antidotes:

It neutralizes the evil effects of poison by a chemical reaction forming harmless or insoluble compounds e.g.

1. Acid for alkali and alkali for acid.
2. Alkaline carbonate and magnesia for mineral acid.
3. In case of caustic alkali, never give mineral acid but give lemon juice or vinegar.
4. Lime for Oxalic acid.
5. Na-Sulphate for lead.

$KMnO_4$ is an important chemical antidote.

Because of its oxidizing property, it is commonly used in opium poisoning. It can also be used in phosphorous, cyanides, barbiturates, morphine, atropine and other alkaloids. If $KMnO_4$ is not available, use tincture iodine and it will precipitate many alkaloids.

C. Physiological Antidotes or Pharmacological Antidotes:

They counteract or neutralize the evil effects of poison by acting on the cellular or tissue level and produce signs and symptoms exactly opposite to that of poison e.g.

1. Diazepam for strychnine.
2. Atropine for pilocarpine and organo-phosphorous compounds.
3. Caffeine and naloxone for morphine poisoning.

Atropine	Physostigmine
It paralyses the 3rd nerve endings leading to dilation of pupil	It will Stimulate the 3rd nerve endings leading to constriction of pupils.
Paralysis of Vagus nerve ending leading to Tachycardia	Stimulates Vagus nerve leading to Bradycardia
Glandular secretions are decreased	Glandular secretions are increased

D. Universal Antidote:

It is used when diagnosis is not certain. It is also used when one or more poisons are suspected. It is a combination of three Substances i.e.

Constituents	Quantity	Purpose
Powdered charcoal(Burnt toast)	2 parts	Adsorbs alkaloids
MgO (Milk of Magnesia)	1 part	Neutralizes acids
Tanic acid (Strong Tea)	1 part	Precipitates alkaloids, certain glucosides many metals

Even when given this mixture soon after the ingestion of poison, it is not very effective.

E. Specific Antidotes:

Are those which are used specifically for certain poisons.

1. Nalorphine bromide or naloxone is used for opium and its alkaloids. Naloxone dramatically improves respiration and also CNS system manifestations in cases of opium poisoning depending upon the severity of poisoning. It may be used in poisoning of morphine, codeine,

heroine, pethidine and methadone. Dose of nalorphine is 10-40 mg and one can repeat this dose after 15 minutes, 2 hrs and 3 hrs and can be given I/V, I/M and S/C.

2. Meginide or pamigride are used for barbiturates.

F. Chelating Agents:

These are substances that form chelates i.e. firm non ionized cyclic complex with cations. Such compounds can form stable, soluble and non toxic complexes with calcium and certain heavy metals. The important amongst them are:

I. British Anti-Lewisite (BAL) or Dimercaprol:

It is used in the treatment of certain types of heavy metal poisoning. It is contraindicated in liver damage.

II. EDTA:

It is effective in lead, mercury, arsenic and copper poisoning. It has been shown to be superior to BAL in some respects for the treatment of arsenic and mercury poisoning. It is contraindicated in renal damage.

III. Penicillamine(Cuprimine):

It is used in Pb, Hg, Cu and gold poisoning. It is specially useful in hepatolenticular degeneration (Wilson's disease) which is caused by a disorder of copper metabolism.

Iv. Desferrioxamine:

It chelates iron. It is chiefly valuable in the treatment of acute iron poisoning.

3. REMOVAL OF ABSORBED POISON:

A. Diuresis:

I/V fluids are given which leads to diuresis but take care not to over dose because it will lead to circulatory impairment and pulmonary edema. Also give plenty of water by mouth which will dilute the poison and at the same time increases diuresis.

B. Forced Diuresis:

It is done in acute poisoning. In this we give urea, chlorothiazide, or mannitol along with fluids. Mannitol is given in 10-20% concentration in 500ml, of glucose over 12 hrs. It is done in barbiturates, salicylates and aspirin poisoning.

C. Artificial Kidney:

It is used for haemodialysis It is done in cases of barbiturates salicylates and methyl alcohol poisoning.

D. Peritoneal Dialysis:

It is done when haemodialysis fails.

E. Exchange Transfusion:

We remove 100-200ml of blood and replace it with fresh donor's blood. It is done in iron salt and CO poisoning.

F. Purgation:

It is only done when there is electrolyte balance.

G. Hot Bath.

4. SYMPTOMATIC TREATMENT:

A. ACUTE MANIFESTATIONS OF POISON:

1. Shock:

In poisoning shock is primarily due to pain and dehydration and secondarily due to renal and hepatic dysfunction and may also be due to reflex shock.

Signs and symptoms of shock are

1. Decreased blood pressure
2. Rapid pulse
3. Cold and moist skin.
4. Pallor or cyanotic appearance

Nausea, vomiting and diarrhea depending upon the condition.

Treatment:

To keep the blood pressure normal immediately raise the foot end of bed 10-20 inches till blood pressure reaches normal

Cover the individual with blanket to retain normal temperature of the body.

Use hot water bottles wrapped in blanket

In atropine poisoning temperature may rise up to 106 F then we do cold sponging.

2. Pain:

Use analgesics e.g. morphine, pethidine (50-100 mg 1/M), in abdominal colics we give atropine. We also give barbiturates for convulsion and restlessness.If patient is excited give paraldehyde.

3. Dehydration

First give blood depending upon requirement if blood is not available give plasma or 5 % dextrose solution in saline, if kidney is damaged then give 5% dextrose in water.

To treat nausea, vomiting and electrolyte imbalance we give nothing by mouth.

Prepare input and output charts in which we measure fluids and electrolytes.

Electrolytes are serum, K, Na, Ca and Cl

ions and drugs for vomiting are argental, Maxalon, Chlorpromazine and Metoclopramide.

4. Peripheral Circulatory Failure:

Give nor-adrenaline drip to elevate B.P if nor-adrenaline is not available give amphetamine.

5. Cardiac Arrest:

Do external cardiac massage or directly injecting drug like adrenaline in heart if there are fibrillations then defibrillate the heart.

6. Renal Failure:

If there is haematuria, dysuria, oliguria and anuria it means that kidney is damaged, so transfer load to artificial kidneys and when kidneys regain its function, again re-switch to the real kidney.

7. Hepatic Failure:

If there is hepatocellular failure and jaundice, give rest to the liver cells by stopping, fats and giving plenty of carbohydrates and proteins.

8. Anaphylactic Shock:

Treat it by adrenaline, anti-histamine and corticosteroids.

9. Coma:

Coma may be renal or diabetic it is nursing-needed in coma and not the drugs. Keep the respiratory tract open so that he should receive oxygen and it is done by removing mucus by sucker, or by fingers. Give oxygen if needed. Always pass catheter in coma. Check the CVS by monitoring of heart. If coma is due to barbiturates give pamigride & if coma is due to opium give naloxone.

10. Asphyxia:

a) Removal from source to open air

b) Remove obstruction by suction or with help of finger

c) If trachea is blocked we pass intubations tube to supply Oxygen. In certain cases we do tracheostomy.

d) One-should use mask and catheter. By mask one can supply 8-9 liters/min oxygen and by nasal catheter we supply 5-6 liters/min, one can select the combination of O_2 and CO_2 in a ratio of 95:5. This is because CO_2 stimulates respiratory center.

e) If there is pulmonary edema, give aminophyline.

f) If a machine, called IRON LUNG,is available use it for artificial respiration.

B. Chronic Manifestations of Poison:

1. Infections:

Choice of antibiotic is still penicillin. If patient is allergic we can give tetracycline.

2. Stricture Formation (abnormal narrowing of duct):

It is commonly seen is corrosive poisons like sulphuric acid and nitric acid which may lead to nausea; vomiting, dyspepsia, malabsorption and starvation. Treat these strictures by dilating with different types of mercury filler "BOGGIS". If strictures are not dilated,then do surgery i.e. Gastrojejunostomy.

3. Wrist and Foot Drop:

It is nervous manifestation and we refer case for physiotherapy.

If there is depression we give treatment by anti-depressants or anti-anxiety drugs if there is pigmentation of skin refer the case to dermatologist.

In private practice, suicidal or accidental cases are not reported to the police, but if patient is brought to the hospital, then all the three manners of poisoning are considered as medico-legal cases.

If the doctor is called to the court then it is his ethical duty to keep the secret of patient. If the judge insists then request him that you will give him in writing or tell him in private room.