**Identification**

**DETERMINATION OF SEX**

**Indices used for Determination of SEX**

1. **Medullary index (From long bones)**
2. **Ischiopubic index (Washburn index): From Hip bones**
3. **Sciatic notch index: From Hip bones**
4. **Sacral indices**

- **Alar index**
- **Corpo- basal sacral index**

5. **Cheiotic line: sacrum/pelvis**

- **Breadth of base of sacrum**

1. **Male 42**
2. **Female < 42**

- **Sex from chromatin can be determined by Barr body,**
- **Barr body is better appreciated in cell of Buccal mucosa.**
- **Davidson's body — sex chromatin in neutrophil: Drumstick appearance**
- **Best bone for determination of sex is pelvis.**
- **Best criteria in pelvis, for determination of sex is sciatic notch index.**
- **Chilotic line is useful for determination of sex. In males, sacral part of it is more prominent while in females pelvic part more prominent.**
- **Karl Pearson's formula is used to calculate stature of individual from long bones.**
  - **In general female pelvis is characterized by**

1. **Obtuse subpubic angle.**
2. **Larger, wider and shallower greater sciatic notch.**
3. **Presence of preauricular sulcus.**
4. **Small and triangular obturator foramen.**
5. **Ischial tuberosity is everted.**

**Difference between male and female**

| Pelvis | Male | Female |
|---|---|---|
| Pre auricular sulcus | Less frequent, narrower and shallow. | More frequent, deep and broder. |
| Obturator foramen | Large, Oval. | Small, Triangular |
| Greater sciatic notch | Smaller, deeper and narrower. | Larger, shallower, wider. |
| Pelvic brim | Heart shaped. | Circular/elliptical |
| Ischiopubic index | Less | More |

6. **Krogman's table: Accuracy of sex determination is 100% by entire skeleton, 98% by pelvis + skull, 95% by pelvis alone 80% by long bones.**

## Tattoo

- It is a mark that are designed made in the skin by multiple small puncture wounds with needles or electric vibration dipped in coloring matter
- The dyes commonly used are Indian ink, Carbon (Black), Cinnabar or vermilion, Red, Chromic acid (Green), Indigo cobalt, Prussian blue (ferri ferrocyanide), Ultramarine (Blue).

## Forensic Odontology

- It deals with science of dentistry to aid in administration of justice
- Forensic odontologists use their knowledge of dental anatomy, dental records, and bite mark analysis to assist law enforcement agencies, medical examiners, and forensic pathologists in identifying human remains, solving crimes, and providing expert testimony in court.
- Forensic odontologists, who are trained dentists with expertise in forensic science, are often responsible for analyzing and identifying bite marks.
- They use their knowledge of dental anatomy to assess the pattern and characteristics of the bite, which may include features like tooth size, shape, spacing, and alignment.

## Bite marks

- Thet are impressions or injuries caused by the teeth of an animal or human biting into the skin or other soft tissues of a person or object.
- Bite marks can occur in various contexts, including forensic investigations, criminal cases, and medical assessments.
- **F**orensic bite mark analysis involves the examination and interpretation of bite marks found on a person's body, clothing, or objects at crime scenes.

## Footprints

- They are impressions or marks left by a person's or an animal's foot on a surface, typically a solid one like soil, sand, mud, or snow.
- Footprints can convey various information, including the presence of an individual or species, the direction of movement, and even the size and shape of the foot.

## Indices of determination of race

- Cephalic index
- Brachial index

## Age Determination can be done by

- Dentition.
- Skeletal age determined by bone age/X-Ray.

## Important Points

- **The age of a 15 year old female is best determined by radiographs of upper end of radius and ulna (elbow).**
- **Forage determination of a 21 years old female, X-ray films should be taken of — clavicle and iliac crest.**
- **Skeletal age is more advanced in girls compared to boys (by 1 year in early childhood & 2 years in mid childhood).**
- **Bone age determination in children is best done by — X-Ray of wrist + hand.**
- **Most reliable suture for age determination — Saggital suture.**
- **Fusion of skull sutures earlier in male than female.**

- **Metopic sutures closure at age of 2-3 years.**
- **Temporoparietal sutures fuses at last.**
- **Anterior fontanel usually close at 18-24 months.**
- **Posterior fontanel usually close at 6-8 months.**
  - **Rule of Hasse use to determine age of fetus.**

- **Trichology is the study of Hair.**
- **Dactylography is the study of fingerprint.**

**In finger print**

- **Most common Loops> Whorls >Arches & Composite.**
- **Cheiloscopy is the study of Lip print.**

## Basic knowledge of DNA in forensic medicine

- In forensic medicine and forensic science, DNA analysis plays a crucial role in identifying individuals, solving crimes, and providing evidence in legal proceedings.

1. **DNA Profiling:-**
   - DNA profiling, also known as DNA fingerprinting, is a technique used to analyze specific regions of an individual's DNA to create a unique DNA profile.
   - This profile can be used for identification purposes.
   - Each person's DNA profile is highly unique, except in the case of identical twins who share the same DNA.
2. **Collection of DNA Evidence:-**
   - Forensic investigators collect DNA evidence from various sources, including blood, saliva, hair follicles, semen, skin cells, and even bones.
   - The choice of sample depends on the nature of the case and the available evidence.
3. **Preservation of DNA Evidence:-**
   - Proper storage and preservation of DNA evidence are crucial to maintaining its integrity.
   - DNA samples should be stored in a cool, dry place and protected from contamination.
4. **DNA Amplification:-**
   - DNA samples obtained from crime scenes are often limited in quantity.
   - Polymerase chain reaction (PCR) is a technique used to amplify or make copies of specific DNA regions, making it easier to analyze.
   - This allows for the analysis of even tiny or degraded DNA samples.

▪ Once the DNA is amplified, it can be analyzed in various ways, including:

I. **Short Tandem Repeat (STR) Analysis:-**
   - This is the most common method of DNA analysis in forensics.
   - STRs are specific regions of the DNA that vary in the number of repeating units.

- Comparing the number of repeats at multiple STR loci provides a unique DNA profile.

II. **Mitochondrial DNA (mtDNA) Analysis:-**
- Mitochondrial DNA is inherited only from the mother and is used when nuclear DNA is degraded or unavailable.
- It is less discriminating than STR analysis.

III. **Y-Chromosome Analysis:-**
- This is used to analyze male-specific DNA regions, which can be helpful in cases where a male suspect is involved.

**DNA analysis is used in various forensic applications, including:**

I. **Criminal Investigation:-**
- DNA evidence can link a suspect to a crime scene, victim, or other evidence, providing crucial information in criminal cases.

II. **Missing person and Unidentified Remains:-**
- DNA analysis can help identify missing persons or victims of disasters or crimes.

III. **Paternity Testing:-**
- DNA can be used to establish biological relationships, such as paternity or identifying relatives.

IV. **Expert Testimonials:-**
- Forensic scientists and DNA analysts often provide expert testimony in court to explain the analysis methods and results to judges and juries.

**Exhumation**

- It is the process of digging up and removing a buried body or remains from its place of interment, which is typically a grave, tomb, or burial site.
- Exhumations are conducted for various reasons, and the procedures involved can vary depending on the circumstances and legal requirements.