

SKELETAL SYSTEM

- Skeletal system consists of a framework of bones and a few cartilages. This system has a significant role in movement shown by the body.
- Bone and cartilage are specialised connective tissues. The former has a very hard matrix due to calcium salts in it and the latter has slightly pliable matrix due to chondroitin salts.
- The study of bone structure and treatment of bone disorder is called osteology.
- The specialized branch of medicine that deals with preservation and restoration of skeletal system and joints is called orthopaedics.
- Bones are made up of a protein called ossein and cartilages are made of a protein called chondrin. Hence study of bones is called osteology and study of cartilage is called chondrology.

Axial skeleton:

- Axial skeleton comprises 80 bones distributed along the main axis of the body. The skull, vertebral column, sternum and ribs constitute Axial skeleton.

Skull

The skull is composed of two sets of bones - cranial and facial. That totals to 22 bones. Cranial bones are 8 in number (frontal-1, parietal-2, temporal-2, occipital-1, ethmoid-1 and sphenoid). They form the hard protective outer covering. Cranium for the brain. Cavity of sphenoid bone is called sella turcica in which pituitary gland is present.

The facial region is made up of 14 skeletal elements (Inferior turbinals-2, Maxilla-2, Malar (Zygomatic)-2, Nasal-2, Palatine-2, Lacrymal-2, Vomer-1, Mandible-1) which form the front part of the skull. A single U-shaped bone called hyoid is present at the base of the buccal cavity and it is also included in the skull.

Hyoid bone is the only bone which is not attached with any other bone of the body.

Tongue is attached with hyoid bone

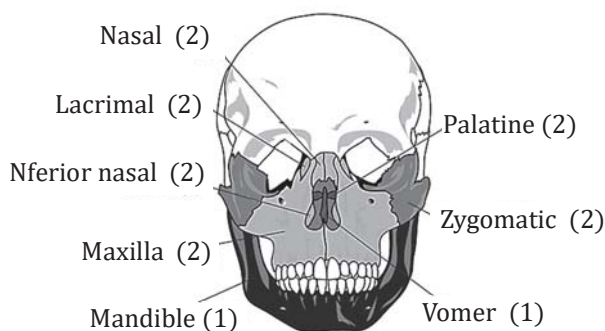


Fig. Facial Bones

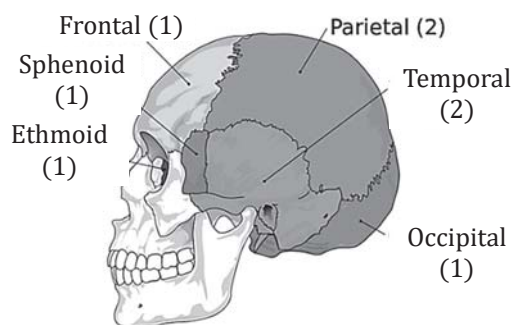
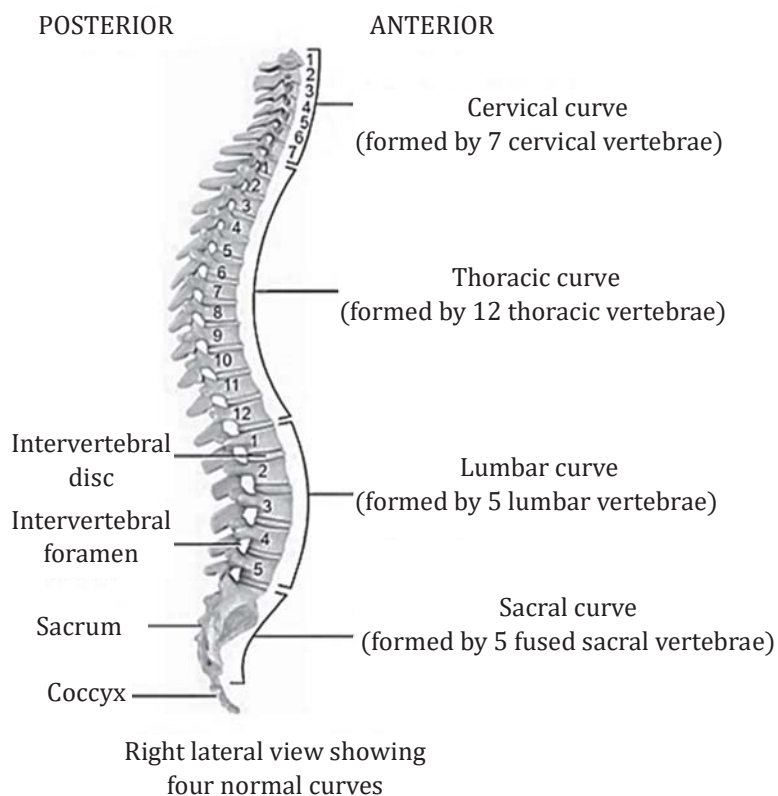


Fig. Cranial Bones

Each middle ear contains three tiny bones - Malleus, Incus and Stapes, collectively called Ear Ossicles. Joint between malleus and incus is hinge whereas joint between incus and stapes is ball and socket. Malleus is modification of articular bone, Incus is modification of quadrate bone, Stapes is smallest bone of body, modification of hyomandibular bone. The skull region articulates with the superior region of the vertebral column with the help of two occipital condyles (dicondylic skull). An opening is present at the base of occipital bone called foramen of magnum. Medulla oblongata leaves out through foramen of magnum and enters into the cavity of vertebral column. This extended part of medulla oblongata is called spinal cord.

Vertebral column:

- Our vertebral column is formed by 26 serially arranged units called vertebrae and it is dorsally placed. It extends from the base of the skull and constitutes the main framework of the trunk.
- Each vertebra has a central hollow portion (neural canal) through which the spinal cord passes.
- First vertebra is the atlas and it articulates with the occipital condyles.
- The vertebral column is differentiated into cervical (7), thoracic (12), lumbar (5), sacral (1-fused) and coccygeal (1-fused) regions starting from the skull. The number of cervical vertebrae are seven in almost all mammals including human beings.
- The vertebral column protects the spinal cord, supports the head and serves as the point of attachment for the ribs and musculature of the back.
- Sternum is a flat bone on the ventral midline of thorax.

**Fig.** Vertebral column

- Sternum is a flat bone on the ventral midline of thorax. There are three parts of sternum – prosternum (manubrium), mesosternum and metasternum (xiphoid process). Clavicle and 1st pair of ribs are attached with manubrium. 2nd to 7th pair of ribs are attached with mesosternum.
- Xiphoid process is smallest part, lower half of 7th costal cartilage articulate.
- The sternum is a favoured site for obtaining samples of haemopoietin tissue during diagnosis of suspected blood diseases.

Ribs

There are 12 pairs of ribs. Each rib is a thin flat bone connected dorsally to the vertebral column and ventrally to the sternum. It has two articulation surfaces on its dorsal end and is hence called bicephalic.

First seven pairs of ribs are called true ribs. Dorsally, they are attached to the thoracic vertebrae and ventrally connected to the sternum with the help of hyaline cartilage. The 8th, 9th and 10th pairs of ribs do not articulate

directly with the sternum but join the seventh rib with the help of hyaline cartilage. These are called vertebrochondral (false) ribs. Last 2 pairs (11th and 12th) of ribs are not connected ventrally and are therefore, called floating ribs (false ribs). Thoracic vertebrae, ribs and sternum together form the rib cage.

There are five parts of rib cage:

- (1) Dorsal consist of vertebral column and ribs
- (2) Ventral consist of sternum and ribs
- (3) Lateral consist of ribs
- (4) Anterior consist of neck and clavicle
- (5) Posterior consist of diaphragm

Appendicular skeleton:

The bones of the limbs along with their girdles constitute the appendicular skeleton. Each limb is made of 30 bones.

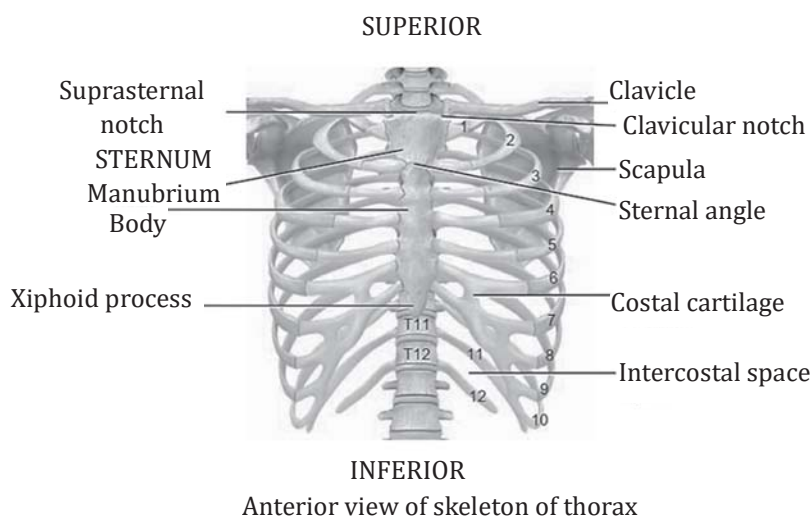


Fig. Ribs and rib cage

Fore Limb Bones

The bones of the hand (fore limb) are humerus, radius and ulna, carpals (wrist bones - 8 in number), metacarpals (palm bones - 5 in number) and phalanges (digits - 14 in number).

Humerus: Head of humerus articulates with the glenoid cavity of scapula to form shoulder joint (ball and socket joint). This bone has an elevated rough part on the shaft called deltoid ridge where deltoid muscles are attached. Lower end of humerus articulates laterally with radius and medially with ulna.

Radius and Ulna: Head of radius is disc shaped, covered with hyaline cartilage. Superior concave surface of head of radius articulates with the humerus at the elbow joint. Circumference of head of radius fits into socket of ulna to form radioulnar joint. Inferior surface of radius bears a particular area for scaphoid and lunate bone. Upper end of ulna articulates with humerus whereas lower end articulates with carpals.

Pectoral girdle: Each half of pectoral girdle consists of a clavicle and a scapula. Scapula is a large triangular flat bone situated in the dorsal part of the thorax between the second and the seventh ribs. The dorsal, flat, triangular body of scapula has a slightly elevated ridge called the spine which projects as a flat, expanded process called the acromion. The clavicle articulates with this. Below the acromion is a depression called the

glenoid cavity which articulates with the head of the humerus to form the shoulder joint. Each clavicle is a long slender bone with two curvatures. This bone is commonly called the collar bone.

Pelvic girdle: It consists of two coxal bones. Each coxal bone is formed by the fusion of three bones - ilium, ischium and pubis. At the point of fusion of the above bones is a cavity called acetabulum to which the thigh bone articulates. The two halves of the pelvic girdle meet ventrally to form the pubic symphysis containing fibrous cartilage.

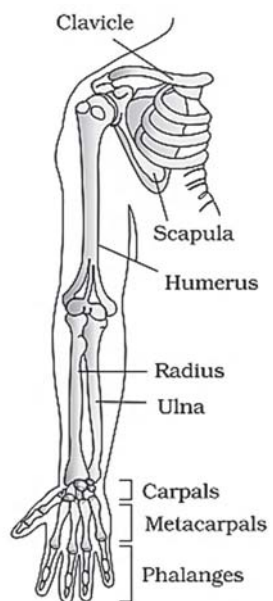


Fig. Right pectoral girdle and upper arm. (Frontal view)

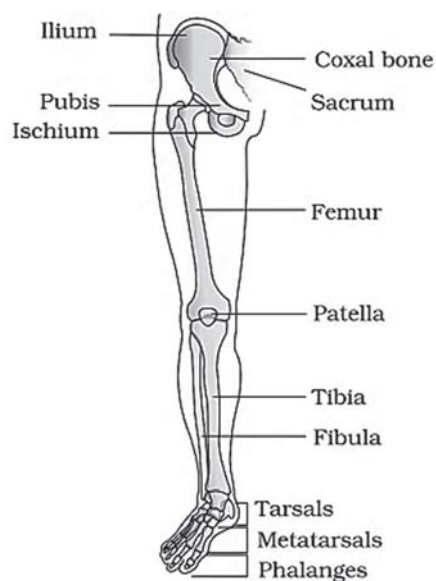


Fig. Right pelvic girdle and lower limb bones (frontal view)