

## HUMAN ANATOMY

### **1. GOAL**

The broad goal of the teaching of undergraduate students in Anatomy aims at providing comprehensive knowledge of the gross and microscopic structure and development of human body to provide a basis for understanding the clinical correlation of organs or structures involved and the anatomical basis for the disease presentations.

### **2. OBJECTIVES**

#### **2.1. Knowledge**

At the end of the course the student shall be able to :

- 2.1.1. comprehend the normal disposition, clinically relevant interrelationships, functional and cross sectional anatomy of the various structures in the body;
- 2.1.2. Identify the microscopic structure and correlate elementary ultrastructure of various organs and tissues and correlate the structure with the functions as a prerequisite for understanding the altered state in various disease processes;
- 2.1.3. Comprehend the basic structure and connections of the central nervous system to analyze the integrative and regulative functions of the organs and systems. He / She shall be able to locate the site of gross lesions according to the deficits encountered;
- 2.1.4. Demonstrate knowledge of the basic principles and sequential development of the organs and systems; recognize the critical stages of development and the effects of common teratogens. He / She shall be able to explain the developmental basis of the major variations and abnormalities.

#### **2.2. Skills**

At the end of the course the student shall be able to:

- 2.2.1. Identify and locate all the structures of the body and mark the topography of the living anatomy.
- 2.2.2. Identify the organs and tissues under the microscope;
- 2.2.3. Understand the principles of karyotyping and identify the gross congenital anomalies;
- 2.2.4. Understand the principles of newer imaging techniques like Ultra sound, Computerized Tomography Scan (CTS); Interpretation of Plain and contrast X-rays.
- 2.2.5. Understand clinical basis of some common clinical procedures i.e. intramuscular and intravenous injection, lumbar puncture, kidney biopsy etc.

#### **2.3. Integration**

From the integrated teaching of other basic sciences, student shall be able to comprehend the regulation and integration of the functions of the organs and systems in the body and thus interpret the anatomical basis of disease processes.

### **3. SYLLABUS**

The course in Human Anatomy is to provide an understanding of the structure of the human body as a foundation for the scientific study and practice of medicine.

#### **3.1. Theory**

### **3.1.1. General Anatomy**

Introduction to anatomy - Anatomical terms of position and movement - Tissues- General features of bone, joints, muscles, blood vessels, lymph vessel, nerves, skin and fasciae.

#### **1. Upper limb**

Introduction of Upper limb - Osteology: Anatomical features and clinical importance of clavicle, scapula, humerus, radius, ulna, skeleton of hand - Pectoral region: Muscles, Breast and Clavipectoral fascia - Axilla: Boundaries; Contents: Axillary vessels, Brachial plexus, Axillary lymph nodes - Back: Muscles that attach scapula to the trunk - Inter muscular spaces - Anastomoses around scapula - Free Upper limb: Fasciae of upper limb and compartments; Veins of upper limb: Superficial and Deep; Lymphatic drainage of upper limb; Cutaneous nerves of upper limb - Dermatomes of upper limb - Shoulder Region: Muscles attaching the humerus to the scapula; Shoulder joint; Movements at the shoulder joint - Arm: Anterior compartment: Muscles, vessels and nerves - Cubital fossa - Posterior compartment: Muscles, vessels and nerves - Forearm and Hand: Anterior compartment: Muscles, Flexor retinaculum, vessels and nerves of fore arm; Palm: Palmar aponeurosis, Muscles, vessels and nerves - Posterior compartment: Muscles, Extensor retinaculum, vessels and nerves - Dorsum of Hand: Extensor expansion: Formation and muscles attached; Anatomical snuff box; Muscles, vessels and nerves - Joints of upper limb: Elbow joint; Wrist joint; Proximal and Distal Radio ulnar joints; First carpometacarpal joint; Meta carpophalangeal joint; Interphalangeal joint - Radiology: A-P and Lateral views of upper limb joints - Surface Marking: Bony landmarks; Surface marking of important vessels and nerves - Embryology: Rotation of limb bud; Axial lines; Development of seventh cervical inter segmental and axis arteries; Dorsal migration of the apical ectoderm of the digits

#### **2. Lower limb**

Introduction of Lower limb - Osteology: Anatomical features and clinical importance of Hip bone, Femur, Patella, Tibia, Fibula and Skeleton of Foot - Free Lower limb: Fasciae of lower limb and compartments; Veins of lower limb: Superficial and Deep; Lymphatic drainage of lower limb; Cutaneous nerves of lower limb; Dermatomes of lower limb - Front of thigh: Superficial inguinal lymphnodes; Iliotibial tract; Muscles, vessels and nerves; Femoral triangle - Medial side of thigh: Muscles, vessels and nerves; Adductor canal - Gluteal region: Fasciae, Muscles, vessels and nerves - Back of thigh: Muscles, vessels and nerves - Hip joint: Movements at the shoulder joint - Popliteal fossa: Boundaries, roof, floor & contents; Popliteus muscle - Leg and foot: Anterior compartment of leg: Muscles, vessels and nerves; Extensor retinaculum: superior & inferior; Dorsum of foot: Muscles, vessels and nerves; Lateral compartment of leg: Muscles, vessels and nerves; Peroneal retinaculum; superior & inferior - Posterior compartment of leg: Muscles, vessels and nerves - Flexor retinaculum; Sole of foot: Muscles, vessels and nerves; Arches of foot - Joints of lower limb: Knee joint, anastomosis around knee joint, locking & unlocking of knee joint; Tibia fibular joints; Ankle joints; Subtalar joint - Radiology: A-P and Lateral views of Lower limb joints - Surface Marking: Bony landmarks; Surface marking of important vessels and nerves - Embryology:

Rotation of limb buds; Axial lines; Axis artery of lower limb; Dorsal migration of the apical ectoderm of the digits

#### **3. Thorax**

Osteology: Anatomical features and clinical importance of Sternum, Ribs and thoracic vertebra - Thoracic cage: Boundaries of thoracic inlet, cavity and outlet - Walls of thorax Muscles, vessels &

nerves - Cavity of thorax: Pleura, lungs, trachea, phrenic nerve - Mediastinum: Subdivision, boundaries & content - Middle mediastinum: Pericardium; Heart ; Coronary arteries; Venous drainage of heart; Ascending aorta & arch of aorta; Superior venacava - Posterior mediastinum: Oesophagus; Thoracic sympathetic chain; Thoracic duct; Azygos vein, hemiazygos and accessory hemiazygos vein; Descending thoracic artery - Joints of thorax: Manubriosternal joint; Sternocostal joints; Costovertebral; Xiphisternal joint; Intervertebral joint; Mechanism of respiration - Radiology: Plain X-ray PA view of chest; Bronchogram - Surface Marking: Bony landmarks; Surface marking of pleura, lung & heart

#### **4. Abdomen**

Osteology: Anatomical features and clinical importance of lumbar vertebra - Anterior abdominal wall: Quadrants of anterior abdomen wall; Muscles; Rectus sheath formation & its contents; Superficial & deep inguinal rings; Inguinal ligament - Inguinal canal: Extent, boundaries & contents; Hasselbach's triangle; Inguinal hernia - Male external genital organs Testis; Epididymis; Penis - Posterior abdominal wall: Muscles, Lumbar plexus - Peritoneal cavity: Lesser sac; Greater sac; Epiploic foramen; Ligaments, omentum & mesentery; Rectouterine pouch; Uterovesical pouch; Rectovesical pouch - Viscera: Spleen - Abdominal part of oesophagus; Stomach; Liver; Gall bladder; Pancreas; Small intestine; Caecum; Appendix; Colon; Kidneys; Ureters; Suprarenal glands; Extra Hepatic biliary apparatus - Blood vessels & nerves: Portal vein; Portocaval anastomosis; Inferior venacava; Abdominal aorta & its branches; Autonomic Nervous system; Coeliac ganglion - Diaphragm: Attachments, openings, nerve supply & action

#### **5. Pelvis**

Muscles: Levator ani, Coccygeus, Obturator internus & piriformis - Viscera: Urinary bladder; Rectum Anal canal; Prostate; Seminal vesicles; Vas deferens; Ejaculatory duct; Male urethra; Uterus and its supports; Fallopian tube; Ovary; Vagina; Female urethra - Blood vessel: Internal iliac artery - Nerves: Sacral plexus; Pelvic splanchnic nerve - Perineum: Subdivisions; Superficial perineal pouch; Deep perineal pouch; Perineal body; Perineal membrane; Ischiorectal fossa - Joints: Intervertebral joints; Sacroiliac joints; Pubic symphysis - Radiology: Plain X-ray of Abdomen and pelvis; AP View; Contrast X-ray; Barium swallow; Barium meal; Barium enema; Hysterosalpingogram; Pyelogram - Surface marking: Region & planes of abdomen; superficial inguinal ring; Deep inguinal ring; Stomach; Liver; Fundus of gall bladder; Spleen; Duodenum; Pancreas; Iliocecal junction; Mcburney's point; Kidneys; Abdominal part of ureter; Root of mesentery; Abdominal aorta; inferior vena cava

#### **6. Head and neck**

Osteology: Cranium; Normas of skull; Cranial cavity; Individual bones of skull - Scalp and temple: Layers, Blood supply, Nerve supply - Face: Muscles, Innervation and Blood supply -Side of the neck: Deep Fascia of neck; Triangles of neck: Posterior triangle - Backs: Muscles of Back; Suboccipital triangle - Anterior triangle of the neck: Sternocleidomastoid; Infrahyoid region; Digastric triangle; Carotid triangle; Muscular triangle; Infrahyoid muscles - Cranial cavity: Dural venous sinuses; Pituitary gland; Trigeminal nerve; Oculomotor, Trochlear and abducent nerve; Cavernous sinus - Deep structures in the neck: Thyroid gland; Subclavian artery; Vertebral artery; Common carotid, External carotid and Internal carotid artery; Internal jugular vein; Vagus nerve; Hypoglossal nerve; Sympathetic trunk; Cervical plexus; Scalene muscle; Lymph nodes of head and neck - Prevertebral region: Muscles of the prevertebral region - Deep dissection of Face: Arteries Veins and Nerves of Face; Buccinator; Lacrimal apparatus - Orbit: Structures of orbit; Ciliary ganglion; Extra ocular

muscles; Ophthalmic artery - Parotid region: Parotid gland - Temporal and infratemporal regions: Temporal fascia ; Muscles ; Infra temporal fossa ; Maxillary artery; Mandibular nerve; Otic ganglion; Temporo-mandibular joint - Submandibular region: Submandibular gland; Muscles, Nerves; Lingual artery - Mouth and Pharynx: Features of Mouth; Muscles and Interior of Pharynx; Tonsil; Inlet of larynx; Piriform recess; Soft palate; Auditory tube - Cavity of nose: Septum of nose; Lateral wall of nose; Pterygopalatine ganglion; Maxillary sinus - Larynx: Cartilages; Interior of larynx; Muscles of larynx - Tongue:

Dorsum of tongue; Muscles of tongue; Nerves - Organs of hearing and equilibrium: External ear; Tympanic membrane; Middle Ear; Mastoid antrum; Internal ear; Bony and membranous labyrinth - Eyeball: Structure of eyeball - Contents of vertebral canal: Internal vertebral venous plexus; Meninges of spinal cord; Arteries of spinal cord - Joints of the neck:

Joints of Atlas, Axis and Occipital bone - Radiology: Plain X-ray skull; AP and lateral View; Plain X-ray Cervical spine lateral view; Plain X-ray of Paranasal sinuses - Surface marking: Thyroid gland; Parotid gland and duct; Pterion; Common carotid artery; Internal and External jugular veins; Subclavian artery; Facial artery

### **3.1.2. NEURO ANATOMY**

Introduction and parts of brain - Membranes of the brain: Meninges of brain; Subarachnoid spaces - Blood vessels of the brain: Vertebral artery, basilar artery and internal carotid artery, circle of willies - Base of the brain: Interpeduncular fossa; Superficial attachments of cranial nerves - Hindbrain: Surface features of medulla oblongata; Grey and white matter of medulla oblongata; Pons: features - Cerebellum: Features, fissures, cerebellar peduncles; Fourth ventricle - Midbrain: Parts, features, cerebral peduncles - Cerebrum: Cerebral sulci and gyri; White matter of cerebrum; Pineal body; Third ventricle - Lateral ventricles: Choroid fissure; Features of lateral ventricle - Diencephalon: thalami Features of thalamus, medial and lateral geniculate bodies - Deep dissection of hemisphere Insula; Corona radiate; Internal capsule - Deep nuclei of telencephalon: Caudate nucleus; Lentiform nucleus; Claustrum; Amygdaloid body - Nuclei and connections of thalamus: Ascending tracts and efferent fibres of thalamus; Hypothalamus - Craniocerebral topography - Surface marking: Central sulcus; Middle meningeal artery

### **3.1.3. Embryology**

1. General embryology: Oogenesis, spermatogenesis, fertilization, bilaminar germ disc, tri laminar germ disc, embryonic period, placenta, amnion, umbilical cord, twinning and basic teratology
2. Systemic embryology: Gastro intestinal system, urinary system, genital system, spleen, diaphragm, heart, aortic arches, respiratory system, face, palate, tongue, eye, branchial apparatus, pharynx, endocrine system, vertebral column, parts of neural tube and there derivatives.

### **3.1.4. Genetics**

Structure of chromosome - Karyotype - Chromosomal aberrations - Numerical and Structural - Structure of gene - Mutation - Single gene inheritance - Autosomal and sex linked - Prenatal diagnosis & Genetic counseling.

### **3.1.5. HISTOLOGY**

#### **1. General Histology**

Cell, Epithelia, Glands, Connective tissue, Cartilage, Bone, Muscle, Nervous tissue Lymphoid

tissue, Skin and its appendages

## 2. Special Histology

Respiratory system, Vascular system, Gastro-Intestinal system, Urinary system, Reproductive system- Male and Female, Endocrine system, Special senses: Cornea and Retina, CNS - Spinal cord , Medulla Oblongata , Pons , Midbrain , Cerebrum And Cerebellum.

### 3.2. Teaching Schedule

3.2.1. The minimum number of teaching period for the Human Anatomy is 650 Hours, which includes, Introduction, General Anatomy, General Embryology, General Histology

3.2.2. Time Distribution for the Topics

S. No.	Topics	Time distribution in weeks
1.	Upper Extremity	6
2.	Lower Extremity	5
3.	Abdomen and Pelvis	9
4.	Thorax	3
5.	Head and Neck	11
6.	Brain and Spinal cord	6
	Total No. of weeks	40

#### 3.2.3. Horizontal Integration

1. The preclinical departments together plan the Horizontal Integration

2. To stress the importance of clinical and applied Anatomy

2.1. Display study questions on the notice board weekly, pertaining to the region covered.

2.2. At the end of a region students are given cases of that region for study, presentation, analysis and discussion.

2.2.1. Example: Leprosy patients with nerve lesions of the Upper Extremity at the end of the study of Upper Extremity.

2.3. Invite clinicians to give guest lectures and demonstrations to highlight the anatomical basis of the clinical conditions.

2.3.1. Examples: Importance of the venous drainage of Lower Extremity and varicose veins, Anatomical basis of transplant and Anatomical basis of hernia and repair.