



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

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MGM 02 MD Anatomy

Program Outcomes:

PO1. Knowledge of Anatomy: Acquire competencies in gross and surface anatomy, neuroanatomy, embryology, genetics, histology, radiological anatomy, applied aspects and recent advances of the above-mentioned branches of anatomy to clinical practice. These are given in detail in subsequent sections.

PO2. Practical and Procedural skills: Acquire mastery in dissection skills, embalming, tissue preparation, staining and museum preparation.

PO3. Training skill in Research Methodology

- Acquire skills in teaching, research methodology, epidemiology & basic information technology.
- Acquire knowledge in the basic aspect of Biostatistics and research methodology.
- Has knowledge to plan the protocol of a thesis, carry out review of literature, execution of research project and preparation of report.
- Has ability to use computer applications Microsoft office (Microsoft word, excel, power point), Internet, Searching scientific databases (e.g. PubMed, Medline, Cochrane reviews).
- Acquire skills in paper & poster preparation, writing research papers and Thesis.

PO4. Professionalism, attitude and communication skills:

- Develop honest work ethics and empathetic behaviour with students and colleagues.
- Acquire capacity of not letting his/her personal beliefs, prejudices, and limitations come in the way of duty.
- Acquire attitude and communication skills to interact with colleagues, teachers and students.

PO5. Teaching Anatomy

- Practicing different methods of teaching-learning.
- Making presentations of the subject topics and research outputs.

PO6. Problem Solving

- Demonstrate the ability to identify applied implications of the knowledge of anatomy and discuss information relevant to the problem, using consultation, texts, archival literature and electronic media.
- Demonstrate the ability to correlate the clinical conditions to the anatomical/ embryological/hereditary factors.
- Demonstrate the ability to evaluate scientific/clinical information and critically analyse conflicting data and hypothesis

SUBJECT SPECIFIC COMPETENCIES

At the end of the course, the student should have acquired following competencies:

A. Cognitive domain

1. Describe gross anatomy of entire body including upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, brain and spinal cord.
2. Explain the normal disposition of gross structure, and their interrelationship in the human body. She/He should be able to analyze the integrated functions of organs systems and locate the site of gross lesions according to deficits encountered.
3. Describe the process of gametogenesis, fertilization, implantation and placenta formation in early human embryonic development along with its variation and applied anatomy.
4. Demonstrate knowledge about the sequential development of organs and systems along with its clinical anatomy, recognize critical stages of development and effects of common teratogens, genetic mutations and environmental hazards. She/He should be able to explain developmental basis of variations and congenital anomalies.
5. Explain the principles of light, transmission and scanning, compound, electron, fluorescent and virtual microscopy.
6. Describe the microscopic structure of various tissues & organs and correlate structure with functions as a prerequisite for understanding the altered state in various disease processes.
7. Demonstrate knowledge about cell and its components, cell cycle, cellular differentiation and proliferation.
8. Describe structure, number, classification, abnormalities and syndromes related to human chromosomes.
9. Describe important procedures in cytogenetics and molecular genetics with its application.
10. Demonstrate knowledge about single gene pattern inheritance, intermediate pattern and multiple alleles, mutations, non-mendelian inheritance, mitochondrial inheritance, genome imprinting and parental disomy.
11. Describe multifactorial pattern of inheritance, teratology, structure gene, molecular screening, cancer genetics and pharmacogenetics.
12. Demonstrate knowledge about reproduction genetics, assisted reproduction, prenatal diagnosis, genetic counseling and ethics in genetics.
13. Explain principles of gene therapy and its applied knowledge.
14. Describe immune system and cell types involved in defense mechanisms of the body. Also explain gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body.
15. Demonstrate knowledge about common techniques employed in cellular immunology and histocompatibility testing.
16. Demonstrate applications of knowledge of structure & development of tissue-organ system to comprehend deviations from normal.
17. Demonstrate knowledge about recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.

18. Explain collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies.
19. Demonstrate knowledge about surface marking of all regions of the body.
20. Able to interpret various radiographs of the body, normal CT Scan, ultrasound and MRI.
21. Demonstrate knowledge about different anthropological traits and use of related instruments.
22. Demonstrate knowledge about outline of comparative anatomy of whole body and basic human evolution
23. Demonstrate knowledge about identification of human bones, determination of sex, age, and height for medico legal application of anatomy

B. Affective domain

1. Demonstrate self-awareness and personal development in routine conduct. (*Self-awareness*)
2. Communicate effectively with peers, students and teachers in various teaching-learning activities. (*Communication*)
3. Demonstrate
 - a. Due respect in handling human body parts & cadavers during dissection. (*Ethics & Professionalism*)
 - b. Humane touch while demonstrating living surface marking in subject/patient. (*Ethics & Professionalism*)
4. Acquire capacity of not letting his/her personal beliefs, prejudices and limitations come in the way of duty.
5. Appreciate the issues of equity and social accountability while exposing students to early clinical exposure. (*Equity and social accountability*)

C. Psychomotor domain

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

1. Identify, locate and demonstrate surface marking of clinically important structures in the cadaver and correlate it with living anatomy.
2. Acquire mastery in dissection skills, embalming, tissue preparation, staining and museum preparation.
3. Locate and identify clinically relevant structures in dissected cadavers.
4. Locate and identify cells & tissues under the microscope.
5. Identify important structures visualized by imaging techniques, specifically radiographs, computerized tomography (CT) scans, MRI and ultrasonography.
6. Demonstrate various movements at the important joints and actions of various groups of muscles in the human body.
7. Demonstrate anatomical basis of common clinical procedures expected to be performed by a basic medical doctor.
8. Demonstrate different methods of teaching-learning and make presentations of the subject topics and research output

Specific practice based competencies:

1. Gross anatomy:

- 1.1 Procurement, Embalming and Preservation of human cadavers
- 1.2 Preparation of tanks for preserving bodies
- 1.3 Dissection of cadaver
- 1.4 Window dissection of important regions
- 1.5 Preparation of specimens for museum with display
 - a) soft parts
 - b) models
 - c) charts
- 1.6 Preparation and preservation of human bones / skeleton as assigned by the Faculty

2. Histology

- 2.1 Preparation of common fixatives embalming fluid 10% formalin, Bouin's fluid etc
- 2.2 Making paraffin blocks and section cutting and mounting
- 2.3 Preparation of staining set for H and E staining and staining paraffin sections with the stain
- 2.4 Making celloidin, araldite, gelatin blocks and their section cutting
- 2.5 Processing hard tissues, decalcification of bones, block making and sectioning, preparation of ground sections of calcified bones.
- 2.6 Frozen section cutting on freezing microtome and cryostat
- 2.7 Honing and Stropping of microtome knives, including sharpening by automatic knife sharpener
- 2.8 Histology file in which LM and EM pictures of all the organs and tissues of the body should be drawn and a small description of salient features written.

3. Histochemical Methods

- 3.1 Practical classes for staining of glycogen, mucopolysaccharides, alkaline phosphatase acid phosphatase, and calcium

4. Cytogenetics

- 4.1 Preparation of media, different solutions, stains etc.
- 4.2 Preparation of buccal smear for sex chromatin
Human chromosome preparation from peripheral blood and karyotyping.
- 4.3 Banding techniques (G and C)
- 4.4 Making of Pedigree charts for study of patterns of inheritance.
- 4.5 Chromosomal Analysis.

5. Neuroanatomy:

- 5.1 Dissection of brain and spinal cord for teaching and learning purpose
- 5.2 Preparation of brain and spinal cord macroscopic and microscopic sections and identification of different parts in them.
- 5.3 Discussions on clinical problems related to neurological disorders and anatomical explanation for the same.

COURSES OUTCOME

Syllabus

A post graduate student, after three years of training in M.D. (Anatomy) should have acquired knowledge in the following aspects of anatomy:

Gross anatomy

Section - I

Gross Anatomy of entire body including upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, brain and spinal cord

Section - 2

Developmental anatomy/embryology

- General embryology: gametogenesis, fertilization, implantation and placenta, early human embryonic development.
- Systemic embryology: development of organ systems and associated common congenital abnormalities with teratogenesis.
- Physiological correlations of congenital anomalies.

Section - 3

Histology and histochemistry

Cell Biology

Cytoplasm - cytoplasmic matrix, cell membrane, cell organelles, cytoskeleton, cell inclusions, cilia and flagella.

- Nucleus - nuclear envelope, nuclear matrix, DNA and other components of chromatin, protein synthesis, nucleolus, nuclear changes indicating cell death.
- Cell cycle - mitosis, meiosis, cell renewal.
- Cellular differentiation and proliferation.

Microscopic structure of the body:

- Principles of light, transmission and scanning, electron, fluorescent, confocal and virtual microscopy.
- The systems/organs of body - Cellular organization, light and electron microscopic features, structure - function correlations, and cellular organization.

Section - 4

Neuroanatomy:

- Brain and its environment, Development of the nervous system, Neuron and Neuroglia, Somatic sensory system, Olfactory and optic pathways, Cochleovestibular and gustatory pathways, Motor pathways, Central autonomic pathways, Hypothalamo-hypophyseal system, Limbic system, Basal ganglia, Reticular system, Cross Sectional anatomy of brain and spinal cord.
- Detailed structure of the central nervous system and its applied aspect.

Section - 5

Genetics

- Human Chromosomes - Structure, number and classification, methods of chromosome preparation banding patterns. Chromosome abnormalities,

Autosomal and Sex chromosomal abnormalities syndromes, Molecular and Cytogenetics.

- Single gene pattern inheritance: Autosomal and Sex chromosomal pattern of inheritance, Intermediate pattern and multiple alleles, Mutations, Non-Mendelian inheritance, Mitochondrial inheritance, Genome imprinting, parental disomy.
- Multifactorial pattern of inheritance: Criteria for multifactorial inheritance, Teratology, Structure gene, Molecular Screening, Cancer Genetics - Haematological malignancies, Pharmacogenetics.

Reproduction Genetics - Male and Female Infertility, Abortuses, Assisted reproduction, Preimplantation genetics, Prenatal diagnosis, Genetic Counseling and Ethics of Genetics.

- Principles of Gene therapy and its applied knowledge.

Section - 6

Immunology

- Immune system and the cell types involved in defense mechanisms of the body. Gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body.
- Biological and clinical significance of the major histocompatibility complex of man including its role in transplantation, disease susceptibility/resistance and genetic control of the immune response.
- Common techniques employed in cellular immunology and histocompatibility testing.
- Molecular hybridization and PCR technology in immunology research particularly mechanism of antigen presentation, structural and functional relevance of the T cell receptor, genetic control of the immune response. Molecular basis of susceptibility to disease.

Section - 7

Applied anatomy and recent advances

- Clinical correlations of structure and functions of human body. Anatomical basis and explanations for clinical problems.
- Applications of knowledge of development, structural (microscopy), neuro anatomy to comprehend deviations from normal.
- Recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.
- Collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies.

Section - 8

□ Surface Marking and Radiology

Surface marking of all regions of the body. Interpretation of normal

radiographs of the body including special contrast procedures including barium studies, cholecystography, pyelography, salphingography. Normal CT Scan, MRI and Ultrasound.

Anthropology

Different anthropological traits, Identification and use of Anthropological instruments.

Forensic Medicine:

Identification of human bones from their remains and determination of sex, age, and height. for medico legal application of Anatomy.

Outline of comparative anatomy of the whole body and basic human evolution

Departmental Resources:

It is mandatory for the department of Anatomy to develop at least three of the following laboratories, in addition to the other facilities. The laboratory should be involved in active research in at least one well defined field.

1. Histology
2. Immunology
3. Electronmicroscopy/ Fluorescence microscopy/ confocal and other forms of microscopy laboratories
4. Developmental anatomy
5. Anthropometry
6. Neuroanatomy
7. Cytogenetics
8. Imaging technique for Radiologi



Dr. Rajesh B. Goel
Registrar

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