JSS Academy of Higher Education & Research
(Deemed to be University)
Re-Accredited "A+" Grade by NAAC
Sri Shivarathreeshwara Nagara Mysuru - 570015, Karnataka

Regulation & Syllabus

MD PATHOLOGY

2020

MD PATHOLOGY

GOAL: The goal of postgraduate training in Pathology would be to train medical professionals who will be capable of planning and managing a multidisciplinary laboratory attached to patient care systems.

Program Outcomes:

PO1: The postgraduate student in pathology should be sufficiently trained, professionally competent, and confident in handling, processing, and diagnosis related to histopathology (surgical pathology), cytopathology and hematology.

PO2: The student should have reasonable working knowledge in blood banking, laboratory medicine, medical statistics, and ancillary techniques with understanding of general principles and methodology.

PO3: The student should have knowledge for performing the laboratory investigations which include instrumentation, methodologies, quality assessment and assurance.

PO4: The student must be able to diagnose routine and complex clinical problems on the basis of laboratory investigations.

PO5: The student should be able to interpret laboratory data in relation to clinical findings with reasonable accuracy.

PO6: The student should be able to teach pathology to undergraduates and paramedical staff including laboratory personnel.

PO7: The student should be able to perform most of the routine tests in laboratory including gross sampling of specimens, processing, and instrumentation.

PO8: The student should inspire members of the team with whom he /she is involved in the fields of diagnostics, teaching and research.

PO9: The student should develop communication skills not only word reports and professional opinions but also to interact with patients, relatives, peers and paramedical staff.

PO10: The student must update his/her knowledge of recent advances in laboratory medicine and allied subjects.

PO11: The student should be able to carry out research on laboratory science related topics.

Course Outcomes: (Each Paper is Course):

Paper I: Basic sciences as applied to the subject (general pathology, pathophysiology, immunopathology, and molecular biology).

CO1: Overview of cellular responses and adaptations to stress and noxious stimuli.

CO2: Overview of cell injury and cell death

CO3: Demonstrate the acquisition of comprehensive knowledge related to inflammation and repair

CO4: Demonstrate the acquisition of comprehensive knowledge related to functioning of immune system, immune responses, and autoimmune diseases

CO5: Demonstrate the acquisition of comprehensive knowledge related to carcinogenesis and characteristics of benign and malignant neoplasms.

Paper II: (Systemic pathology and Cytopathology)

CO1: Demonstrate the acquisition of comprehensive knowledge related to pathogenesis of disease processes in various organ systems.

CO2: Demonstrate the acquisition of comprehensive knowledge related to morphology and microscopic features of tumors pertaining to organ systems

CO3: Demonstrate the acquisition of comprehensive knowledge regarding differential diagnosis, special stains, and immunohistochemistry

CO4: Demonstrate the acquisition of comprehensive knowledge related to diagnostic cytology, techniques of fine needle aspiration and interpretation of the same.

CO5: Demonstrate the acquisition of comprehensive knowledge related to fluid cytology and PAP smears.

Paper III: (Hematology, transfusion medicine and laboratory medicine including instrumentation and quality control).

CO1: Demonstrate the acquisition of comprehensive knowledge related to red cell disorders, white cell disorders and bleeding disorders.

CO2: Demonstrate the acquisition of comprehensive knowledge related to immunophenotyping, molecular studies and cytogenetics

CO3: Demonstrate the acquisition of comprehensive knowledge related to blood bank and transfusion related disorders.

CO4: Demonstrate the acquisition of comprehensive knowledge related to quality assurance and control in laboratory

Paper IV: Recent advances in the subject

Demonstrate the acquisition of comprehensive knowledge about recent advances in the subject.

Objectives

At the end of the training in M.D. Pathology, the candidate will be able to:

1. Discuss the etiology and the pathophysiological basis of diseases.
2. Explain the salient aspects of epidemiology, clinical presentation, and prognosis of these disorders.
3. Discuss rationality of the treatment and diagnosis of the above disorders.
4. Make rational and relevant selection of tests (hematology/cytology/surgical pathology/flow cytometry/ immunohistochemistry etc.)
5. Perform the specified important tests belonging to hematology, cytology, and surgical pathology.
6. Plan and manage a large multidisciplinary laboratory services.
7. Supervise and train technical staff of the laboratory.

Competencies:

A. COGNITIVE DOMAIN:

A postgraduate student upon successfully qualifying the MD (Pathology) examination should have acquired the following BROAD theoretical competencies and should be:

- Capable of offering an accurate diagnostic opinion in a given clinical situation with an appropriate and relevant sample of tissue, blood, body fluid, etc. for the purpose of diagnosis.

● Conversant with the standard operating procedures of various laboratories including histopathology, cytopathology, hematology, and laboratory medicine

● Able to teach and share his knowledge and competence with others. The student should be imparted training in teaching methods in the subject which may enable the student to take up teaching assignments in Medical Colleges/Institutes.

● Capable of pursuing clinical and laboratory-based research. He/she should be introduced to basic research methodology so that he/she can conduct fundamental and applied research. At the end of the course, the student should have acquired the following competencies as a diagnostician:

Surgical pathology

● Be conversant in the histogenesis and pathophysiological processes associated with various diseases.

● Should be able to identify problems in the histopathology laboratory and offer viable solutions.

● Possess the background knowledge necessary for the evaluation and reporting of Surgical Pathology.

● Conversant with the various equipments used in the histopathology laboratory.

● Should have knowledge of automation and quality assurance in histopathology.

Cytopathology

● Possess the background knowledge necessary for the evaluation and reporting of Cytopathology. Demonstrate and guide clinical/radiology residents in keeping with the clinical information on the choice of site,

collection, preservation, transport, type of preparation and method of obtaining various cytological specimens.

● Conversant with the various equipments used in the cytopathology laboratory.

● Should have knowledge of automation and quality assurance in cytopathology.

Hematology

● Demonstrate ability to utilize the principles of the practice of Hematology for the planning of tests, interpretation, and diagnosis of diseases of the blood and bone marrow.

● Conversant with the various equipments used in the hematology laboratory.

● Should have knowledge of automation and quality assurance in hematology.

● Demonstrate familiarity with the normal range of values of the chemical content of body fluids, significance of altered values, and their interpretation.

● Possess knowledge of the following specialized organ function tests and relative utility and limitations of each and significance of altered values: (i) Renal function test (ii) Liver function test (iii) Endocrine function test (iv) Tests for malabsorption

● Principles, advantage and disadvantages, scope, and limitation of automation in laboratory.

● Learn the principle and methodology of quality control in the laboratory.

Transfusion medicine

● Possess knowledge of basic immunology, ABO and Rh groups, minor blood groups and their clinical significance, transfusion therapy, pre-transfusion testing, transfusion related infections, transfusion reactions and quality control in blood bank.

Autopsy pathology

- Conversant with the technique of autopsy.
- Possess sufficient understanding of the various disease processes so that meaningful clinico-pathological correlation can be made.

Immunopathology

- Demonstrate familiarity with current concepts of structure and function of the immune system, its aberrations, and mechanisms.

- Demonstrate familiarity with the scope, principles, limitations, and interpretations of the results of ELISA techniques, HLA typing, immunofluorescence, and Immunoelectrophoresis, Immunohistochemistry and flow cytometry.

- Demonstrate familiarity with the principles and procedures of performing immunohistochemistry including automation in procedure and interpretation.

- Demonstrate familiarity with the principles and procedures of performing flow cytometry, Cytogenetics and Molecular biology.

- Demonstrate familiarity with the principles of molecular pathology especially related to the understanding of disease processes and its use in various diagnostic tests at least including but not limited to in-situ hybridization, polymerase chain reaction, Sanger Sequencing and Next generation sequencing.

- Demonstrate familiarity with the principles and techniques of electron microscopy and the working of the electron microscope.

- Demonstrate familiarity with the tissue processing and staining methods for electron microscopy, including immune-labelling techniques and use of semi-thin sections.

Enzyme histochemistry

● Demonstrate familiarity with the principles, use and interpretation of common enzyme histochemical procedures.

Quality Control

● Demonstrate familiarity with various quality control programmes running in the department, both internal and external quality.

● Demonstrate familiarity with inter and intra assay variations, batch variations, validation of chemicals and instruments.

● Demonstrate familiarity with good lab practices and safety, record maintenance of capital equipments and consumables, purchase specifications, approximate costs of reagents and equipment, maintenance of store logbooks, etc.

Biomedical Waste Management

● Demonstrate familiarity with disposal methods for each specimen, reagents, instruments, autoclaving techniques, recycling of products and e-waste.

Competencies as a teacher/researcher

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

● Demonstrate familiarity with different modes, methods, and principles of teaching including microteaching.

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

● Conversant with the principles of basic and applied research methodology, literature search, study design, sample size estimation, selection of controls, and appropriate application of medical statistics.

● Possess knowledge about the methods of writing thesis and/or a research paper with the prescribed instructions, as expected of international standards.

● Conversant with the use of digital slide imaging, algorithms to evaluate findings in imaging, morphometry, and application of artificial intelligence.

B. AFFECTIVE DOMAIN

1. The student will show integrity, accountability, respect, compassion, and dedicated patient care. The student will demonstrate a commitment to excellence and continuous professional development.

2. The student should demonstrate a commitment to ethical principles relating to providing patient care, confidentiality of patient information and informed consent.

3. The student should show sensitivity and responsiveness to patients' culture, age, gender, and disabilities.

4. The student should demonstrate a commitment to ethical principles relating to research conduct and research publication.

C. PSYCHOMOTOR DOMAIN

1. Able to perform grossing of biopsy and surgical specimens including gross diagnosis and taking appropriate sections/ samples necessary for diagnosis, comprehensive staging, and ancillary testing.

2. Conversant in histopathology tissue processing techniques and troubleshooting, cutting of paraffin and frozen sections, making imprint smears, and staining, and immunohistochemistry.

3. Able to collect specimens by routinely performing non-invasive out-patient procedures such as venipuncture, finger-prick, fine needle aspiration of superficial lumps and bone marrow aspirates, making smears and staining, and provide appropriate guidance to colleagues performing procedure such as a biopsy or an imaging guided biopsy including on-site microscopic assessment of specimen adequacy.

4. Perform an autopsy, dissect various organs and display the gross findings.

5. Conversant with the function, handling, and routine care of equipment in the laboratory and quality assurance.

6. Able to teach and share his knowledge and competence with others. The student should be imparted training in teaching methods in the subject which may enable the student to take up teaching assignments in Medical Colleges/Institutes.

7. Able to pursue clinical and laboratory-based research. He/she should be introduced to basic research methodology so that he/she can independently conduct fundamental and applied research

Syllabus/ Course Content:

A) General Pathology:

Normal cell and tissue structure and function:

- The changes in cellular structure and function in diseases.
- Causes of disease, its pathogenesis, reaction of cells, tissues, organ systems, and the body to various sub lethal and lethal injuries.
- Cellular adaptation, cell injury, and cell death.

● Mechanism, morphology and examples of cell injury, necrosis, apoptosis, autophagy, and newer forms of cell death including necroptosis and pyroptosis.

● Sub cellular and cellular responses and adaptation to injury.

● Intracellular and intercellular accumulations, pathological calcification, and cell aging. Acute and chronic inflammation:

● Vascular and cellular events in acute inflammation, chemical mediators, outcome, and morphological patterns of acute inflammation.

● Chronic inflammation with special reference to granulomatous inflammation.

● Systemic effects and effects of deranged inflammation.

● Tissue renewal and repair: Regeneration healing and fibrosis.

● Control of normal cell proliferation and tissue growth, mechanism of tissue regeneration, repair by healing and fibrosis.

● Extracellular matrix and cell matrix interactions. Hemodynamic disorders, thromboembolic disease, and shock:

● Edema, hyperemia, congestion, and hemorrhage.

● Normal Hemostasis, thrombosis, DIC, embolism, infarction, and shock.

Genetic Disorders

● Principles of genetics, normal karyotyping.

● Mutations, Mendelian disorders, disorders with multifactorial inheritance cytogenetic disorders involving autosomes and sex chromosomes.

● Single gene disorders with nonclassic inheritance.

● Diagnosis of genetic disorders involving molecular and genetic techniques.

Neoplasia

● Definition, nomenclature, and biology of tumor growth

● Molecular basis of cancer with special reference to carcinogenic agents and molecular basis of multistep carcinogenesis.

● Epidemiology and clinical features of tumors.

● Grading, staging and laboratory diagnosis of cancer.

Infectious Diseases

● Pathology and general principles of microbial pathogenesis, special techniques for diagnosing bacterial, fungal, parasitic, and viral infections.

Environmental and nutritional pathology

● Common environmental and occupational exposures leading on to diseases.

● Nutritional deficiencies and obesity related disorders.

Disease of Infancy and Childhood

● Congenital anomalies, birth injuries, diseases of neonates, inborn errors of metabolism, tumor, and tumor like lesions of infancy and childhood.

Immunopathology

● Innate immunity- Role of phagocytic cells, complement, mast cells & humoral mechanisms.

● Specific Acquired Immunity- Details about antibody production & action, Brief principles about memory, Ag specificity & vaccination.

● Cell involved in Immune response- T- Lymphocytes, B-lymphocytes, macrophages, dendritic cells, and natural-killer cells.

● Cytokines with details about their properties and functions.

● Structure and function of histocompatibility molecules and disease association.

● Disorders of the immune system.

● All hypersensitivity reactions.

● Autoimmune disorders with special reference to SLE, Rheumatoid arthritis, Sjogren's syndrome, systemic sclerosis, polyarteritis nodosa and other vasculitides, Mixed connective tissue disorders and inflammatory disorders.

● Immunodeficiency syndrome – Acquired with emphasis on AIDS.

● Amyloidosis including pathogenesis, special stains & clinical correlation.

● Transplant rejection in detail.

● Graft vs Host Disease.

B) Systemic Pathology:

The study of normal structure and function of various organ systems, etiopathogenesis, gross and microscopic alterations of structure of these organ systems in disease and functional correlation with clinical features.

Blood vessels, lymphatic and veins

● Normal morphology, congenital anomalies, atherosclerosis, hypertensive vascular disease.

● Inflammatory and neoplastic diseases of all the vessels.

Heart

● Normal morphology, its blood supply and effect of aging on heart.

● Ischemic, Hypertensive, valvular, congenital heart diseases.

● Cardiomyopathies

● Myocardial disorders

● Pericardial diseases.

● Tumors of the heart.

Lungs and Mediastinum

● Congenital anomalies

● Obstructive and restrictive pulmonary diseases

● Diseases of vascular origin

● Infections of Lung

● Infections of Mediastinum

● Tumors of lung

● Lung transplantation

● Diseases of pleura

● Thymus – Developmental, autoimmune, and inflammatory disorder and tumors.

Head and Neck

● Oral cavity: - inflammatory disease, Preneoplastic lesions and tumors.

● Diseases of teeth and supporting structures.

● Upper airways and ear – congenital anomalies, infections, and tumors.

● Salivary glands – Infections autoimmune disorders and tumors.

Gastrointestinal Tract

● Congenital anomalies, infections, inflammatory and vascular disorders and tumors of esophagus, stomach, small and large intestines, appendix, and anal canal.

● Diseases of the peritoneum, Omentum and Mesentery Retroperitoneum.

● Inflammatory and neoplastic lesions.

Liver

● Normal morphology with general features of hepatic disease including LFTs.

● Infectious, autoimmune drug induced metabolic and circulatory disorders of liver.

● Hepatic diseases associated with pregnancy, neonates, organ and bone marrow transplantation.

● Liver transplantation pathology.

● Cysts, Nodules, and tumors of liver.

Biliary tract

● Congenital anomalies, injuries, Infection, inflammation, of Gallstones and tumors of gall bladder and extra hepatic bile ducts.

Pancreas.

● Congenital anomalies, pancreatitis, and neoplasms of pancreas.

Kidney

● Clinical manifestations of renal diseases

● Congenital anomalies

● Diseases affecting glomeruli, tubules, interstitium and blood vessels.

● Cystic diseases of kidney

● Nephrolithiasis

● Tumors of kidney

● Kidney Transplant pathology Lower urinary tract and male genital system

● Congenital anomalies, inflammation and tumors of bladder, ureter, urethra, penis, testis, epididymis, and Scrotum.

● Inflammation, enlargement, and tumors of prostate.

Female genital tract

● Physiology, cytology and histology of female genital tract, menstrual disorders, and hormonal abnormalities.

● Congenital anomalies, inflammation, preneoplastic and neoplastic lesions of vulva, vagina, cervix, uterus, fallopian tubes, ovaries and mesonephron.

● Gestational and placental disorders.

Breast

● Inflammations, benign epithelial lesions, and tumors of the breast.

● Diseases of male breast.

Endocrine System

● Normal hormonal levels and functions of all the endocrine glands.

● Hypo and hyperactivity of glands of endocrine system i.e., pituitary, thyroid, parathyroid, pancreas, adrenals, and pineal gland.

● Autoimmune diseases, inflammations and tumors affecting these glands,

● Neuroendocrine tumors, Skin and Subcutaneous tissue

● Disorders of pigmentation and melanocytes,

● Inflammatory, vesiculobullous, and infectious disease,

● Proliferative lesions and Tumors of the epidermis, dermis, and skin appendage.

Musculoskeletal system

● Bone Modelling, growth, and development, genetic and acquired abnormalities in bone cells, matrix and structure, factures, necrosis and infections of bones, tumors and tumorlike lesions,

● Joints: Arthritis, tumor, and tumor-like lesions.

Soft tissue: Tumors and tumor-like lesions. Peripheral nerves and skeletal muscles

● General reactions of motor units.

● Inflammatory, infectious, hereditary, metabolic, and traumatic neuropathies.

● Atrophy, dystrophy, myopathies of the skeletal muscles.

Diseases of neuromuscular junction.

● Tumors of peripheral nerves and skeletal muscles.

Skull and Central Nervous System

● Degenerative, metabolic, toxic, demyelinating, infectious, cerebrovascular malformations, and traumatic injuries.

● Tumors.

Eye and Orbit

● Infections, inflammatory, congenital diseases and neoplasms of orbit, eyelid, conjunctiva sclera, uvea, cornea, retina, and optic nerves.

C) Hematology and Transfusion medicine

The study of Hematology includes all aspects of the diseases of the blood and bone marrow. This would involve the study of the normal, and the causes of diseases and the changes thereof.

Biology of stem cell and Hematopoiesis

● Overview of stem cell biology and cellular biology of hematopoiesis.

● Transcription factors and humoral regulation in normal and malignant hematopoiesis.

● Interaction between hematopoietic stem cells, progenitor cell and stromal compartment of bone marrow.

● Stem cell homing & mobilization. Erythroid maturation, differentiation, and abnormality

● Pathobiology of human erythrocyte & Hemoglobin Anemia.

● Approach to anemia in adults and children in: Clinical correlation & diagnostic modalities.

● Classification of anemias (Morphological, pathophysiological, and based on erythropoiesis i.e., proliferative vs non-proliferative).

Iron deficiency anemia including iron metabolism and differential diagnosis from other microcytic hypochromic anemias.

● Disorder of iron metabolism including iron overload.

● Anemia of chronic disorders with special reference to infections, collagen vascular disorders, inflammation etc.

● Megaloblastic anemia and other causes of megaloblastosis.

● Definition, approach, and classification of hemolytic anemia.

● Lab diagnosis of Hemoglobin disorders and hereditary anemia like Thalassemia and related hemoglobinopathies, sickle cell anemia.

● Hemoglobin associated with altered Oxygen affinity.

● Red blood cell enzymopathy, membrane disorder, autoimmune hemolytic anemia, nonimmune hemolytic anemia, paroxysmal nocturnal hemoglobinuria.

● Approach to Pancytopenia/ Cytopenia.

● Bone marrow failure syndrome.

● Porphyria. WBC disorders, complement and immunoglobin biology

● Normal granulopoiesis.

● Acquired and congenital disorders of phagocytosis (neutrophil, monocyte, eosinophil, and macrophages.

● Disorder of leukocyte number, function, and morphology. Storage disorder Hematological responses to Infections

● Viral disorders - Infectious mononucleosis, Hepatitis, and dengue.

● Parasitic infections - Malaria, Kala azar.

Hematological malignancies

● Conventional & molecular cytogenetic and immunohistochemical basis of hematological malignancies.

● Classification (WHO, ICC).

● Their basis and diagnostic approach to various hematological malignancies.

● Pathophysiology, prognostic factors, cytochemistry, cytogenetics of various leukemias.

● Pathophysiology and classification of MDS, MPN/MDS, myeloproliferative disorders.

● Pathophysiology of Non-Hodgkin's lymphoma, Clinical staging of Hodgkin's lymphoma.

● Role of molecular cytogenetics and immunohistochemistry in Hodgkin's and Non Hodgkin's lymphoma and lymphoproliferative disorders.

● AIDS related and Transplant related lymphomas.

● Plasma cell dyscrasias and gammopathies.

● Mastocytosis.

● Role of chemotherapy and antineoplastic agents based on molecular mechanism of hematological malignancies, clinical use of hematopoietic growth factors. Hematopoietic stem cell transplantation

● Role and indications of HST, immunodeficiency state, hematological Malignancies and Non-hematological disorders.

● Practical aspect of umbilical cord stem cells transplantation.

● Peripheral stem cell collection.

● Role of stem cell in tissue repair.

● Complications of Hematopoietic stem cell transplant.

● Gene therapy and genetic engineering. Prenatal diagnosis of genetic hematological diseases

Hemostasis & Thrombosis

● Megakaryocyte and platelet structure.

● Molecular basis of platelet function, activation.

● Role of blood vessel, coagulation system and fibrinolytic system in hemostasis.

● Clinical and lab evaluation of bleeding and coagulation disorders.

● Clinical & diagnostic aspects of factor deficiencies including hemophilia, von Willebrand disease, DIC, Vitamin K deficiency.

● Thrombotic and non-thrombotic purpura.

● Hereditary and acquired platelet disorders and its management.

● Thrombophilia (Inherited & acquired).

● Lab evaluation and management of hypercoagulable states.

D) Human blood group antigen and antibody and Immuno-hematology

● Selection of donor and screening.

● Principle, indication and storage of red blood cells, WBC, platelet, and plasma transfusion.

● Various methods of component separation and plasma derivatives with special reference to Fresh frozen plasma, cryo-precipitates, platelet concentrate, single donor plasma, albumin, and Immunoglobulin.

● Graft Rejection, GVH diseases, Transfusion Reactions, Blood grouping & cross matching.

● Blood bank audit.

● Apheresis

Hematological manifestations of systemic diseases

● Liver disorders, renal disorders, infections, cancers, parasitic diseases, AIDS, pregnancy, and surgical patients. Spleen and its disorders

E) Laboratory Medicine (Clinical Pathology including Parasitology)

● Principles of testing, indications, values with ranges in normal and diseased states in relation to: Liver function tests, Renal function tests, Endocrine function tests, Body fluid analysis including stool, urine, semen, CSF, etc.

● Principles of laboratory automation, trouble shooting, and quality assurance.

F) Special techniques

The student is expected to acquire a general acquaintance of techniques and principles and to interpret data in the following fields:

● Immunopathology,

● Electron microscopy,

● Histochemistry,
● Immunohistochemistry,
● Cytogenetics and in-situ hybridization,
● Molecular Biology,
● Digital Pathology and image analysis,
● Maintenance of records,
● Information retrieval, use of Computer and Internet in medicine.

G) Instrumentation and automation

● Principles, indications, working, maintenance, and troubleshooting of equipment used in various laboratories:

- ***Histopathology laboratory***: Histopathology tissue processor, microtome, water bath, embedding station, Stainer, IHC Stainer, ultramicrotome, etc.
- Microscopes – Immunofluorescence, FISH, Confocal, Electron, etc.
- ***Cytopathology Laboratory:*** Centrifuge, Cytocentrifuge, Cytospin apparatus, liquid-based cytology, etc.
- ***Hematology Laboratory***: automated cell counter, flow cytometer, coagulometer, HPLC, Electrophoresis apparatus, immunoblot, etc.
- ***Clinical Pathology***: Photoelectric colorimeter, Spectrophotometer, pH meter, Centrifuge, Electrophoresis apparatus, ELISA Reader, chemiluminescence, etc.
- ***Digital pathology*** – Whole slide scanners
- ***Molecular pathology*** – PCR, Sanger sequencer, NGS sequencers, etc.
- ***Automation in Pathology***.

● Good lab practices and safety, record maintenance of capital equipment and consumables, purchase specifications, approximate costs of reagents and equipment, maintenance of store logbooks, etc.

H) Quality assurance program

● Internal and external quality assurance methods.

● Intra assay variations, batch variations, validation of chemicals and instruments.

I) Establishment Act and Rules and regulations formed by Govt. or regulatory bodies

J) Biomedical Waste management

● Disposal methods for each specimen, reagents, instruments, autoclaving techniques, recycling of products and e-waste.

K) Biostatistics, Research Methodology and Clinical Epidemiology

K) Ethics and Medico legal aspects relevant to Pathology

L) Current topics and recent advances in pathology.

Certifiable competencies

Demonstrate following predominant Psychomotor domain competencies

- Demonstrate the analytical skills related to histopathology, cytology and hematology related tests
- Should be able to analyze and troubleshoot common problems related to machines and also perform routine tests in pathology
- Demonstrate different methods of teaching-learning and assessments.
- Make presentations of the subject topics for teaching

Department resources:

Teaching and Learning Methods:

The Pathology resident is expected to sit in reporting every day, having seen the slides the previous day with written descriptions, which should be evaluated daily by the reporting faculty. This is the mainstay of training in all disciplines of Pathology.

Postings:

Sl. No	**Section/Subject**	**Duration**
1.	Surgical Pathology	15 months
2.	Hematology	10 months
3.	Blood bank	1 month
4.	Cytopathology	7 months
5.	District Residency Programme	3 months
	Total	**36 months**

A: Lectures:

A minimum of 10 lectures per year in the concerned PG department. All postgraduate trainees will be required to attend these lectures.

B: Teaching sessions

	Activity	**Frequency**	**Moderator**
1	Journal club	Once a week	Faculty
2	Seminar	Once a week	Faculty
3	Symposium	Once in 3 months	Faculty

C: Rotational postings:

- Faculty and students must attend monthly meetings between the main Department and other department/s on topics of current/common interest or clinical cases.
- This includes institutional activities such as clinical combined rounds (CCR), clinic-pathological correlation conferences (CPC), and departmental activities like autopsy conferences.
- Depending on local institutional policy and the subject specialty needs, postgraduate trainees may be posted in relevant departments/ units/ institutions.

- The aim would be to acquire more in-depth knowledge applicable to the concerned specialty. Postings would be rotated between various units/departments and details to be included in the specialty-based Guidelines.

Prof year	Department	Period of postings	Focus areas
1st year	Blood bank	1 month	Blood grouping, Cross matching, Coombs test
2nd year	Oncopathology	1 month	Immunohistochemistry, Flow cytometry, Molecular pathology
3rd year	Neuropathology	15 days	Tumours of brain, grossing, special stains
4th year	Autopsy	1 week	Dissection of organs

Posting under "District Residency Programme" (DRP):

- All postgraduate students pursuing MS/MS in broad specialties in all Medical Colleges/Institutions shall undergo a compulsory rotation of three months in District Hospitals/District Health System as a part of the course curriculum, as per the Postgraduate Medical Education (Amendment) Regulations (2020). Such rotation shall take place in the 2nd year of the Postgraduate programme and the rotation shall be termed as "District Residency Programme" and the PG medical student undergoing training shall be termed as "District Resident".
    - **Teaching skills:** All postgraduate students shall conduct a research project of sufficient depth to be presented to the University as a postgraduate thesis under the supervision of an eligible faculty member of the department as guide and one or more co-guides who may be from the same or other departments.
    - In addition to the thesis project, every postgraduate trainee shall participate in at least one additional research project that may be started or already ongoing in the department. It is preferable that this project will be in an area different from the thesis work.
    - MEU/DOME should train PG students in education methodologies and assessment techniques.
    - The PG students shall conduct UG classes in various courses and a faculty shall observe and provide feedback on the teaching skills of the student.
    - **Research Methodology:** All postgraduate students shall complete an online course in Research Methodology within six months of the commencement of the batch and generate the online certificate on successful completion of the course.

- **Logbook**

  During the training period, the postgraduate student should maintain a Logbook indicating the duration of the postings/work done in Wards, OPDs, Casualty and other areas of posting. This should indicate the procedures assisted and performed and the teaching sessions attended. The logbook entries must be done in real time. The logbook is thus a record of various activities by the student like:

  (1) Overall participation & performance,

  (2) attendance,

  (3) participation in sessions,

  (4) record of completion of pre-determined activities, and

  (5) acquisition of selected competencies.

  The purpose of the Logbook is to:

- help maintain a record of the work done during training,
- enable Faculty/Consultants to have direct information about the work done and intervene, if necessary,
- provide feedback and assess the progress of learning with experience gained periodically.
- The Logbook should be used in the internal assessment of the student, should be checked and assessed periodically by the faculty members imparting the training.
- The PG students will be required to produce completed logbook in original at the time of final practical examination. It should be signed by the Head of the Department.
- A proficiency certificate from the Head of Department regarding the clinical competence and skillful performance of procedures by the

student will be submitted by the PG student at the time of the examination.

- Components of good teaching practices must be assessed in all academic activity conducted by the PG student and at least two sessions dedicated for assessment of teaching skills must be conducted every year of the PG program.

● The Postgraduate trainees must participate in the teaching and training program of undergraduate students and interns attending the department.

● Trainees shall attend accredited scientific meetings (CME, symposia, and conferences) at least once a year.

● The Postgraduate trainees should undergo training in Basic Cardiac Life Support (BCLS) and Advanced Cardiac Life Support (ACLS).

ASSESSMENT

- ***FORMATIVE ASSESSMENT***:

  Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.

  General Principles: Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

- The Internal Assessment should be conducted in theory and practical/clinical examination, should be frequent, cover all domains of

learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

- ***Quarterly assessment during the MD training should be based on:***

  ● Case presentation, case work up, case handling/management: once a week

  ● Laboratory performance: twice a week

  ● Journal club: once a week

  ● Seminar: once a fortnight

  ● Case discussions: once a fortnight/month

  ● Interdepartmental case or seminar: once a month

  Note: These sessions may be organized and recorded as an institutional activity for all postgraduates.

  ● Attendance at Scientific meetings, CME programmes (at least 02 each) The student to be assessed periodically as per categories listed in appropriate (nonclinical/clinical) postgraduate student appraisal form (Annexure I).

- **SUMMATIVE ASSESSMENT**:

  Essential pre-requisites for appearing for examination

- **3 parts of examination: Thesis, Theory and Practical/ Clinical & Viva-voce**
- (Give a description how 3 parts are conducted, Number of days for practical/ Clinical examinations assessment at the end of training
- **Essential pre-requisites for appearing for examination include:**
  1. Logbook of work done during the training period including rotation postings, departmental presentations, and internal assessment reports should be submitted.

2. At least two presentations at state/national level conference. One paper (thesis or non-thesis related work) should be published /accepted/publication draft in an indexed journal.
3. The theory examination shall be held in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the clinical/Practical and Oral examination.

The postgraduate examination shall be in three parts:

1. Thesis: Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A postgraduate student in broad specialty shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

2. Theory examination: The examinations shall be organized based on 'Grading 'or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill, and competence at the end of the training, as given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination. The examination for M.D./ M.S shall be held at the end of 3rd academic year.

There shall be four theory papers (as per PG Regulations).

Paper I: Basic sciences as applied to the subject (general pathology, pathophysiology, immunopathology, and molecular biology).

Paper II: (Systemic pathology – surgical and cytopathology).

Paper III: (Hematology, transfusion medicine and laboratory medicine including instrumentation and quality control).

Paper IV: Recent advances in the subject.

The papers should ideally have one (01) structured long answer question which will evaluate comprehensive in-depth knowledge and 6-8 short answer questions.

3. Practical/clinical and Oral/viva voce examination: Practical examination should be spread at least over two days for each student and include various major components of the syllabus focusing mainly on the psychomotor domain.

- Oral/Viva voce examination on defined areas should be conducted by each examiner separately.
- Oral examination shall be comprehensive enough to test the post graduate student's overall knowledge of the subject focusing on psychomotor and affective domain.
- It is emphasized that Oral/viva voce examination shall be comprehensive enough to test the post graduate student's overall knowledge of the subject.
- The practical examination in Pathology should follow general guidelines outlined below which may be modified according to local university guidelines and should be spread over at least two days.

The following marks distribution is suggested:

- ***Practical 500 marks (including 100 marks for internal assessment)***

Section I: Histopathology: 150 marks

● Slides (12-15)

● Grossing/autopsy

● Long case (write a full description with clinical information provided) and/or 2 biopsy cases with ancillary tests reporting (written work only, no viva)

Section II: Cytopathology and histo/cyto techniques: 80 marks

● Slides (5-8)

● Histo/Cyto techniques

● Special stain exercise

● Immunopathology, OSPE, EM

Section III: Hematology, transfusion medicine and clinical pathology: 120 marks

● Slides

● Exercises

● Case study

● Blood bank

● Clinical pathology exercises and OSPE Section IV: Viva, basic sciences, and communication skills: 50 marks

● Pedagogy/thesis presentation

● Oral viva

● Basic Sciences Details of exercises in individual sections are given below:

I**. Clinical Pathology**:

● Discussion of a clinical case history.

● Plan relevant investigations of the above case and interpret the biochemistry findings.

● Two investigations should be performed including at least one clinical pathology exercise like CSF, pleural tap etc. analysis and complete urinalysis.

II. **Haematology:**

● Discuss hematology cases given the relevant history. Plan relevant investigations.

● Perform complete hemogram and at least two tests preferably including one coagulation exercise.

● Identify electrophoresis strips, osmotic fragility charts etc., interpretation of data from auto analyzers, HPLC and flow cytometry.

● Examine, report, and discuss around ten cases given the history and relevant blood smears and/or bone marrow aspirate smears and bone marrow biopsy interpretation.

III. **Transfusion Medicine:**

● Perform blood grouping

● Perform the necessary exercise like cross matching.

● Coomb's test, gel cards interpretation.

IV. **Histopathology and cytopathology**:

● Examine, report, and discuss 12-15 cases histopathology and 5-8 cytopathology cases, given the relevant history and slides.

● Perform a Hematoxylin and Eosin stain and any special stain on a paraffin section. Should be conversant with histopathology techniques including cryostat.

● Long case (write a full description with clinical information provided) and/or 2 biopsy cases with ancillary tests reporting

V. **Autopsy**:

● Given a case history and relevant organs (with or without slides), give a list of anatomical diagnosis in an autopsy case.

VI. **Gross Pathology**

● Describe findings of gross specimens, give diagnosis, and identify the sections to be processed. The post graduate student should perform grossing in front of the examiners for evaluation.

VII. **Basic Sciences**: 10-15 spots based on basic sciences be included

● Identify electron micrographs

● Identify gels, results of PCR, immunological tests including interpretation of Immunofluorescence pictures, etc.

● Identify histochemical and immuno-histochemistry stains

VIII**. Teaching exercise**

● Teach on a small topic for about 10 min or present dissertation and research

● General Viva-Voce (Grand Viva) – structured viva may be done separately or combined with above exercises

Recommended Reading:

Books (latest edition)

1. Histology for Pathologists. Stephen S. Sternberg (Ed), Raven Press, New York.

2. Robbin's Pathologic Basis of Disease Ramzi S.Cotran, Vinay Kumar, Stanley L Robbins WB Saunders Co., Philadelphia.

3. Ackerman's Surgical Pathology. Juan Rosai Mosby. St. Louis.

4. Diagnostic Surgical Pathology. Stephen S Sternberg. Lippincott, William Wilkins. Philadelphia.

5. Diagnostic Histopathology of Tumours. Christopher DM Fletcher (Ed). Churchill Livingstone. Edinburgh. 6. Manual & Atlas of Fine Needle Aspiration Cytology. Svante R Orell, et al London.

7. Theory and Practice of Histological Techniques, Bancroft JD, Stevens A, Turner DR, Churchill Livingstone, Edinburgh.

8. Diagnostic Cytology and its Histopathologic Basis, Koss LG, J.B. Lippincott, Philadelphia.

9. Comprehensive Cytopathology, Bibbo M, W.B. Saunders Co., Philadelphia.

10. Wintrobe's Clinical Hematology, Lee GR, Foerster J, Lupeus J, Paraskevas F, Gveer JP, Rodgers GN, Williams & Wilkins, Baltimore.

11. Atlas and Text of Hematology 4th edition. Singh T. Avichal Publishing Company.

12. Dacie and Lewis Practical Hematology, Bain BJ, Bates I, Laffan MA. Elsevier.

13. Bone Marrow Pathology, Bain BJ, Clark DM, Lampert IA, Blackwell Science, Oxford.

14. Henry's clinical diagnosis and management by laboratory methods.

15. WHO classification of tumors. IARC Lyon.

Journals

03-05 international Journals and 02 national (all indexed) journals

Annexure I

Student appraisal Form:

Student appraisal form for MD in Preclinical/ Paraclinical

	Elements	Less than satisfactory			Satisfactory			More than satisfactory			Comments
1.Scholastic Aptitude & learning											
1.1	Has knowledge appropriate for level of training										
1.2	Participation and contribution to learning activity (e.g., Journal Club, Seminars, CME etc)										
1.3	Conduct of research and other scholarly activity assigned (e.g Posters, publications etc)										

1.4	Documentation of acquisition of competence (eg Log book)										
1.5	Performance in work based assessments										
1.6	Self-directed Learning										
2.Work related to training											
2.1	Practical skills that are appropriate for the level of training										
2.2	Respect for processes and procedures in the work space										
2.3	Ability to work with other										

	members of the team										
2.4	Participation and compliance with the quality improvement process at the work environment										
2.5	Ability to record and document work accurately and appropriate for level of training										
3.Professional attributes											

3.1	Responsibility and accountability										
3.2	Contribution to growth of learning of the team										
3.3	Conduct that is ethically appropriate and respectful at all times										
4.Space for additional comments											
5. Disposition											
	Has this assessment pattern been discussed with the trainee?	**Yes**					**No**				

	If not explain.	
	Name and Signature of the assesse	
	Name and Signature of the assessor	
	Date	

Link to download the curriculum: https://www.nmc.org.in/information-desk/for-colleges/pg-curricula-2/