

UNDERGRADUATE CURRICULUM

Pathology including blood bank based on NMC advocated competency based curriculum.

GOAL:

The broad goal of the teaching of undergraduate student in the Pathology is to provide the students with a comprehensive knowledge of the mechanisms and causes of disease in order to enable him/her to achieve complete understanding of the natural history and clinical manifestations of the disease.

OBJECTIVES

A. KNOWLEDGE:

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

- a. Describe the structure and ultrastructure of a sick cell, mechanisms of cell degeneration, cell death and repair and be able to correlate structural and functional alterations.
- b. Explain the pathophysiological processes which govern the maintenance of homeostasis, mechanisms of their disturbance and the morphological and clinical manifestations associated with it.
- c. Describe the mechanisms and patterns to tissue response to injury such that she/he can appreciate the pathophysiology of disease processes and their clinical manifestations.
- d. Correlate normal and altered morphology (gross and microscopic) of different organ systems in common diseases to the extent needed for understanding of disease processes and their clinical significance.

B. SKILLS:

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

- a. Describe the rationale and principles of technical procedures of the diagnostic laboratory tests and interpretation of the results;
- b. Perform the simple bed-side tests on blood, urine and other biological fluid samples;
- c. Draw a rational scheme of investigations aimed at diagnosing and managing the cases of common disorders;
- d. Understand biochemical/physiological disturbances that occur as a result of disease in collaboration with pre clinical departments.

C. INTEGRATION:

- a. At the end of training he/she should be able to integrate the causes of disease and relationship of different etiological factors (social, economic and environmental) that contribute to the natural history of diseases most prevalent in India.

SYLLABUS IN PATHOLOGY

GENERAL PATHOLOGY:

1. INTRODUCTION TO PATHOLOGY
2. CELL INJURY AND CELLULAR ADAPTATIONS:
 - a. Definition, causes –
 - Chemical agents.
 - Physical agents.
 - Radiation.
 - Immunology.
 - Infections.
 - Genetics.
 - Free radical injury.
 - b. REVERSIBLE AND IRREVERSIBLE CELL INJURY:

Adaptation to cell injury, atrophy, hypertrophy, hyperplasia, metaplasia and dysplasia.

- c. Apoptosis.
- d. Necrosis & Gangrene.
- e. Intracellular Accumulation – Lipids, Protein, Glycogen, Pigments.
- f. Pathological Calcification

3. AMYLOIDOSIS

4. INFLAMMATION:

a. Acute inflammation- Causes, signs of inflammation humoral and cellular events of inflammation – margination chemotaxis phagocytosis, chemical mediators.

b. Chronic inflammation- Causes, macrophages in chronic inflammation – special forms, granulomas.

5. HEALING AND REPAIR

Mechanism of repairing soft tissues, factors governing wound healing, fracture healing.

6. HEMODYNAMIC DISORDERS

Hyperemia and congestion, edema, thrombosis, embolism, infarction, shock.

7. NEOPLASIA

a. Definition – nomenclature, difference between benign and malignant neoplasm, anaplasia, rate of

growth, local invasion, metastasis, epidemiology – incidence geographic factors heredity.

b. Pre neoplastic disorders.

c. Molecular basis of cancer – oncogenes, cancer suppressor genes, genes that regulate apoptosis,

genes that regulate DNA repair.

d. Biology of tumor growth – tumor angiogenesis, tumor progress, mechanism of invasion and

metastasis vascular dissemination.

e. Carcinogenic agent – chemical carcinogenesis, physical radiation carcinogenesis, viral and

microbial carcinogenesis.

f. Tumour immunity.

Clinical features of tumours, effect of tumour on host, paraneoplastic syndromes.

g. Grading and staging of tumour.

h. Lab diagnosis of cancer.

8. BASIC DIAGNOSTIC CYTOLOGY

9. IMMUNOPATHOLOGY AND AIDS

Cells of immune system – antigen, antibody, T-lymphocytes, B-lymphocytes, T-cell

receptors, primary and secondary lymphoid organs, major histocompatibility antigen, cytokines.

Functional immune response – antibody production, cell mediated immunity, non specific effector

mechanism complement macrophages.

IMMUNO DEFICIENCY DISEASE

Hypersensitivity reactions, auto immune diseases, amyloidosis, principle of organ transplantation.

10. INFECTIONS AND INFESTATIONS

a. Bacterial disease – gram positive, gram negative infection, typhoid, tuberculosis, leprosy,

syphilis. Fungal infection.

b. Protozoal infection – amoeba, malaria.

c. Viral infection.

11. GENETIC DISORDERS AND PAEDIATRIC DISEASES

Normal karyotype, mendelian disorders, autosomal recessive. X linked disorder, cytogenetic

disorders, techniques – PCR, fish.

a. Inborn errors of metabolism- Phenyl ketonuria, Galactosemia, cystic fibrosis

b. Childhood tumors – benign and malignant.

12. ENVIRONMENTAL AND NUTRITIONAL DISORDERS:

Occupational disorders – tobacco, alcohol, drug abuse, radiation injury vitamin deficiency, protein,

calorie, malnutrition

13. INTRODUCTION TO HEMATOLOGY:

Normal development of blood cells.

14. MICROCYTIC ANAEMIA

15. MACROCYTIC ANAEMIA

16. HEMOLYTIC ANAEMIA

17. APLASTIC ANAEMIA

18. LEUCOCYTIC DISORDERS

19. LYMPH NODE AND SPLEEN

- a. lymphadenopathy
- b. TB lymphadenitis
- c. HL & NHL
- d. Causes of splenomegaly & enlarged spleen

20. PLASMA CELL DISORDERS

21. HEMORRHAGIC DISORDERS

Due to vessel wall abnormality.

Thrombocytopenis - ITP

Drug induced.

Micro angiopathy.

Hemolytic uremic syndrome.

Due to defective platelet function.

Due to abnormalities in clotting factors.

Factor VIII deficiency

VON Willebrand disease.

Hemophilia A & B.

Disseminated intra vascular coagulation.

22. BLOOD BANKING AND TRANSFUSION

23. CLINICAL PATHOLOGY

- a. Urine Examination
- b. Body fluid examination
- c. Semen analysis, TFT, LFT, KFT

24. GASTRO INTESTINAL TRACT

Barrett esophagitis.

Carcinoma esophagus.

Peptic ulcer.

Gastric carcinomas.

Malabsorption syndromes.

Idiopathic irritable bowel syndromes –
chron's disease, Ulcerative colitis.

Tumours of small & large intestine –
benign and malignant.

25. LIVER, BILIARY TRACT & PANCREAS

Pathology of jaundice.

Viral hepatitis.

Cirrhosis.

Alcoholic liver disease.

Inborn errors of metabolism –
hemochromatosis, Wilsons

disease.

Cholecystitis.

Gall stones.

Acute pancreatitis.

26. RESPIRATORY SYSTEM

ARDS, COPD – bronchial asthma

Bronchiectasis

Emphysema

Bacterial pneumonia – broncho pneumonia & lobar pneumonia.

Viral & mycoplasmal pneumonia lung abscess.

Pulmonary tuberculosis – primary & secondary.

Interstitial pneumonia.

Pneumoconiosis.

Tumours of lung.

27. CARDIOVASCULAR SYSTEM

Atherosclerosis

Arterio sclerosis

Aneurysms

Hypertensive heart disease

Valvular heart disease

Infective endocarditis

Non bacterial endocarditis

Libman sack's endocarditis

Cardiomyopathies/myocarditis

Pericarditis

Tumour of heart

28. URINARY TRACT

Acute glomerulo nephritis.

Nephritic syndrome.

chronic glomerulonephritis.

Glomerular lesions associated with systemic disease – SLE.

Diabetes mellitus.

Amyloid.

Diseases of tubules / interstitium – pyelonephritis.

Diseases of blood vessels – benign nephrosclerosis.

Malignant hypertension.

Obstructive uropathy – calculi.

Tumours of kidney

29. MALE GENITAL SYSTEM

Carcinoma penis.

Pre malignant lesions.

Tumours of testis.

Prostate tumours.

30. FEMALE GENITAL SYSTEM

Carcinoma cervix, CIN.

Endometrium, Endometriosis.

Tumours of body of uterus.

Ovarian tumours.

Trophoblastic disease.

31. BREAST

Tumours of breast- benign and malignant.

32. ENDOCRINE SYSTEM

Thyroiditis, Goitre, Tumours, pheochromocytoma/

Neuroblastoma, Diabetes mellitus,

Multiple endocrine neoplasia.

33. BONE AND SOFT TISSUE

Osteomyelitis

Bone tumours – Osteoblastoma

Osteosarcoma.

Ewing's tumour.

Giant cell tumour.

34. SKIN

Premalignant lesions & Tumours.

35. CNS

Meningitis.

Tumours – primary and secondary.

36. EYE

Retinoblastoma

PRACTICALS:

Fatty liver - Specimen & Slide.

Acute appendicitis	-	Specimen & Slide.
TB Lymph node	-	Specimen & Slide.
TB Lung with cavity	-	Specimen
Lobar Pneumonia	-	Specimen
Granulation tissue	-	Slide.
CVC liver	-	Slide & Specimen
Gangrene intestine	-	Specimen & Slide.
Infarct Spleen	-	Specimen
Rhinosporidiosis	-	Slide
Hydatid cyst	-	Slide & Specimen
Capillary Hemangioma	-	Slide
Cavernous Hemangioma	-	Slide
Lipoma	-	Slide & Specimen
Gastric Carcinoma	-	Slide & Specimen
Colon Carcinoma	-	Specimen
Renal cell carcinoma	-	Slide & Specimen
Carcinoma Testis	-	Specimen
Carcinoma Penis	-	Specimen
Fibroid Uterus	-	Specimen
Carcinoma Cervix	-	Specimen
Carcinoma Breast	-	Specimen
Fibroadenoma Breast	-	Slide
Colloid goitre	-	Slide & Specimen

Squamous cell carcinoma	-	Slide
Basal cell carcinoma	-	Slide
Malignant Melanoma	-	Slide
Osteosarcoma	-	Slide & Specimen
Giant cell tumour	-	Slide
Cirrhosis Liver	-	Specimen

Cytology slides - Carcinoma Breast

FNAC Breast- Fibroadenoma

FNAC Papillary Carcinoma Thyroid

Ascitic Fluid - Positive for Malignancy

Pap Smear – NILM

Hematology Slides- Neutrophilia

Eosinophilia

Microcytic Hypochromic Anaemia

AML

CML

PRACTICALS - CLINICAL PATHOLOGY CLASS SCHEDULE – 5 TH SEMESTER.

- 1.Introduction to clinical pathology – Sample collection, anticoagulants.
- 2.Urine examination.
- 3.Hemoglobin estimation.

4. Different count.
5. Blood grouping and blood banking.
6. Reticulocyte – slide demonstration..
7. Bone marrow biopsy – demonstration.
8. CSF examination.
9. Semen analysis.
10. Exfoliative cytology.
11. Instrument demonstration- Westergren Tube

Wintrobe's Tube

Bonemarrow Aspiration Needle

Lumbar puncture Needle

Urinometer

12. Charts-Spotters :

BM- Megaloblasts

Beta Thalassemia

RS cell

Renal Amyloidosis

Renal Calculi

Candida Albicans

Multiple Myeloma

Splenomegaly

PG CURRICULUM

The study of Pathology includes all aspects of Pathology. The Broad outlines are provided.

General Pathology :

Normal cell and tissue structure and function. The changes in cellular structure and function in disease. Causes of disease and its pathogenesis. Reaction of

cells, tissues, organ systems and the body as a whole to various sublethal and lethal injuries.

Systemic Pathology:

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

Surgical Pathology :

* The student should be able to demonstrate an understanding of the histogenetic and Pathophysiologic processes associated with various lesions.

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

* Given the clinical and operative data, the student should be able to identify, and Systematically and accurately describe the chief gross anatomic alterations in the Surgically removed specimens and be able to correctly diagnose at least 80 percent of the Lesions received on an average day from the surgical service of an average teaching Hospital.

*A student should be able to demonstrate ability to perform a systematic gross Examination of the tissues ‘including the taking of appropriate tissue sections and in Special cases as in intestinal mucosal biopsies, muscle biopsies and nerve biopsies, demonstrate the orientation of tissues in paraffin blocks.

*The student should be able to identify and systematically and accurately describe the Chief histomorphological alterations in the tissue received in the surgical pathology service.

Cytopathology :

Should possess the background knowledge necessary for the evaluation and reporting of Cytopathology specimens.

* Demonstrate familiarity with, the following, keeping in mind the indication for the test:

- (i) Choice of site from which smears may be taken (as in the case of vaginal smears).
- (ii) Type of samples.
- (iii) Method of obtaining various specimens (urine sample, gastric smear, colonic lavage, etc.)
- (iv) Be conversant with the principles and preparation of solution of stains
Independently be able to perform fine needle aspiration of palpable superficial lumps in patients; make good quality smears, and be able to decide on the type of staining in a given case.
- (v) Be conversant with the techniques for concentration of specimens: i.e. various filters, centrifuge and cytocentrifuge. Independently prepare and stain good quality smears for cytopathologic examination.

Given the relevant clinical data, he / she should be able to independently and correctly:

- (i) Evaluate hormonal status in all cases as may be required.
- (ii) Diagnose the status of malignancy or otherwise in at least 75% of the cases received in a routine laboratory and categorise them into negative, inconclusive and positive.

Autopsy Pathology :

*Should be aware of the technique of autopsy.

*Should have sufficient understanding of various disease processes so that a meaningful clinicopathological correlation can be made.

*Demonstrate ability to perform a complete autopsy independently with some physical assistance, correctly following the prescribed instructions. Correctly identify all major lesions which have caused, or contributed to, the patient's death on, macroscopic examination alone on microscopy in at least 90% of the autopsies in an average teaching hospital.

*In places where non-medicolegal autopsies are not available each student / candidate should be made to dissect organs from at least five medicolegal

autopsies. Write correctly and systematically Provisional and Final Anatomic Diagnosis reports.

Hematology

*The study of hematology include all aspects of the diseases of the blood and bone marrow this would involve the study of normal and the causes of the diseases and the changes there of Laboratory medicine (clinical biochemistry/clinical pathology including parasitology), Transfusion medicine (blood banking)

* Should demonstrate the capability of utilizing the principles of the practice of Hematology for the planning of tests, interpretation and diagnosis of diseases of the blood and bone marrow.

* Should be conversant with various equipments used in the Haematology laboratory.

* Should have knowledge of automation and quality assurance in Haematology.

* Correctly plan a strategy of investigating at least 90% of the cases referred for special investigations in the Haematology Clinic and give ample justification for each step in consideration of the relevant clinical data provided.

*Describe accurately the morphologic findings in the peripheral and bone marrow smears, identifying and quantitating the morphologic abnormalities in disease states and arriving at a correct diagnosis in at least 90% of the cases referred to the Haematology clinic, given the relevant clinical data.

Transfusion Medicine (Blood Banking)

Students should possess knowledge of the following aspects of Transfusion Medicine:

*Basic immunology.

*ABO and Rh groups.

*Clinical significance of other blood groups.

*Transfusion therapy including the use of whole blood and RBC concentrates.

*Blood component therapy.

*Rationale of pre-transfusion testing.

*Infections transmitted in blood. Adverse reactions to transfusion of blood and components.

*Quality control in blood bank.

*Students should be able to correctly and independently perform the following:.

-Selection and bleeding of donors:

-Preparation of blood components Le., Cryoprecipitates, Platelet concentrate, Fresh Frozen Plasma, Single Donor Plasma, Red Blood Cell concentrates.

-ABO and Rh grouping.

Demonstrate familiarity with Antenatal and Neonatal work:

(i) Direct antiglobulin test.

(ii) Antibody screening and titre.

(iii) Selection of blood for exchange transfusion.

Demonstrate familiarity with principle and procedures involved in :

(i) Resolving ABO grouping problems.

(ii) Identification of RBC antibody.

(iii) Investigation of transfusion reaction.

(iv) Testing of blood for presence of :

(a) HBV (Hepatitis. B Virus Markers).

(b) HCV (Hepatitis C Virus Markers).

(c) HIV (Human Immunodeficiency Virus Testing).

(d) VDRL

Laboratory Medicine:-

Be conversant the automatic tissue processing machine and the principles of its running. Process

a tissue, make a paraffin block and cut sections of good quality on a rotary microtome. Stain paraffin

sections with at least the following:

(i) Haematoxylin and eosin.

- (ii) Stains for collagen, elastic fibers and reticulin.
- (iii) Iron stain.
- (iv) PAS stain.
- (v) Acid fast stains.

(vi) Any other stains needed for Demonstrate understanding of the principles of:

- (i) Fixation of tissues.
- (ii) Processing of tissues for section cutting.
- (iii) Section cutting and maintenance of related equipment.
- (iv) Differential (Special) stains and their utility.

Cut a frozen section using freezing microtome / cryostat, stain and interpret the slide in correlation with the clinical data provided, and correctly diagnose at least 75 percent of the lesions within 15 minutes. Perform fat stain on frozen section.

Correctly and independently perform the following special tests,. in addition to doing the routine blood counts:

- (i) Haemogram including Reticulocyte and Platelet counts.
- (ii) Bone marrow staining including stain for iron.
- (iii) Blood smear staining. .
- (iv) Cytochemical characterization of leukemia with special stains like Peroxidase, Leukocyte Alkaline Phosphatase (LAP), PAS, Sudan Black, etc. .
- (v) Hemolytic anaemia profile including HbF, Hb electrophoresis, etc.
- (vi) Coagulation profile including PT, APTT.FDP.
- (vii) BM aspiration and BM biopsy.

Demonstrate familiarity with the principle and interpretation of results and utility in diagnosis of the following:

- (i) Platelet function tests including platelet aggregation and adhesion and PF3 release.

(ii) Thrombophilia profile: Lupus anticoagulant (LAC), Anticardiolipin Antibody (ACA), Activated Protein C Resistance (APCR), Protein C (PrC), Protein S (Pr S) and Antithrombin III (AT III).

(iii) Immunopheno typing of leukaemias. (iv) Cytogenetics.

Possess knowledge of the normal range of values of the chemical content of body fluids, significance of the altered values and its interpretation.

Possess knowledge of the principles of following specialized organ function tests and the relative utility and limitations of each and significance of the altered values

(i) Renal function test.

(ii) Liver function test.

(iii) Gastric and Pancreatic function.

(iv) Endocrine function test.

(v) Tests for malabsorption.

*Know the principles, advantages and disadvantages scope and limitation of Automation in laboratory.

*Know the principles and methodology of quality control in laboratory .

*Plan a strategy of laboratory investigation of a given case, given the relevant clinical history and physical findings in a logical sequence, with a rational explanation of each step, Be able to correctly interpret the laboratory data of such studies, and discuss their significance with a view to arrive at a diagnosis.

*Demonstrate familiarity with and successfully perform.

(i) Routine Urinalysis including Physical, Chemical and Microscopic, examination of the sediment.

(ii) Macroscopic and Microscopic examination of Faeces and identify the ova and cysts of common parasites.

(iii) A complete examination; physical, chemical and cell content of Cerebrospinal Fluid (C.S.F.), Pleural and Peritoneal fluid.

(iv) Semen analysis.

(v) Examination of Peripheral Blood for the commonly occurring parasites.

Independently and correctly perform at least the following Quantitative Estimations by Manual Techniques and / or Automated Techniques:

(i) Blood urea.

(ii) Blood sugar.

(iii) Serum Proteins total & fractional.

(iv) Serum Bilirubin total & fractional.

(v) Serum amylase.

Demonstrate familiarity with the following Quantitative Estimations of blood serum by Automated Techniques, serum cholesterol, Uric acid, Serum Transaminases (AL T and AST / SGOT and SGPT), etc.

* Prepare standard solutions and reagents relevant to the above tests, including the preparation of normal solution, molar solution and Buffers.

* Explain the principle of Instrumentation, use and application of the instruments commonly used in the laboratories, eg., Photoelectric colorimeter, Spectrophotometer, pHmeter, Centrifuge, Electrophoresis apparatus, ELISA Reader, Flow cytometer.

Reference books for division into chapters:

* ANDERSON 'S PATHOLOGY,

* Surgical Pathology: ACKERMAN & ROSAI

* Theory and practice of Histological Techniques: JOHN D. BANCROFT

* WINTROBE CLINICAL HAEMATOLOGY: JOHN P. GREER et al

* Clinical diagnosis and management by laboratory methods: Todd Sanford Davidson

TRAINING PROGRAMME

FIRST YEAR

1. Clinical pathology including Haematology, O.P. laboratory -3 Months

2. Blood Bank- 1 Month

3. Cytology laboratory- 1 Month

4. Biopsy -4 Months
5. Museum- 1 Month
6. Autopsy -2 Months

Total 12 Months

SECOND YEAR

1. Clinical pathology including (operation theatre: 15 days for training in imprint smears, FNA techniques : 15 days in Medical wards to train in Bone marrow aspiration, Body fluid tapping, C.S.F. analysis etc.; 15 days in serology laboratory to learn techniques in immunology)- 3 Months
2. Biopsy (including frozen section laboratory) -6 Months
3. Autopsy -2 Months
4. Animal experiment laboratory- 1 Month

Total 12 Months

THIRD YEAR

1. Clinical pathology -2 Months
2. Biochemistry laboratory -1 Month
3. Cytology laboratory- 2 Months
4. Biopsy- 6 Months
5. Autopsy 1 Months

Total 12 Months

GUIDELINES :-

- 1) The post graduate students shall attend the clinical postings in the forenoon session between 10 a.m. to 12 noon and attend to his department teaching work in the after – noon session.
- 2) The student must visit the patients in the hospital through out training period both O.P. and I.P. service. No hospital ward posting is required other than indicated.

- 3) It must be left to the discretion of the head of the department to send the student for specialized training in other institutions, viz
- (a) Electron microscopy division either at MMC or CMC of any research institutions,
 - (b) Egmore TB chemotherapeutic research institute for immunology, research methodology and funding
 - (c) Radio isotope techniques in any specialized laboratory doing this investigation.
 - (d) Molecular biology laboratory at hyderabed
 - (e) Haematology laboratory : C.M.C.
- 4) When posted in biopsy section, the student must be a part of the team; from the time the specimens are received till the reports are despatched. He must be encouraged to perform as many histochemical procedures as required for diagnostic purposes.
- 5) Teaching undergraduate students must be apart of his training throughout but prior information is necessary. Lectures in clinical pathology can be completely entrusted to them.

Practical class posting also can be a part of this training but it must be for a specified period.

Scheme of Examination

(At the end of 3rd year)

Paper Subject Duration Maximum Marks- 100

Paper - I General Pathology- 3 hrs 100

Paper - II Systemic Pathology -3 hrs 100

Paper - III General Medical and surgical Pathology including applied aspects, Hematology, Cytology, Clinical Pathology-3 hrs 100

Paper - IV Immunopathology, Principles and application of technological advances in laboratory services. Recent Advances-3 hrs 100

PRACTICAL EXAMINATION :-

S.No. Subject Marks-300

1. Autopsy (including interpretation of date in the light of clinical findings) -25
 2. Histo pathology techniques (cutting section and staining with H & E, special staining procedure and cytological staining; Frozen section and interpretation)- 25
 3. Clinical Pathology and case examination and investigation- 30
 4. Haematology and cytology spotters (5 slides in haematology) (20 + 20) (5 slides in cytology)- 40
 5. Morbid anatomy and museum techniques -10
 6. Immunological and special serological techniques including blood banking- 10
 7. Histo pathology spotters (15 slides) -60
- Total - 200

Guidelines :-

Duration for practical and oral examinations is for 3 days. The examiners may be requested to complete all the practical tests of the fore noon of third day.

Distribution of Marks :-

Theory - 4 papers - 400

Practical - 200

Log Book - 20

Pedagogy - 30 - 100

Oral – 50

Marks Qualifying for a pass :-

1. 50% of marks in the university theory examination 200 / 400
 2. 50 % of marks in the university practical examination 100 / 200
 3. Viva 100
 4. Aggregate of Practical & Oral (2 + 3) 150 / 300
- Total 350 / 700