BRANCH – III M.D. (PATHOLOGY)

GUIDELINES FOR COMPETENCY BASED POST GRADUATE TRAINING PROGRAMME FOR M.D. PATHOLOGY.

Preamble

The purpose of this programme is to standardize Pathology teaching at Post Graduate level through out the country so that it will benefit in achieving uniformity in undergraduate teaching as well and resultantly creating suitable manpower with appropriate expertise.

Programme Objectives

A candidate upon successfully qualifying in the M.D. (Pathology) examination should be -

1) Capable of offering a high quality diagnostic opinion in a given clinical situation with an appropriate and relevant sample of tissue, blood, body fluid, etc., for the purpose of diagnosis and overall wellbeing of the ill.

2) Able to teach and share his knowledge and competence with others. He / She should be imparted Training in teaching methods in the subject which may enable them to take up teaching assignments in Medical Colleges /Institutes.

3) Capable of pursuing clinical and laboratory based research. He /She should be introduced to basic research methodology so that they can conduct fundamental and applied research.

Specific Learning Objectives :-

Cognitive Domain-

1) Diagnose routine and complex clinical problems on the basis of Histopathology (Surgical Pathology) and Cytopathology specimens, Blood and Bone Marrow examination and various tests of Laboratory Medicine (Clinical Pathology, Clinical Biochemistry) as well as Blood Banking (Transfusion Medicine).

2) Inrepret and correlate clinical and laboratory data so that clinical manifestations of desease can be explained.

3) Advice on the appropriate specimens and tests necessary to arrive at a diagnosis in a problematiccase.

4) Correlate clinical and laboratory findings with Pathology findings at autopsy, identify discorrelations and the causes of death due to diseases (apart from purely metabolic causes).

5) Should be able to teach Pathology to undergraduates, postgraduates, nurse and paramedical staff including laboratory personnel.

6) Plan, execute, analyse and present research work.

7) Make and record observations systematically and maintain accurate records of tests and their results for reasonable periods of time. Identify problems in the laboratory, offer solutions thereof & maintain a high order of quality control.

8) Capable of safe & effective disposal of laboratory waste.

9) Able to supervise and work with subordinates and colleagues in a laboratory.

Psychomotor Domain -

1) Able to perform most of the routine tests in a Pathology Laboratory including grossing of specimens, processing, cutting of paraffin and frozen sections, making smears, and staining.

2) Able to collect specimens by routinely performed non-invasive out-patient procedures such as vene-puncture, finger-prick, fine needle aspiration of superficial lumps and bone-marrow aspirates, and provide appropriate help to colleagues performing an invasive procedure such as a biopsy or an imaging guided biopsy.

3) Perform an autopsy, dissect various organ complexes and display the gross findings.

4) Should be familiar with the function, handling and routine care of equipment in the laboratory.

Affective Domain-

1) Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.

2) Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel & respect the rights of the patient including the right to information and second opnion.

3) Develop communication skills to word reports and professional opinions as well as to interact with patients, relatives, peers and paramedical staff, & for effective teaching.

Post Graduate Training :-

Based on the available facilities, Department can prepare a list of postgraduate experiments pertaining to basic and applied Pathology. Active learning should form the mainstay of postgraduate training there should be lectures for postgraduates (at least 20 per year) along with seminars, symposia, group-discussions, Journal clubs. The postgraduate students should regularly the ward rounds of various clinical departments and learn cases of interest for discussion with the Pharmacology faculty. Each college should have a

medical education unit to generate teaching resource material for U.G. and evolving of problem solving modules.

The three-year training programme for the M.D. degree may be arranged in the form of postings to different assignments / laboratories for specified periods as outlined below. The period of such assignments / postings is recommended for 35 months. Postings schedules may be modified depending on needs, feasibility and exigencies. For facilities not available in the parent institution as well as for additional knowledge & skill, extramural postings may be undertaken.

Section / Subject		**Duration in Month**
(i)	Surgical Pathology and Autopsy	14
(ii)	Surgical Pathology Techniques	1
(iii)	Haemotology	8
(iv)	Cytopathology	6
(v)	Laboratory Medicine	2
(vi)	Transfusion Medicine /Blood Bank	1
(vii)	Basic Sciences including Immunopathology, Electronmicroscopy, Molecular Biology, Research Techniques and Cytogenesis, etc.	1
(viii)	Elective / Reorientation	2
	Total =	35 months

The training programme should be designed to enable the student to acquire a capacity to learn and investigate for himself / herself, to synthesize and integrate a set of facts and develop a faculty to reason. The curricular programmes and scheduling of postings must provide the student with opportunities to achieve the above broad objectives. Must of the learning is to be accomplished by the student himself. Interactive discussions are to be preferred over didactic sessions. The student must blend as an integral part of the activities of an academic Department that usually revolves around three equally important basic functions of teaching, research and service. As mentioned earlier the emphasis is recommended under a residency programme or learning while serving / working. The following is a rough guidelines to various teaching / learning activities that may be employed : -

- Collection of specimens including Fine needle aspiration of superficial lumps.

- Grossing of specimens.
- Performing autopsics.
- Discussions during routine activities such as during signing out of cases.
- Presentation and work-up of cases including the identification of special stains and ancillary procedures needed.
- Clinico-pathological conferences.
- Intradepartmental and interdepartmental conferences related to case discussions.
- Conferences, Seminars, Continuing Medical Education (CME) Programmes.
- Journal Club.
- Research Presentation and review of research work.
- Guest and in-house lectures.
- Participation in workshops, conferences and presentation of papers, etc.
- Laboratory-work.
- Use and maintenance of equipment.
- Maintenance of records.
- Teaching undergraduates and paramedical staff.

Post Graduate Examination :-

The Post Graduate Examination shall be in three parts :-

1) **Thesis, to be submitted by each candidate at least 6 months before the date of commencement of the theory examination.**

2) **Theory : There shall be four theory papers – as given separately**

3) Practicals and Viva /Oral

The practical examination shall consist of the following and should be spread over two days.

(i) **Clinical Pathology** **:** Discussion of a clinical case history.
Plan relevant investigations of the above case (Two investigations should be performed including at least one Biochemistry exarcise).
Complete urinalysis.

(ii) **Haematology** **:** Discuss haematology cases given the relevant history.
Plan relevant investigations.
Perform complete hemogram and atleast two tests preferably Including coagulation exercise.
Identify electrophoresis strips, osmotic fragility charts, etc.
Examine, report and discuss around ten cases given the history and Relevant blood smears and / or bone marrow aspirate smears.

(iii)**Transfusion Medicine** **:** Perform blood grouping.
Perform the necessary exercise given a relevant history.

(iv) **Histopathology & Cytopathology** **:** Examine report and discuss ten to twelve histopathology and three to five Cytopathology cases given in the relevant history and slides.
Perform a Haematoxylin and Eosin stain and my special stain on a paraffin section.
Report on a frozen section.

(v) **Autopsy** **:** Given a case history and relevant organs (with or without slides).
Give a list of anatomical diagnosis in a autopsy case.

(vi)**Gross Pathology** **:** Describe findings of gross specimens, give diagnosis and identify the sections to be processed.

(vii) **Basic Sciences** **:** Identify electronmicrographs.
Identify gels, results of PCR, immunological tests including staining for direct / indirect immuno fluorescence.
Identify histochemical and immunohistochemistry stains.

All practical exercises are to be evaluated jointly by all the examiners. An oral question-answer section should be conduced at the end of each exercise.

(a) Viva on dissertation and research methodology.
(b) General Viva.Voce.

Course Content :-

The study of Pathology Anatomy includes all aspects of Pathology as encompassed in the branches of General and Systemic Pathology. Only the broad outlines are provided.

1) **A) 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.

B) 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.

2) **Haematology:**

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

3) Laboratory Medicine (Clinical Biochemistry /Clinical Pathology including Parasitology).

4) Transfusion Medicine (Blood-Banking).

5) In the following fields, the student is expected to acquire a general acquaintance of techniques and principles and to interpret data :

a) Immunopathology.
b) Electron microscopy.
c) Histochemistry.
d) Immunohistochemistry.
e) Cytogenetics.
f) Molecular Biology.
g) Maintenance of records.
h) Information retrieval, Computer, Internet in Medicine.

It is difficult to give a precise outline of the Course Content for postgraduate training. A postgraduate is supposed to acquired not only professional competence of a well-trained specialist but also academic maturity, a capacity to reason and critically scientific data as well as to keep himself/herself abreast of the latest developments in the field of the pathology and related sciences. A brief outline of what is expected to be learnt during the M.D. Course is given under each head.

Surgical Pathology:-

Knowledge-

- The student should be able to demonstrate an understanding of the histogenetic and patho-physiologic processes associated with various lesions.
- Should be able to identify problems in the laboratory and offer viable solutions.

Skills-

- 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 accuratcly describe the chief histomorphological alterations in the tissue received in the surgical pathology service. He /She should also correctly interpret & correlate with the clinical data to diagnose at least 90% of the routine surgical material received on an average day. He /She should be able to diagnose at least 75% of the classical lesions being commonly encountered in the surgical pathology service without the aid of the clinical data.
- 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 diagnosis.

- 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.

- Demonstrate the understanding of the utility of various immunihistochemical stains especially in the diagnosis of tumour subtypes.

Autopsy Pathology :-

Knowledge –

- Should be aware of the technique of autopsy.

- Should have sufficient understanding of various disease processes so that a meaningful clinico-pathological 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 atleast five medicolegal autopsies.

- Write correctly and systematically Provisional and Final Anatomaic Deagnosis

reports.

Cytopathology:-

Knowledge -

- Should possess the background 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.

Skills-

- Independently prepare and stain good quality smears for cytopathologic examination.

- Be conversant with the techniques for concentration of specimens: i.e., various filters, centrifuge and cytocentrifuge.

- 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.

- 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.

  (iii) Demonstrate ability in the technique of screening and dotting the slides for suspicious cells.

  (iv) Indicate correctly the type of tumour, if present, in at least 75% cases.

  (v) Identify with reasonable accuracy the presence of organisms, fungi and parasites in at least 75% of cases.

Haematology :-

Knowledge-

- Should demonstrate the capability of utilizing the principles of the practice of Haematology 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 lest 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.

Skills-

- 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 charactization 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.

- Domonstrate 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 (Pr c), Protein S (Pr S) and Antithrombin III (AT III).
  - (iii) Immunopheno typing of leukaemias.
  - (iii) Cytogenetics.

- 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.

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Laboratory Medicine :-

Knowledge -

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

- Prossess 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.

Skills –

- 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.

- Domonstrate familiarity with and successfully perform.
  - (i) routine Urinalysis including Physical, Chemical and Microscopic, examination of
  - (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) Seman analysis.

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

- Independently and correctly perform a 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(ALT and AST /SGOT and SGPT), etc.

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

- Explain the principle of Instrumentation, use and application of the instruments commonly used in the laboratories, eg., Photoelectric colorimeter, Spectrophotometer, pH meter, Centrifuge, Electrophoresis apparatus, ELISA Reader, low cytometer.

Transfusion Medicine (Blood Banking) :-

Knowledge -

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.

Skills -

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

- Selection and bleeding of donors.
- Preparation of blood components i.e., 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) PBV (Hepatitis B Virus Markers).
    - (b) HCV (Hepatitis C Virus Markers).
    - (c) HIV (Human Immunodeficiency Virus Testing).
    - (d) VDRL.

Basin Sciences (in relation to Pathology) : -

a) Immunopathology:

Knowledge –

(i) Demonstrate familiarity with the current concepts of structure and function of the immune system, its aberrations and mechanisms thereof.

(ii) Demonstrate familiarity with the scope, principles, limitations and interpretations of the results of the following procedures employed in clinical and experimental studies relating to immunology :

(a) ELISA techniques.
(b) Radioimmuno assay.
(c) HLA typing.

(iii) Interpret simple immunological tests used in diagnosis of diseases and in research procedures.
(a) Immunoelectrophoresis.
(b) Immunofluorescence techniques especially on kidney and skin biopsies.
(c) Anti-nuclear Factor (ANF).
(d) Anti-neutrophil cytoplasmic antibody (ANCA).

b) ss**Electron Microscopy :**

Knowledge –

(i) Demonstrate familiarity with Principles and Techniques of electron microscopy and the working of an electron microscope (including Transmission and Scanning Electron Microscope: TEM and SEM).

(ii) Recognise the appearance of the normal subcellular organelles and their common abnormalities (when provided with appropriate photographs).

C) Enzyme Histochemistry :

Knowledge –

Should be familiar with the principles, use and inrerpretation of common enzyme histochemical procedures (Alkaline Phoshatase, Acid Phosphatase, Glucose-6-Phosphate Dehydrogenase, Chloroacetate Esterse).

d) Immunohistochemistry :

Knowledge –

Demonstrate familiarity with the principles and exact procedures of various immunohistochemical stains using both PAP (Peroxidase-Antiperoxidase) and AP-AAP (Alk. Phosphatase-anti Alk. Phosphatase) ABC (Avidin-Biotin Conjugate) Systems;

Employing monoclonal and polyclonal antibodies. Be aware of the limitations of immunohistochemistry.

Skills (desirable) –

Be able to perform immunohistochemical staining using paraffin section with at least one of the commonly used antibodies (Cytokeratin or LCA) using PAP method.

e) Molecular Biology:

Knowledge –

Should understand the principles of Molecular Biology especially related to the understanding of disease processes and its use in various diagnostic tests.

Should be conversant with the principle & steps and interpretations of a Polymerase Chain Reaction (PCR Western Blot, Southern Blot, Northern Blot and Hybridisation procedures).

f) Cytogenetics :

Knowledge –

Demonstrate familiarity with methods of Karyotyping and Fluorescent in-situ Hybridisation(FISH).

g) Tissue Culture:

Knowledge –

Demonstrate familiarity with methods of tissue culture.

h) Principles of Medical Statistics:

Knowledge –

Demonstrate familiarity with importance of statistical methods in assessing data from patient material and experimental studies.