MAHARASHTRA UNIVERSITY OF HEALTH SCIENCES,

NASHIK

SYALLABUS

Fellowship Course in Benign Hematology

Fellowship Course-1 year

1. **Proper name of the certificate course**
   Fellowship Course in Benign Hematology
2. **Duration of the course**
   1 year
3. **Eligibility criteria for admission**
   MD (Pathology) / MD (Gen. Medicine) /DCP/DNB
   intake capacity – As prescribed rules by the University
4. **Complete curriculum of the course**

A) Clinical hematology

I) Red Cell Disorders

Clinical evaluation of a patient with anemia: history, physical examination, appropriate laboratory investigations and management. Comparative epidemiologic significance of 'nutritional' and other anemias in the population and the national programme for control.

1) Iron Deficiency Anemia

Epidemiology, iron deficiency as a community health problem, causes in the population, control,strategies in the population. Evaluation of the individual patient, interpretation of serum iron, TIBC, transferrin. Indications for and interpretation of ferrokinetic studies, management including iron replacement.

2) Megaloblastic Anemia

Clinical and laboratory evaluation, clinical recognized, evaluation and management of complications of vitamin B 12 deficiency investigation of etiology and management. Understanding the role of vitamin B 12 and folate in cellular metabolism and the interaction of disease and drugs with the metabolism of folate.

3) Hemolytic anemia

a. Evaluation of a patient with hemolysis and investigations of its causes.

i. Thalassemia: Principles of control of the thalassemia syndromes in the population, screening strategies, antenatal diagnosis, genetic counseling, clinical and laboratory diagnosis of alpha and beta thalassemia syndromes. Management of thalassemia intermedia and major-transfusion regimes chelation, role of splenectomy and bone marrow transplantation. Comprehensive thalassemia care center, its functions, role of the staff, social workers and paramedics, etc.

ii. Sickle cell disease: Evaluation, management of the steady state, management of painful and anemic crisis, management of chronic complications, clinical

and hematological features of the various sickle cell diseases, clinical and hematological effects of the thalassemia with sickle cell anemia, therapeutic role of bone marrow transplantation.

iii. Inherited enzymopathies (Red Cell G6PD deficiency): Evaluation and management of acute hemolytic crisis.

iv. Acquired hemolytic disorder: Immune hemolytic anemia management with immunosuppression, role of intravenous immunoglobulin, plasmaheresis, and splenectomy. Clinical and laboratory evaluation etilogical diagnosis) of patients suffering from acquired intravascular hemolysis.

4) Aplastic Anemia

Etiology, evaluation and management including immunosuppression (Antilymphocyte globulin, etc) and supportive therapy. Role of bone marrow transplantation in treatment of the individual patient; preparation for bone marrow transplantation.

5) Pure red cell anemia

Diagnostic evaluation and treatment of congenital and acquired forms. Transient erythroid alasia including the pathogenic role and biology of the human B19 parvovirus.

II white cell disorders:

1) Neutropenia

Clinical evaluation of a neutropenic patient, role of surveillance microbiology, antimicrobial therapy in neutropenia role of growth factors, principles in providing a sterile environment for the neutropenic patient.

2) Functional Disorders of neutrophils

Neutrophil function, laboratory tests foe evaluation and management of patient with chronic neutrophil dysfunction, role of growth factors and bone marrow transplantation.

III. Hemostasis:

Trainees should be thoroughly grounded in the general clinical (history and physical signs) approach to the patient with a bleeding tendency.

1. Thromobcytopenia

Thorough understanding of platelet kinetics and evaluation with radionuclids. Evaluation and investigation of the etiology of thrombocytopenia. The student should be conversant with the spectrum of management including immunosuppression, intravenous immunoglobuilin, plasmapheresis and immunoadsorption.

2. Inherited platelet function disorders

Clinical evaluation, laboratory diagnostic strategies and management.

3. Inherited coagulation factor deficiencies

Laboratory diagnostic of hemophilia genetics and antenatal diagnosis. Principles of factor replacement; factor replacement schedule in a patient with hemophilia who needs surgery; management of complications. Principles of management of patients with inhibitors. Organization of hemophilia care center and training.

4. Acquired bleeding disorders

Vitamin K deficiency and supplementation; DIC its causes and management, management of haemorrhagic complications of liver disease and renal failure, after cardiothoracic surgery.

5. Thrombotic Disordes

Classification and laboratory diagnosis of inherited thrombotic disorders; evaluation of hemostasis in the acquired thrombotic, clinical use and monitoring of anticoagulants.

B) Transfusion Medicine:

1) **Blood component preparation and their clinical use Collection of blood,** correct techniques of venepuncture, plastic systems, anticoagulants and additives, and their effect of storage stability, centrifugation, preparation of platelets, fresh frozen plasma and cryoprecipitate, storage of components, principles of fractionation. Quality control. A thorough understanding of the clinical indications for proper use of specific blood components.
2) **Diagnosis & Management of Transfusion related complications** Febrile transfusion reactions- laboratory investigations, diagnostic, management and prevention. Diagnosis and management of hemolytic transfusion reactions. Infections transmitted by transfusion, physical and clinical complications of transfusion.

3) Cell separation principles

The trainee must be able to perform cell separation and apheresis. Principles of cell separators; continuous versus intermittent flow techniques, replacement fluids for plasmapheresis, current status and indications in various diseases should be known and understood.

4) Techniques of leuco- depletion

Problems related to white cells in donor blood and techniques of removal. Principles of filter design and use.

5) Irradiation of blood and components

Biology of irradiation of blood and components, transfusion graft versus host disease GVIHD Indications for irradiation of blood and protocols. Use of equipment.

6) Management of alloimmunization in relation of transfusion Techniques for prevention of alloimmunization, role of ultraviolet radiation and photosensitizers, management of patients with red cell and platelet alloantibodies.

C) Consultation Haematology Services

1. Hematological complications of pregnancy and the interaction of the pregnant state with disorders of the haemopoietic system.
2. Hematological complications of systemic disease.
3. Hematological problems in Intesive Care Unit paitents.
4. Hematological management of neonatal sepsis, hemolytic disease of new born (HDN), alloimmune thrombocytopenia, etc

D) Practical Laboratory Training

I) General Hematology

1. Proper use and care of common instruments such as light microscope, centrifuge, water baths, freezers, weighing, balance etc.
2. Blood collection samples- venepuncture and finger prick methods of sample collection, types of anticoagulants, containers and the effects of delay in processing and storage.
3. Determination of peripheral blood counts (Hemoglobin, Hematocrit, Total WBC and platelets) manually and calculation of red cell indices.
4. Use of automated blood cell counters including principles and practice. Interpretation of peripheral blood counts and abnormal flags.
5. Preparation of blood films and, staining of peripheral blood films and cytospin slides with Ramanowsky and other dyes.

6. Review of normal and abnormal blood films with emphasis on morphology of red cells, white cells and platelets.
7. Performance of WBC differential counts; subjective assessment of platelet counts and diagnostic interpretation of abnormal counts.
8. Preparation and staining of thick and thin blood films for malarial parasites.
9. Measurement and significance of ESR and plasma viscosity.
10. Supravital staining of reticulocytes, counting of reticulocytes.
11. Performance of bone marrow aspiration; trephine needle biopsy, splenic aspiration.
12. Preparation of smears of bone marrow aspirates and biopsy (touch) imprints. Staining and diagnostic evaluation of bone marrow aspirates.

II) Laboratory evaluation of hemolytic anemias

1. Hb S solubility test ,
2. Screening for unstable hemoglobin ,supravital staining of Hb H inclusions .
3. Principles and practice of separation and identification of normal and abnormal hemoglobins by electrophoresis and chromatography.
4. Quantitation of normal and abnormal hemoglobins by densitometry and chromatography,
5. Quantitation of HbF by alkali denaturation and cellular distribution of HbF. By Kleihauer acid elution technique,
6. Heinz body preparation,
7. Screening for G6PD deficiency and quantitative estimation of G6PD and other red cell enzymes.
8. Direct and indirect Coomb's test, warm and cold autoantibody titers,
9. Miscellaneous biochemical test on red cell, plasma and urine,
    i. Principle and procedures for estimation of plasma bilurubin and haptoglobin; and significance of the results, screening for methaemalbumin, methaemoglobin and sulphaehemoglobin,
    ii. Screening for cryoglobins, principles of immunoglobin estimation and immune electrophoresis,
    iii. Estimation of urine of Hb, red cells, hemosiderin, urobillinogen, and bilurubin,
    iv. Principles of estimation of serum ferritin and iron/TIBC,
    v. Principles and estimation of red cell folate, serum folate and serum cobalamin.

III) Laboratory investigations of Bleeding Disorders

Platelets

1) Performance of Ivy bleeding time and platelet count; study of platelet morphology
2) Principles, practice and interpretation of platelet aggregometry tests.
3) Platelet associated immunoglobulin (PAIgG) and circulating antiplatelet antibodies.

Screening for coagulation factor abnormalities:

1. Prothrombin time and styven time.
2. Activated partal thromboplastin time.
3. Thrombin time and reptilase time.
4. Plasma fibrinogen.
5. Correction studies with normal plasma, aged serum and factor deficiency plasmas.
6. FDP and D-Dimers.
7. Assays of clotting factors particularly factors VIII and 1X.
8. Urea solubility test for factor XIII
9. Euglobulin lysis time and other relevant tests of plasma fibrinolytic activity.

IV. Laboratory Investigation of Thrombotic Disorders

Principles:

1. Assays of plasma AT I11, protein C, protein 5, Factor V Leiden
2. Screening for lupus anticoagulant and activated protein C resistance-principles of screening tests and interpretation of results.
3. Laboratory monitoring of anticoagulant (heparin and oral anticoagulants) therapy.

V. Cytogenetics

Familiarisaton with cytogenetics, understanding the rinciples of cytogenetics and appreciating the relevance and significance of chromosomes in dagnostic hematology, interreting the results of chromosome preparation of hemopoietic cells.

VI. Flow Cytometery

A working knowledge of the principle and practice of flowcytometery and interpretation of the clinical significance of common leukocyte immunophenotypes.

5. Teaching scheme: Total periods and allotted to each topic

Didactic lectures: These will be held once a week and will be dilevered either by a faculty member or by a specialist in the area from hemato-oncology and allied disciplines.

*Seminars and journal clubs :*Seminars and journal clubs will be held once a week. Candidates are required to present 1 seminar and 2 journal clubs per month.

Therapeutic case and problem discussions: This will be held every week and each student is expected to present every week after the first

3 months. Experts from related specialties will be present for these discussions.

Patient care, teaching and research: It is expected that the fellowship candidates will contribute to patient care in the hematology department in all aspects ie management of indoor patients, OOPDs, emergencies, as well as the laboratory work up of the patients. They are also required to give lectures on selected topics to the IIIrd year undergraduate medical students.

Project work and paper publication: Each fellowship candidate will be required to undertake a research project on a topic decided after consultation with the guide. This topic will require to be approved by the institutional ethics committee. The project work will be submitted in the form of thesis at the end of 10 months of the fellowship. It will undergo evaluation by 3 independent experts from within the institution, who will then grade it. This project will also be written up for publication and sent to a suitable journal before completion of the fellowship. Award of the certificate of fellowship is subject to successful completion of the project, approval of the thesis by experts and submission to a peer-reviewed journal.

Attending conferences: The candidate will attend the Annual conference of the Indian Society of hematology and blood transfusion or other similar hematology meeting / conference and present a paper (oral) poster on the work carried out during the fellowship tenure. Candidates will also be encouraged to participate in other related meetings, CMEs etc organized in the city.

6. Text books and reference books

1. William's Hematology [Beutler, Lichtman, Coller & Kipps]
2. Wintrobe's Clinical Haematology [Lee, Boggs, Bithell, Foerster, Athens, Lukins]
3. Haematology – Basic Principles & Practice[Hoffman, Benz, Shattil, Furie, Cohen & Silberstein]
4. Blood- [Jand]
5. Practical Haematology [Dacie & Lewis]
6. Thalassaemia Syndromes – [Weatherall & Clegg]
7. Haemostasis & Thrombosis – Basic Principle & Clinical Practice [Coleman, Hirsch, Marder & Salzman]
8. Blood Banking [Mollison]
9. Modern Blood banking & transfusion practices [Denese M Hannening]
10. Bone Marrow Transplantation, [Forman, Blume& Thomas]
11. The molecular basis of Blood Diseases [Stamatoyannopulos, Neinhuis, Leder & Majerus].
12. Paediatric Haematology by [Nathan & Ozaskie]

Suggested Journals

1. Blood
2. British J. Hematology
3. Seminars in Haematology
4. Haematology & Oncology Clinics
5. Transfusion
6. Indian J. Hematology & Blood Transfusion
7. Hemostasis & Thrombosis
8. Bone Marrow Transplantation
9. Lancet
10. New England Journal of Medicine

7. Scheme of examination in details: (Numder of question papers, Number of marks to each question paper, Duration of question paper, practical examination etc.)

Each year an examination coordination committee (ECC) consisting of three teachers running Fellowship/certificate curses will be nominated by the Head of the Institute/ College. Both theory and practical Examinations will be concluded within 15 days of the end of the course. Examination will be conducted in individual colleges. Each examination will have one internal and one external examiner (approved by ECC).

Theory

100 marks

10short notes of 10 marks each to be attempted from 12 questions. Passing marks 50% All theory examinations will be held on a single day for all courses of similar lengths.

8. **Infrastructure required for conducting the course :** This will include seminar room for teaching, laboratories for training, computers for software training as well as training on patients etc.
9. **Faculty required with their qualification and experience**

The following are the existing faculty

Professor – Hematology

Additional professor

Associate Professor- Hematology

Assistant Professor - Hematology

Visiting faculty – to be identified

10. Interview

By a panel of experts of three3 – including the head of the institute and at least one external expert and an internal expert

11.Selection

Total candidates per year will be selected for each course as per University norms. Selection will be based on performance at interview 30%, University level academic merits (20%) publications if any (20%), and recommendations from PG teacher (30%)

12. Pattern of Exam

Each year an examination coordination committee (ECC) consisting of three teachers running Fellowship/certificate courses will be nominated by the director. Both theory and practical Examinations will be concluded within 15 days of the end of the course.

Examination will be conducted in individual colleges. Each examination will have one internal and one external examiner (approved by the ECC)

Theory

100marks

10 short motes of 10 marks each to be attempted from 12 questions. Passing marks 50% All theory examinations will be held on a single day for all courses of similar lengths.

13. Practicals

Each candidate will be examined by both examiners simultaneously for between 60 and 90 mins. This will cover a viva-voce and practical. Details will be dependent on the subspeciality –please write this. Passing marks 50%.Candidates have to pass individually in both theory and practical.

14. Announcement of results

Results will be announced on the Website and Notice board within one week of the conclusion of the examination. The result will be only "Fellowship granted/Denied and marks will not be displayed. Repeats will be at the end of on earlier than 3-6 months depending on the length of the course.

15. Award of Fellowship

Certificates will be awarded by the MUHS after the results will be sent to the MUHS The University (with signature of the Registrar) will award the certificate.

Note-

The decision of the Examination Co-ordination Committee will be binding on all. On all matters pertaining to the examinations