BLOOD AND IMMUNOLOGY II MODULE

MBBS Year-3 (Academic Year 2020-2021)

KMU Central Curriculum Committee
Khyber Medical University, Phase V, Hayatabad | Peshawar

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List of Themes

Three Weeks

Themes	**Duration in weeks**
Pallor and Fatigue	1 week
Fever	1 week
Bleeding	1 week

General Learning outcomes

At the end of this module, the 3rd year students would be able to:

By the end of Blood & Immunology II Module, 3rd year MBBS students will be able to:

1. Describe the pathophysiology and diagnosis of different types of anemia.
2. Explain the pathogenesis of different hematological malignancies.
3. Discuss the diagnostic approach to malignant hematological disorders.
4. Discuss the pathophysiology and diagnosis of bleeding disorders.
5. Explain the immune system of the body and its components.
6. Describe the mechanism of defense from infection.
7. Explain hypersensitivity and allergy.
8. Discuss the rationale for immunomodulation and its impact on improving the therapeutic dynamics of autoimmune disorders and malignancies.
9. Describe the drugs for treating various types of anemia.
10. Write prescription for the prevention and treatment of iron-deficiency anemia.
11. Describe the application of blood groups in Forensic work
12. Describe the examination of blood stains
13. Describe the medico legal importance of blood as trace evidence
14. Describe the EPI schedule of Pakistan and the basic principles of Immunization.
15. Describe the most prevalent anemia's that affect the population of Pakistan, and the risk factors for vulnerable population.
16. Describe the most prevalent blood borne infections that affect the population of Pakistan, and the appropriate preventive strategies including safe blood practices

Learning objectives Theme 1: Pallor and Fatigue			
Subject	**Topic**	**Sr.**	**Learning objectives**
PHYSIOLOGY	Red blood cells	1	Discuss the steps of Erythropoiesis with correlation to Red cell indices and its clinical implications.
PATHOLOGY	Anemia	2	Discuss Physiologic basis of Anemia.
		3	Classify anemia's according to underlying mechanism
	Blood loss	4	Describe the pathogenesis of blood loss anemia
	Hereditary Spherocytosis	5	Discuss the pathogenesis of Hereditary Spherocytosis
		6	Describe morphological changes in peripheral smear of HS patient
		7	Explain how will you diagnose a case of HS?
	Sickle cell Anemia	8	Discuss the morphology of RBCs in Sickle cell Anemia
		9	Describe the etiology and pathogenesis in SA
		10	Explain how will you diagnose a case of SA?
	Thalassemia	11	Describe Thalassemia
		12	Discuss the conditions contributing to the pathogenesis of beta- thalassemia
		13	Explain the genetics of thalassemia
		14	Describe the morphological changes physically and on peripheral smear
		15	Explain how will you diagnose a case of alpha or beta thalassemia?
	Glucose 6 phosphate dehydrogenase deficiency	16	Classify G6PD
		17	Discuss the pathogenesis of G6PD with reference to oxidative injury of RBCs
		18	Describe the morphology of RBCs in G6PD
		19	Explain how will you diagnose a case of G6PD deficiency
	Paroxysmal Nocturnal Hemoglobinuria	20	Describe the pathophysiology of Paroxysmal Nocturnal Hemoglobinuria
		21	Explain the diagnosis of a case of PNH?
	Immune hemolytic anemia's	22	Classify immune hemolytic anemia's
		23	Discuss the etiological mechanism of warm and cold antibody immune hemolytic anemia
		24	Explain the diagnostic workup of immune hemolytic anemia

	Iron deficiency anemia	25	Discuss the pathophysiological mechanism of Iron deficiency anemia
		26	Describe the clinical course and morphological changes in Ida
		27	Explain laboratory investigations for the diagnosis of IDA
	Megaloblastic Anemia	28	Describe Megaloblastic Anemia
		29	Describe the pathogenesis of MA with respect to Vitamin B12 and Folic acid
		30	Discuss the morphological changes in RBCs, WBCs and platelets in MA.
		31	Explain how will you diagnose the cause of MA?
	Aplastic Anemia	32	Enumerate causes of Aplastic anemia
		33	Describe the pathophysiology of aplastic anemia
		34	Diagnose a case of aplastic anemia
	polycythemia vera	35	Discuss the pathophysiology of polycythemia vera
		36	Describe the clinical course and morphological features of Polycythemia vera
		37	Explain how will you diagnose a case of Polycythemia vera?
PHARMACOLOGY	Drugs used in anemia	38	Classify the drugs used in anemia
		39	Describe pharmacokinetics of Iron
		40	Describe the various oral and parenteral formulations of iron
		41	Describe the adverse effects of iron therapy
		42	Describe the drug treatment of Iron toxicity
		43	Describe the various oral and parenteral preparations of cyanocobalamin (Vit B12)
		44	Describe the clinical use of cyanocobalamin (Vit: B12)
		45	Describe the clinical use of Folic acid
		46	Describe the pharmacological rationale of combining cyanocobalamin with folic acid and iron
		47	Describe the role of granulocyte colony stimulating factors (Filgrastim) and granulocyte monocyte colony stimulating factors in the treatment of leucopenia.
		48	Describe the role of thrombocyte colony stimulating factor (Oprelvekin) in the treatment of thrombocytopenia.
FORENSIC MEDICINE	FORENSIC EVIDENCE	49	Describe trace evidence
		50	Classify trace evidence.

		51	Describe Locard's exchange principle.
		52	Describe composition of blood and characteristics of different blood cells.
		53	Describe basic genetic principles related to blood groups and blood groups as hereditary factors.
	BLOOD GROUP SYSTEMS	54	Describe different blood groups systems. ▪ Grouping based on red cell antigens ▪ Grouping based on blood proteins ▪ Grouping based on enzymes ▪ Grouping based on white cell antigens. ▪ Describe different methods for blood group determination. ▪ Direct agglutination ▪ Ring test ▪ Gel diffusion ▪ Immune-electrophoresis ▪ Indirect agglutination
		55	Describe the application of blood in forensic work. (medico legal importance) ▪ Inheritance claims ▪ Rh hazards ▪ Transfusion errors and adverse reactions ▪ DNA profiling ▪ Disputed paternity and maternity
COMMUNITY MEDICINE	Epidemiology of nutritional anemias	56	Differentiate between diseases of blood, blood forming organs and blood borne Infections
		57	Describe the population at risk of nutritional anemia in Pakistan.
		58	Explain effective public health strategies for prevention of different types of anemia's in a community in Pakistan
		59	Describe risk factors for different nutritional anemia's.
		60	Describe effective public health strategies for prevention of different types of anemia's in Pakistan
PAEDIATRICS	Thalassemia	61	Describe Classification, Laboratory Investigation and management of Thalassemia
MEDICINE	Sickle Cell Anemia	62	Discuss the pathophysiology, investigations and management of Sickle Cell Anemia.

Learning objectives Theme 2: Fever			
Subject	**Topic**	**Sr.**	**Learning objectives**
PHYSIOLOGY	WHITE BLOOD CELLS	63	Classify the different types of white blood cells, Polymorph's, Lymphocytes and Plasma cells and their disorders.
PATHOLOGY	ACUTE MYELOGENOUS LEUKEMIA	64	Classify acute myelogenousleukemias according to FAB.
		65	Discuss the pathophysiology of AML.
		66	Describe the morphological features of AML.
		67	Explain how will you proceed for diagnosis of AML?
	CHRONIC MYELOGENOUS LEUKEMIA	68	Discuss the pathophysiology of CML.
		69	Describe the peripheral blood findings in CML
		70	Explain how will you proceed for diagnosis of CML?
	MYELODYSPLASTIC SYNDROME (MDS)	71	Enlist types of MDS.
		72	Discuss causes, pathogenesis and Morphology.
		73	Interpret blood and bone marrow changes in patient with MDS.
		74	Discuss symptoms and diagnostic strategies for patient with MDS.
	LYMPHOID NEOPLASMS	75	Enumerate Lymphoid neoplasm
		76	Classify lymphoid neoplasms according to WHO classification.
	ACUTE LYMPHOCYTIC LEUKEMIA	77	Discuss the pathophysiology of Acute lymphocytic leukemia
		78	Discuss the morphological features of ALL
		79	Explain how will you diagnose a case of ALL?
	CHRONIC LYMPHOCYTIC LEUKEMIA	80	Discuss the pathophysiology of Chronic lymphocytic leukemia
		81	Describe the distinguishing morphological features of CLL
		82	Explain the diagnostic workup for a case of CLL
	PLASMA CELL DISORDER	83	Describe the pathogenesis of multiple myeloma
		84	Describe the molecular genetics involved in multiple myeloma

		85	Discuss the type of multiple myeloma
		86	Enlist the clinical features
	HODGEKIN' S LYMPHOMA	87	Classify Hodgkin'slymphoma
		88	Discuss the etiology and pathogenesis of Hodgkin's lymphoma
		89	Describe the morphological changes and clinical course of the disease in Hodgkin's Lymphoma
	NON-HODGEKIN' S LYMPHOMA	90	Enlist Non-Hodgkin's lymphoma
		91	Describe the basic pathologic classification of NHL (the WHO classification).
		92	Describe the predisposing factors to developing NHL, including infectious agents associated with development of specific lymphomas.
		93	Describe the morphologic features of lymph nodes involved in Non-Hodgkin lymphoma
		94	Enlist the lab investigations required for diagnosis of NHL
	IMMUNITY	95	Describe the functions and types of immunity.
		96	Enlist the three lines of defenses and outline their properties
		97	Describe the characteristics, origin and functions of cells of immune system
		98	Compare innate and acquired immunity
		99	Compare the mechanism of active and passive immunity
	HUMERAL IMMUNITY	100	Describe the role of T and B lymphocytes in immunity
		101	Describe the role of B lymphocytes in humeral immunity
		102	Describe humeral immunity
		103	Explain how helper T cells regulate the immune system
		104	Differentiate between humeral and cell mediated immunity
	CELL MEDIATED IMMUNITY	105	Explain the Specificity of immune response
		106	Describe cell mediated components of Cell mediated immunity (CMI),
		107	Explain types of cells in CMI system
		108	Describe T-cell activation and diversity

		109	Illustrate Schematic representation of T cell activation and diversity
		110	Differentiate between Primary and secondary immune response
	ANTIBODIES	111	Describe antigen and antibodies.
		112	Differentiate B/W Monoclonal and polyclonal antibodies.
		113	Classify immunoglobulin
		114	Illustrate structure (diagram) of immunoglobulin A.
		115	Describe important functions of immunoglobulin
		116	Explain How antibodies neutralize toxins, microbes and viruses
		117	Illustrate class switching of immunoglobulin
		118	Explain transfer of immunity from mother to fetus and from mother to infant during breast-feeding
	ALLERGY & HYPERSENSITIVITY	119	Describe the pathophysiology of allergy and hypersensitivity with examples
		120	Compare immediate and delayed hypersensitivity reactions
		101	Enlist the diseases associated with hypersensitivity reactions
	IMMUNE TOLERANCE	102	Describe Immunotolerance.
		103	Describe Immunological unresponsiveness of the body especially to self-antigens.
		104	Explain the role of immune system in protecting the human body.
		105	Distinguishing between types of immunotolerance
		106	Explain the mechanism of graft rejection and graft vs host disease.
	AUTOIMMUNE DISEASES	107	Describe Autoimmunity.
		108	Discuss Pathogenesis of Autoimmune diseases.
		109	Explain the factors leading to Autoimmune Diseases.
	IMMUNODEFICIENCY DISEASES	110	Describe immunodeficiency
		111	Differentiate between Autoimmune and immunodeficiency diseases.
		112	Classify Congenital and acquired Immunodeficiency diseases.
		113	Describe the pathogenesis of HIV.

	COMPLEMENT	114	Describe complement.
		115	Describe components of the Complement System
		116	Describe the synthesis of complements
		117	Describe pathways of activation and inactivation of complement
		118	Describe important functions of each component of complement system
		119	Describe the diseases associated with deficiency of the complement proteins
PHARMACOLOGY	Immune modulator drugs	120	Classify immunomodulating drugs
		121	Describe the role of corticosteroids as immunosuppressant agents.
		122	Describe mechanism of action of immunophilin ligands.
		123	Describe clinical uses and adverse effects of immunophilin ligands.
		124	Describe mechanism of action of enzyme inhibitors.
		125	Describe clinical uses and adverse effects of enzyme inhibitors.
		126	Describe mechanism of action of cytotoxic agents as immunosuppressant
		127	Describe clinical uses and adverse effects of cytotoxic agents
		128	Describe mechanism of action of immunosuppressive antibodies used as immunosuppressant
		129	Describe clinical uses and adverse effects of immunosuppressive antibodies
		130	Describe mechanism of action of monoclonal antibodies
		131	Describe clinical uses and adverse effects of monoclonal antibodies
		132	Describe mechanism of action of immunostimulant drugs
		133	Describe clinical uses and adverse effects of immunostimulant drugs
		134	Describe the advantages and disadvantages of various combinations of Immuno-modulating drugs
		135	Describe Forensic Lab Systems
PRIME/RESEARCH	Academic writing and plagiarism	136	Emphasize the role of academic writing in research
		137	Explain the role of “Grammarly” for use in academic writing

		138	Define plagiarism
		139	Enlist plagiarism detection software

FORENSIC MEDICINE	FORENSIC LAB PROCEDURES	140	Describe Forensic Lab Procedures · Forensic histopathology · Naked eye examination · Histological examination · Forensic histochemistry · Steam distillation · Micro-diffusion analysis · Stas-Otto method · Colour reaction method · Chromatography · Spectroscopy · Electrophoresis · Radio-activation technique
		141	Detection of insecticide compounds
COMMUNITY MEDICINE	Immunization	142	Define immunity
		143	Explain the types of immunity
		144	Discuss immunizing agents
		145	Explain the hazards of immunization
		146	Explain the cold chain in the context of immunization
	Vaccination i	147	Explain the importance of vaccination in the control of infectious diseases
		148	Describe the basic principles of vaccination
		149	List the main types of vaccine and illustrate them with examples
		150	Describe vaccines that are associated with adverse reactions
		151	Explain the difference between live attenuated and inactivated vaccines
		152	Describe the role of vaccines in preventing disease.
		153	Differentiate between vaccination and immunization
		153	Describe the strategies used from community medicine's perspective to promote vaccination in communities. (EPI)
		154	Explain various programs of vaccination in Pakistan with particular reference to EPI.
		155	Describe the factors responsible for success and failure of vaccination programs in Pakistan.
	EPIDEMIOLOGY OF BLOOD BORNE	156	List the important blood borne diseases in Pakistan as prioritized by the National Institute of health (NIH)

	DISEASES/INFECTIONS	157	Discuss the global burden of blood borne diseases & compare with Pakistan
		158	Describe important blood borne pathogens

		159	Explain the evidence based public health practices to reduce transmission of blood borne infectious disease
		160	Explain the evidence based best practices and procedures for safe blood transfusion and prevention of needle stick injury
MEDICINE	Myeloproliferative Disorders (MPN)	161	Classify myeloproliferative neoplasms.
		162	Discuss the investigations & management steps of CML.

Learning objectives Theme 3: Bleeding			
Subject	**Topic**	**Sr.**	**Learning objectives**
PHYSIOLOGY	Platelets	163	Enumerate the causes of thrombocytopenia.
		164	Explain the intrinsic and extrinsic pathways of Coagulation
PATHOLOGY	Thrombocytopenia & Von Willebrand Disease	165	Enlist causes of Thrombocytopenia
		166	Describe the pathogenesis of immune thrombocytopenic purpura
		167	List thrombotic microangiopathies
		168	Explain the diagnostic plan for ITP
		169	Classify VWD
		170	Enlist investigations required for diagnosis of VWD
	1. HEMOPHILIA	171	Discuss the pathogenesis of hemophilia A and B
		172	Describe the clinical course of the disease.
		173	Enlist the laboratory investigation for diagnosing a case of hemophilia
	1. DISSEMINATED INTRAVASCULAR COAGULOPATHY	174	Enlist major disorders associated with DIS
		175	Discuss the pathophysiology of DIC
		176	Explain the morphological changes in DIC
		177	Explain how will you diagnose DIC?
	Transfusion medicine	178	Describe various blood component preparation
		179	Identify indications for different blood components
		180	Describe transfusion reactions associated with blood transfusion
PHARMACOLOGY	Anti-plasmin (antifibrinolytic) drugs	181	Describe mechanism of action of Anti-plasmin (antifibrinolytic) drugs
		182	Describe clinical uses and adverse effects of Anti-plasmin (antifibrinolytic) drugs
	Drug treatment of Haemophilia	183	Describe the drug treatment for various types of Haemophilia
		184	Describe the role of Desmopressin in the treatment of haemophilia

FORENSIC MEDICINE	Blood Stains	185	Describe examination of blood stains. · Physical examination · Chemical examination · Physicochemical examination · Micro chemical examination · Spectroscopic examination · Immunological and enzymological methods for species determination
		186	Describe the medico legal importance of blood stains.
	Collection And Preservation Of Biological Material	187	Describe the collection and preservation of biological material · Blood · Swabs and smears · Saliva . Semen
MEDICINE	Platelets (ITP)	188	Describe Clinical features, investigations and management of a patient with Immune Thrombocytopenia (ITP).
PRIME/Medical education	Principles of medical ethics	189	Explain the pillars of medical ethics
		190	Explain the privacy and confidentiality of the patients and its medico-legal and cultural aspects
	Confidentiality	191	Exhibit Confidentiality of colleagues and patients
		192	Appropriately use of social media

Practical Work			
Subject	**Topic**	**Sr.**	**Learning objectives**
Theme 1			
PATHOLOGY	Normal Complete blood count	193	Differentiate between a normal blood cells of different lineages
	ABNORMAL PERIPHERAL SMEAR IN DIFFERENT ANEMIAS	194	Differentiate between a normal and an abnormal RBC
		195	Identify different shapes of RBCs.
		196	Identify the common types of Anemia on the basis of RBC morphology
PHARMACOLOGY	Iron-deficiency anemia	197	Write prescription for a patient at risk of developing iron-deficiency anemia
		198	Write Chart order for treating an in-door patient with iron-deficiency anemia
FIELD VISIT	VISIT TO BLOOD BANK OF A TERTIARY CARE HOSPITAL	199	Explain safe blood transfusion practices
		200	List the common pathogens that cause blood borne infections which may be acquired from unsafe blood transfusion practices.
		201	List the most common transfusion reactions seen in a blood bank in a local teaching hospital in Pakistan
		202	Communicate with health care staff effectively
		203	Describe the standard operating procedures (SOP's) of blood transfusion
Theme 2			
PATHOLOGY	Normal white cell smear	204	Describe causes of leukocytosis
		205	Differentiate different types of white blood cells under microscope
FORENSIC MEDICINE	Microscopic examination of animal and human blood	206	Perform Microscopic examination of animal and human blood.
	Examination of blood stains under ultraviolet light	207	Perform examination of blood stains under ultraviolet light.
	Different pattern of stains	208	Identify different pattern of stains.
FIELD VISIT	Visit to basic health	209	Observe administration of different vaccines as part of Expanded Program of immunization

	care unit EPI center	210	(EPI) schedule of Pakistan at the vaccination center.
		211	List and explain the route of administration and mechanism of storage and maintenance of cold chain of each vaccine in the EPI schedule (support with images where possible)
		212	List the different components of each vaccine in the EPI schedule including the adjuvants, preservatives and explain their relevance to the vaccine.
		213	Differentiate between live attenuated vaccines, conjugate vaccines, subunit vaccines, and toxoid vaccines in the EPI schedule and their mode of action
		214	Identify the contraindications for vaccination that may present an additional risk
		215	Describe the organ gram of EPI center
		216	Explain the role of EPI center.
		217	Observe the process of vaccination on a case.
Theme 3			
PATHOLOGY	Coagulation tests	218	Interpret Prothrombin time and activated partial thromboplastin time
		219	Interpret bleeding time and clotting time

Hours allocation for different subjects

S. No	Subject	Hours needed
1	Pathology	30
2	Pharmacology	7
3	Forensic medicine	9
4	Community medicine	9
5	Medicine	3
6	Physiology	3
7	Pediatrics	1
8	PRIME/Medical Education and Research	2+1
	Total	**65**