

Blood and Immunology Module

First Professional Year MBBS

4 Weeks



GENERAL LEARNING OUTCOMES

COGNITIVE DOMAIN

By the end of this module, First year MBBS students shall be able:

1. Identify & describe the various cellular and non-cellular components of blood in relation to its Anatomy, Physiology & Biochemistry
2. Describe structure, synthesis and degradation of Hemoglobin
3. Describe the regulatory mechanisms of normal hemostasis and coagulation
4. Describe the conditions associated with dysfunction of cellular and non-cellular components of blood
5. Describe the basic characteristics of immune system.
6. Discuss the structure, functions and biochemical aspects of the Lymphoreticular system.
7. Explain the principles and clinical significance of ABO/RH blood grouping system
8. Explain the pathophysiology of various bleeding disorders
9. Identify the role of pharmacology in anemia and bleeding disorders
10. Describe the basics of communication skills
11. Describe different types of stress, and its behavioral aspects

PSYCHOMOTOR DOMAIN

Description of the psychomotor skills to be developed and the level of performance required:

By the end of BLOOD Module, the student should be able to:

1. Carry out practical work as instructed in an organized and safe manner
2. Make and record observations accurately.
3. Identify slide of Lymph node, thymus, tonsils and spleen under microscope

4. Identify slide of Gut associated lymphoid tissue
5. Determine percentage of formed blood elements.
6. Identify RBC and should be able to do its counting on counting chamber and to know normal values. And also classify Anemia morphologically.
7. Determine the Hemoglobin with the apparatus and have knowledge of normal and abnormal value.
8. Identify WBC morphology and its different types, should be able to count them on counting chamber and to know the normal values. Describe the diagnostic importance of each WBC.
9. Identify Platelets and should be able to do its counting on counting chamber and to know normal values. Its diagnostic importance in relation to bleeding disorders
10. Perform bleeding time and clotting time and to know normal values and its diagnostic importance in relation to bleeding disorders.
11. Perform Blood groups typing and Rh factor.
12. Perform ESR and to know its normal value and prognostic importance.
13. Detect blood, bile pigments & bile salts in the given sample of urine

ATTITUDE AND BEHAVIOUR:

By the end of BLOOD Module the student shall gain the ability and carry responsibility to:

1. Demonstrate ability to give and receive feedback, respect for self and peers.
2. Demonstrate empathy and care to patients.
3. Develop respect for the individuality and values of others - (including having respect for oneself) patients, colleagues and other health professionals
4. Organize & distribute tasks
5. Exchange opinion & knowledge
6. Develop communication skills and etiquette with sense of responsibility.
7. To equip themselves for teamwork
8. Regularly attend the classes

9. Demonstrate good laboratory practices

THEMES FOR BLOOD MODULE

SNO	Theme	Duration
1	Pallor and fatigue	1 weeks
2	Fever (Infection and Immunity)	2 weeks
3	Excessive bleeding & Transfusion Reaction	1 week

BLOOD MODULE

THEME –I

Pallor and fatigue

SNO	Topic	Learning Outcomes
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ANATOMY		
1	Introduction to hematopoietic system	1. Define and classify lymphoid organs and lymphoid tissues
PHYSIOLOGY		
2	Introduction to Blood	2. Describe the composition and functions of blood 3. Define Hematocrit 4. Enlist the components of plasma 5. Explain the difference between Serum and plasma
3	Red Blood Cells	6. Describe the structure, function, life span and normal count of Red Blood Cells. 7. Define Haemopoiesis 8. Classify haematopoietic stem cells 9. Summarize the erythropoiesis sites during pre-natal and post-natal periods.
4	Red Blood Cells Genesis Erythropoiesis	10. Illustrate the stages of RBC development from pluripotent hematopoietic stem cells to a mature RBC. 11. Describe the erythropoiesis and factors regulating erythropoiesis 12. Describe the role of Vitamin B12 and Folic acid in RBC maturation. 13. Describe the effects of deficiency of Vitamin B12 and Folic acid on RBC maturation.

5	Erythropoitin	<p>14. Describe source, control / regulation and functions of Erythropoitin</p> <p>15. Explain the role of Erythropoietin in RBC production.</p> <p>16. Describe the effects of high altitude and exercise on RBC production.</p>
6	Anemia	<p>17. Define and describe the different types of anemia</p> <p>18. Define hemolysis</p> <p>19. Describe the various red cell indices</p> <p>20. Interpret the diagnosis of anemia by using red cell indices</p> <p>21. Describe the effects of anemia on functions of circulatory system / human body</p>
7	Polycythemia	<p>22. Define and classify polycythemia</p> <p>23. Differentiate between primary and secondary Polycythemia</p>
BIOCHEMISTRY		
8	Introduction of Porphyrins	<p>24. Define Porphyrins</p> <p>25. Describe Chemistry of Porphyrins</p> <p>26. Enlist the types, metabolic causes and clinical presentation of different types of Porphyrias.</p>
	B- Complex vitamins	
9	Iron metabolism	27. Describe the iron metabolism

10	<p>Introduction to heme synthesis and degradation</p>	<p>28. Define heme and Describe its structure and functions</p> <p>29. Describe the biochemical features of the hemoglobin molecules</p> <p>30. Describe Heme Synthesis on cellular and molecular level</p> <p>31. Describe Heme Degradation</p> <p>32. Describe the Regulation of Heme Synthesis.</p> <p>33. Describe the concept of Oxygen binding with hemoglobin</p>
11	<p>Hemoglobinopathies</p>	<p>34. Define Hemoglobinopathies and enlist the variants of hemoglobin</p> <p>35. Describe causes of Hemoglobinopathies</p> <p>36. Describe two major categories of hemoglobinopathies</p> <p>37. Describe the amino acid substitution in sickle cell disease.</p> <p>38. Define and Classify thalassemias.</p> <p>39. Explain the genetic defects in α and β thalassemias.</p> <p>40. Enlist the clinical features of α and β thalassemias</p>
12	<p>Proteins</p>	<p>41. Define proteins,</p> <p>42. Describe the Biomedical importance of Proteins</p> <p>43. Classify proteins based on Physiochemical properties, Functions, Nutrition</p> <p>44. Explain Structure of proteins</p> <p>45. Describe the significance of Proteins</p>

13	Amino Acids	<p>46. Define Amino acids,</p> <p>47. Describe their structure, properties & functions</p> <p>48. Classify Amino Acid</p> <p>49. Describe nutritional significance of amino acids</p> <p>50. Describe Dissociation, titration and importance of amino acid in pH maintenance</p>
14	Proteins	<p>51. Explain Separation of proteins e.g. salting out, ELISA, Electrophoresis, Chromatography, Centrifugation</p>
15	Proteins	<p>52. Explain Separation of proteins e.g. Chromatography, Centrifugation</p>
16	Plasma Proteins	<p>53. Classify and describe the physical, chemical and electro-phoretic properties of plasma proteins.</p> <p>54. Illustrate the production of plasma proteins and the factors affecting plasma protein synthesis.</p> <p>55. Describe clinical significance of Plasma proteins</p> <p>56. Explain Globulin proteins and Albumin with their functions</p> <p>57. Explain gamma Globulin proteins and Albumin with their functions</p>
PATHOLOGY		
17	<ul style="list-style-type: none"> • Anemia's of diminished erythropoiesis 	<p>58. define anemia</p> <p>59. List the factors for regulation of erythropoiesis</p> <p>60. Enlist the types of anemia</p>
18	<ul style="list-style-type: none"> • Hemolytic anemia's 	<p>61. Define hemolytic anemia.</p>

		62. Enlist types of hemolytic anemia.
PHARMACOLOGY		
19	Drug treatment of anemia's	<p>63. Enlist the drugs used in the treatment of iron deficiency & Megaloblastic anemia</p> <p>64. Describe the pharmacological basis/ role of iron in iron deficiency anemia</p> <p>65. Describe the pharmacological basis/ role of vit B12 and folic acid in megaloblastic anemia</p> <p>66. Describe the role of Erythropoietin in the treatment of Anemia</p>
COMMUNITY MEDICINE		
20	Epidemiology of blood borne diseases	<p>67. Describe Epidemiology of Iron Deficiency Anemia</p> <p>68. Describe prevention of different types of anemia's in community</p>

BLOOD MODULE

THEME –II

Fever (Infection and Immunology)

SNO.	Topic	Learning Outcomes
ANATOMY		
27	Histology of lymphoid tissues	<p>79. Identify and describe the histological features and functions of Lymph node</p> <p>80. Identify and describe the histological features and functions of Thymus</p> <p>81. Identify the locations of tonsils and describe the histological features and functions of Tonsils</p> <p>82. Describe the histological features and functions of spleen.</p>
PHYSIOLOGY		
29	White Blood Cells	<p>83. Classify white blood cells</p> <p>84. Describe the structure, function, life span and normal count of White Blood Cells</p> <p>85. Describe the stages of differentiation of white blood cells (leukopoiesis)</p> <p>86. Describe the characteristics of WBCs (phagocytosis / chemotaxis, diapedesis)</p>
30	Reticulo-endothelial (Monocyte-Macrophage) system	<p>87. Describe the components of reticulo-endothelial system (monocyte-macrophage system)</p> <p>88. Describe the role of monocyte macrophage system in immunity</p> <p>89. Explain the role of neutrophils, macrophages, basophils, eosinophils and monocytes in providing immunity against infections (immune system)</p>
31	Inflammation	

		<p>90. Define inflammation</p> <p>91. Describe characteristics of inflammation (hallmark of inflammation)</p> <p>92. Describe the causes, sequence of events and cardinal signs of inflammation</p>
32	Abnormal leukocyte counts/ Leukemia	<p>93. Define Leukopenia and Leukocytosis and Lukemia</p>
33	Introduction to immunity	<p>94. Define and classify immunity</p> <p>95. Define antigen</p> <p>96. Define pathogen</p> <p>97. Enlist the tissues that contribute to immunity and explain their function</p> <p>98. Describe the functions of immune system</p> <p>99. Describe the structure and function of lymphatic system</p>
34	Immune system	<p>100. Enlist the three lines of defenses and outline their properties</p> <p>101. Describe the characteristics, origin and functions of cells of immune system</p> <p>102. Describe the types of immunity</p> <p>103. Enlist the innate defenses</p> <p>104. List the substances and cells that participate in adaptive immunity</p> <p>105. Compare the characteristics innate and acquired immunity</p> <p>106. Compare the active and passive immunity mechanism</p>

35	Immune response	<p>107. Differentiate between primary and secondary immune response</p> <p>108. Describe the roles of cytokines, chemokines, and colony-stimulating factors in the immune response</p>
36	Humoral and cell mediated immunity	<p>109. Describe the role of T and B lymphocytes in immunity</p> <p>110. Describe the role of B lymphocytes in humoral immunity</p> <p>111. Describe cell mediated and humoral immunity</p> <p>112. Explain how helper T cells regulate the immune system</p> <p>113. Explain the function of cytotoxic T cells</p> <p>114. Describe the role of helper T cells</p> <p>115. Differentiate between humoral and cell mediated immunity</p>
37	Complement system	<p>116. Describe the complement system</p> <p>117. Explain how the complement system elicits the inflammatory response, lyses foreign cells, and increases phagocytosis</p> <p>118. Describe the two pathways that activate the complement system</p> <p>119. compare Classic and alternate pathways pathways of complement activation</p>
38	Immunity: extremes of ages	<p>120. Compare the active and passive immunity</p> <p>121. Explain the transfer of passive immunity from mother to fetus and from mother to infant during breast-feeding</p>

		122. Describe changes in immune response that occurs with aging
39	Allergy & Hypersensitivity	123. Define allergy and allergen 124. Describe the pathophysiology of allergy and hypersensitivity 125. Define and classify the hypersensitivity reaction 126. Compare the immediate and delayed hypersensitivity reactions 127. List the diseases associated with hypersensitivity reactions
Biochemistry		
40	Immunoglobulin's / Antibodies	128. Define Immunoglobulin's 129. DESCRIBE Types of Immunoglobulin's 130. Describe Structure of Immunoglobulin's 131. Describe the mechanism of action of antibodies 132. Explain biochemical role of each immunoglobulin in immunity
COMMUNIUTY MEDICINE		
41	Vaccinology	146. Define vaccine and immunization 147. Explain the expanded program of immunization (EPI) in Pakistan
LAB WORK		
PHYSIOLOGY PRACTICAL		
42	TLC determination	148. Determine the total leukocyte count (TLC) in the given sample

43	DLC determination	149. Determine the differential leukocyte count (DLC) in the given sample
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Blood MODULE

THEME –III

Excessive Bleeding

PHYSIOLOGY		
SNO	Topic	Learning Outcome
44	Introduction to hemostasis	<p>150. Describe the structure, function, life span and normal count of Platelets.</p> <p>151. Define hemostasis</p> <p>152. Describe the role of platelets in hemostasis</p> <p>153. Outline the sequence of processes involved in hemostasis.</p>
45	Blood Coagulation	<p>154. Enlist the clotting factors</p> <p>155. Explain the role of calcium in coagulation</p> <p>156. Explain how clotting is prevented in the normal vascular system</p> <p>157. Outline the sequence of processes during blood coagulation</p> <p>158. Describe with the help of a flow diagram (or draw) intrinsic pathway of coagulation cascade</p> <p>159. Describe with the help of a flow diagram (or draw) extrinsic pathway of coagulation cascade</p> <p>160. Explain how the mechanism of clot dissolution.</p>
46	Bleeding disorders	<p>161. describe the role of Vit K in clotting</p> <p>162. Describe the following bleeding disorders</p> <ul style="list-style-type: none"> - Vitamin K deficiency - Thrombocytopenia - Hemophilia <p>163. Define Von Willebrand disease</p>

47	Thrombotic disorders	<p>164. Describe the effects of low platelet count on Hemostasis</p> <p>165. Define thrombus/thrombi</p> <p>166. Define emboli/embolus</p> <p>167. Enlist the causes of thromboembolic conditions</p> <p>168. Describe Femoral venous thrombosis and pulmonary embolism</p>
Pharmacology		
48	Coagulation modifying drug	<p>169. Identify the site of action of following drugs in coagulation cascade</p> <ul style="list-style-type: none"> • Aspirin, • Heparin, • Tranexamic acid • Vit. K
LAB WORK		
49	Clotting time determination	170. Determine the clotting time
50	Bleeding time determination	171. Determine the bleeding time
51	Prothrombin time determination	172. Determine the Prothrombin time (PT) in the given sample

BLOOD MODULE

THEME –IV

Transfusion Reaction

SNO	Topic	Learning Outcome
PHYSIOLOGY		
52	Blood Grouping	173. Describe different types of blood groups 174. Describe the genotype-phenotype relationships in blood groups. 175. Interpret the plausible blood groups (A-B-O) in children of parents with known blood groups. 176. Describe the role of agglutinogens and agglutinins in blood grouping 177. Describe the antigens and antibodies of the O-A-B blood types/ Interpret the types of agglutinins present in individuals with a specific blood group 178. Describe the process of agglutination
54	transfusion reactions	179. Describe the antigens and antibodies of the Rh system 180. Describe the principles of blood typing 181. Explain universal donor and universal recipient blood groups 182. Enlist the manifestations of transfusion reaction
55	Erythroblastosis fetalis	183. Define Rhesus incompatibility 184. Describe erythroblastosis fetalis 185. Describe the transfusion reactions resulting from mismatched O-A-B and Rh blood types
56	Major histocompatibility complex	186. Define autoimmunity 187. Explain how immune reaction to self-antigens is avoided 188. Define and classify Major Histocompatibility complex (MHC) Characterize the significance and function of major histocompatibility complex molecules

Forensic Medicine		
56	Medico-legal importance of blood groups	189. Describe the Medico-legal importance of blood groups in forensic work that is (a) Personal Identity (b) inheritance claims (c) DNA profiling (d) Disputed paternity and maternity
COMMUNITY MEDICINE		
57	epidemiology of blood borne diseases	190. Identify important blood borne pathogens and how they are spread 191. Discuss the epidemiology of blood borne disease transmission and the potential for HIV, HBV and HCV transmission. 192. Identify routes of transmission of blood borne pathogens 193. Discuss the best practices to perform safe blood transfusion. 194. Identify potential exposure risks 195. List important safeguards against blood borne pathogen disease
LAB WORK (Physiology Practical)		
58	Blood grouping	196. Determine the O-A-B and Rh blood group in the given sample
59	Blood smear preparation	197. Prepare blood smear by thumb prick method.
60	Blood Bank	198. Observe the process of blood donation, blood product separation, screening and storage and observe the process of blood transfusion.

