

Jinnah Sindh Medical University

	Spiral I
MODULE TITLE	Cardiovascular system -I (CVS)
INTRODUCTION	<p>This module is the first step towards producing doctors who have the basic information for decision making. This module provides the basis for Cardiovascular 2 and then rotations of Medicine in later years and help students develop necessary skills in diagnosing and developing management plans for common Cardiovascular related conditions. This module will focus on the normal structure and function of the cardiovascular system and will help students apply this information to solve clinically relevant problems suitable for this level of students.</p>
RATIONALE	<p>CVS related morbidity and mortality in Pakistan are among the highest in the region. An in-depth understanding of managing CVS conditions is an essential part of expertise by our graduates. The country needs to offer safe health care delivery and produce safe general practitioners, especially those who can identify and provide initial management for CVS conditions. Hence it becomes imperative for institutions to provide detailed and clinically relevant information related to basic sciences to its students.</p>
TARGET STUDENTS	1st year MBBS, 2022
DURATION	4 weeks
MODULE OUTCOME	<p>By the end of CVS-1 module, students will be able to describe the development, structure, and gross and biochemical functions of various parts of the Cardiovascular System.</p>
DEPARTMENTS	Anatomy, Biochemistry, Physiology
OBJECTIVES	By the end of the module, students will be able to:

LECTURES

ANATOMY

1. Overview of Cardiovascular system

- Explain the organization of cardiovascular system
- Enumerate the components of cardiovascular system
- Enumerate the vessels related to the heart

2. Middle Mediastinum: Pericardium

- Describe the boundaries of middle mediastinum
- Discuss the contents of the middle mediastinum
- Explain the different coverings of heart (pericardium)
- Discuss the location of pericardial sinuses
- Discuss the clinical conditions associated with the pericardium

3. External features of the Heart

- Describe the location, coverings, borders & surfaces of the heart
- Discuss the external features of heart
- Briefly discuss the chambers and valves of the heart
- Discuss the different circulatory circuits and their working

4. Heart: Internal features- I & II (Demonstration)

- Describe the anatomical position of the heart
- Describe the chambers and valves of the heart
- Discuss the internal features of chambers and valves of right & left sides of heart.

5. Histology of Heart

- Discuss the basic structure of blood circulatory system
- Enumerate the layers of the walls of heart
- Describe the histological characteristics of cardiac muscle
- Discuss the structure and significance of intercalated discs

6. Coronary blood vessels, blood supply of heart

- Describe coronary circulation and its importance
- Name the different branches of coronary arteries and their area of supply
- Describe variations of coronary arteries and right and left dominance
- Discuss variations of coronary artery disease
- Discuss clinical manifestations of blockage of coronary arteries
- Discuss Myocardial Infarction and Angina Pectoris in relation to vessel occlusion

7. Conducting system of heart and nerve supply

- Describe the conducting system of heart
- Explain the different components of conducting system

- Discuss blood supply of conducting system of heart
- Discuss the innervation of heart and clinical relevance of cardiac pain

8. Surface markings of heart, valves and great vessels

- Describe the position of the heart
- Identify the surface anatomy of heart on a mannequin or normal subject
- Identify the surface marking of the borders, great vessels and valves of heart
- Identify the surface markings of the areas of auscultation.

9. Development of Heart

- Discuss the development of heart tube
- Describe the development of atria and interatrial septum, AV valves and aortic and pulmonary valves, ventricles and interventricular septum
- Describe the partitioning of outflow tract and role of neural crest cells during it

10. Congenital Anomalies of the Heart (Excluding vessels)

- Describe congenital heart defects
- Discuss clinical features of heart defects

11. Development of arterial system & anomalies

- Discuss the relation of pharyngeal arches and aortic arches
- Explain the fate and formation of aortic arches
- Describe the formation of brachiocephalic trunk, common carotid and left subclavian arteries
- Describe the anomalies of arterial system

12. Development of veins and their anomalies

- Describe the major veins of heart, coronary sinus, anterior cardiac veins, venae cordis minimae
- Explain the development and fate of umbilical, vitelline and cardinal veins
- Describe the anomalies of venous system

13. Fetal Circulation

- Describe the components of fetal circulation
- Describe the location of foramen ovale
- Describe the ductus arteriosus
- Explain the path of fetal circulation
- Explain the changes in circulation after birth
- Discuss the problems with persistence of fetal components of circulation after birth (patent ductus arteriosus and patent foramen ovale)

BIOCHEMISTRY

TOPIC 1: LIPID METABOLISM

1. Fatty Acid & Triacylglycerol Metabolism

- Briefly describe the digestion and absorption of lipids
- Discuss the biochemical significance of Fatty Acids
- Discuss the synthesis of fatty acids
- Discuss the regulation of fatty acid synthesis
- Describe energy requirement during fatty acid synthesis
- Describe the synthesis of Triacylglycerol

2. Beta oxidation

- Discuss the beta oxidation of fatty acids
- Discuss the regulation of beta oxidation
- Describe energy generation during beta oxidation
- Name the steps of unsaturated fatty acid oxidation
- Compare fatty acid synthesis with fatty acid oxidation

3. Cholesterol Metabolism

- Briefly describe the structure and functions of cholesterol
- Describe the mechanism of cholesterol synthesis and its degradation
- Discuss the regulation of cholesterol metabolism
- Explain the formation of Bile salts and vitamin D
- Describe the clinical significance of cholesterol
- Discuss the biochemical role of cholesterol in CVS diseases
- Discuss the clinical significance of hyperlipidemia

4. Transport of Lipids

- Classify the lipoproteins
- Discuss the metabolism, transport and clinical significance of lipoproteins

5. Ketone Bodies Metabolism

- Classify the Ketone bodies
- Describe the biochemical role of Ketone bodies, their synthesis and utilization
- Discuss the mechanism of ketoacidosis
- Discuss the clinical significance of ketone bodies

6. TOPIC 2: OXIDANTS & ANTIOXIDANTS

- Classify oxidants and antioxidants
- List the sources of oxidants and antioxidants
- Discuss their biochemical role specially with reference to CVS diseases

7. TOPIC 3: ROLE OF MINERALS IN BLOOD PRESSURE REGULATION

- Discuss hypertension and its risk factors
- Describe the mechanism of action of sodium and potassium in blood pressure regulation
- Explain dietary approaches to reduce hypertension
- List other life style interventions for the management of hypertension

PHYSIOLOGY

1. Properties of cardiovascular muscles

- Define the properties of cardiac muscles
- Explain the phenomenon of generation of action potential in cardiac muscles and process of excitation contraction coupling

2. Excitatory and conductive system of heart

- Describe the conducting system of heart, and role of pacemaker in maintaining cardiac rhythm
- Explain the regulation of heart rhythm and conduction by autonomic nervous system

3. Cardiac cycle and heart sounds

- Describe events of cardiac cycle and associated events (pressure changes and heart sound generation), and its effect on volume of heart chambers and vessels (aorta, pulmonary artery)

4. ECG 1: Lead System

- Describe 12 lead ECG record
- Define Einthoven's triangle & Einthoven's law

5. ECG 2: Normal ECG pattern

- Explain the normal ECG waves

6. ECG 3: Vector Analysis

- Analyze ECG vectors and their interpretation
- Define right & left axis deviation

7. Cardiac arrhythmia

- Define arrhythmia
- Discuss the common cardiac arrhythmias, their causes and effects

8. Overview of circulation (blood flow, pressure, resistance)

- Define vascular distensibility and compliance
- Define blood flow pressure and resistance in different blood vessels
- Explain veins and their functions

9. Cardiac output, venous return and its regulation

- Define cardiac output and factors regulating cardiac output

10. Nervous regulation of circulation and arterial pressure

- Define arterial blood pressure state mechanism of regulation of blood pressure (short, intermediate, long term)

11. Intermediate and long term control of blood pressure

- Discuss the processes and regulatory mechanisms of intermediate and long term control of blood pressure

12. Local control of blood flow

- Explain the process of Acute and long term blood flow regulation
- Discuss auto regulation of blood flow
- Describe humoral regulation of circulation

13. Micro-circulation

- Describe Starling Equilibrium for capillary exchange

14. Lymphatic system and edema

- List the functions of lymphatic systems
- Define edema and its types
- Describe the process of edema formation

15. Circulatory shock

- Explain physiological causes of shock, its stages and types

16. CVS adaption during exercise

- Describe cardiovascular adaptation to exercise

17. Ischemic Heart Diseases (IHD)

- List the common ischemic heart diseases
- Define common IHDs
- Discuss the changes and effects of common IHDs

TUTORIALS

ANATOMY

1. Anatomic Radiology

- Identify parts of the heart and major vessels on normal chest X ray

BIOCHEMISTRY

1. Lipid Profile

- Discuss the importance of lipid profile in CVS diseases
- Correlate the laboratory investigations with relevant clinical conditions

2. Cardiac Biomarkers

- Discuss the importance of cardiac bio-markers in CVS diseases
- Correlate the laboratory investigations with relevant clinical conditions

PRACTICALS

ANATOMY

1. Histology of the heart

- Describe the characteristic histological features of cardiac muscle and layers of heart walls under the light microscope

2. Histology of vessels

- Describe the characteristic histological features of blood vessels under the light microscope

BIOCHEMISTRY

1. Triacylglycerol (TAGs)

- Identify the chemical tests and bio-techniques to detect Triacylglycerol
- Outline the method for detection of Triacylglycerol in a sample
- Describe the estimation of TAGs in the given sample by Spectrophotometry
- Correlate the laboratory investigations with relevant clinical conditions

2. Total Cholesterol, HDL (High Density Lipoprotein) & LDL (Low Density Lipoprotein) Estimation

- Identify the chemical tests and bio-techniques to detect total cholesterol, HDL & LDL
- Outline the method for detection of total cholesterol, HDL & LDL in a sample
- Perform the estimation of total cholesterol, HDL & LDL in serum by Spectrophotometry
- Correlate the laboratory investigations with relevant clinical conditions

3. Cardiac Bio-markers

- Outline the bio-techniques for detection of cardiac bio-markers in a sample
- Discuss the importance of cardiac bio-markers in the diagnosis of CVS disease
- Correlate the laboratory investigations with relevant clinical conditions

PHYSIOLOGY

1. Power lab: The refractory period of cardiac muscle

- Describe how to record refractory period of cardiac muscles through power lab

2. ECG (its major components, Correlation of ECG and heart sounds) <ul style="list-style-type: none">Describe how to setup ECG machine and arrangement of leads	
3. Normal and abnormal heart sounds <ul style="list-style-type: none">Describe how to differentiate between normal and abnormal heart sounds	
4. Examination of arterial pulses <ul style="list-style-type: none">Examine arterial pulses in normal human subjectDefine common abnormal arterial pulsations	
5. Recording of blood pressure <ul style="list-style-type: none">Describe how to record blood pressure by palpatory and auscultatory methods	
INTERNAL ASSESSMENT	<ul style="list-style-type: none">Continuous monitoring of attendance and practical assessment in short groups.It will be in the form of MCQs, assignments, stages/sub-stages, projects, quiz or OSPE.Internal evaluation carries 20% weightage in summative semester examination.
FINAL EXAM	Final Annual exam will consist of MCQs (One Correct & One Best) and OSPE (observed + unobserved stations)
COURSE EVALUATION	Course evaluation will be obtained through a feedback form which will be posted on the JSMU website