Cardiovascular System (CVS) Module

First Professional Year MBBS

5 Weeks

KMU - Central Curriculum Committee

LIST OF TEAM MEMBERS

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Themes of CVS module

1- Chest pain- (1 week)	2- Breathlessness and ankle swelling- (2 weeks)	3- Blood Pressure - (1 week)
4- Palpitations (1 week)		

General Learning outcomes

At the end of this module, the students will be able to;

1) Describe the structure and surface markings of the heart, valves and great vessels
2) Describe the steps of development of the heart
3) Describe the steps of development of arterial, venous and lymphatic system
4) Describe the conduction system of the heart
5) Describe the anatomy of valves of the heart
6) Describe the microscopic structure of myocardium, and blood vessels
7) Describe the cardiac cycle
8) Discuss cardiac output, and venous return
9) Discuss blood pressure and its regulation
10) Discuss coronary circulation and diseases associated with it
11) Describe the mechanisms and types of circulatory shock and associated compensatory mechanisms
12) Describe the anatomy and common pericardial diseases
13) Describe the cardiac enzymes
14) Discuss the hyperlipidemias and the roles lipoproteins and cholesterol in the development of atherogenesis
15) Describe the mechanisms of impulse generation, conduction and excitation of myocardium
16) Discuss normal ECG and common ECG abnormalities

17) Enlist the drugs used in ischemic heart disease and hyperlipidemias
18) Describe preventive strategies of cardiovascular diseases

Specific learning objectives (theme based)

1- Chest Pain			
Subject	**Topic**	**S. No**	**Learning objectives**
Anatomy	Surface anatomy	1	Describe the surface marking of the heart
		2	Describe the surface marking of the heart valves
		3	Illustrate the surface marking of the aorta on models / x-rays
		4	Describe the surface marking of the superior vena cava
		5	Describe the surface marking of the inferior vena cava
		6	Describe the gross structure of the heart
	Coronary circulation	7	Describe the coronary arteries
		8	Enlist the branches of each main artery
		9	Describe the anastomosis of coronaries
		10	Identify the area of the heart supplied by a coronary artery and its branches
		11	Describe the venous drainage of the heart
		12	Describe the lymphatic drainage of the heart

	Pericardium	12	Define pericardium
		14	Describe different reflections of pericardium
		15	Identify entry & exit of vessels of heart via pericardium
		16	Define the following clinical condition; pericarditis pericardial effusion cardiac Tamponade
Histology	Histology of heart muscles	17	Explain the characteristics of cardiac muscle cell
		18	Explain the Structure of Intercalated disc
		19	Define the junctional specializations making up the intercalated disk
		20	Describe identification of different microscopic views of Cardiac muscle and its ultra-structures
		21	Differentiate histologically between cardiac and skeletal muscle and smooth muscles
		22	Enumerate histological layers of heart wall
Physiology	Cardiac muscles	23	Explain the physiologic anatomy of the cardiac muscle
		24	Describe the properties of the cardiac muscle
	Coronary circulation	25	Describe the physiologic basis coronary circulation
		26	Describe the steps of coronary thrombosis
		27	Describe the etiology of coronary thrombosis
Biochemistry	Cardiac enzymes	28	Identify the enzymes that increase in myocardial

			infarction
	Lipids and cholesterol	29	Describe the Chemical Structure and function of cholesterol
		30	Describe the fate of cholesterol in the body
		31	Define and Classify lipids
		33	Describe the functions of lipids in the body
		34	Classify lipoproteins and their functions
		42	Describe Cardiac enzymes and their pattern of elevation in ischemic heart diseases
		47	Describe the role of Na, K, Ca and Mg in cardiac muscles contractility and their biochemical abnormalities
		48	Describe the cardiac manifestations of vitamin B1 deficiency
Pharmacology		49	Enlist the groups of drugs used in the treatment of CAD (angina and MI)
		50	Enlist the groups of lipids lowering drugs
Pathology		51	Describe the risk factors, and lab. Diagnosis of CAD
		52	Define and Enlist the stages of atherosclerosis
Forensic medicine		53	Describe the medicolegal aspects of sudden death due to cardiovascular diseases
Community Medicine	Prevention of CVD	54	Describe primordial, primary, secondary and tertiary prevention of CV diseases in community
2- Breathlessness and ankle swelling			
Embryology	Fetal circulation	55	Describe the physiological changes in circulation

			after birth
	Cardiac developmental anomalies	56	Enlist the developmental anomalies of heart
		57	Describe the congenital anomalies of the heart. ASD VSD PDA Tetralogy of Fallot transposition of the great vessels Hemangiomas and Telangiectasia
Physiology	Cardiac cycle	58	Describe the Cardiac cycle
		59	Describe the concept of systole and diastole,
		60	Describe the role of atria and ventricles as pumps,
		61	Describe the functions of heart valves,
		62	Correlate the cardiac cycle events with ECG
		63	Describe the mechanism of production of normal and abnormal heart sounds
		64	Relate heart sounds with cardiac cycle,
		65	Describe the metabolism and oxygen utilization of cardiac muscle
		66	Describe the regulation of cardiac cycle
	Cardiac output	67	Describe pressure volume loop (end-systolic volume / end-diastolic volume / ejection fraction /

			systolic volume / systolic work output)
		68	Explain the Frank-Starling mechanism of the heart for the control of cardiac output by venous return
		69	Describe the methods for measuring of cardiac output
		70	Describe normal cardiac output and venous return during rest and during activity
		71	Enlist the causes of abnormally high and abnormally low cardiac output
		72	Explain the mechanisms of normal cardiac contractility and the role of calcium ion/ ATPase pumps
		73	Explain cardiac output (regulation/measurement) and peripheral resistance and its regulation
		74	Explain the factors regulating cardiac output and venous return.
	Blood flow	75	Describe the Biophysics and Interrelationships of Pressure, Flow, and Resistance in terms of Ohm's law and Poiseuille's Law
		76	Describe starling forces
		77	Describe regulation of blood flow
		78	Define basal tone.
		79	List several substances potentially involved in local metabolic control of vascular tone.
		80	State the local metabolic vasodilator hypothesis.
		81	Describe physiological Vasodilators and

			Vasoconstrictors and their mechanisms
		82	Describe the factors affecting the local blood flow including auto-regulation.
		83	Describe the function of capillaries
		84	Describe circulatory changes during exercise
		85	Describe blood flow to different organs like brain, heart, liver and skin during exercise
	Functions of heart valves	86	Describe the functions of mitral, tricuspid, aortic and pulmonic valves
		87	Describe the hemodynamics and sequel related to stenosis and regurgitation of heart valves
	Lymphatic system	88	Describe the function of lymphatic system in the maintenance of interstitial fluid volume.
		89	Describe the effects of Interstitial Fluid Pressure on Lymph Flow.
		90	Describe how changes in capillary hydrostatic pressure, plasma oncotic pressure, capillary permeability, and lymphatic function can lead to tissue edema
Medicine	Heart failure	91	Define Heart failure
		92	Differentiate between right-sided Heart failure and left-sided heart failure
3- Blood Pressure			
Anatomy			
	Histology of	93	Describe the histological composition of vessel

	blood vessels		
		94	Describe the microscopic structure of artery and vein
		95	Differentiate histologically between artery and vein under light microscope
		96	Describe the histological composition of lymphatic channels
Embryology	Development of arteries and veins	97	Describe the development of arterial system
		98	Describe the development of venous system
		99	Describe the congenital abnormalities in in the vessels. - Coarctation of Aorta
Physiology	Blood Pressure	100	Define blood pressure
		101	Describe the causes of High / low BP
		102	Discuss the mechanisms for rapid and long term control of blood pressure (including Renin Angiotensin system)
		103	Describe the effects of sympathetic and parasympathetic stimulation on the heart and circulation
	Circulatory Shock	104	Define Circulatory Shock
		105	Explain the physiologic causes of circulatory shock
		106	Explain the stages of circulatory shock
		107	Describe cardiogenic shock

		108	Describe Hemorrhagic Shock
		109	Describe of Neurogenic Shock
		110	Describe Anaphylactic Shock
		111	Describe Septic Shock
		112	Explain the physiology of treatment in Shock
Pharmacology		113	Describe the mechanisms of drugs used in the treatment of Hypertension
Community medicine		114	Describe the preventive strategies of hypertension
4- Palpitations			
Anatomy	Conduction system of the heart	115	Describe the different components of conduction system SA Node AV Node Bundle of His Purkenje Fibers Bundle branches
		116	Describe the sympathetic innervation of heart
		117	Describe the parasympathetic innervation of the heart
Physiology	Excitation and contraction of cardiac muscles	118	Describe the excitation–contraction process in cardiac muscle. Describe Chronotropic, Inotropic and Dromotropic Effects
		119	Describe Chronotropic, Inotropic and Dromotropic Effects
		120	Differentiate excitation–contraction process in

			cardiac and skeletal muscle cells
		121	Describe gap junctions and the significance of functional syncytium
		122	Explain phases of cardiac muscle action potential
		123	Describe the characteristics of cardiac action potentials and the role of “slow calcium” channels in causing plateau and its significance
		124	Describe the significance of AV nodal Delay
		125	Define Pacemaker and explain why SA node is the normal pacemaker of the heart
		126	Define Ectopic Pacemaker and describe its causes
		127	Describe the effects of sympathetic and parasympathetic stimulation on the heart rate and conduction of cardiac action potentials
		128	Define various types of refractory periods
		129	Differentiate the refractory period of cardiac muscle with that of skeletal muscle
		130	Describe the significance of prolonged action potential in cardiac muscle
		131	Describe the physiological anatomy of the sinus node
		132	Define automaticity and rhythmicity and conductivity
		133	Describe the specialized excitatory and conductive pathway of the cardiac muscle tissue
	ECG	134	Describe the characteristics of normal ECG, time duration of waves, segments and voltages
		135	Explain how to record ECG

		136	Describe the AV nodal, ventricular impulse conduction
		137	Interpret ECG paper and its calibration
Community Medicine	CVD prevention	138	Identify the major risk factors which contribute to common diseases of the cardiovascular system
		139	Enumerate modifiable and non-modifiable risk factors of CV diseases
		140	Apply primordial, primary, secondary and tertiary prevention of CV diseases in community

Psychomotor domain		
Chest Pain	Anatomy	1- Identify the heart & its coverings in the model / dissected specimen 2- Identify the heart and major blood vessels in cadaver/dissected specimen 3- Identify the chambers of the heart. 4- Identify the internal structures of various chambers of the heart. 5- Identify the Cardiac Muscle under the microscope
	Physiology	6- Perform basic life support.
Blood Pressure		7- Identify salient features of a medium sized artery & vein in a cross-section under microscope. 8- Identify the histological differences between medium size artery & vein under microscope. 9- Describe the histological differences between large size artery & vein.
Breathlessness and ankle swelling	Clinical	10- Identify normal cardiac shadow, borders and cardiomegaly on chest radiographs. 11- Identify the position of borders and valves of the heart by surface marking on model / simulator 12- Palpate and find apex beat, and auscultatory areas in the chest of the subject provided and describe their significance.

		13- Demonstrate the use of Stethoscope for Auscultation. 14- Differentiate between normal and displaced apex beat
	Physiology	15- Measure the blood pressure. 16- Measure the effect of posture and exercise on blood pressure. 17- Examine the arterial pulses. 18- Auscultate the heart sounds.
Palpitations		19- Perform systematic analysis of ECG
Affective domain		
PRIME		20- Demonstrate ability to give and receive feedback, respect for self and peers. 21- Carry out practical work as instructed in an organized and safe manner 22- Demonstrate empathy and care to patients. 23- Develop respect for the individuality and values of others - (including having respect for oneself) patients, colleagues and other health professionals 24- Organize& distribute tasks 25- Exchange opinion & knowledge 26- Develop communication skills and etiquette with sense of responsibility. 27- To equip themselves for teamwork 28- Regularly attend the classes 29- Role play for the counseling of patients with risk factors for coronary heart diseases on modification of life style 30- Role play for the counseling of patients with risk factors for coronary heart diseases on modification of life style