

Study Guide
MBBS YEAR I
BLOCK III
MODULE VI
Respiratory System
2026-2030

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VISION

National University of Medical Sciences envisions a world with a better quality of life for all by enhancing our contribution to healthcare, education, innovation, and research.



MISSION

To produce competent medical professional graduates equipped with sound knowledge & research capabilities based on scientific principles, imbued with ethics and moral values, primed to serve the community through the profession and pursue research & advanced training in any branch of medicine.

Program Learning Outcomes (PLOs)

By the end of 5-year MBBS program the WMC student should be able to:

- PLO 1. Independently manage common, non-critical clinical problems
- PLO 2. Assist in the management of critically ill patients & demonstrate competency in life saving procedures.
- PLO 3. Exhibit the attributes of an ethical professional.
- PLO 4. Conduct research which brings relevance to health care practices.
- PLO 5. Act as an efficient community health promoter.
- PLO 6. Exhibit scientific knowledge in all professional activities.
- PLO 7. Demonstrate clear and efficient written & verbal communication skills.
- PLO 8. Exhibit the habits of a lifelong learner.

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Introduction to the module:

Dear students

Welcome to the “Respiratory Module” of the first year of MBBS. Building on the fundamental concepts of medical sciences covered in the 1st and 2nd Block, this module will focus on teaching you specialized topics of the respiratory system.

This study guide is organized around themes represented by clinical cases or vignettes, which describe the different ways patients suffering from medical issues related to the respiratory system present to the clinics or emergency rooms. The learning objectives are mentioned to guide you to the relevant knowledge and skills. You should refer to these clinical cases during Small Group Discussions (SGDs) and Case-based learning (CBL) sessions. These themes, along with the learning objectives, are presented in the next section in a structured format for your easy understanding.

You will study, building on your previous knowledge from modules covered in the 1st and 2nd Block, the anatomical details, histology and the stages of embryological development of the thoracic wall, respiratory system as well as different anomalies and anatomical defects that may occur in addition to that you will learn about the normal functioning of lungs, mechanics, diffusion and transport of gases in respiratory system. You will also be taught about the biochemical role of vitamins and phospholipids in the body, and learn about the pathophysiology, diagnosis, and management of various common respiratory diseases that patients commonly present with.

This module comprises of four themes. Each theme is designed to align with anatomy, physiology, biochemistry, and clinical sciences to provide a holistic understanding.

All of the themes are incorporated with scenarios that make integration with anatomy, physiology, and biochemistry, along with clinical sciences. Most of our themes in this module **respiratory system** are integrated and have the content of anatomy, physiology & biochemistry, which are linked together. However, there are usually a few sessions or themes that may not obviously integrate; you will observe that in themes 3 and 4. For better presentation and understanding, we have divided theme 3 in three subdivisions as 3a, 3b, and 3c. this will help in better understanding of each subject's content. The biochemistry content for themes 3 & 4 is the same, which is why you will not find biochemistry learning objectives under theme 4 in your study guide.

To make you a well-rounded graduate, different subjects from the humanities and various generic competencies are part of the curriculum. Thus, apart from medical subjects, you will study Medical Ethics and Professionalism, Communication Skills, Functional English, Islamiyat, Quranic studies, and photography and videography will be taught as an elective discipline.

Some of the learning strategies you will encounter may be new to you, such as Large Group Interactive Sessions (LGIS), Flipped Classrooms, Small Group Discussions (SGDs), and the most interesting of all, Case-based Learning (CBL). CBL and SGD are scored for your active participation and critical thinking, and the score is counted toward the internal assessment. You will learn the clinical skills in “Skill Lab” and will do laboratory work in Laboratory sessions (practical)

You will undergo formative and summative assessments. Formative assessment will be in the form of tests, quizzes, and scoring of CBL and SGDs, while summative assessment will be done at the end of the Block, comprising both MCQs (multiple-choice questions) and SAQs (short answer questions). The performance exam will be taken at the end of Block III in the form of OSPE (Objective Structured Performance Exam).

The respiratory system maintains oxygen delivery and carbon dioxide removal, which are essential for cellular metabolism. Disorders of the respiratory system—such as asthma, COPD, pneumonia, tuberculosis, and lung cancer—are major causes of morbidity and mortality worldwide. Understanding respiratory system forms the basis for clinical decision-making in emergencies like hypoxia, respiratory failure, and critical care settings. So let's learn the competencies you will require as a doctor to manage these diseases.

Please feel free to contact me for questions and comments. Let's get started!

Structured summary/overview of themes

Block Code	Y1BIII MV
Anatomy	➤ Histology of the Respiratory System ➤ Development of the Respiratory System ➤ Gross anatomy of pleurae ➤ Lungs ➤ Gross features (Lobes, fissures, impressions, Bronchopulmonary segments) ➤ Neuro vasculature ➤ Clinical relevance ➤ Diaphragm ➤ Gross features (Parts & apertures) ➤ Clinical correlation ▪ Development of Gut tube and the body cavities ➤ Development of the Vertebral column, ribs
Physiology	• Mechanics of pulmonary ventilation • Lung compliance • Role of surfactant • Dead space • Lung volumes and capacities • Pulmonary circulation and its pressure • Blood flow through lungs • Pulmonary capillary dynamics • Pulmonary edema • Gas diffusion and partial pressure • Composition of alveolar and atmospheric air • Diffusion of gases through respiratory membrane • Factors affecting diffusion of gases • Ventilation perfusion ratio • Transport of oxygen and carbon dioxide • Oxy hemoglobin dissociation curve • Neuronal control of respiration • Peripheral control of respiration • Regulation of respiration during exercise • Factors affecting respiration • Respiratory insufficiency and its causes • Hypoxia and Oxygen therapy • Artificial respiration
Biochemistry	<u>Phospholipids</u> • Give the overview of chemistry of phospholipids. • Elaborate the metabolism of phospholipids

- Correlate the biomedical significance of Phospholipids in Acute Respiratory Distress Syndrome (ARDS)
- Discuss the clinical significance of Phospholipids (Paroxysmal nocturnal hemoglobinurias, Niemann-Pick disease, role of phospholipases in poisoning)

Hemoglobin

- Describe the structure of Hemoglobin and Myoglobin
- Elaborate the globin gene organization
- Discuss various types of Hemoglobin and explain its functions in detail
- Correlate the oxygen-binding capacity of hemoglobin and myoglobin with reference to the O₂- Hb dissociation curve
- List various factors affecting and regulating the oxygen-binding capacity of hemoglobin
- Explain the clinical disorders related to oxygen-Hb binding capacity (Carbon Monoxide Poisoning, Cyanide poisoning and Methemoglobinemia)
- Explain various Hemoglobinopathies (Hb-S, Hb-C, Hb-SC and thalassemia)
- Correlate the chemistry & biomedical significance of respiratory proteins (Hb, Mb, alpha-1 antitrypsin, elastin, cytochrome oxidase, IgA)

Vitamins

- Classify types of vitamins
- Discuss chemistry, sources, biochemical functions, metabolism and daily allowance of Water-soluble vitamins (Vitamin B Complex and Vitamin C)
- Discuss chemistry, sources, biochemical functions, Metabolism and daily allowance of Fat-soluble vitamins (Vitamin A, D, E and K)

Clinical relevance

- Discuss deficiency manifestations and hypervitaminosis of Water-soluble vitamins
- Discuss deficiency manifestations and hypervitaminosis of Fat-soluble vitamins
- Correlate the biomedical effects of Vitamin A deficiency with acute respiratory Infections

Icon index

Case-based learning (CBL)	
Small group discussion (SGD)	
Learning objectives	
Large Group Interactive Session (LGIS)	
Demonstration	
Laboratory Session (Practical)	
Skill Lab sessions	
Clinical case/vignette	
Critical Questions/Guiding Questions	
Interesting facts	
Useful links	
Important	
Self-assessment	

Week 1

Theme: Sudden-Onset Shortness of Breath



A 19-year-old male college student is brought to the emergency department after experiencing sudden, sharp pain on the right side of his chest while playing basketball. He also complains of shortness of breath. On examination, the doctor notes decreased chest expansion on the right side, hyper-resonance on percussion, and absent breath sounds on auscultation. A chest X-ray confirms the presence of air in the right pleural cavity with partial lung collapse.



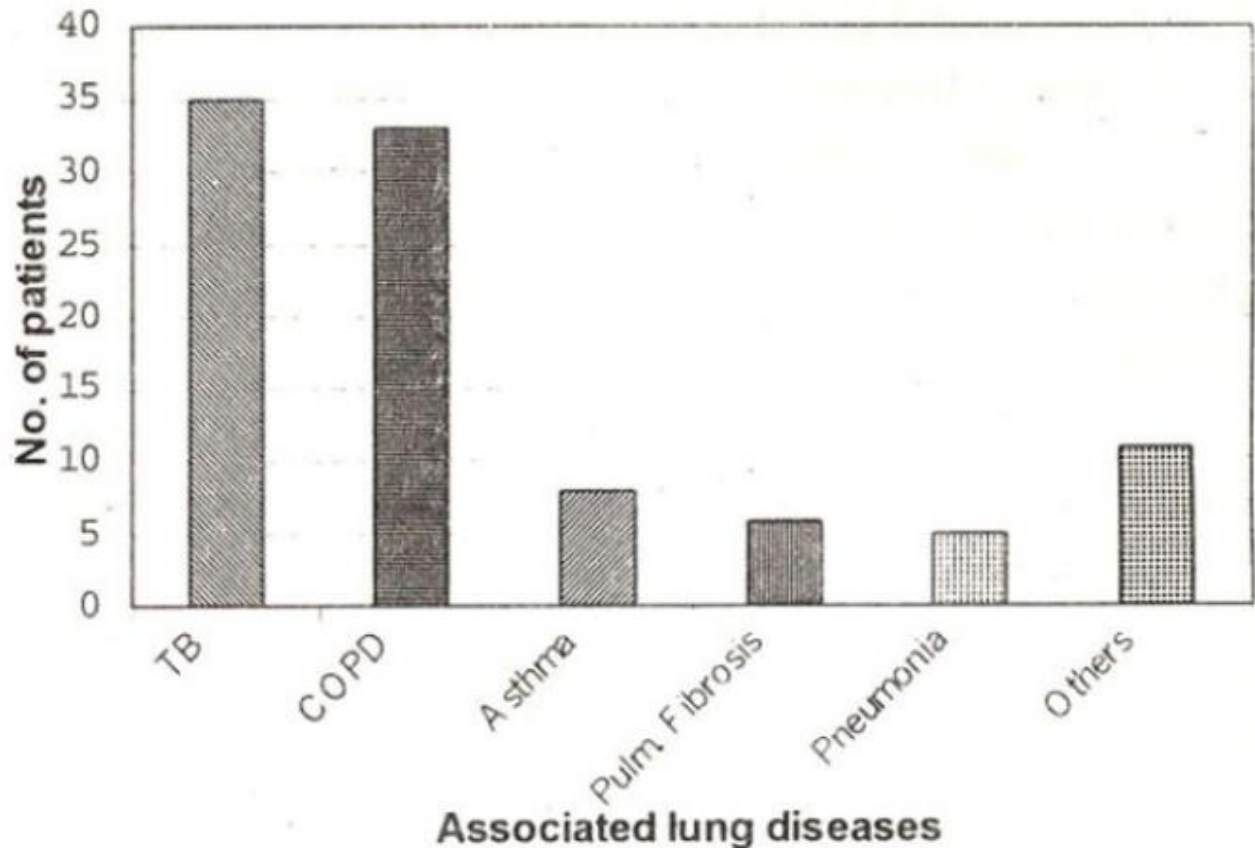
- Have you ever encountered a person with sudden, sharp pain chest in your vicinity? What was the outcome?



By the end of this session, the first-year MBBS students will be able to:

	Anatomy: • Identify various parts of pleura. • Recognize pleural reflections & recesses. • Correlate the innervation of visceral & parietal layers of pleura in different clinical presentations of pleurisy. • Explain the clinical significance of reflections and recesses of pleura & pleural cavity. • Recognize signs, symptoms & radiological findings of pleural effusion, pneumothorax, empyema & haemothorax.	
	• Recognize the light microscopic features of different parts of the respiratory system. • Correlate the microscopic structure of the respiratory system with its function and dysfunction. • Correlate the developmental events of respiratory skeletal system with its congenital anomalies.	
	<u>Physiology</u> • Explain the mechanics of quiet and forced inspiration and expiration. • Describe how changes in alveolar and intrapleural pressures cause airflow into and out of the lungs. • Explain the role of surfactant in reducing alveolar surface tension and preventing atelectasis. • Describe how lung compliance is affected in restrictive and obstructive lung diseases.	Must Know

	• Apply knowledge of pressure changes to interpret clinical situations such as pleural effusion, emphysema, or restrictive lung disease. • Predict how changes in intrapleural pressure during pneumothorax affect ventilation. • Differentiate between anatomical and physiological dead space. • Explain the concept of alveolar ventilation and its importance compared to minute ventilation. • Calculate alveolar ventilation given tidal volume, respiratory rate, and dead space. • Analyze the effects of high airway resistance (e.g., asthma) on work of breathing. • Correlate changes in lung compliance and resistance with spirometry findings in different diseases.	
	Spirometry	Must Know
	<u>Biochemistry</u> • Describe the structure of Hemoglobin and Myoglobin • Elaborate the globin gene organization • Discuss various types of Hemoglobin and explain its functions in detail • List various factors affecting and regulating the oxygen binding capacity of hemoglobin	Must Know
	• Explain the clinical disorders related to oxygen-Hb binding capacity (Carbon Monoxide Poisoning, Cyanide poisoning and Methemoglobinemia)	Must Know
	• Correlate the Oxygen binding capacity of hemoglobin and myoglobin with reference to the O₂- Hb dissociation curve	Good to know
	• Interpretation of HBA1c	Good to know



Reference: Lung diseases associated with Pneumothorax

Hussain, S. F., Aziz, A., Fatima, H. (1999). Pneumothorax: a review of 146 adult cases admitted at a university teaching hospital in Pakistan. Journal of Pakistan Medical Association, 49(10), 243-246. Available at: https://ecommons.aku.edu/pakistan_fhs_mc_med_intern_med/85

NOTES:

[illegible]

Important concepts:

Exam style question

Teacher's expectation

Week 2

Theme 2: Persistent Cough and Breathing Difficulty



A 60-year-old man, with a significant history of chronic and heavy cigarette smoking, presents with a **persistent cough for the past 4 months** that has not responded to conventional therapy. He describes **occasional hemoptysis (blood-streaked sputum)** along with **progressive dyspnea**. Over the last few weeks, he has also developed **unintentional weight loss, loss of appetite, and generalized fatigue**, suggesting systemic involvement.

On physical examination, **hard, non-tender supraclavicular lymph nodes are palpable**, raising concern for **metastatic spread**. A **chest radiograph** demonstrates an **irregular hilar mass in the right lung**, a typical location for bronchogenic carcinoma. Subsequent **sputum cytology** confirms the presence of **malignant epithelial cells**, thereby establishing the suspicion of **bronchogenic carcinoma**



- Have you ever encountered a patient with this type of carcinoma?

	By the end of this session, the students of first-year MBBS will be able to:	
	<u>Anatomy:</u> Discuss the gross features, blood supply, nerve supply, and lymphatic drainage of both lungs Correlate bronchopulmonary segments with their position and significance	
	• Describe the development of trachea and different stages of lung maturation. • Correlate the cells comprising respiratory and olfactory epithelium with their clinical significance • Differentiate between the light microscopic structure of conducting and gas exchange portion of respiratory system • Describe the components forming blood air barrier and the role of type-II alveolar cells in surfactant production	
	• Demonstrate the histomorphological features of trachea, bronchus, bronchioles and alveoli by focusing the slides at various magnifications under light microscope and illustrate them with help of hematoxylin and eosin.	



Physiology:

**Must
Know**

- Describe the anatomical and functional organization of pulmonary and bronchial circulations.
- Explain the differences between systemic and pulmonary circulatory pressures and resistances.
- Discuss the factors influencing pulmonary vascular resistance (PVR).
- Illustrate the effects of gravity on pulmonary blood flow distribution (zones of the lung).
- Explain the relationship between alveolar pressure, arterial pressure, and venous pressure in determining lung perfusion.
- Describe the effects of hypoxia and hypercapnia on pulmonary vascular tone.
- Discuss physiological changes in pulmonary circulation during exercise and in different body positions.
- Define pulmonary edema and differentiate between cardiogenic and non-cardiogenic causes.
- Describe the normal Starling forces controlling fluid movement across pulmonary capillaries.
- Explain the mechanisms by which left heart failure, increased capillary permeability, and decreased plasma oncotic pressure cause edema.
- Discuss the concept of pulmonary capillary wedge pressure and its clinical importance.
- Describe the protective mechanisms against pulmonary edema (lymphatic drainage, interstitial pressure, etc.).
- Explain the pathophysiological consequences of pulmonary edema on gas exchange.
- Describe the anatomy of the pleural membranes and pleural cavity.
- Discuss the role of lymphatic drainage in maintaining normal pleural fluid volume.
- Differentiate between transudative and exudative pleural effusions (with causes and mechanisms).

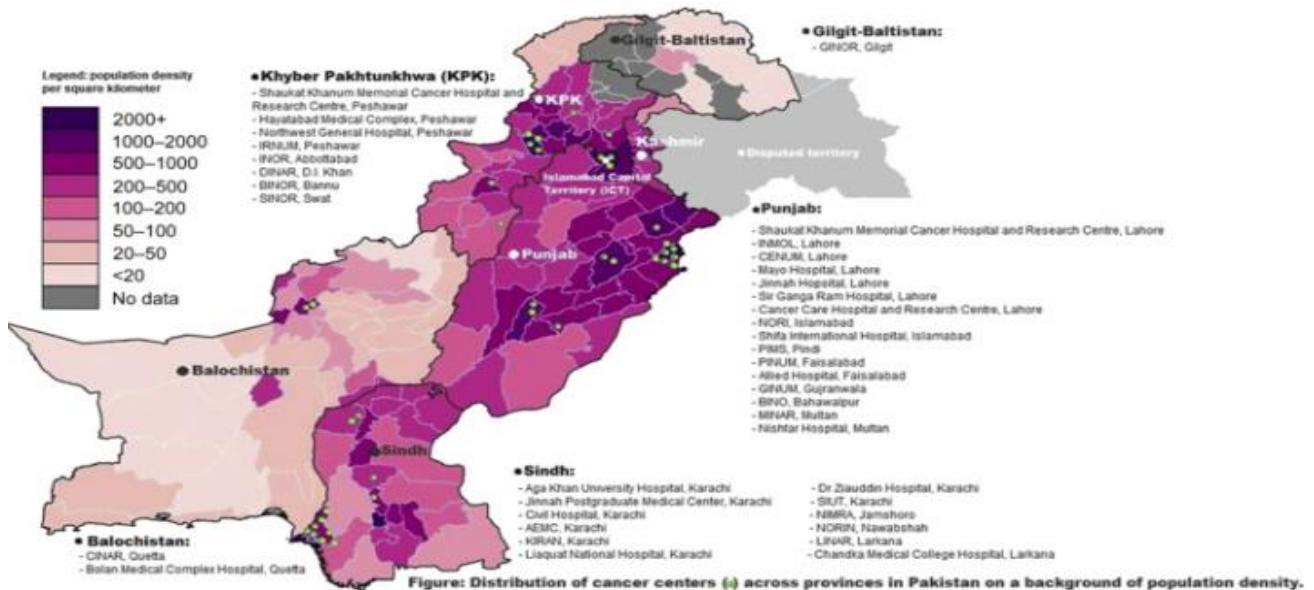
	• Explain the effects of pleural effusion on lung mechanics and ventilation. • Outline the clinical presentation and basic diagnostic approach to pleural effusion. • Define partial pressure of gases and explain Henry's Law of partial pressures. • Describe the composition of atmospheric, alveolar, and expired air. • Explain how partial pressure gradients drive gas exchange between alveoli, blood, and tissues. • Discuss the factors affecting alveolar partial pressures of oxygen (PO₂) and carbon dioxide (PCO₂). • Describe the concept of ventilation–perfusion (V/Q) ratio and its effect on gas exchange efficiency. • Describe the concept of physiologic shunt and physiologic dead space in ventilation–perfusion (V/Q) ratio. • Describe the structure and components of the respiratory membrane. • Explain Fick's Law of diffusion and its application to pulmonary gas exchange. • List the factors that determine the rate of gas diffusion across the respiratory membrane: • Surface area of the membrane • Thickness of the membrane • Diffusion coefficient of the gas • Partial pressure gradient • Compare the diffusion capacities of oxygen and carbon dioxide and explain why CO₂ diffuses more rapidly despite a smaller gradient.	
	Examine the chest for respiratory system	Must know
	Examination of the chest with respect to the respiratory system	
Checklist for chest Examination	<u>Inspection:</u> - Stand at foot end of patient. - Look for: • Body mass • Shape the chest	

	- Breathing pattern - Scar mark - Any gadgets attached or not c. Move to the right side of patient. Measure pulse and respiratory rate. Examine hands for tobacco staining, dubbing and tremors. Palpation: - Position of trachea - Compare movements of 60th side of chest. Palpate lymph nodes (submental, submandibular, SCM(Cervical), pre-& post auricular) Percussion: Lateral: 4th to 7th intercostal space on lateral side. Posterior: Ask patient to place right hand on left shoulder and left hand on right shoulder. Perform percussion on Apices, above spine of scapulae and below the spine of scapulae down to the 11th rib. Auscultation: - Ask patient to breath in and breath out while doing auscultation. - Place stethoscope on sites where percussion has been performed earlier. Whispering pectoriloquy. Ask patient to whisper 1, 1, 1 and auscultate the chest. <u>ATTITUDE</u> - Practice the art of taking consent and communicating with the patient prior to conducting ECG - Explain the procedure, reassure and communicate the precautions to be taken by the patient	
	<u>Biochemistry</u> Explain various Hemoglobinopathies (Hb-S, Hb-C, Hb-SC and thalassemia)	Must Know
	Correlate the chemistry & biomedical significance of respiratory proteins (Hb, Mb, alpha 1 anti-trypsin, elastin, cytochrome oxidase, IgA)	Good to know
	Estimation and clinical interpretation of Plasma Proteins	Good to know



Reference: <https://doi.org/10.1016/j.jtho.2022.01.009>

Lung cancer ranks among the top cancers in Pakistan, particularly among men, with a significant number of cases and deaths annually.





- ❖ **Oxygen's "small push, big impact"** – The alveolar-to-capillary PO_2 gradient is only about 60 mmHg, yet it is enough to fully saturate hemoglobin under normal conditions.
- ❖ **CO_2 is the "stealth gas"** – Despite a partial pressure gradient of only ~6 mmHg (alveolar to venous blood), CO_2 diffuses ~20 times faster than O_2 because it is more soluble in plasma.
- ❖ **Pulmonary edema's double hit** – It both thickens the respiratory membrane (slowing diffusion) and reduces alveolar surface area, making oxygenation much harder.
- ❖ **Diffusing capacity boost in exercise** – $DL(O_2)$ can increase up to threefold during exercise because more pulmonary capillaries open and alveolar surface area increases
- ❖ **Minimal but vital** – Only about 10–20 mL of pleural fluid is normally present, yet without it, breathing would be extremely painful due to friction.
- ❖ **Negative pressure secret** – The pleural space normally has a slightly negative pressure (~–5 cm H_2O) which helps keep the lungs expanded
- ❖ **Rapid turnover** – Pleural fluid is constantly being produced and absorbed via lymphatics in the parietal pleura—blockage here can quickly cause pleural effusion.

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Week 3

Anatomy

Theme 3a: Congenital Diaphragmatic Hernia (CDH)



A full-term newborn male is delivered after an uneventful pregnancy. Immediately after birth, the baby develops severe respiratory distress, with rapid breathing and cyanosis. On examination, the abdomen appears scaphoid (sunken), and breath sounds are markedly reduced on the left side of the chest.

The heart sounds are displaced to the right. A chest X-ray reveals gas-filled loops of intestine in the left thoracic cavity, with mediastinal shift to the right.



Critical Thinking Questions

1. What could be the reason for scaphoid abdomen?
2. Why were the intestinal loops seen in the thoracic cavity on X-ray



By the end of this session, the students will be able to:

	• Relate the development, structure & position of the diaphragm with its functional & clinical aspects. • Describe the formation of the intra-embryonic coelom and its divisions • Correlate the effects of folding with the relocation of different parts of the intraembryonic coelom • Elucidate the processes involved in the partitioning of intraembryonic coelom into definitive body cavities • Explain the contribution of different developmental sources of the Diaphragm • Correlate the nerve supply of the diaphragm with its developmental sources	•
	• Identify parts & list the apertures in the diaphragm with their levels and structures passing through each on a model • Describe the role of the diaphragm, thoracoabdominal muscles and thoracic cage in changing the diameters of thoracic cavity and mechanics of respiration	•
	<u>Biochemistry</u> • Give the overview of chemistry of phospholipids. • Elaborate the metabolism of phospholipids • Correlate the biomedical significance of Phospholipids in Acute Respiratory Distress Syndrome (ARDS)	Must Know

	● Discuss the clinical significance of Phospholipids (Paroxysmal nocturnal hemoglobinuria, Niemann pick disease, role of phospholipases in poisoning)	Must Know
	● Estimation and clinical interpretation of Serum Amylase	Good to know

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Physiology

THEME 3b: Headache, Dizziness, and Breathlessness



A Woman with complaints of headache, nausea and dizziness

A 30-year-old woman is brought to the emergency department in winter season after being found confused and drowsy in her apartment. Her roommate says they've had the gas heater running all night due to a power outage. She complains of headache, nausea, and dizziness.

On examination, she is tachycardic, SpO₂ is 99% on room air, but she appears confused and flushed.



Critical Thinking Questions

1. Why is the pulse oximeter reading misleading in this case?
2. What could be the reason for confusion and drowsiness?

	By the end of this session the first-year MBBS students will be able to:	Importance
	• Define the processes of oxygen and carbon dioxide transport in blood and tissue fluids. • Explain how oxygen is carried in blood: • Describe the oxyhemoglobin dissociation curve and the physiological significance of its sigmoid shape. • Discuss the factors shifting the oxyhemoglobin dissociation curve to the right or left (Bohr effect, temperature, pH, PCO₂, 2,3-BPG). • Explain how oxygen is delivered from capillary blood to tissues. • Explain the main forms in which CO₂ is transported in blood • Describe the chloride shift (Hamburger phenomenon) and its importance in CO₂ transport. • Explain the Haldane effect and its role in facilitating CO₂ transport. • Describe the diffusion gradients for O₂ and CO₂ between systemic capillaries and tissues. • Relate the partial pressures of O₂ and CO₂ in arterial and venous blood to tissue metabolism.	Must Know

	• Explain how oxygen and CO₂ transport mechanisms are integrated with pulmonary ventilation and tissue respiration. • Discuss how exercise alters O₂ and CO₂ transport dynamics. • Interpret the effects of anemia, carbon monoxide poisoning, and O₂ transport. • Explain the effects of respiratory diseases (e.g., COPD) on CO₂ transport and elimination.	
	Interpretation of ABGs	Must know



INTERESTING FACTS

Each hemoglobin molecule can carry **four oxygen molecules** — that's **over a billion O₂ molecules per red blood cell!**

The **oxyhemoglobin dissociation curve** is sigmoid-shaped because the first oxygen binds slowly, but each one makes the next binding easier (cooperative binding).

At rest, your tissues only extract **about 25%** of the oxygen carried by blood — the rest is a reserve for exercise or emergencies.

About **70%** of CO₂ is transported as **bicarbonate ions** — a chemical trick that also helps maintain blood pH.

The **Haldane effect** makes CO₂ unloading easier in the lungs when hemoglobin is oxygenated, while the **Bohr effect** helps oxygen unload in tissues with high CO₂.

Your body produces **~200 mL of CO₂ every minute** at rest — enough to inflate a small balloon every 5 minutes.

The **chloride shift** swaps bicarbonate for chloride ions across RBC membranes, keeping the electrical balance — without it, CO₂ transport would collapse.

2,3-BPG (bisphosphoglycerate) in RBCs lowers hemoglobin's oxygen affinity, helping oxygen jump ship in tissues — this is especially vital at high altitude.

Pulse oximeters can't tell the difference between oxyhemoglobin and carboxyhemoglobin — so in CO poisoning, SpO₂ readings can look normal while the patient is hypoxic.

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Week 4

THEME 4: Altered Breathing Pattern



An old man with barrel-shaped chest

A 75-year-old smoker presents to ER with shortness of breath, productive cough, and increased sputum production for the past three days. On examination, he is using accessory muscles to breathe, has a barrel-shaped chest, and pursed-lip breathing. His respiratory rate is 30/min, and pulse oximetry shows SpO₂ of 86% on room air. Auscultation reveals decreased breath sounds with prolonged expiration and scattered wheezes.

Chest X-ray showed hyper-inflated lungs with a tubular heart.



Critical Thinking Questions:

1. What is the reason of prolonged expiration?
2. Why did the heart appear tubular on X-ray?

	By the end of this LGIS the students will be able to:	
	<u>Anatomy:</u> Describe development of ribs, vertebrae with its congenital anomalies (Klippel-feil sequence, scoliosis, kyphosis)	
	<u>Physiology:</u> - Describe the overall goals of respiratory control in maintaining arterial PO₂, PCO₂, and pH. - Outline the basic components of the respiratory control system (sensors, central controller, effectors). - Identify the location and functions of the dorsal respiratory group (DRG), ventral respiratory group (VRG), and pneumotaxic center. - Explain the role of the pre-Bötzinger complex in generating the basic rhythm of breathing. - Describe the role of higher brain centers (cerebral cortex, hypothalamus) in voluntary and emotional control of breathing. - Describe the role of central chemoreceptors in sensing changes in PCO₂ and pH of cerebrospinal fluid.	Must know

	• Describe the role of peripheral chemoreceptors (carotid and aortic bodies) in sensing changes in PO_2, PCO_2, and pH in arterial blood. • Compare the sensitivity and response times of central vs. peripheral chemoreceptors. • Explain the ventilatory response to: Hypoxia (low arterial PO_2), Hypercapnia (high arterial PCO_2), Metabolic acidosis or alkalosis • Describe how respiratory control is altered in: COPD, Sleep apnea, CNS lesions affecting brainstem centers • Relate the physiological basis of respiratory insufficiency to common clinical scenarios COPD, Acute severe asthma, Pulmonary edema, Pneumonia	
	• Record & Interpret Peak expiratory flow rate	Must know
	<u>ATTITUDE</u> • Practice the art of taking consent and communicating with the patient. • Explain the procedure, reassure and communicate the precautions to be taken by the patient.	

Theme 4b Biochemistry



A 10-day-old neonate is brought to the emergency department with poor feeding, vomiting, irritability, and lethargy. The parents mention that the infant's urine has a sweet, maple syrup-like odor. On examination, the baby is hypotonic with episodes of abnormal movements and poor suck reflex.

Laboratory findings are Plasma amino acids: markedly elevated leucine, isoleucine, and valine, Metabolic acidosis present, Urine: increased branched-chain α -ketoacids.



Critical Thinking Questions:

1. What causes the sweet odor of urine?

	By the end of this session the students of first-year MBBS will be able to:	Importance
	• Discuss amino acid isomers • Elucidate the diseases associated with the metabolism of branch chain amino acids • Elucidate the diseases associated with the metabolism of branch chain amino acids (BCKD deficiency, Jamaica vomiting sickness). • Elaborate Protein folding mechanism. • Give an explanation to the disorders related to protein misfolding	Must know



INTERESTING FACTS

Your brain is the “autopilot” for breathing

Even unconscious, the medullary respiratory centers keep you breathing, unless damaged. CO₂, not O₂, is your main breathing trigger – a small rise (just 5 mmHg arterial PCO₂ above normal) can almost double ventilation.

You can hold your breath... but not forever

Rising CO₂ levels eventually override voluntary control via powerful brainstem drive.

Altitude climbers owe their lives to peripheral chemoreceptors

Without them, your breathing wouldn't increase enough to cope with low oxygen levels.

Your breathing changes before your blood gases change

Higher brain centers can anticipate physical activity and increase ventilation before muscles even start working (feedforward control).

The lungs have a “spare capacity”

A healthy person can lose up to 50% of functional lung tissue before noticeable symptoms appear at rest.

Respiratory muscle fatigue can itself cause respiratory insufficiency

Even if the lungs are healthy, as in severe neuromuscular diseases.

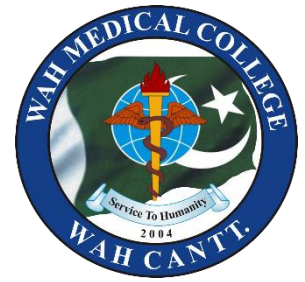
NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:



MODULE VII

MSK-II

2025-2029

Introduction to the module:

Dear students

Welcome to the MSK-II Module of the first year of MBBS. Building on the fundamental concepts of medical sciences covered in the 1st and 2nd Block, this module will focus on teaching you specialized topics of the lower limb and special Physiology including high altitude, space, deep-sea and sports Physiology, relating them to proteins, minerals and vitamins.

This study guide is organized around themes represented by clinical cases or vignettes, which describe the different ways patients suffering from medical issues present to the clinics or emergency rooms. The learning objectives are mentioned to guide you to the relevant knowledge and skills. You should refer to these clinical cases during Small Group Discussions (SGDs) and Case-based learning (CBL) sessions. These themes, along with the learning objectives, are presented in the next section in a structured format for your easy understanding.

You will study, building on your previous knowledge from modules covered in the 1st and 2nd Blocks,

This module comprises of many themes that are divided in five weeks. Each theme is designed to align with anatomy, physiology, biochemistry, and clinical sciences to provide a holistic understanding. However, there are usually a few sessions or themes that may not obviously integrate; you will observe that in week 1 there are 3 themes related to each subject content. Theme 1 for physiology will be continued in week 2.

Week 3 has same theme for physiology and anatomy; however, it does align with biochemistry so there is also theme 3b, this will help in better understanding of each subject's content. The physiology content for themes 4 & 5 is not shared as it remains revisit of previous themes.

Some of the learning strategies you will encounter may be new to you, such as Large Group Interactive Sessions (LGIS), Flipped Classrooms, Small Group Discussions (SGDs), and the most interesting of all, Case-based Learning (CBL). CBL and SGD are scored for your active participation and critical thinking, and the score is counted toward the internal assessment. You will learn the clinical skills in "Skill Lab" and will do laboratory work in Laboratory sessions (practical)

You will undergo formative and summative assessments. Formative assessment will be in the form of tests, quizzes, and scoring of CBL and SGDs, while summative assessment will be done at the end of the Block, comprising both MCQs (multiple-choice questions) and SAQs (short answer questions). The performance exam will be taken at the end of Block III in the form of OSPE (Objective Structured Performance Exam).

Please feel free to contact me for questions and comments. Let's get started!

Structured summary/overview of themes

Block Code	Y1BIII MVII
Anatomy	• Osteoarthritis ✓ Histology of Cartilage ✓ Histology of Bones ✓ Development of Limbs ✓ Development of Muscles ✓ Birth Defects ✓ Osteology of Hip bone ✓ Gross anatomy of gluteal region ✓ Osteology of Femur • Compartment Syndrome ❖ Hip joint ❖ Gross Anatomy of Thigh Region ✓ Skin, Fascia, Cutaneous nerves & vessels ✓ Inguinal lymph nodes ✓ Fascial compartments (Anterior, Medial & Posterior) ✓ Osteology of Tibia and Fibula • Saphenous Cut Down ✓ Knee Joint ✓ Anastomosis around knee joint ✓ Popliteal Fossa (Boundaries, Muscles, Vessels) ✓ Leg compartments (Anterior, Lateral & Posterior) ✓ Proximal & distal tibiofibular joints ✓ Venous drainage of Lower limb ✓ Blood Supply of Lower Limb • Flat foot ✓ Foot (Sole & Dorsum) ✓ Arches ✓ NVB ✓ Osteology of foot
Physiology	• <u>OSTEOARTHRITIS</u> ✓ Sports physiology • <u>ACUTE MOUNTAIN SICKNESS</u> ✓ Space and deep-sea physiology
Biochemistry	<u>Amino Acids and Proteins</u> ✓ Classify amino acids ✓ Protein folding mechanism

	✓ biochemical structure and functions of collagen and elastin ✓ Branched-chain amino acids ✓ Explain the metabolism of creatine ✓ Diseases associated with the metabolism of branch-chain amino acids ✓ Disorders related to protein misfolding ✓ Diseases associated with the metabolism of branch-chain amino acids ✓ Disorders related to protein misfolding <u>Minerals</u> ✓ Classify minerals ✓ Macro minerals ✓ Micro minerals ✓ Ultra-trace minerals
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Week 1

Theme1a Anatomy Sciatica



A 38-year-old office worker presents with severe pain that began in his lower back and radiates to the left buttock, down the back of the thigh, and into the lateral aspect of the leg. He describes it as “electric shock–like” pain that worsens when he coughs, sneezes, or sits for a long time. Walking on his heels is difficult. On Examination: Gait: Slight limp, avoids putting weight fully on the left leg. Straight Leg Raise Test: Positive at 40° on the left. Motor: Weakness of ankle dorsiflexion. Plantarflexion is intact. Sensory: Decreased sensation over the dorsum of the foot and great toe. Reflexes: Knee jerk is normal; ankle jerk is diminished.

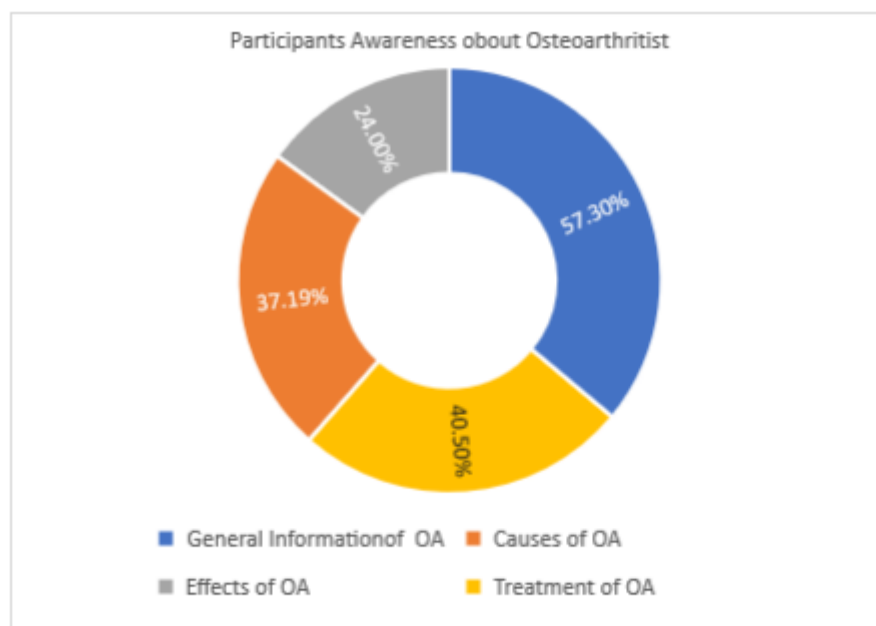


Critical Thinking Questions:

1. why does the pain worsen on cough and on sitting for a long time?
2. Why is there a limp on walking?

	By the end of this session, the first-year MBBS students will be able to:	
	Anatomy: • Demonstrate the anatomical orientation of the hip bone, determine its side, and identify the major bony landmarks along with their muscular and ligamentous attachments on both gross specimens and radiographic images. • Describe the anatomical features of the hip joint (type, articular surfaces, capsule, ligaments, relations). • Identify blood supply and nerve supply of the hip joint and their clinical significance in osteoarthritis. • Explain the anatomical basis of pain referral to the knee (role of obturator nerve). • Explain the factors of hip joint stability and Trendelenburg sign • Demonstrate the boundaries, muscles, and neurovascular structures of the gluteal region relevant to surgical approaches. • Identify the muscles of the gluteal region, indicating their attachments, innervation, and major actions. Note the roles of the gluteal muscles during locomotion.	

	- Describe the arrangement and mechanical significance of the deep fascia in the lower limb. Identify the fascia lata, iliotibial tract, and intermuscular septa in the hip and thigh. - Demonstrate the anatomical orientation of the femur, determine its side, and identify the major bony landmarks along with their muscular and ligamentous attachments on models and radiographic images. - Appraise the importance of blood supply of head of femur in relation to age related complications of fractures of femoral neck.	
	- Correlate microscopic structure of bones and cartilage with their function and dysfunction - Describe the development of limbs and muscles	
	- Histology of Hyaline, elastic and fibrous cartilage - Histology of Spongy and compact bone	Must Know



! Awareness level of participants about different aspects of Osteoarthritis in Pakistan



Reference: Awareness of Osteoarthritis among Housewives of Pakistan. Khurshid F, Farooq N, Ahsan S, Waqar S, Javaid SF. Awareness of osteoarthritis among housewives of Pakistan. Pak J Multidiscip Innov. 2022;3(2):10-5.

Theme 1b Physiology

Breathlessness at High Altitude



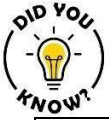
A 35-year-old gentleman previously healthy, travels from sea level to hiking in a hill at 3,400 meters (11,200 ft). Within 6 hours of arrival, he develops headache, nausea, dizziness and severe fatigue. The headache is dull and persistent, and he feels shortness of breath. On examination, his pulse is 110/min, respiratory rate 24/min, BP 120/70 mmHg, SpO₂ 86% on room air.



Critical Thinking Questions:

1. Why does the patient develop a headache and nausea within hours of arrival?
2. What causes his respiratory rate to increase?

	By the end of this session the students of first-year MBBS should be able to:	Importance
	• Explain the physiological effects of sudden decompression at high altitude. • Define hypobaric hypoxia and describe its cause at high altitudes. • Describe acute mountain sickness (AMS): pathophysiology, symptoms, and physiological basis. • Explain chronic adaptations to high altitude (acclimatization) • Distinguish between acute, subacute, and chronic mountain sickness.	Must know
	<u>SKILLS</u> • ABGs interpretation	Must know



INTERESTING FACTS

Jet lag in long flights happens because of **desynchronization of circadian rhythm** → melatonin regulation gets disturbed.

At Mount Everest (8,848 m), the inspired PO_2 is so low that **supplemental oxygen is almost mandatory** for survival. **Sherpas of Nepal and Andean natives** show natural genetic adaptation: Sherpas rely on **increased ventilation** while Andeans rely on **polycythemia**.

Astronauts returning from space often **faint on standing** because of loss of vascular reflexes and reduced blood volume → orthostatic hypotension. In microgravity, body fluids shift to the head → astronauts look “**puffy-faced**” and legs look thin (“bird legs”). NASA uses **resistance exercise and treadmills with harnesses** to simulate load and reduce muscle/bone loss.

Decompression sickness (“the bends”) got its name because divers developed painful joint bends from nitrogen bubbles in tissues.

Theme 1C Biochemistry

A 14-year-old girl presented with a 5-month history of progressively worsening hemorrhagic syndrome, including gingival bleeding, purpuric lesions, pallor, walking difficulties, myalgia, and bilateral knee and ankle pain. She also reported anorexia, weight loss, and generalized weakness. There was no history of trauma, similar illness, or family history of hematological/systemic disease.

On examination, she was pale, cachectic, and irritable, without fever, hepatosplenomegaly, or lymphadenopathy. Vitals were stable (BP 100/60 mmHg, HR 100/min, RR 24/min, Temp 37 °C). Anthropometry showed weight 20 kg and height 132 cm (both -3 SD). Musculoskeletal exam revealed knee flexion contracture, lower limb edema (ankles and right knee), and pain on joint mobilization, rendering her unable to walk. Cutaneous findings included petechiae and confluent ecchymoses on the legs. Oral examination revealed gingival bleeding with bilateral inflammatory lesions.



Critical Thinking Questions

- Why did she have walking difficulty and joint pains?
- What could be the reason of weight loss?



By the end of this session the first-year MBBS students will be able to:

Importance

	• Classify types of vitamins • Discuss chemistry, sources, biochemical functions, metabolism and daily allowance of Water-soluble vitamins (Vitamin B Complex and Vitamin C)	Must Know
	• Discuss deficiency manifestations and hypervitaminosis of Water-soluble vitamins	Must Know
	• Discuss deficiency manifestations and hypervitaminosis of Water-soluble vitamins	Must Know
	• Estimation & clinical interpretation of Vitamin C	Must Know

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Week 2

Theme 2a Anatomy Femoral Fracture



A 32-year-old male is brought to the emergency department after a road traffic accident where his motorbike collided with a car. He complains of severe pain in his right thigh and is unable to bear weight.

On examination, the right thigh is swollen, deformed, and markedly tender.

The leg appears shortened and externally rotated. Distal pulses (dorsalis pedis and posterior tibial) are palpable, but sensation is slightly diminished over the dorsum of the foot. The Vital signs Were BP: 90/60 mmHg, HR: 120/min, RR: 22/min, SpO₂: 95% on room air.



Critical Thinking Questions:

1. Why is the leg externally rotated?
2. Why is the leg shortened?

	By the end of this SGD the students of first-year MBBS will be able to:	Importance
	• Demonstrate/Explain compartments of the thigh (anterior, medial, posterior) and identify their boundaries, muscles, and contents. • Define the boundaries and contents of the femoral triangle. • Describe the composition of the femoral sheath, canal, and ring. • Describe the anatomical basis of a femoral hernia. • Define the boundaries of the popliteal fossa and describe its contents. • Identify the main components of the arterial anastomoses around the knee. • Correlate neurovascular bundles (femoral nerve, artery, vein, profunda femoris, sciatic nerve) with compartment involvement. • Demonstrate the anatomical position of the tibia and fibula, determine their sides, and identify the major bony landmarks along with their muscular and ligamentous attachments on models and radiographic images.	Must know

Theme 2b: Physiology:

Muscle Weakness and Bone Loss



A 42-year-old male astronaut, 6 months into an ISS mission, after returning from space mission he has Complaint of Blurred vision, mild headache, and feeling of eye pressure with decreased visual acuity, optic disc edema, and globe flattening on fundoscopy along with this he Complaint of Persistent lower back pain after a minor fall and difficulty in walking. DEXA scan shows 15% decrease in lumbar spine bone mineral density. he experiences Light headedness and near-syncope when he tries to stand.

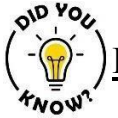


Critical Thinking Questions:

1. Why does he feel light-headedness when he tries to stand up?
2. Why does he has a complaint of difficulty walking?
3. Why does disturbance of vision occur?

	By the end of this session, the students of first-year MBBS should be able to:	Importance
	• Define aviation physiology and explain the physiological challenges faced during flight. • Describe the effects of acceleration, deceleration, and gravitational (G) forces on the human body. • Explain the concept of positive G and negative G effects on circulation (blackouts, redouts). • Understand the role of pressurized cabins and oxygen supplementation in high-altitude flights. • Describe the concept of microgravity and its physiological effects. • Explain cardiovascular changes in space: fluid redistribution, decreased plasma volume, and orthostatic intolerance on return to Earth. • Describe musculoskeletal changes: muscle atrophy and bone demineralization due to lack of gravity. • Discuss the effects of radiation exposure and circadian rhythm disturbance in space. • List countermeasures used in astronauts (exercise, pressure suits, pharmacological measures). • Define barometric (hyperbaric) pressure and explain its effect on partial pressures of gases during deep-sea diving. • Explain nitrogen narcosis and its mechanism. • Describe oxygen toxicity and its pathophysiology at high pressures.	Must know

	• Explain decompression sickness (“the bends”), its cause (nitrogen bubble formation), and preventive measures (slow ascent, decompression chambers). • Discuss modern applications: hyperbaric oxygen therapy.	
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INTERESTING FACTS

Jet lag in long flights happens because of desynchronization of circadian rhythm → melatonin regulation gets disturbed.
At Mount Everest (8,848 m), the inspired PO ₂ is so low that supplemental oxygen is almost mandatory for survival. Sherpas of Nepal and Andean natives show natural genetic adaptation: Sherpas rely on increased ventilation while Andeans rely on polycythemia .
Astronauts returning from space often faint on standing because of loss of vascular reflexes and reduced blood volume → orthostatic hypotension. In microgravity, body fluids shift to the head → astronauts look “ puffy-faced ” and legs look thin (“bird legs”). NASA uses resistance exercise and treadmills with harnesses to simulate load and reduce muscle/bone loss.
Decompression sickness (“the bends”) got its name because divers developed painful joint bends from nitrogen bubbles in tissues.

Theme 2C: Biochemistry

Vitamin D deficiency



An 18-month-old toddler presents with bowed legs, delayed walking, and widening of the wrists, caused by severe nutritional vitamin D deficiency.

His detailed history showed he was exclusively breastfed past 12 months with no vitamin D supplementation and very limited outdoor sunlight exposure due to indoor-focused care. The mother noticed the child stopped trying to pull to stand and prefers sitting.

Physical Exam showed noticeable outward bowing of both legs (genu varum) when standing. Prominent, widened wrists and ankles due to metaphyseal hyperplasia. A "rachitic rosary" (beading along the costochondral joints of the ribs). Delayed motor milestones (unable to walk independently yet).

Laboratory Findings showed Serum 25-hydroxyvitamin D: Markedly low (< 12 ng/mL), Serum Calcium: Low-normal or moderately reduced (hypocalcemia), Serum Phosphorus: Low (hypophosphatemia secondary to secondary hyperparathyroidism). Alkaline Phosphatase (ALP): Significantly elevated, indicating high bone turnover. Parathyroid Hormone (PTH): Elevated (secondary hyperparathyroidism).

Radiographic Findings: Wrist and knee x-rays show cupping, fraying, and widening of the metaphyses of long bones, alongside generalized osteopenia and widened growth plates.

Doctor discharged him on high-dose Vitamin D supplementation and daily dietary calcium. He gave dietary counseling to introduce vitamin D-fortified foods and cow's milk or appropriate supplements and encouraged supervised safe outdoor sunlight exposure.



.Critical Thinking Questions:

1. Is there any relation of age with patient condition?
2. What has sunlight exposure to do with this child's condition?

	By the end of this session the first-year MBBS students will be able to:	Importance
	Discuss chemistry, sources, biochemical functions, Metabolism and daily allowance of Fat-soluble vitamins (Vitamin A, D, E and K)	Must Know

	• Discuss deficiency manifestations and hypervitaminosis of Fat-soluble vitamins	Must Know
	• Correlate the biomedical effects of Vitamin A deficiency with acute respiratory Infections	Must Know
	• Estimation & clinical interpretation of Vitamin D	Must Know

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Week 3

Theme 3a: Anatomy

Physiology: Muscle Fatigue and Exercise Performance



A 22-year-old medical student participates in a high-intensity football match. During the final 20 minutes, he develops **muscle fatigue, breathlessness, increased heart rate, sweating, and reduced exercise performance**. After the match, he complains of **muscle cramps and generalized weakness**.



Critical Thinking Questions:

1. Why does muscle fatigue occur during intense exercise?
2. Why do heart rate and breathing increase during exercise?

		Importance
	<u>Anatomy:</u> • Describe the articular surfaces, type, capsule, ligaments, synovial membrane, nerve supply, blood supply, and important relations of Knee joints • Demonstrate various movements of knee joint (axes, limiting factors and muscles involved). • Analyze mechanism of locking and unlocking of knee joint while foot is off or on the ground. • Correlate various types of bursae (communicating and non-communicating bursae) to their clinical significance. • Identify the role of Vastus medialis in stability of patella. • Analyze various ligamentous & meniscal injuries of knee joint • Explain the structure and mechanism of knee joint movements. <u>Physiology:</u> • Define sports physiology and explain its importance in medical and athletic fields. • Differentiate between aerobic and anaerobic forms of exercise. • Describe the types of muscle fibers (slow-twitch vs. fast-twitch) and their roles in different sports activities. • Explain the concept of muscle fatigue and its physiological basis. • Discuss oxygen debt and recovery oxygen consumption.	Must know

	• Explain the sources of energy during exercise (ATP, creatine phosphate, glycolysis, oxidative metabolism). • Describe how energy utilization changes with duration and intensity of exercise. • Differentiate between short-term sprint energy vs. long-term endurance energy systems. • Describe the role of the cardiovascular system in meeting increased oxygen demand during exercise. • Explain cardiac output, stroke volume, and heart rate changes during exercise. • Discuss the redistribution of blood flow to muscles, skin, and other organs during exercise. • Describe the concept of VO₂ max and its significance in athletic performance. • Describe mechanisms of heat production and heat loss during exercise. • Explain physiological adaptations to exercise in hot vs. cold environments. • Understand the risk of heat stroke, heat exhaustion, and hypothermia. • Explain the physiological basis of doping and performance-enhancing drugs. • Describe the role of catecholamines, cortisol, growth hormone, and insulin in exercise metabolism.	
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Theme 3a: Biochemistry

Minerals



A 12-year-old girl from a mountainous village is brought to the clinic by her mother because of a swelling in the front of her neck that has gradually increased over the past year. The mother reports that the child often feels tired, struggles with concentration in school, and has been lagging behind her classmates in growth.

On examination, the girl appears short for her age and has a diffuse, soft swelling in the anterior neck region that moves with swallowing. Her pulse and blood pressure are within normal range. The family diet mainly consists of locally grown vegetables and grains, with little access to seafood or iodized salt.



Critical Thinking Questions:

1. Is there any association of diet with this condition?
2. What is the reason for tiredness and lack of concentration in this patient?

		Importance
	• Discuss the sources and biochemical role of ultra-trace minerals (I, Se, Mo, Co)	Must know

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Week 4

Theme 4a Anatomy

Compartment Syndrome



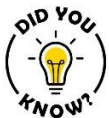
A 28-year-old male is brought to the emergency department after a high-speed motorbike accident. He sustained a closed fracture of the midshaft of the tibia and fibula. A tight plaster cast was applied to stabilize the fracture. Six hours later, he complains of severe pain in the affected leg that is not relieved by strong analgesics. On examination, his leg appears swollen and tense. Passive stretching of the toes causes excruciating pain. Distal pulses are faint, toes appear pale and cold, and capillary refill is delayed.



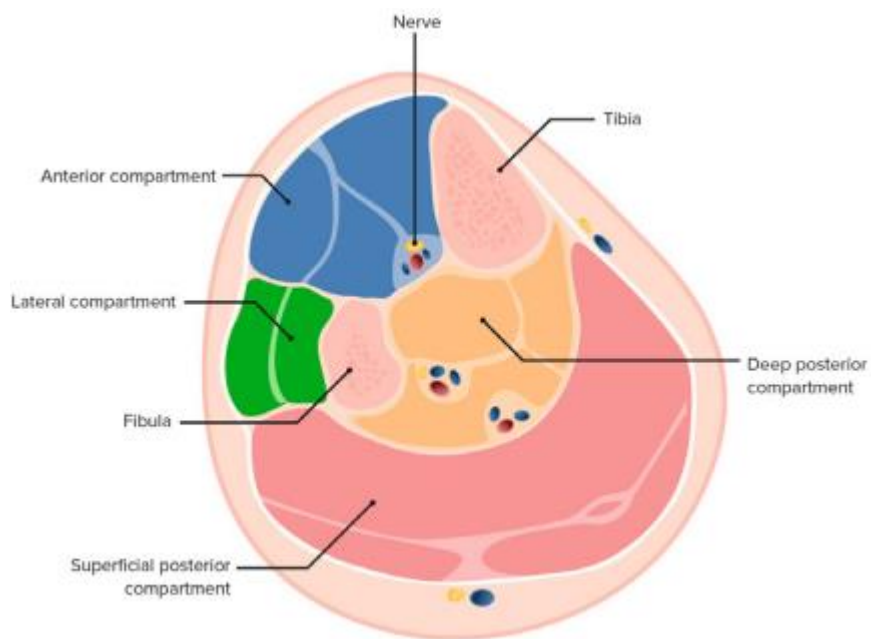
Critical Thinking Questions:

1. Have you ever come across a case of fracture where a tight bandage or cast was applied? What complications did you observe, and how might these be related to the development of compartment syndrome?

	By the end of this SGD the students of first-year MBBS will be able to:
	• Correlate neurovascular bundles (femoral nerve, artery, vein, profunda femoris, sciatic nerve) with compartment involvement. • Demonstrate the anatomical position of the tibia and fibula, determine their sides, and identify the major bony landmarks along with their muscular and ligamentous attachments on models and radiographic images.



- Compartment syndrome is an emergency condition requiring urgent diagnosis and immediate implementation of appropriate therapy.
- The condition can result from various causes (trauma, burns, coagulation disorders), but the most common cause is a tibial fracture.
- It is important to consider the possibility of iatrogenic CS (too tight dressings) and preventing it.
- The most important parameter for the diagnosis of compartment syndrome is ICP, being $> 30\text{mmHg}$ when the condition is present.



Reference: Miciak M, Jurkiewicz K. Compartment syndrome-a complex and insidious medical problem. Journal of Pre-Clinical & Clinical Research. 2023 Apr 1;17(2).

Theme 4b Biochemistry

Compartment Syndrome



5-year-old woman presents with fatigue, muscle cramps, and tingling around her mouth and fingers. She reports frequent episodes of muscle spasms, especially after exercise. On examination, she has a positive Chvostek's sign and Trousseau's sign. Laboratory tests show: Serum calcium: 6.8 mg/dL (low), Serum phosphate: 5.9 mg/dL (high), Serum magnesium: Normal, Parathyroid hormone (PTH): Low



Critical Thinking Questions:

1. What causes tingling around the mouth?
2. What is the reason for frequent muscle cramps after exercise?

	By the end of this SGD the students of first-year MBBS will be able to:
	• Explain the sources, biochemical role and RDA of Macro minerals (Na, K, Ca, Cl, P, Mg, F, S) in human body

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Week 5

Theme 5a Anatomy

Venous Cutdown



A 60-year-old man is rushed to the emergency department following a road traffic accident. He is pale, cold, and sweating profusely. His blood pressure is 70/40 mmHg, pulse is 140/min and he is tachypneic. Clinical diagnosis of hypovolemic shock is made. Peripheral veins have collapsed, and multiple attempts at intravenous cannulation in the upper arm fail. The surgical team decides to perform a saphenous vein cutdown at the ankle to secure venous access for rapid fluid resuscitation. An intern makes the skin incision but mistakenly enters a nearby artery, resulting in brisk bleeding. The supervisor immediately identifies the error, explains the applied anatomy, and successfully isolates the great saphenous vein, inserting a cannula to restore IV access.



By the end of this session, the students will be able to:



- Describe the articular surfaces, type, capsule, ligaments, synovial membrane, nerve supply, blood supply and important relations of joints(Ankle, Proximal and distal tibiofibular joints)
- Define the Osseofascial compartments of the Leg (Anterior, Lateral & Posterior)
- Describe the attachments, innervation, and major action of each muscle.
- Describe the significance of the saphenous veins in terms of common clinical conditions.
- Describe the blood supply and lymphatic drainage of lower limb

Theme 5b Biochemistry:



A 20-year-old female medical student comes to the clinic with complaints of feeling tired all the time and shortness of breath while climbing stairs. She also says she often feels dizzy and looks pale compared to her friends are on examination: She is pale (conjunctival pallor). Her nails are thin and spoon-shaped (koilonychia). Tongue looks smooth and red (glossitis). Laboratory tests: Hemoglobin: 8.5 g/dL (low). Mean corpuscular volume (MCV): 68 fL (microcytic). Serum ferritin: Low



Critical Thinking Questions:

- Why does she look pale?
- Is there any association between heavy menstrual bleeding and this disease?



By the end of this session, the students will be able to:



- Elucidate the sources, biochemical role, and RDA of microminerals (Fe, Zn, Cu, Cr, Mn) in the human body

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Assessment Policies:

During the block, you shall be continually formatively assessed in all three learning domains i.e., Cognitive, Psychomotor & Affective. The exam will be integrated with Anatomy, Physiology & Biochemistry as the main subjects with contribution from surgery and medicine.

- The weighting of internal assessment shall be 20% in 1st professional MBBS Examination.
- There shall be two integrated EBE and one integrated pre-annual examination. There will be no 3rd block exam.
- To be eligible to sit in the pre-annual exam a student must pass at least 50% of all the formal formative & summative assessments conducted during the year. The final decision of eligibility to sit in the pre-annual exam for the students failing to meet the requirements will be taken by the respective HODs & the DBOS. This decision will be on a case-to-case basis depending upon the student's performance in all 3 learning domains throughout the year.
- The scores of class tests, each integrated EBE & integrated pre-annual examination shall be used for calculation of the internal assessment.
- The Internal assessment will be calculated according to NUMS curriculum.

Internal Assessment (Theory) – MBBS/ BDS Year (Basic Sciences)

Criteria	Percentage	I / II/III
▪ Continuous assessment : (Average score of class tests/ quizzes etc)	03 %	Marks obtained* 3 / Total Marks
▪ EOB Exam ; For each discipline;	05 %	Marks obtained* 5 / Total Marks
▪ Attendance	02 %	> 95 % = 02, 90- 94 % = 01
▪ Pre annual Exam : Theory ▪ Paper I, II & III	10 %	Marks obtained*10 /Total Marks
▪ Final IA	20%	

Internal Assessment (Practical) – MBBS/ BDS Year I (Basic Sciences)

Criteria	Percentage	I / II/III
▪ Continuous assessment (05%): (EOB)	05%	Marks obtained * 5/Total Marks
▪ Attendance (02 %)	02 %	> 95 % = 02, 90- 94 % = 01
▪ Practical books/Logbooks (01%)	01%	Obtained marks * 01 / Total marks
▪ Discipline/Attitude, Responsibility and Teamwork	02%	Obtained marks* 02 / Total marks
▪ Pre Annual Practicals	10%	Marks obtained* 10 /Total Marks
▪ Final IA	20%	

Integrated End Block and Integrated Pre-Annual Examination:

- There will be two integrated end-block examinations, one at the end of each of Y1B1 and Y1B2 blocks & one pre-annual examination at the end of the academic year.
- The structure of the paper of all the end block examination and pre-annual will be the same as that for the annual examination though syllabus will be different.
- The syllabus for integrated EBE will be announced by the department at least 02 weeks prior to examination.
- Integrated Pre-annual examination will include the whole syllabus.
- The date sheet for end block and pre-annual examinations will be prepared by coordinators of 1st & 2nd year while the examinations will be conducted by the respective departments.
- The result will be utilized for calculation of internal assessment which will be submitted to NUMS examination branch at least two weeks prior to the annual exam.

Rules & regulations:

Student's code of conduct

The Student Code of Conduct sets out the standards of conduct expected of students. It holds individuals and groups responsible for the consequences of their actions. Failure to fulfill these responsibilities may result in the withdrawal of privileges or the imposition of sanctions.

Wah Medical College is a community of students, faculty and staff involved in learning, teaching, research and other activities. All members of WMC community are expected to conduct themselves in a manner that contributes positively to an environment in which respect, civility, diversity, opportunity and inclusiveness are valued, so as to assure the success of both the individual and the community. The Student Code of Conduct reflects a concern for these values and tries to ensure that members of the WMC can make use of and enjoy the activities, facilities and benefits of WMC without undue interference from others.

WMC STUDENT CODE OF CONDUCT

- Discipline
- Decent dress
- Good Manners
- Smart Turn Out
- Healthy Activities
- No smoking
- No Abusive Language
- Cooperative Attitude
- Respect for All

Feedback on the study guide

We value your feedback and will use it for improvement of this Study guide.

Kindly provide feedback for this study guide. At the email:

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dmewahmedicalcollege@gmail.com