



HEALTH SCIENCES

(Grade-X)

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**PUNJAB EDUCATION, CURRICULUM,
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CENTRAL NERVOUS SYSTEM

After studying this chapter, students will be able to:

- Describe the role of Central Nervous System in controlling body functions and behaviour.
- Explain the causes, symptoms, and management of epilepsy, headaches, and migraine.
- Describe the symptoms, progression, and risk factors of Alzheimer's diseases.
- Explain the causes, symptoms, and treatment options for meningitis and encephalitis.
- Describe the symptoms, complications, and rehabilitation strategies for brain and spinal cord injuries.
- Explain the risk factors, symptoms, and emergency management of strokes.
- Briefly describe diagnostic imaging and common treatment options (e.g., MRI, CT scans, medications).
- Identify the major parts of the brain and spinal cord using diagrams or models
- Interpret diagnostic test results (e.g., CSF analysis) to identify CNS infections.
- Identify the signs of a stroke using the FAST (Face, Arms, Speech, Time) acronym.
- Role-play a patient consultation to explain the purpose of an MRI scan.

Two organ systems in our body are responsible for coordination i.e., communication among different parts of the body and generation of responses to the stimuli of environment. These are the nervous system and the endocrine system. The nervous system has two major components i.e., Central Nervous System (CNS) and Peripheral Nervous System (PNS). This chapter mainly focuses on the CNS. Here, you will learn how the CNS controls the body and behaviour. You will also learn the common brain and spinal cord diseases and their diagnoses.

9.1 Role of Central Nervous System

Background: There are two major components of nervous system i.e., **central nervous system (CNS)** and **peripheral nervous system (PNS)**. The CNS comprises of brain and spinal cord. The PNS consists of nerves that arise from brain and spinal cord and spread in different parts of body. All these components are made of neurons and supporting cells.

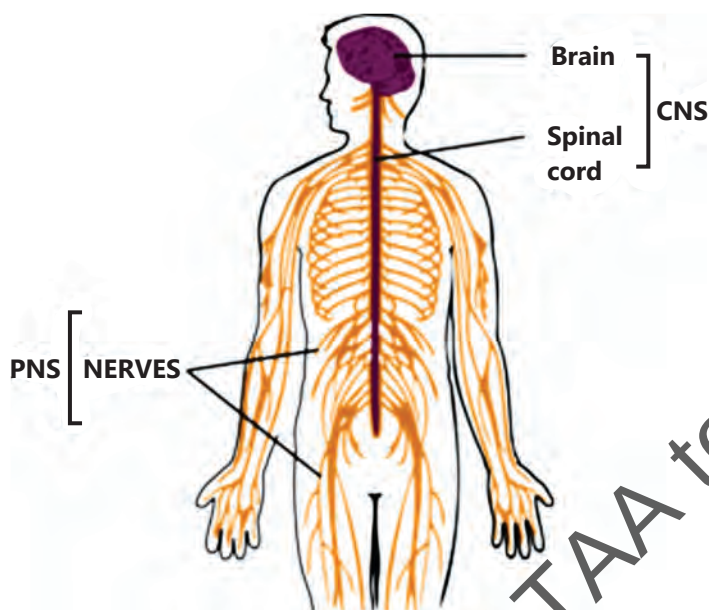


FIGURE 9.1 CNS and PNS

The CNS controls almost everything we do. It receives information from the body and environment, processes it, and then sends commands. In this way, we move, feel, think, and react. Both parts of the CNS (brain and spinal cord) work together like a command system of the body.

Role of the Brain

The brain controls both voluntary actions (which we do knowingly) and involuntary actions (which happen without our control).

The brain acts like a super-computer that keeps the whole body working in a balanced way.

Controlling body functions: The brain controls breathing, heartbeat, digestion, blood pressure, and body temperature through special centres located in it.

Movement control: The brain sends signals to muscles for walking, running, speaking, writing, or even smiling.

Senses and perception: The brain receives messages from the eyes, ears, nose, tongue, and skin. It processes these messages. Then it generates the vision, hearing, taste, smell, and touch.

Thinking and memory: The brain helps us in learning, remembering, solving problems, and making decisions.

Emotions and behaviour: Special parts of the brain control our feelings such as fear, anger, joy, or sadness. These feelings shape our behaviour i.e., how we act with others.

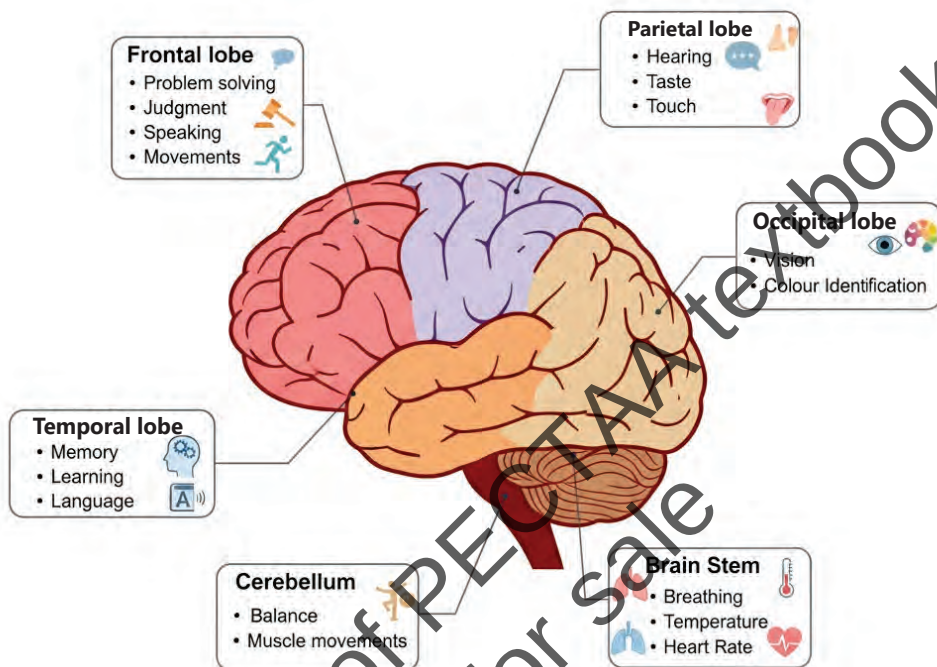


FIGURE 9.2: Functions of the parts of brain

Role of the Spinal Cord

The spinal cord is like a "road" between the brain and the rest of the body.

Carrying commands of the brain: The spinal cord carries messages from the brain to the arms/legs, and other body parts. This allows us to move our hands, feet, and other muscles exactly when we want.

Bringing information back: It also carries signals from the body back to the brain—such as pain, touch, heat, or cold. This helps the brain to respond properly.

Reflex actions: The spinal cord controls some quick actions without waiting for the brain. For example, if you touch a hot surface, the spinal cord immediately makes you pull your hand back. This protects you from harm.

Supporting body functions: Through nerve connections, the spinal cord also controls some functions like body posture and balance.

9.2 Common Neurological Disorders

The CNS can be affected by different disorders. Three common disorders are epilepsy, headaches, and migraine.

1- Epilepsy

Epilepsy is a disorder in which a person has repeated fits (seizures) due to sudden abnormal activity in the brain.

Causes: Epilepsy may be due to brain injury, infection, or stroke. Sometimes, epilepsy runs in families.

Symptoms: Common symptoms include sudden fits (seizures), shaking of the body, loss of control over muscles, and loss of consciousness. Patient feels confusion and faint after a seizure.

Management: Epilepsy patient should take regular medicines as prescribed by doctor to control seizures. Patients should avoid bright flashing lights and stress, as these may trigger fits. Family members ensure safety by keeping sharp objects and fire away during a seizure.

Seizures are defined as sudden, uncontrolled body movements and changes in behavior. Seizures occur due to abnormal electrical activity in the brain.

2- Headaches

A headache is a painful sensation in any part of the head, ranging from mild to severe.

Causes: Headaches are very common. They may be caused by stress, lack of sleep, eye strain, dehydration, or infections.

Symptoms: Pain or pressure in the head, forehead, or back of the neck, irritability or tiredness.

Management: Most headaches improve with rest, clean water intake, and proper sleep. Pain-relieving medicines may also help. Reducing stress and correcting eyesight problems are important for long-term relief.

3- Migraine

Migraine is a severe and repeated type of headache. It often affects one side of the head.

Causes: Migraine can be due to changes in brain activity, blood flow, or nerve signals. It often runs in families. Stress, loud noise, bright lights, and certain foods can trigger migraine.

Symptoms: Severe headache, often on one side of the head, nausea and vomiting, blurred vision or seeing flashing lights before headache starts.

Management: Migraine cannot be fully cured, but attacks can be controlled. Patients should avoid known triggers such as loud noises or certain foods.

Stress, lack of sleep, and skipping meals are common triggers for both headaches and migraine.

Medicines may reduce pain. Resting in a dark and quiet room often gives relief during an attack.

Table 9.1: Comparison of Epilepsy, Headaches, and Migraine

Disorder	Causes	Symptoms	Management
Epilepsy Repeated fits (seizures)	- Brain injury or infection - Stroke	- Sudden seizures - Unconsciousness - Confusion	- Regular anti-seizure medicines - Avoiding stress, flashing lights
Headache A painful sensation in any part of the head	- Stress - Lack of sleep - Dehydration - Infections	- Pain or pressure in head/neck - Tiredness	- Rest and proper sleep - Drinking enough water - Stress management - Pain-relieving medicines
Migraine Severe headache that often affects one side of the head	- Abnormal brain activity - Family history - Triggered by stress, light or sound	- Severe one-sided headache - Nausea, vomiting - Flashing lights, blurred vision before pain	- Avoiding triggers (light, sound) - Prescribed medicines - Rest in dark, quiet room - Regular sleep and meals

4- Alzheimer's Disease

It is a brain disorder that slowly damages memory, thinking, and behaviour. It mostly affects older people and worsens with time.

Causes: The exact cause of Alzheimer's disease is not known. Scientists believe that it happens due to abnormal protein deposits in the brain. These deposits cause death of brain cells. It leads to shrinkage of the brain. Faulty genes also play role in developing Alzheimer's disease.

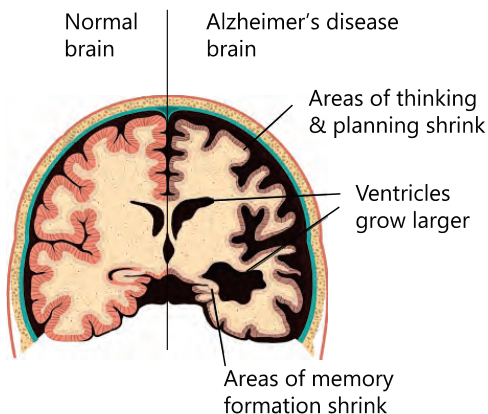


FIGURE 9.3:

Brian - Normal vs Alzheimer's disease

Symptoms: Forgetting names, events, or recent conversations, asking the same questions again and again, difficulty in planning or solving problems, confusion about time, place, or familiar faces, trouble in speaking or writing, changes in mood (anger, sadness, fear), difficulty in daily tasks like dressing, or handling money.

Progression: Alzheimer's disease develops slowly in three stages:

1. **Early stage:** Mild memory loss, forgetting words or names, misplacing items.
2. **Middle stage:** Increased confusion, wandering, trouble recognizing family, difficulty sleeping, major changes in behaviour.
3. **Late stage:** Severe memory loss, inability to recognize close family, loss of movement and speech, problems in eating and swallowing, complete dependence on others.

Risk Factors: Certain factors increase the chance of developing Alzheimer's:

- **Age:** Most common after 65 years.
- **Family history:** Higher risk if parents or relatives had it.
- **Genetics:** Some genes increase risk.
- **Medical conditions:** High blood pressure, diabetes, obesity, and stroke.
- **Lifestyle:** Smoking, poor diet, lack of exercise, little mental activity.

Table 9.2: Progression in Alzheimer's disease

Early stage	Middle stage	Late stage
- Mild memory loss - Forgetting words or names	- Increases confusion - Trouble recognizing family	- Severe memory loss - Loss of movement & speech - Problems in eating & swallowing

9.2 Infections of the Central Nervous System

The CNS can sometimes be affected by infections. Two important infections are meningitis and encephalitis.

1- Meningitis

The infection and swelling of meninges is called meningitis. Meninges are the

three membranes that envelop the brain and spinal cord. Meninges are filled with cerebrospinal fluid (CSF).

Causes: It may be caused by bacteria, viruses, or fungi (rare, mostly in people with weak immunity). Sometimes autoimmune disorders (the immune system attacks the body's own tissues) can lead to meningitis. Certain medications can start drug reactions which cause meningitis.

Symptoms: Severe headache, stiff neck, high fever, sleepiness or confusion.

Treatments: Bacterial meningitis are treated through prescribed antibiotics. Sometimes steroids are also used to reduce swelling. Viral meningitis are usually milder. There are no specific treatments for other causes of meningitis. Medications are used to reduce inflammation or relieve your symptoms.

Pakistan's Expanded Program on Immunisation (EPI) has reduced bacterial meningitis in children, but viral infections are still common.

2- Encephalitis

Encephalitis is swelling (inflammation) of the brain itself, usually caused by a viral infection.

Causes: It may be caused by viruses (Herpes simplex virus, rabies virus). Encephalitis from bacterial or fungal infections are the least common.

Encephalitis virus is more common in rice-growing areas of Asia, including parts of Pakistan.

Symptoms: Common symptoms are high fever, severe headache, confusion or disorientation, seizures, difficulty in speaking or moving. In severe cases, the patient may lead to coma.

Treatments: Antiviral drugs (for herpes and some other viruses), medicines to control fever and seizures. Vaccines are available for some causes of meningitis and encephalitis, but not for all.

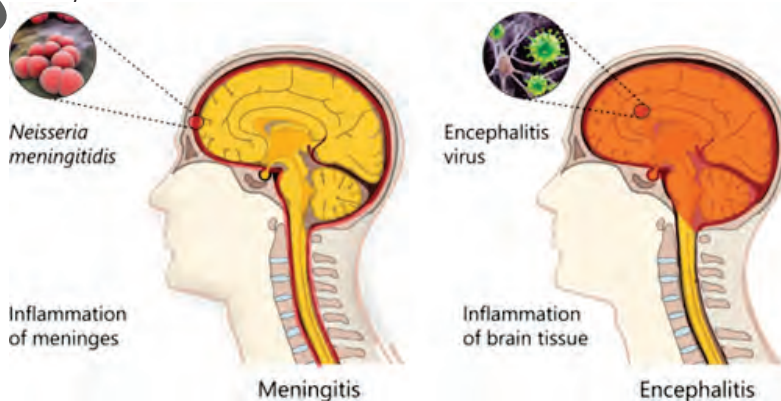


FIGURE 9.4: Meningitis and Encephalitis

Table 9.2: Comparison of Meningitis and Encephalitis

Feature	Meningitis	Encephalitis
Definition	Infection and swelling of the membranes (meninges) covering the brain and spinal cord	Swelling (inflammation) of the brain tissue itself
Main Causes	Bacteria, viruses, fungi	Viruses, sometimes bacteria or parasites
Key Symptoms	Severe headache, stiff neck, high fever, nausea, sensitivity to light, confusion	High fever, severe headache, confusion, seizures, speech/movement difficulty
Treatments	• Prescribed antibiotics)for bacterial causes) • Rest and fluids for viral causes • Medicines for fever	• Antiviral drugs (for herpes, etc.) • Prescribed medicines for fever and seizures
Serious Risks	Can cause deafness, brain damage, or death if untreated	Can cause paralysis, memory loss, speech problems, or death if untreated

Diagnostic Tests for CNS Infections

Doctors use different tests to confirm infections of the brain and spinal cord. One of the most important tests is Cerebrospinal Fluid (CSF) analysis. CSF is a clear liquid present in meninges (around brain and spinal cord), and in the ventricles of the brain and central canal of spinal cord. It protects the CNS and provides nutrients. For the chemical analysis of CSF, a needle is inserted into the lower back to collect CSF from spinal cord.

Normal CSF is clear and colourless. It contains few white blood cells and normal amounts of glucose and proteins. When infection occurs, the following changes occur in the colour, cells, and chemical levels in CSF.

1. In bacterial meningitis, CSF is cloudy with many white blood cells, high protein, and low glucose level.
2. In viral meningitis, CSF is clear but with increased white blood cells, normal glucose, normal or slightly raised proteins level.
3. In encephalitis, CSF has more white blood cells, more protein levels, and normal glucose. It may also have viral DNA or antibodies.

Other Diagnostic Tools

- MRI and CT scans: Show swelling or damage in brain tissues.
- Blood tests: Detect bacteria, viruses, or body's immune response.
- Electroencephalogram (EEG): Measures brain activity and may show abnormal patterns in encephalitis.

Table 9.3: CSF Analysis in CNS Infections

Feature	Normal CSF	Bacterial Meningitis	Viral Meningitis	Encephalitis
Appearance	Clear	Cloudy	Clear	Usually clear
White Blood Cells	Very few	Very high	Moderate	Moderate
Protein Level	Normal	High	Normal / slightly high	High
Glucose Level	Normal	Low	Normal	Normal

9.4 Traumatic Brain and Spinal Cord Injuries

The brain and spinal cord are very delicate organs. Any severe fall, traffic accident, sports injury, or act of violence can cause serious harm to them. Such injuries are called traumatic injuries. Because these organs control the whole body, damage to them affects movement, memory, behaviour, and even vital functions like breathing.

In Pakistan, traffic accidents are the leading causes of brain and spinal cord injuries, especially among young people.

Wearing helmets on motorcycles and using seat belts in cars can prevent many of these injuries.

Symptoms

Brain injuries: In mild cases, a person may feel headache, dizziness, or confusion. Sometimes, there is temporary loss of consciousness. Blurred vision, difficulty in speaking, and memory loss may also occur. In more severe injuries, the patient may experience seizures, repeated vomiting, or even fall into a coma.

Spinal cord injuries: A spinal cord injury shows its effects below the level of injury. For example, if the upper part of the spinal cord is damaged, arms and legs may be affected. Symptoms include weakness or complete loss of movement, numbness, and loss of sensation in parts of the body. People may also face

difficulty in controlling their bladder or bowel. If the injury is high in the spine, the patient can have serious breathing problems.

Complications

Brain and spinal cord injuries can lead to long-term complications. One of the most common is paralysis, in which the patient loses the ability to move certain parts of the body. Many patients suffer from chronic pain, which makes daily life difficult. Because the brain controls thinking and memory, some patients develop problems in concentration, decision-making, and emotions. This can also lead to depression and anxiety. Spinal cord injuries may cause frequent infections due to prolonged bed rest or use of catheters.

Rehabilitation Strategies

Rehabilitation is the process of helping patients recover and live as independently as possible.

- **Physiotherapy** helps strengthen weak muscles and restore movement through special exercises.
- **Speech therapy** helps patients with speech or swallowing problems. It helps them to regain communication skills.
- **Counselling and psychological support** are also essential because many patients experience stress, sadness, and hopelessness.
- **Occupational therapy** trains patients in performing daily activities like eating, dressing, or writing.
- **Assistive devices** like wheelchairs, walking aids, and electronic communication tools are also used to support movement and communication.
- **Family support** is equally important. Encouragement and help from relatives give patients confidence and hope.



FIGURE 9.5: Rehabilitation strategies after brain or spinal cord injury

9.4 Stroke and Cerebrovascular Diseases

Diseases that affect the blood supply to the brain are called cerebrovascular diseases. The most common and dangerous of these is stroke. **Stroke** is a medical condition in which poor blood flow to a part of the brain causes cell death. There are two main types of stroke:

1. **Ischemic stroke:** This happens when a blood clot blocks a blood vessel in the brain. It is the most common type. Because of the blockage, brain cells do not get oxygen and start dying.
2. **Haemorrhagic stroke:** This occurs when a blood vessel in the brain bursts and there is bleeding. The leaked blood damages brain tissue and increases pressure inside the skull. This type is usually more severe.

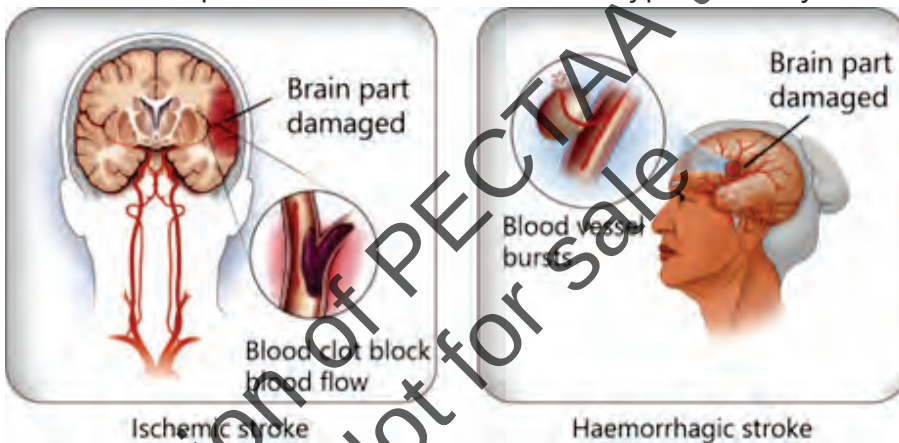


FIGURE 9.6: Types of stroke

Risk Factors of Stroke

Several conditions and habits increase the chance of a stroke. **High blood pressure** (hypertension) is the most common risk factor. **Diabetes**, high **cholesterol**, and **heart diseases** also raise the risk. **Smoking**, obesity, lack of physical activity, and eating too much oily or salty food make the problem worse. The risk also increases with age and family history. In Pakistan, where many people do not control their blood pressure and diabetes, strokes are becoming more common.

Symptoms of Stroke

Stroke symptoms usually appear suddenly. A person may feel weakness or numbness in the face, arm, or leg, especially on one side of the body. This

weakness can progress to **paralysis**. Paralysis means that the person cannot move the affected body parts. Paralysis usually occurs on the opposite side of the body from where the brain is damaged. For example, if the stroke damages the left side of the brain, the right side of the body may be paralyzed.

Other symptoms include difficulty in speaking or understanding words, blurred or lost vision, and problems with balance. A sudden and severe headache is more common in haemorrhagic strokes.

Doctors use the FAST rule to identify stroke quickly:

F (Face): Is one side of the face drooping (bending)?

A (Arms): Is one arm weak or difficult to raise?

S (Speech): Is speech unclear or strange?

T (Time): Time to call emergency services immediately.

Emergency Management of Stroke

Stroke needs urgent treatment. In ischemic stroke, doctors use special medicines (called clot-busters) to dissolve the clot if given within the first few hours. In haemorrhagic stroke, surgery may be needed to stop bleeding and reduce pressure on the brain.

Paralysis caused by stroke may improve slowly with treatment and therapy. After the emergency stage, patients require rehabilitation. Physiotherapy is done to strengthen weak muscles. Speech therapy supports communication, and counselling helps to manage stress and depression.

9.4 Diagnostic and Therapeutic Approaches

Doctors use diagnostic tools to find problems in the brain and spinal cord, and then apply therapeutic methods to manage or cure the disease.



FIGURE 9.6:
FAST method to identify stroke

Diagnostic Imaging

1- CT Scan

One of the most common diagnostic tools is the Computed Tomography (CT Scan). It uses X-rays combined with computer technology to produce quick and clear images of bones, organs and soft tissues. CT scans are particularly important in emergencies such as stroke, head injury, or bleeding inside the brain. By looking at the CT scan, doctors can distinguish between an ischemic and a haemorrhagic stroke.

CT scan takes multiple X-ray pictures at different angles. When the images are combined, it creates a 3D image. CT scans can show abnormalities like tumors, injuries and diseases in more detail than an X-ray.

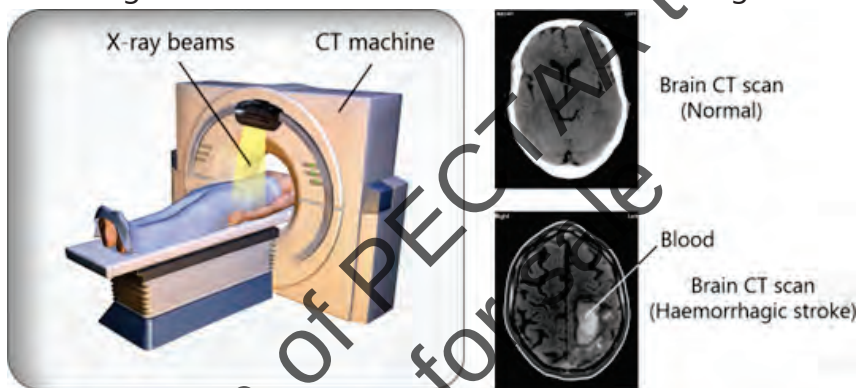


FIGURE 9.7: CT Scan machine and brain CT scans

2- MRI

Magnetic Resonance Imaging (MRI) is a diagnostic tool which uses strong magnets and radio waves. It creates highly detailed images of brain tissues. MRI is slower than CT but provides more details. So, it is useful for detecting tumors, multiple sclerosis, infections, or even very small strokes.

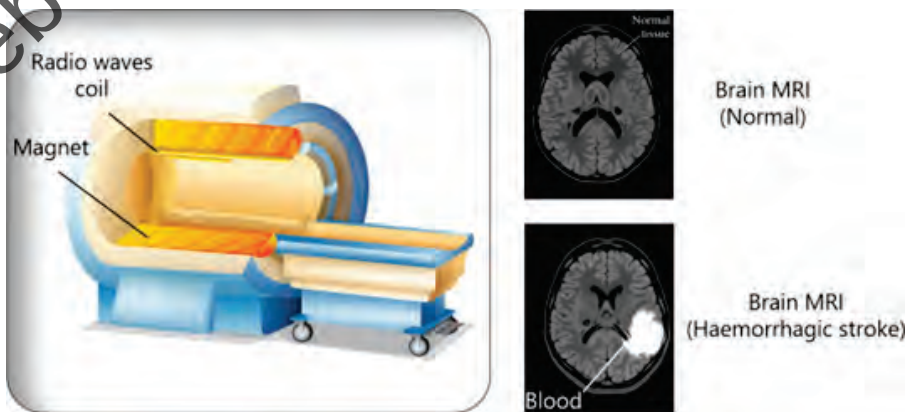


FIGURE 9.8: MRI machine and brain MRI scans

3- EEG

Electroencephalogram (EEG) records brain electrical impulses in the form of waves. In this test, small metal discs called electrodes are attached to the scalp. The electrical impulses generated by brain cells are recorded as wavy lines on an EEG recording. It is used for diagnosis of brain tumors, damage from head injury, inflammation of the brain, epilepsy etc.

Another diagnostic tool called angiography helps to visualize blood vessels in the brain to identify blockages.

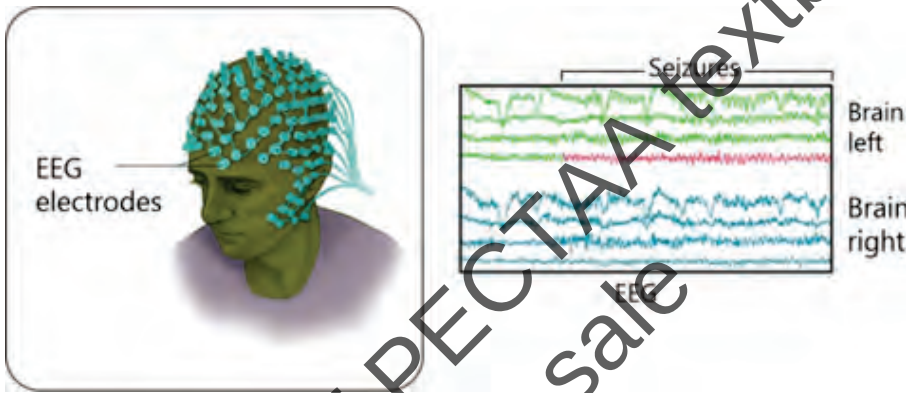


FIGURE 9.9: EEG procedure and results

Treatment Options

After diagnosing the problem, doctors select treatments for it.

Medications: Medications are the most common option. For example, clot-busting drugs are given in ischemic stroke cases if the patient arrives at the hospital quickly. Similarly, antibiotics are prescribed for bacterial meningitis. Anti-seizure drugs are used to control epilepsy.

Surgery: In more severe cases, surgery may be recommended. Surgeons may remove brain tumors. They can also repair bleeding in haemorrhagic strokes.

Rehabilitation therapies: These are important for long-term recovery. Patients recovering from stroke require physiotherapy to restore movement. Speech therapy is done to regain communication. Similarly,



Punjab Institute of Neurosciences (PINS), Lahore, is the largest specialized centre in Pakistan that offers advanced diagnostic facilities like MRI, CT scan, brain angiography etc.

occupational therapy is good to rebuild independence in daily activities.

Role-Play: Patient Consultation for MRI Scan

Characters: Students will take turns being doctor and patient.

Doctor: Assalam-Alaikum. How are you feeling today?

Patient: Wa-Alaikum-Salaam, Doctor. I have a strong headache since many days. Sometimes, I also feel dizzy.

Doctor: Oh! To know the exact cause, I need to see inside your brain. For this, I am advising you to get an MRI scan.

Patient: Doctor, what is an MRI scan? Will it hurt me?

Doctor: No, it will not hurt. MRI means *Magnetic Resonance Imaging. It is a big machine that uses magnets and radio waves to make very clear pictures of brain. These pictures can tell if there is a problem like an infection or small stroke.

Patient: Do I have to stay in the hospital for it?

Doctor: No. It is a safe test. You will lie down on a table, and the machine will take pictures. It makes loud sounds, but you will be safe. The test takes 20–30 minutes.

Patient: And what will you do after the MRI?

Doctor: After MRI, I will look at the pictures. Then I can decide the right treatment.

Patient: Thank you, Doctor. Now I understand why MRI is important.

Exercise

A. Select the correct answers for the following questions.

1. Which of these is an early sign of Alzheimer's disease?

- | | |
|----------------------|------------------------------|
| (a) Sudden paralysis | (b) Forgetting recent events |
| (c) Loss of balance | (d) Seizures |

2. A 45-year-old patient has fever, headache, and stiff neck. What condition is suspected?

- | | |
|----------------|------------------|
| (a) Stroke | (b) Encephalitis |
| (c) Meningitis | (d) Trauma |

3. Which diagnostic test is most useful for identifying CNS infections?

- | | |
|-------------------------|-------------------------|
| (a) Blood pressure test | (b) CSF analysis |
| (c) ECG | (d) Renal function test |

4. Which complication is more common after spinal cord injury?

- (a) Blindness
- (b) Loss of bowel control
- (c) Memory loss
- (d) Skin rash

5. Stroke due to blocked blood vessel is called:

- (a) Ischemic stroke
- (b) Haemorrhagic stroke
- (c) Spinal stroke
- (d) Transient stroke

6. A patient develops paralysis of the right side of body. The doctor suspects:

- (a) Stroke in left side of brain
- (b) Stroke in right side of brain
- (c) Alzheimer's disease
- (d) Spinal cord fracture

7. Which risk factor increases the chance of stroke the most?

- (a) High blood pressure
- (b) High cholesterol
- (c) Vitamin deficiency
- (d) Low blood pressure

8. FAST test is used for early detection of:

- (a) Alzheimer's disease
- (b) Stroke
- (c) Encephalitis
- (d) Brain tumor

9. Which step is part of emergency stroke management?

- (a) Giving insulin
- (b) Giving clot-busting drug
- (c) Giving antibiotics
- (d) Giving painkillers only

10. CSF analysis shows cloudy fluid with high white blood cells. This suggests:

- (a) Viral encephalitis
- (b) Bacterial meningitis
- (c) Alzheimer's disease
- (d) Ischemic stroke

B. Write short answers.

1. What is the main role of the central nervous system?
2. Differentiate between ischemic and haemorrhagic strokes.
3. Why does meningitis cause neck stiffness?
4. How can epilepsy be managed in daily life?
5. What are two early signs of Alzheimer's disease?
6. Why is MRI better than CT scan in detecting brain tumors?
7. How does physiotherapy help stroke patients?
8. What does the FAST test check during a suspected stroke?

C. Write answers in detail.

1. Describe the role of the brain in controlling body functions and behaviour. Give examples of voluntary and involuntary actions.
2. Define epilepsy. Discuss its main causes, symptoms, and management strategies.
3. Differentiate between common headaches and migraine. Explain the causes, symptoms, and treatment of each.
4. What are the major causes of Alzheimer's disease? Draw a chart to explain the three stages of Alzheimer's disease.
5. Compare meningitis and encephalitis in terms of causes, symptoms, and treatment options.
6. Explain the importance of cerebrospinal fluid (CSF) analysis.
7. Describe the symptoms, complications and treatments of traumatic brain injuries.
8. Explain how spinal cord injuries affect movement and body functions. Also describe rehabilitation strategies.
9. Discuss the risk factors, symptoms, and emergency management of strokes. How the FAST test helps in the early identification of a stroke?
10. Differentiate between ischemic and haemorrhagic strokes. How can each type lead to paralysis?
11. Describe the use of CT scans and MRI in diagnosing brain and spinal cord problems.
12. Discuss the importance of combining medication, surgery, and rehabilitation in treating CNS disorders.

Group Activities

1. Label a diagram of the CNS and explain the function of each part.
2. Write a short report on the clinical presentation and treatment of epilepsy.



Chapter

10

MUSCULOSKELETAL SYSTEM

After studying this chapter, students will be able to:

- Describe the role of the musculoskeletal system in movement, support, and protection.
- Identify the major bones, muscles, and joints using diagrams or models.
- Explain the causes, symptoms, and management of osteoarthritis and rheumatoid arthritis.
- Interpret bone density scan results to assess osteoporosis risk.
- Describe the causes, symptoms, and prevention of osteoporosis and rickets.
- Explain the symptoms, progression, and management of these disorders.
- Briefly describe diagnostic imaging and common treatment options.
- Role-play a patient consultation to explain the purpose of an X-ray.

The musculoskeletal system is made up of bones, muscles, and joints. In this chapter, you will learn about the role of musculoskeletal system. You will also study some common health problems, which affect the bones and joints. The chapter will also describe the modern diagnostic tools like X-rays and bone scans.

10.1 Functions of Musculoskeletal System

The musculoskeletal system is a network of bones, muscles, joints, tendons, ligaments, and cartilage. This system provides the body with structure, support, protection, and the ability to move. It allows for posture, movement, and stability. It also protects vital organs and playing roles in mineral storage and blood cell production. Major roles of the musculoskeletal system are described next.

1- Movement

The musculoskeletal system makes all body movements possible. Bones act like hard levers. Muscles are attached to the bones by strong bands called tendons. When a muscle contracts, it pulls the bone and produces

There are more than 600 muscles in the human body. Almost half of our body weight comes from muscles.

movement. Joints between bones make bending and rotation possible.

Example – Movements of the forearm at the elbow joint: The biceps muscle is present at the front of the upper arm (part of the arm between shoulder and elbow). It is attached to the bone of forearm (part of the arm between the elbow and the wrist). When biceps contracts, it pulls the forearm upward. At the same time, the triceps muscle, present at the back of the upper arm, relaxes. When we straighten the arm, the triceps contracts and the biceps relaxes. This shows how muscles always work in pairs to move bones.

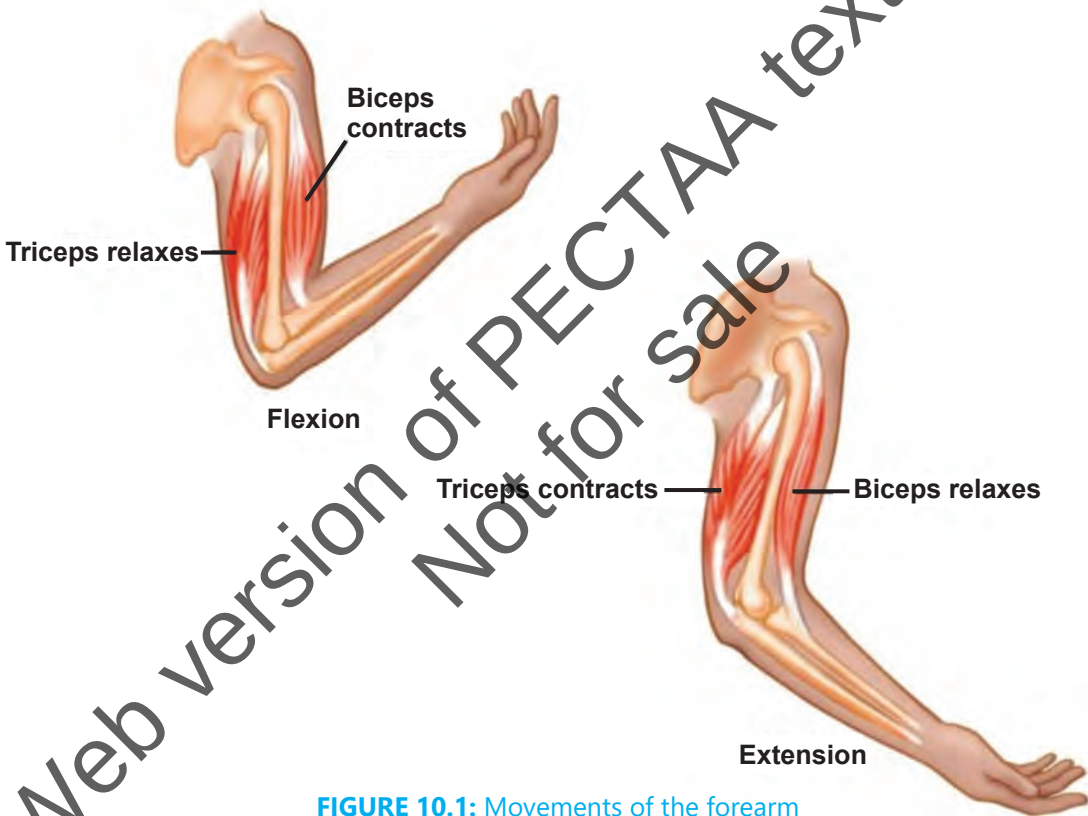


FIGURE 10.1: Movements of the forearm

2-Support

The musculoskeletal system also gives strength and shape to the body. Bones form a hard framework, called the **skeleton**. It supports the whole body. Skeleton allows us to stand upright instead. Muscles also keep bones in the correct position and help maintain balance.

The skeleton of an adult makes up about 20% of body weight. The longest bone is the femur (thigh bone). It is stronger than concrete.

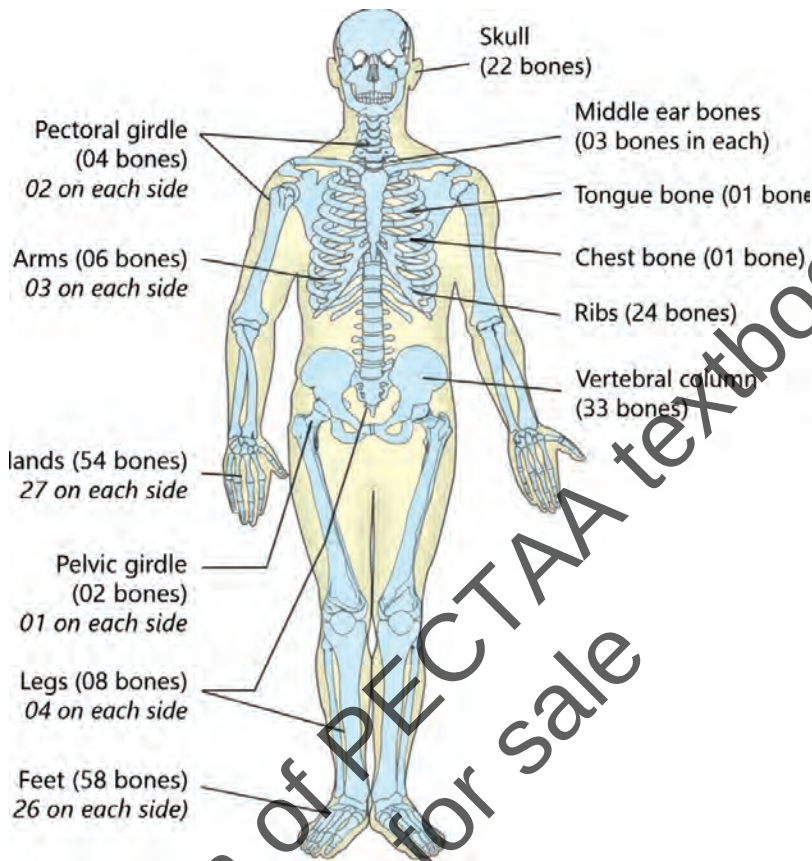


FIGURE 10.2: Bones on human skeleton

3- Protection

Bones also act like a shield and protect the soft and delicate organs. For example, the ribcage protects the heart and lungs. The skull covers the brain. The vertebral column guards the spinal cord. This protection is important because these organs are too soft to bear injuries.



FIGURE 10.3:
Ribcage covering the heart and lungs

10.2 Common Musculoskeletal Disorders

Sometimes the musculoskeletal system face different health problems. These problems are called musculoskeletal disorders. Some disorders affect the bones, such as osteoporosis and rickets. These disorders make bones weak and soft. Other disorders affect the joints, like osteoarthritis and rheumatoid arthritis.

These disorders cause pain, swelling, and stiffness. There are also disorders that involve the muscles. Muscle disorders lead to weakness, cramps, or loss of movement.

Table 10.1: Categories of Musculoskeletal Disorders

Bones	Joints	Muscles
Osteoporosis (weak bones)	Osteoarthritis (joint wear)	Muscle cramps (sudden pain)
Rickets (soft bones)	Rheumatoid arthritis (joint swelling)	Muscle weakness

10.3 Bone Diseases

Bones are very important for the support, movements, and strength of body. Sometimes bones become weak or soft due to certain diseases. Two common bone diseases are osteoporosis and rickets. Both affect bone health.

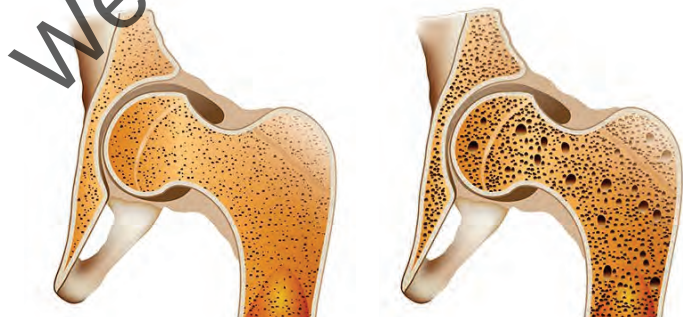
1- Osteoporosis

It is a disease in which bones become thin, weak, and breakable. This disease mostly affects older people.

Causes: Osteoporosis happens when the body loses too much calcium and other minerals from the bones. Aging, poor diet, lack of exercise, smoking, and less sunlight exposure increase the risk of osteoporosis.

Symptoms: Patient may suffer from back pain, bent spine, and broken bones even after a small fall or injury.

Prevention: Eating foods rich in calcium and vitamin D (e.g., milk, yogurt, cheese, and fish), regular exercise, and spending time in sunlight can prevent osteoporosis. Avoiding smoking and too many fizzy drinks also protects bones.



Normal bone (compact and strong)

Osteoporotic bone (porous and weak)

FIGURE 10.4: Bone density scans

In Pakistan, many elderly women develop osteoporosis because they spend little time in sunlight and do not drink enough milk. Doctors often advise them to walk in the morning sun and use dairy products daily.

2- Rickets

It is a childhood disease in which bones become soft and bend easily due to extreme and prolonged vitamin D or calcium deficiency.

Causes: The main cause is deficiency of vitamin D, which is needed to absorb calcium from food. Children who do not get enough sunlight or who eat poor diets are more likely to suffer from rickets.

Symptoms: Children with rickets may have weak, soft bones, bent legs, bone pain, and slow growth. Their teeth may also appear late or be weak.

Prevention: Spending time in sunlight, eating vitamin D-rich foods (like milk, eggs, and fish), and taking a balanced diet can prevent rickets.

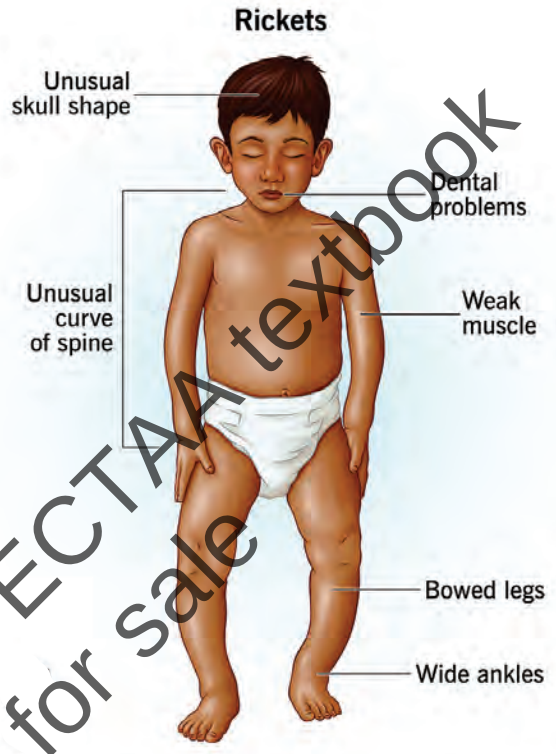


FIGURE 10.5: Symptoms of rickets

10.4 Joint Diseases

Joints are the places where two or more bones meet. They help the body move smoothly. Sometimes joints are affected by diseases that cause pain and stiffness. Two important joint diseases are osteoarthritis and rheumatoid arthritis.

Osteomalacia is caused by severe Vitamin D deficiency in adults. Patients suffer from bone softening, weakness and pain.

1- Osteoarthritis

Osteoarthritis is a joint disease in which the smooth covering of bones, called cartilage, wears away. Due to this, the bones begin to rub against each other. It causes pain and stiffness. Osteoarthritis is more common in older people.

Causes: Osteoarthritis usually develops with aging. Heavy weight, repeated stress on joints, previous injuries, and weak muscles also increase the risk.

Symptoms: Joint pain, stiffness, and swelling are common symptoms. Movement becomes difficult, especially in the knees, hips, and hands. The pain often increases after work or exercise.

Management: Osteoarthritis cannot be fully cured, but it can be managed. Light exercise, losing extra weight, using warm compress, and taking medicines for pain relief help patients. In severe cases, doctors may suggest joint replacement surgery.

Osteoarthritis
(late stage)

Fusiform
swelling
of joints

Heberden's nodes

FIGURE 10.6: Osteoarthritis in fingers

2- Rheumatoid Arthritis

It is a long-term disease in which the body's immune system attacks the tissue lining the joints on both sides of the body. Due to it, the joints become inflamed (swollen, painful), and stiff. It usually affects the joints in fingers, hands, wrists, knees, ankles, feet and toes.

Rheumatoid arthritis often starts in the small joints of the hands and feet before moving to larger joints.

Women are about three times more at risk to develop rheumatoid arthritis than men

Causes: The exact cause is not fully known. In rheumatoid arthritis, something triggers the immune system to attack the joints. An infection, smoking, or physical or emotional stress may act as triggers.

Symptoms: Joints become painful, swollen, and stiff, especially in the morning. It often affects both sides of the body, such as both hands or both knees. Over time, joints may become deformed.

Management: There is no complete cure, but the disease can be controlled. Doctors prescribe medicines to reduce pain and swelling. Physiotherapy and light exercise help to keep joints flexible. In severe cases, surgery may be needed.

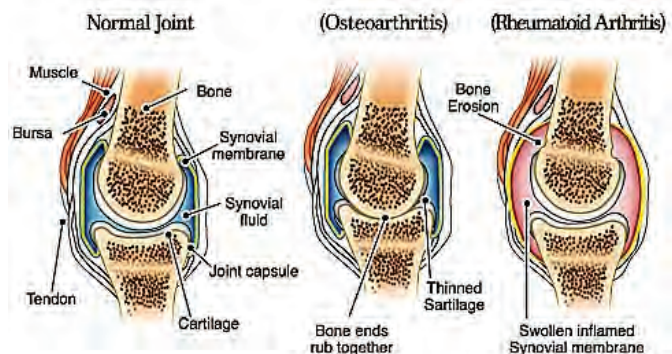


FIGURE 10.7: Normal Vs Arthritic Joints

Table 10.2: Comparison of Osteoarthritis and Rheumatoid Arthritis

Feature	Osteoarthritis	Rheumatoid Arthritis
Definition	Wear and tear of cartilage in joints	Immune system attacks joints (autoimmune disease)
Common Age	Mostly in older people	Can start at any age, often in middle age
Main Cause	Aging, overuse, injury, obesity	Immune system problem, family history
Joints Affected	Usually weight-bearing joints (knees, hips, spine)	Usually small joints first (hands, feet), then larger ones
Symptoms	Pain, stiffness, swelling, limited movement	Pain, swelling, stiffness (especially in morning), joint deformity
Progression	Slow and gradual over years	Can be faster, causes permanent joint damage
Management	Exercise, pain medicines, weight control, surgery in severe cases	Medicines to control immune system, physiotherapy, surgery in severe cases

10.5 Muscle Disorders

The disorders in the structure or function of muscles lead to weakness, pain, or difficulty in movement. The two common muscle disorders are muscular dystrophy and muscle cramps.

1- Muscular Dystrophy

It is a group of inherited diseases that cause slow weakening and loss of muscle mass.

Causes: It is caused by mutations in genes passed from parents to children. These mutations stop the production of proteins which are needed for muscle growth and repair.

Symptoms: Weakness in muscles (often starting in legs and hips), difficulty in walking, frequent falls, and in severe cases, breathing or heart problems.

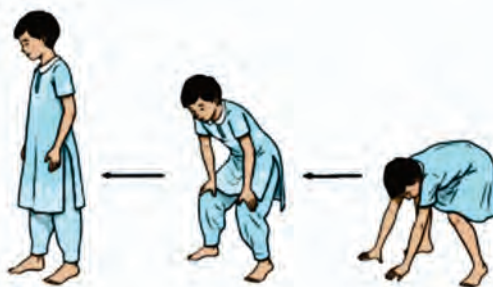


FIGURE 10.8: Child with muscular dystrophy (standing up with difficulty)

Progression: The condition worsens over years, as muscles continuously lose strength and may even shrink.

Management: There is no complete cure. However, physiotherapy, use of supportive braces, regular exercise, and certain medicines can help to slow the progression of dystrophy.

2- Muscle Cramps

Muscle cramps are sudden, involuntary contractions of a muscle, often painful but usually harmless.

Causes: Common causes include dehydration and deficiency of potassium, calcium, or magnesium. Overuse of muscles during sports or hard physical work can also result in muscle cramps.

Symptoms: Sharp pain in a muscle, hard lump of tightened muscle that can be felt under the skin.

Progression: Cramps usually last a few seconds to minutes and go away on their own. They may occur repeatedly, especially during exercise or at night.

Management: Gentle stretching, massaging the muscle, drinking plenty of water, and maintaining a diet rich in minerals like potassium and calcium can help prevent cramps.

10.6 Infections of the Musculoskeletal System

The musculoskeletal system can be affected by infections. These infections may be caused by bacteria or fungi that enter bones, joints, or muscles. The two common infections are osteomyelitis (infection of the bone) and septic arthritis (infection of the joint).

1- Osteomyelitis

Osteomyelitis is an infection of the bone.

Causes: Bacteria (most often *Staphylococcus aureus*) spread from the blood or nearby infected tissue into the bone. It may also occur after an injury, fracture, or



FIGURE 10.9: Child with cramp in calf muscle

surgery.

Symptoms: Severe pain in the infected bone; swelling, redness, and warmth over the affected area; fever and general weakness; difficulty moving the nearby limb.

Treatment: Strong antibiotics are given for several weeks.

2- Septic Arthritis

It is an infection inside a joint, caused by bacteria or sometimes fungi.

Causes: Bacteria entering the joint through the bloodstream; direct injury or surgical procedure near the joint.

Septic arthritis can damage a joint within a few days if not treated quickly.

Symptoms: Sudden and severe joint pain, usually in the knee or hip; swelling and redness around the joint; fever and tiredness.

Treatment: Intravenous antibiotics given directly into the vein and surgery.

10.7 Diagnostic and Therapeutic Approaches

Doctors use special methods to diagnose problems in the musculoskeletal system and then decide the best way to treat them.

Diagnostic Imaging

Diagnostic imaging means creating pictures of bones, joints, and muscles using machines. The following are the common types of diagnostic imaging:

X-ray: Shows broken bones, bone infections, or joint problems.

X-rays are the most common and cheapest imaging tool. X-rays facilities is available in many hospitals of Pakistan. MRI and CT scans are available in big cities but are costly.

CT Scan (Computed Tomography): Gives a 3D image of bones and joints, helpful in complex fractures.

MRI (Magnetic Resonance Imaging): Shows detailed pictures of soft tissues like muscles, ligaments, and cartilage.

Bone Scan: Uses a small amount of radioactive substance to detect bone infections or tumors.

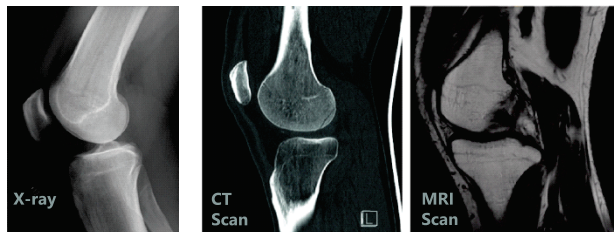


FIGURE 10.10: X-ray, CT scan and MRI scan of normal knee joint

Table 10.3: Diagnostic Imaging Tools of the Musculoskeletal System

Tool	What It Shows	Advantages	Limitations
X-ray	Bones, fractures, joint problems	Quick, cheap, widely available	Cannot show soft tissues clearly
CT Scan	Bones and joints in 3D view	More detail than X-ray, useful for complex fractures	Higher radiation, costly
MRI	Muscles, ligaments, cartilage, spinal cord	Very detailed images of soft tissues	Expensive, not easily available everywhere
Bone Scan	Infections, tumors, hidden fractures in bones	Detects problems not visible in X-ray	Requires radioactive dye, limited use

Common Treatment Options

The following are the major treatments of musculoskeletal problems:

Medicines: Pain relievers, antibiotics (for infections), and anti-inflammatory drugs are commonly used.

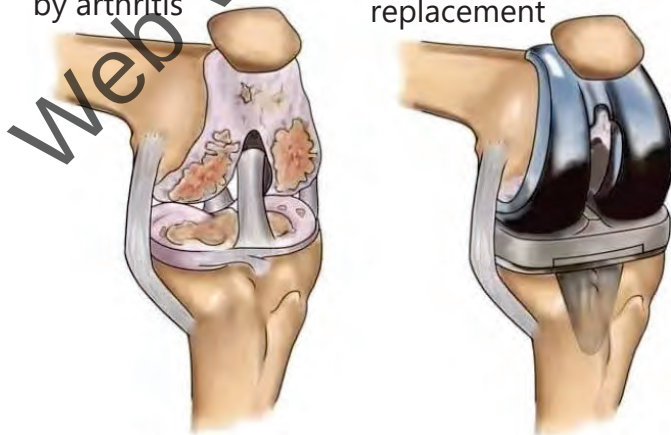
Physiotherapy: Exercises and movements that help strengthen muscles, improve flexibility, and reduce pain.

Surgery: Used in severe cases, such as repairing broken bones, replacing damaged joints (hip/knee replacement), or removing infected tissue.

Lifestyle Changes: Healthy diet, regular exercise, and avoiding smoking support recovery and prevent future problems.

Knee damaged by arthritis

Knee after replacement



Joint replacement surgery (like knee replacement) is becoming more common in Pakistan, especially in older people with severe arthritis.

FIGURE 10.11: Knee Replacement

Role-Play: Explaining the Purpose of an X-ray

Characters: Students will take turns being doctor and patient.

A patient has pain in the arm after falling. The doctor suggests an X-ray.

Doctor: Assalam-Alaikum. How are you feeling today?

Patient: Wa-Alaikum-Salaam, Doctor. My arm hurts after I fell yesterday.

Doctor: I see. Your arm may have a fracture. To check it, I suggest an X-ray.

Patient: What is an X-ray, doctor?

Doctor: An X-ray is a special picture of your bones. It helps us see if your bone is broken or not.

Patient: Will it hurt?

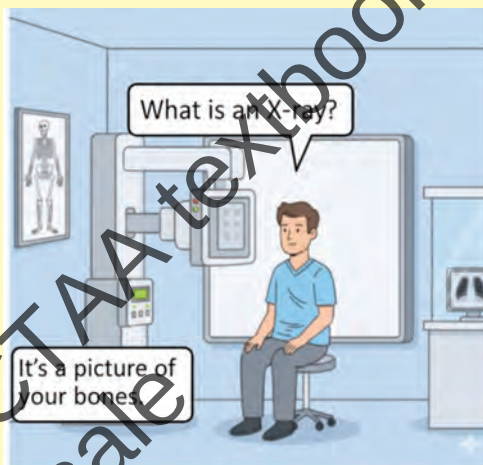
Doctor: No, it does not hurt. You just need to sit still for a few seconds while the machine takes the picture.

Patient: Is it safe?

Doctor: Yes. It uses a very small amount of radiation, and it is safe for you.

Patient: Okay, doctor. Thank you for explaining.

Doctor: You're welcome. After the X-ray, we will know the treatment for your arm.

**Exercise**

A. Select the correct answers for the following questions.

1. Biceps and triceps muscles help in moving:

- | | |
|-------------|----------|
| (a) Forearm | (b) Leg |
| (c) Hand | (d) Neck |

2. Which disease is caused by low bone density?

- | | |
|---------------|------------------|
| (a) Rickets | (b) Osteoporosis |
| (c) Arthritis | (d) Cramps |

3. A child with bowed legs suffers from:

- | | |
|------------------|---------------|
| (a) Osteoporosis | (b) Rickets |
| (c) Arthritis | (d) Dystrophy |

4. Which arthritis is caused by wear and tear of joints?

- | | |
|----------------------|--------------------------|
| (a) Septic arthritis | (b) Rheumatoid arthritis |
| (c) Osteoarthritis | (d) Gout |

5. Rheumatoid arthritis is different from osteoarthritis because it:

- (a) Happens only in old age
- (b) Is an infection of bone
- (c) Is an autoimmune disease
- (d) Affects only knees

6. A farmer gets leg cramps in summer. What is the most probable cause?

- (a) Overeating
- (b) Dehydration
- (c) Lack of sleep
- (d) Weak joints

7. A 60-year-old woman's bone density scan shows low density. What risk is high?

- (a) Muscular dystrophy
- (b) Rickets
- (c) Osteoporosis
- (d) Arthritis

8. A child often falls and struggles to climb stairs. This may be:

- (a) Muscle cramps
- (b) Muscular dystrophy
- (c) Osteoarthritis
- (d) Bone infection

9. Which treatment option is useful for severe arthritis?

- (a) Joint replacement surgery
- (b) Drinking more water
- (c) Simple massage
- (d) Antibiotics

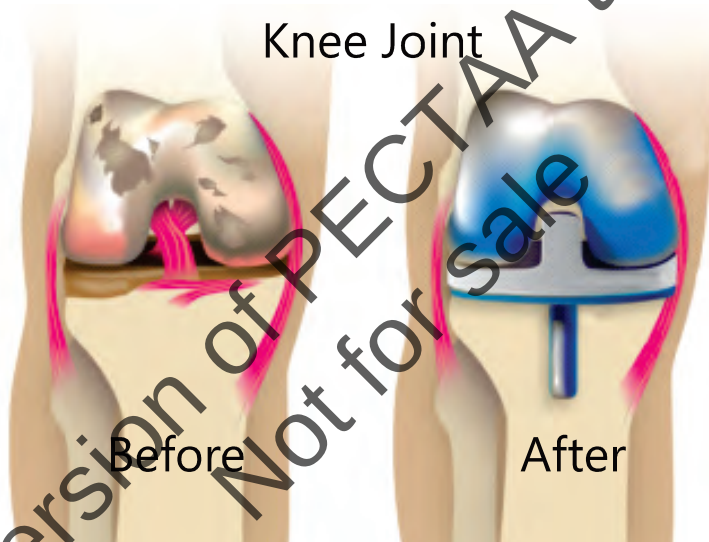
10. A doctor wants to see tissue that joins bone at a joint. Which test should be advised?

- (a) MRI
- (b) X-ray
- (c) CT Scan
- (d) Ultrasound

B. Write short answers.

1. How does the musculoskeletal system help in protection of internal organs?
2. Describe how biceps and triceps work together to bend the forearm.
3. Compare osteoporosis and rickets in terms of causes.
4. What are two key differences between osteoarthritis and rheumatoid arthritis?
5. Why are children more likely to develop rickets than adults?
6. A bone density scan shows very low density in a 65-year-old woman. What does this indicate?

7. Describe the main difference between muscular dystrophy and muscle cramps.
8. What are two main symptoms of septic arthritis?
9. Which diagnostic tool is better for seeing muscles: X-ray or MRI? Explain briefly.
10. A farmer develops leg cramps while working in the field. What can be the likely cause and a quick remedy?
11. Look at the picture of a surgery. Why is this surgery done, and in which disease is it common?



C. Write answers in detail.

1. Describe in detail how the musculoskeletal system works in movement, support, and protection of the body. Give examples.
2. Explain with the help of a diagram how biceps and triceps help in bending and straightening the forearm at the elbow joint.
3. Define osteoporosis. Discuss its causes, symptoms, and prevention.
4. Define rickets. How does it develop in children, and how can it be prevented in Pakistan?
5. Compare osteoporosis and rickets in terms of causes, symptoms, and prevention.

6. Differentiate between osteoarthritis and rheumatoid arthritis. Explain their causes, symptoms, and management.
7. Explain muscular dystrophy in detail. Include its causes, symptoms, progression, and management.
8. During a cricket match, Pakistani fast bowler, Shoaib Akhtar suddenly experienced severe leg cramps when he was bowling. Explain its cause and management.
9. Describe septic arthritis. Explain its causes, symptoms, and treatment options.
10. Compare osteomyelitis and septic arthritis in terms of site of infection, symptoms, and treatment.
11. Write a detailed note on diagnostic imaging tools. Explain their uses, advantages, and limitations.
12. Explain the common treatment options for musculoskeletal diseases. Give examples.

Group Activities

1. Label a diagram of the musculoskeletal system and explain the function of each part.
2. Write a short report on the clinical presentation of rheumatoid arthritis.
3. Create a poster on the importance of calcium and Vitamin D for bone health.



Chapter 11

ENDOCRINE SYSTEM

After studying this chapter, students will be able to:

- Describe the role of hormones in regulating body functions (e.g., metabolism, growth, reproduction).
- Identify the major endocrine glands and their hormones using diagrams or models.
- Explain the causes, symptoms, and management of pituitary disorders (e.g., gigantism, diabetes insipidus).
- Describe the causes, symptoms, and treatment of hypothyroidism and hyperthyroidism.
- Interpret thyroid function tests (e.g., TSH, T3, T4 levels) to diagnose thyroid disorders.
- Describe the causes, symptoms, and management of diabetes mellitus (Type 1 and Type 2) and hypoglycemia.
- Demonstrate blood glucose monitoring and insulin administration.
- Explain the causes, symptoms, and treatment of PCOS.
- Explain the principles of diagnostic tests and common treatment options (e.g., hormone replacement therapy).
- Analyze hormone level test results to diagnose reproductive hormone disorders.
- Role-play a patient consultation to explain the purpose of a hormone level test.

The endocrine system controls body functions with the help of hormones. Hormones are special chemical messengers made by endocrine glands. In this chapter, you will identify the major endocrine glands and their roles. You will also study common diseases related to endocrine system.

11.1 Introduction to Endocrine System

Our body is controlled by two important systems. The first one is the nervous system, which works with electrical signals. It controls body actions very quickly, but the effect does not last long. The second system is the endocrine system, which controls the body through chemical messengers called **hormones**. The endocrine system works slowly, but its effects remain for a long time.

Hormones are special chemicals made by endocrine glands. Hormones are released into the blood which carries them to different parts of the body. When they reach their target organ, they give signals and control its activity. In this way, hormones regulate many body functions such as growth, metabolism,

reproduction, mood, and balance of body conditions like sugar level in the blood.

Table 11.1: Comparison between Nervous System and Endocrine System

Feature	Nervous System	Endocrine System
Type of signal	Electrical signals (nerve impulses)	Chemical signals (hormones)
Speed of action	Very fast (in seconds)	Slower (hours or days)
Duration of effect	Short-term	Long-lasting
Way of working	Through nerves	Through blood
Examples of control	Thinking, memory, muscle movement, reflex action	Growth, metabolism, reproduction

Important Endocrine Glands and their Hormones

You have studied the endocrine glands in detail in your Biology course. Here, you will recall the major learnings.

1- Pituitary Gland

It is present in the brain. It acts as the master gland and controls many other glands. It makes several hormones. One important hormone is the growth hormone (GH), which helps bones and muscles to grow. Pituitary gland also produces hormones that control the thyroid gland, adrenal glands, and reproductive glands.

2- Thyroid Gland

FIGURE 11.1: It is present in the neck. It produces the hormone thyroxine. It increases the metabolic rate and so produces heat. The second hormone i.e., calcitonin transfers calcium from blood to bone. In this way, it decreases blood calcium levels.

3- Parathyroid Glands

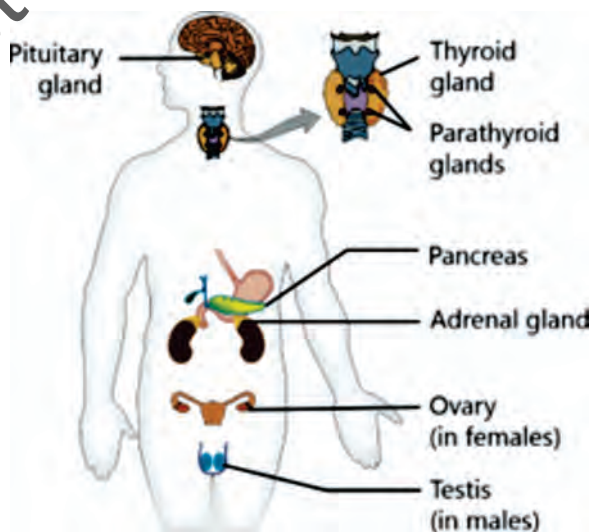


FIGURE 11.1: Important endocrine glands

The four parathyroid glands are attached to the back of thyroid. They secrete a hormone called parathormone. It stimulates the transfer of calcium ions from the bones to the blood.

4- Pancreas

Pancreas is located behind the stomach and in front of the spine. It has special endocrine cells called the **islets of Langerhans**. They secrete two hormones i.e., insulin and glucagon. Insulin lowers the blood glucose level. In contrast, glucagon stimulates increases the blood glucose level.

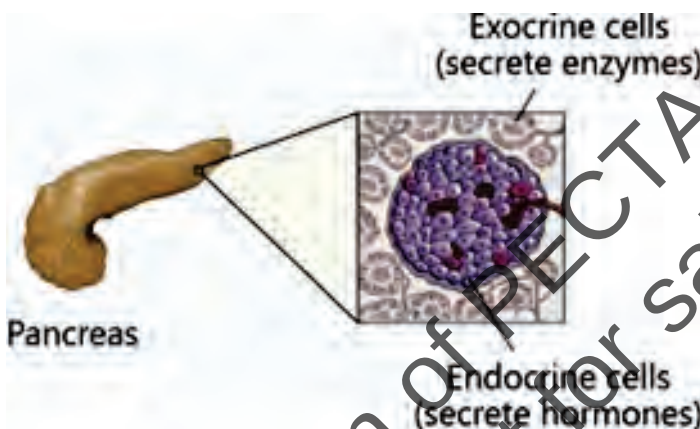


FIGURE 11.2: Pancreas

Pancreas is also a part of digestive system, where it acts as a ducted (exocrine) gland and secretes digestive enzymes.

5. Adrenal Glands

There are two adrenal glands, one present above each kidney. Each adrenal gland has an inner medulla and an outer cortex. The adrenal medulla produces two hormones: epinephrine (adrenaline) and nor-epinephrine (nor-adrenaline). These hormones take part in the emergency responses of the body. The adrenal cortex secretes hormones cortisol and aldosterone. Cortisol promotes the production of glucose from proteins. Aldosterone stimulates salt and water retention by kidneys. So, it raises blood pressure and volume.

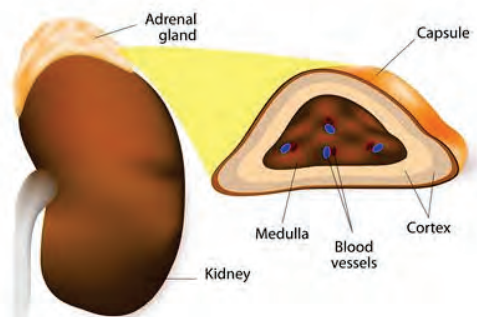


FIGURE 11.3: Adrenal gland

6- Gonads (Ovaries in females and Testes in males)

The ovaries in females produce hormones called estrogen and progesterone.

These hormones control female reproductive functions, menstrual cycle, and pregnancy. The testes in males produce the hormone testosterone, which controls male reproductive functions, sperm production, and body features like deeper voice and muscle growth.

11.2 Role of Hormones in Regulating Body Functions

Hormones are the chemical messengers in our body. When blood carries them to different organs, where they give instructions to work properly. In this way, hormones keep the body balanced and healthy.

Regulation of Growth: Hormones play very important role in growth. For example, the growth hormone from pituitary gland helps bones and muscles to grow. Without this hormone, a child may not grow normally.

Regulation of Metabolism: Hormones also control the rate of metabolism in the body. It is done by the thyroxine hormone which is produced by thyroid gland. If too much hormone is made, the body becomes overactive. If too little is made, the body becomes slow and tired.

Balance of Glucose: Hormones also help in keeping the balance of sugar in the blood. The pancreas makes insulin, which lowers blood sugar, and other hormones that raises it when needed. This balance is very important for life.

Control of Emotions and Stress: Hormones affect mood, emotions, and response to stress. For example; during stress, adrenal glands release adrenaline. It prepares the body to act quickly by increasing heartbeat and breathing.

Regulation of Reproductive System: In females, estrogen and progesterone control the menstrual cycle and help in pregnancy. In males, testosterone controls sperm production and male body features.

Table 11.2: Examples of body functions controlled by hormones

Body Function	Example of Hormone	Gland
Growth	Growth hormone (GH)	Pituitary
Metabolism	Thyroxine	Thyroid
Blood sugar	Insulin	Pancreas
Reproduction	Estrogen, Progesterone, Testosterone	Ovaries/Testes
Stress response	Adrenaline	Adrenal

11.3- Pituitary Gland Disorders

The pituitary gland is the master gland because it controls many other endocrine

glands. If this gland does not work properly, it can cause health problems. Two common disorders are gigantism and diabetes insipidus.

1- Gigantism

Gigantism is a disorder in which a child grows abnormally tall and large because the body makes too much growth hormone.

Cause: Gigantism happens when the pituitary gland makes too much growth hormone during childhood, before the bones have stopped growing.

Symptoms: Abnormally tall height, large hands and feet, enlarged facial features; weakness and joint pain.

Management: Treatment usually involves medicines to lower the production of growth hormone. If a tumor of pituitary gland is causing extra hormone production, surgery may be done to remove that tumor.

2- Diabetes Insipidus

Diabetes insipidus is a disorder in which the body cannot keep the right amount of water. The patient passes a large amount of dilute urine.

Cause: Diabetes insipidus happens when the pituitary gland does not make enough hormone called ADH (antidiuretic hormone), or when the kidneys cannot respond to this hormone. Normally, this hormone is responsible for the reabsorption of water from nephrons in kidneys.

Symptoms: The patient passes large amount of urine, He feels thirst all the time. If the loss of water is not replaced, dehydration can occur.

Management: Treatment includes giving medicines that replace ADH or help the body to save water. Drinking plenty of water is also important.

11.4 Thyroid Gland Disorders

You know that thyroid gland produces the hormone thyroxine, which controls the body's metabolism. Abnormalities in this gland lead to two common disorders: hypothyroidism and hyperthyroidism.

1- Hypothyroidism

Hypothyroidism means less than normal production of thyroxine hormone. Because of this, the body's metabolism becomes very slow.

Causes: It may occur due to iodine deficiency in the diet, damage to the thyroid

gland, or autoimmune diseases (body's defence system attacks the thyroid).

Symptoms: Patients feel very tired and weak. They may gain weight even without eating much. Their skin becomes dry, and their face may be swollen. In children, this condition can slow down growth and learning.

Treatment: Hypothyroidism is usually treated with medicines that replace the missing thyroid hormone. A diet with enough iodine (like iodized salt) is also important.

2- Hyperthyroidism

It is a disorder in which the thyroid gland makes too much thyroxine. Because of this, the body's metabolism becomes very fast.

Causes: Sometimes the body's own defence system causes the thyroid gland to work too hard. This condition is called Graves' disease. In this condition, the gland makes extra hormone. Sometimes, small nodules can form inside the thyroid, which start making extra hormone. Too much iodine in the body can also push the gland to make extra hormone.

Sometimes, the pituitary gland makes too much thyroid-stimulating hormone (TSH), which forces the thyroid to overwork.

Symptoms: Patients feel restless and nervous. They lose weight even if they eat a lot. Their heartbeat becomes very fast, and they may sweat more than usual. In some cases, the eyes may bulge forward.

Treatment: Medicines are used that reduce thyroid hormone production. In some cases, surgery or radioactive treatment is used to remove or destroy part of the thyroid gland.

Table 11.3: Comparison Between Hypothyroidism and Hyperthyroidism

Feature	Hypothyroidism	Hyperthyroidism
Definition	Thyroid gland does not make enough thyroid hormones.	Thyroid gland makes too much thyroid hormone.
Main Cause	Lack of iodine or underactive thyroid gland.	Overactive thyroid gland or swelling in the gland.
Common Symptoms	Tiredness, weight gain, dry skin, slow heartbeat, feeling cold.	Weight loss, fast heartbeat, sweating, nervousness.

Thyroid Function Tests

Special blood tests can help to check if the thyroid gland is working properly. These tests measure the levels of three important hormones: TSH, T3, and T4.

TSH (Thyroid Stimulating Hormone)

TSH is made by the pituitary gland. It works like a signal to the thyroid gland to produce T4 and T3 hormones. In adults, its normal value in blood is 0.4 to 4.5 mIU/L (milli-International Units/litre). A "milli-international unit" is one-thousandth of one International Unit.

T4 (Thyroxine)

It is made by the thyroid gland. It is the less active. Majority of it is converted to T3 form. In adults, its normal value is 5.0 to 12.0 µg/dL (micrograms/decilitre). A microgram (µg) is one-millionth (1/1,000,000) of a gram and a decilitre (dL) is one-tenth of a litre.

International Unit (IU) is the quantity of a substance, such as a vitamin, hormone, or toxin, that produces a specified effect. For example, an IU of vitamin E is the specific biological activity of 0.671 milligrams of vitamin E.

T3 (Triiodothyronine)

It is also made by thyroid gland. It is the active form of the hormone. In adults, its normal values is 80 to 220 ng/dL (nanogram/decilitre). A nanogram (ng) is one-billionth of a gram, and a decilitre is one-tenth of a litre.

Interpreting Results

- If TSH is high and T3/T4 are low, it indicates hypothyroidism.
- If TSH is low and T3/T4 are high, it indicates hyperthyroidism.
- If all levels are normal, the thyroid is working properly.

Table 11.4: Thyroid Function Tests

TSH Level	T3/T4 Levels	Condition
High	Low	Hypothyroidism
Low	High	Hyperthyroidism
Normal	Normal	Normal Thyroid

Activity: Reading a Thyroid Test Report

- Look at the following report and decide: Is it hypothyroidism, hyperthyroidism, or normal thyroid function?

Test	Patient's Value	Normal Range
TSH	0.1 mIU/L	0.4 – 4.5 mIU/L
T4	14.2 µg/dL	5.0 – 12.0 µg/dL
T3	210 ng/dL	80 – 220 ng/dL

11.5- Pancreatic Disorders

The pancreas produces insulin hormone that controls the level of sugar (glucose) in the blood. Abnormalities in pancreatic hormones leads to disorders like diabetes mellitus and hypoglycemia.

1- Diabetes Mellitus

Diabetes mellitus is a disease in which blood sugar levels stay higher than normal. There are two main types:

The word "diabetes" means "to pass through," because patients pass a lot of urine. The word "mellitus" means "sweet like honey". It is because in old times, doctors tested urine to find out if it was sweet due to sugar.

Type 1 Diabetes

It is the condition when body cannot make insulin because the pancreas stops producing it.

Causes: Damage to insulin-making cells often due to the immune system attacking them.

Symptoms: Excessive thirst, frequent urination, weight loss, tiredness, and slow healing of wounds.

Management: Regular insulin injections, healthy eating, exercise, and blood sugar monitoring.

Type 2 Diabetes

It is the condition when body makes insulin, but cells do not use it properly (insulin resistance).

Causes: Overweight, lack of exercise, unhealthy food, family history.

Symptoms: Similar to Type 1 but usually milder in the beginning, such as tiredness, blurred vision, and frequent infections.

Management: Healthy diet, regular exercise, oral medicines, sometimes insulin, and blood sugar monitoring.

Insulin was discovered in 1921 by two Canadian scientists, Frederick Banting and Charles Best. Before this discovery, people with Type 1 diabetes could not survive!

Table 11.5: Difference Between Type 1 and Type 2 Diabetes

Feature	Type 1 Diabetes	Type 2 Diabetes
Age of Onset	Usually in children and young people	Usually in adults (but also in teenagers now)
Insulin Production	Pancreas makes little or no insulin	Pancreas makes insulin, but body cannot use it well
Main Cause	Body's immune system destroys insulin cells	Overweight, poor diet, lack of exercise, family history
Symptoms	Sudden, severe (thirst, urination, weight loss)	Slow, mild at first (tiredness, blurred vision)
Treatment	Insulin injections for life	Healthy lifestyle, tablets, sometimes insulin

2- Hypoglycemia

It is the condition where blood sugar level becomes too low.

Causes: Taking too much insulin, skipping meals, exercising too much without eating, or certain medicines.

Symptoms: Sweating, dizziness, shaking, hunger, headache, irritability, and fainting if severe.

Management: Immediate intake of sugar (such as glucose tablets, fruit juice, or sweets). For long-term prevention, proper insulin dose and regular meals are important.

Classroom Activity: Checking Blood Sugar and Using Insulin

Part A: Blood Glucose Monitoring (demonstration by teacher)

Materials Needed: A glucometer (blood sugar testing machine), Test strips, A lancet (small needle for finger prick), Cotton swab

Procedures:

1. Wash hands with soap and water.
2. Insert a test strip into the glucometer.
3. Use the lancet to prick the finger-tip gently.
4. Place a drop of blood on the test strip.
5. Wait a few seconds for the glucometer to show the blood sugar level on its screen.
6. Record the reading (e.g., normal, high, or low).

Part B: Insulin Administration (Demonstration Only)

(This is a demonstration by the teacher/health worker. Students should not inject themselves in class.)

Materials Needed: Insulin pen or syringe (with dummy saline for practice), Cotton swab, Model or dummy skin pad (for safe practice)

Procedure:

1. Clean the injection site with a cotton swab.
2. Fill the syringe or set the insulin pen with the correct dose.
3. Hold the skin pad, insert the needle at a 90° or 45° angle.
4. Push the plunger to inject.
5. Remove the needle and press the site gently.

11.6 Reproductive Hormone Disorders

When reproductive hormones are not balanced, different health problems can appear. Such problems are called reproductive hormone disorders. One of the most common reproductive hormone disorders in females is Polycystic Ovary Syndrome (PCOS).

Polycystic Ovary Syndrome (PCOS)

It is a condition that affects females during their reproductive years. In this disorder, the ovaries produce too much male hormone (androgen). The ovaries may also develop many small fluid-filled sacs called cysts. It disturbs the normal reproductive cycle and may cause infertility.

Causes: The exact cause of PCOS is not completely known, but some factors play an important role:

- **Hormonal imbalance:** Extra production of male hormones by ovaries.
- **Insulin resistance:** The body does not use insulin properly, which raises blood sugar and increases androgen levels.
- **Family history:** PCOS can run in families.
- **Lifestyle:** Overeating, obesity, and lack of exercise can make the condition worse.

Symptoms: Irregular or absent menstrual cycle; hair growth on the face, chest, or back; acne and oily skin; weight gain, hair thinning on the scalp; difficulty in becoming pregnant.

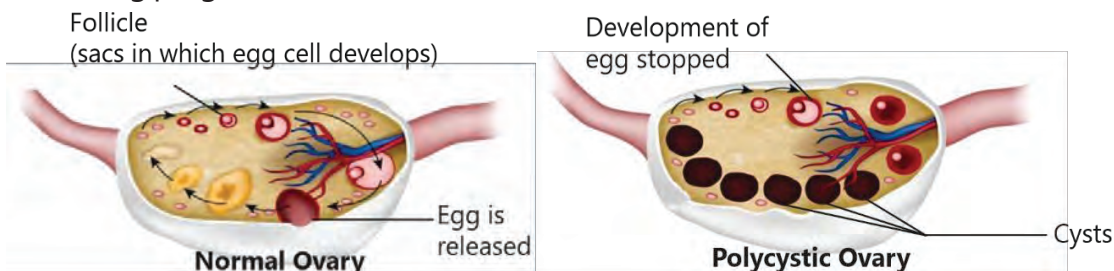


FIGURE 11.4: Normal and polycystic ovaries

Treatment: PCOS has no complete cure. But the symptoms can be controlled by **lifestyle changes** (healthy eating, exercise) weight loss, **medicines** (to regulate reproductive cycle), and **long-term care** (regular medical check-ups).

Hormone Level Tests

Doctors check the level of reproductive hormones in the blood to diagnose a disorder. The main hormones tested in females are FSH (Follicle Stimulating Hormone), LH (Luteinizing Hormone), Estrogen, and Progesterone. In males, important tests include Testosterone and sometimes FSH and LH.

Example: Hormone Levels in PCOS

In women with PCOS, the hormone levels often look different from normal:

- LH (Luteinizing Hormone) is higher than normal.
- FSH (Follicle Stimulating Hormone) is normal or low.
- Androgens (male hormones like testosterone) are higher.
- Progesterone may be low due to lack of ovulation.

Sample Report 1

Hormone	Patient's Value	Normal Range (female)	Interpretation
LH	14 IU/L	5 – 10 IU/L	High LH and testosterone with normal FSH suggest PCOS.
FSH	4 IU/L	4 – 10 IU/L	
Testosterone	High	Low to normal	

Table 11.6: Common Hormonal Disorders

Disorder	Cause	Symptoms	Treatment / Management
Gigantism	Too much Growth Hormone (GH) in childhood	Unusual height, large hands and feet, headache, joint pain	Surgery or medicines to reduce GH production
Diabetes Insipidus	Less ADH from pituitary	Excessive urination, extreme thirst, dehydration	Hormone replacement (synthetic ADH), plenty of water

Hypothyroidism	Too little Thyroid Hormones (T3, T4)	Tiredness, weight gain, slow heartbeat, swelling of face	Thyroid hormone tablets
Hyperthyroidism	Too much Thyroid Hormones (T3, T4)	Weight loss, fast heartbeat, sweating, anxiety, bulging eyes	Medicines to reduce thyroid activity, surgery, or radioactive iodine
Diabetes Mellitus (Type 1)	No insulin production	Thirst, frequent urination, weight loss, tiredness	Insulin injections, diet control, exercise
Diabetes Mellitus (Type 2)	Body cells resistant to insulin	Similar to Type 1 but milder at first: tiredness, infections, blurred vision	Healthy diet, exercise, tablets, sometimes insulin
Hypoglycemia	Too much insulin or too little glucose in blood	Sweating, dizziness, shaking, hunger, fainting	Quick sugar intake (juice, glucose), adjusting insulin dose, regular meals
PCOS (Polycystic Ovary Syndrome)	Too much androgen and imbalance of LH/FSH	Irregular periods, extra hair growth, acne, weight gain, infertility	Lifestyle changes, birth control pills, insulin-sensitizing medicines, fertility treatment

11.7 Diagnostic and Therapeutic Approaches

Doctors use diagnostic tests to find out if a person has a hormonal disorder. These tests measure the amounts of hormones in blood or urine. Once the problem is found, treatment is started.

Diagnostic Tests

Blood tests: These are the most common. A blood sample is tested for

hormones such as T3, T4, TSH (thyroid), insulin, or reproductive hormones.

Urine tests: These are used to measure hormones released in urine over 24 hours.

Imaging tests: Ultrasound, CT scan, or MRI are used to see if a gland has grown too big, has a tumor, or has cysts.

Therapeutic Approaches

Hormone Replacement Therapy (HRT): If the body is not making enough hormones, artificial hormones are given in the form of tablets, injections, or patches. Example: thyroid hormone tablets in hypothyroidism.

Medicines: Drugs can reduce the effect of extra hormones, such as antithyroid medicines in hyperthyroidism or medicines to improve insulin use in diabetes.

Insulin Therapy: Patients with Type 1 diabetes need regular insulin injections because their pancreas cannot produce insulin.

Surgery: If a gland has a tumor or is producing too much hormone, surgery may be needed.

Lifestyle management: A healthy diet, exercise, and regular medical check-ups are important parts of treatment for many endocrine disorders.

Role-play a Patient Consultation

Characters: Students will take turns being doctor and patient.

Doctor: Good morning. How are you feeling today?

Patient: Doctor, I feel very tired these days. I have gained weight even though I don't eat much.

Doctor: I understand. Sometimes these problems are caused by the thyroid gland. To check this, we need to do a blood test.

Patient: What will this test show?

Doctor: This test will measure the levels of three hormones: TSH, T3, and T4. If T3 and T4 are low and TSH is high, it means your thyroid is underactive. If T3 and T4 are high and TSH is low, it means your thyroid is overactive.

Patient: Is the test painful?

Doctor: Not at all. It is just a small blood sample taken from your arm. The test helps us understand what is happening inside your body so we can give the right treatment.

Patient: Thank you, Doctor. I feel better knowing why this test is important.

Exercise

A. Select the correct answers for the following questions.

1. Why is pituitary called the master gland?

- (a) It stores hormones
- (b) It controls other glands
- (c) It makes glucose
- (d) It regulates breathing

2. Excess growth hormone in childhood causes:

- (a) Dwarfism
- (b) Diabetes
- (c) Gigantism
- (d) Obesity

3. Which hormone helps prepare the body for stress?

- (a) Insulin
- (b) Cortisol
- (c) Estrogen
- (d) TSH

4. Which hormone controls blood sugar?

- (a) Thyroxine
- (b) Insulin
- (c) Estrogen
- (d) Cortisol

5. Which test helps monitor diabetes?

- (a) ECG
- (b) Blood glucose test
- (c) MRI
- (d) X-ray

6. Which treatment is common in both Type 1 and Type 2 diabetes?

- (a) Surgery
- (b) Insulin injection
- (c) Oral tablets
- (d) Exercise & diet

7. What may be the cause of hypoglycemia?

- (a) Too much insulin
- (b) Too much thyroxine
- (c) Too little estrogen
- (d) Too little cortisol

8. A patient with high TSH but low T4 may be suffering from:

- (a) Hypothyroidism
- (b) Hyperthyroidism
- (c) Diabetes
- (d) PCOS

9. In diabetes insipidus, the main problem is:

- (a) Lack of insulin
- (b) Lack of ADH
- (c) Extra growth hormone
- (d) Extra thyroxine

10.A female patient's hormone test shows: high LH, high testosterone, irregular menstrual cycles. This suggests:

- (a) Diabetes mellitus (b) Hypothyroidism
(c) PCOS (d) Gigantism

B. Write short answers.

1. What is the main role of hormones in the body? Give two examples.
2. How does the endocrine system differ from the nervous system in controlling body functions?
3. Define gigantism. How does it differ from dwarfism?
4. What are the main symptoms of diabetes insipidus?
5. Compare hypothyroidism and hyperthyroidism in terms of hormone level.
6. How can thyroid function tests (TSH, T3, T4) help doctors make a diagnosis?
7. Differentiate between Type 1 and Type 2 diabetes mellitus.
8. How is blood glucose monitoring useful for a diabetic patient?
9. What are the common symptoms of PCOS in young women?
10. How does PCOS affect hormone balance in the body?

C. Write answers in detail.

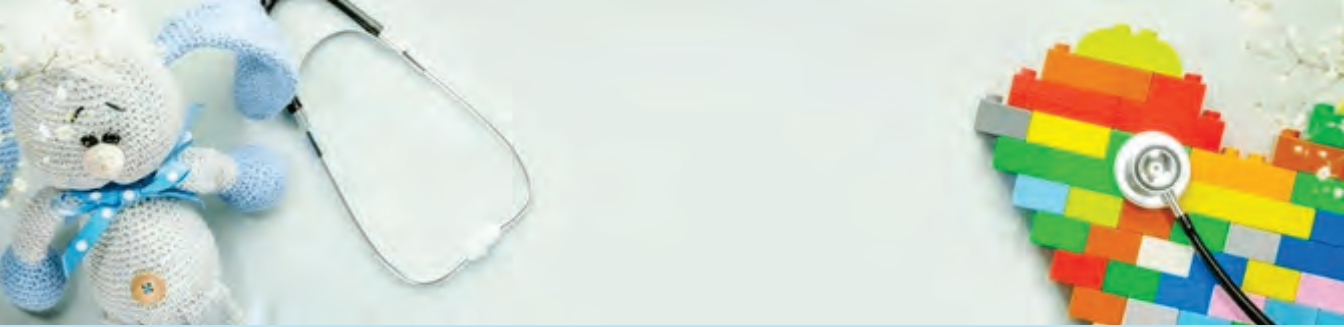
1. Explain how hormones regulate metabolism, growth, and reproduction in the human body. Give examples of specific hormones.
2. Discuss the similarities and differences between the nervous system and the endocrine system in controlling body functions.
3. Explain the causes, symptoms, and management of gigantism.
4. Discuss the causes, symptoms, and management of diabetes insipidus. How does it differ from diabetes mellitus?
5. Explain the causes, symptoms, and treatment of hypothyroidism and hyperthyroidism.
6. Describe how thyroid function tests (TSH, T3, and T4) are interpreted to diagnose thyroid disorders.
7. Discuss the causes, symptoms, and management of Type 1 diabetes

mellitus. How does it differ from Type 2 diabetes mellitus?

8. Discuss the causes, symptoms, and management of hypoglycemia. How can it be prevented in diabetic patients?
9. Discuss the causes, symptoms, and treatment options for polycystic ovary syndrome (PCOS).
10. Describe the principles of diagnostic tests and explain how hormone replacement therapy works as a treatment.

Group Activities

1. Label a diagram of the endocrine system and explain the function of each gland.
2. Write a short report on the clinical presentation and treatment of diabetes insipidus and diabetes mellitus.
3. Create a flowchart showing the management of Type 2 diabetes.
4. Write a reflective note on the importance of early diagnosis in managing endocrine disorders.



Chapter 12

PEDIATRICS

After studying this chapter, students will be able to:

- Describe the causes, symptoms, and treatment of respiratory and gastrointestinal infections.
- Explain the symptoms, complications, and prevention of vaccine-preventable diseases.
- Describe the causes, symptoms, and management of stunting, wasting, and childhood obesity.
- Describe the causes, symptoms, and treatment of asthma and Type 1 diabetes.
- Explain the importance of immunization, nutrition, and hygiene in child health.
- Demonstrate proper hand-washing techniques to prevent infections.
- Develop a vaccination schedule for a child based on national guidelines.
- Design a balanced meal plan for a malnourished child.

Pediatrics is the branch of medicine focused on the health and care of babies, children, and teenagers. Pediatricians treat a wide range of childhood illnesses and guide families on how to raise healthy children. Their work includes physical health, mental well-being, nutrition, growth monitoring, and illness prevention.

Unlike adults, children need special care because their bodies and immune systems are still developing. Pediatric care also involves regular checkups, health education for parents, and the early detection of health problems to ensure proper development.

12.1 Common Infections in Children

Children frequently catch infections due to their developing immune systems. Common illnesses spread through contact with germs found in the air, water, food, and unclean hands. Two main types of infections in children are respiratory and gastrointestinal.

Respiratory Infections

Respiratory infections are illnesses that affect parts of the respiratory system,

such as the nose, throat, windpipe, and lungs. These infections can be caused by viruses, bacteria, or other microorganisms and are very common in children due to their developing immune systems.

These are usually spread through: Coughing or sneezing (droplets in the air), touching contaminated surfaces, close contact with infected individuals

Examples: Common cold, pneumonia, bronchitis, flu

Symptoms: Coughing, sore throat, fever, nasal blockage, shortness of breath

Treatment: Rest, warm fluids, fever control, and antibiotics for bacterial infections. Some infections like flu can be prevented by vaccination.

Gastrointestinal Infections

Gastrointestinal infections are illnesses that affect the stomach, intestines, or digestive tract. They are commonly caused by viruses, bacteria, or parasites that enter the body through contaminated food, water, or poor hygiene.

These infections are especially dangerous for young children as they can lead to dehydration and malnutrition if not treated properly.

Common Causes: Eating unclean or under-cooked food, drinking contaminated water, poor hand hygiene after using the toilet, dirty feeding bottles or utensils

Examples: Diarrhea, vomiting, rotavirus, food poisoning

Symptoms: Loose motions, stomach pain, vomiting, dehydration

Treatment: Oral re-hydration salts (ORS), clean drinking water, and light meals. Severe cases may need hospitalization.

Oral Rehydration Solution (ORS)

ORS helps prevent and treat dehydration caused by diarrhea and vomiting.

Ingredients for Homemade ORS:

- 1 liter (about 5 glasses) of clean water
- 6 level teaspoons of sugar
- ½ level teaspoon of salt

Method to Prepare at Home:

- Wash your hands and use clean utensils.
- Mix 6 level teaspoons of sugar and ½ level teaspoon of salt into 1 liter of (boiled clean water.
- Stir well until the sugar and salt dissolve completely.

Give small sips frequently to the patient after each loose motion or vomiting episode.

Prevention Tips

- Wash hands with soap regularly
- Drink safe and clean water
- Eat hygienic and well-cooked food
- Get vaccinated on time (Rota virus vaccine part of EPI program)
- Wear face mask to avoid infection during flu season.

Breastfeeding in the first 6 months gives babies natural immunity and lowers the risk of infections.

12.2 Vaccine-Preventable Diseases

Immunization

Immunization is one of the most effective and affordable ways to protect children from life-threatening diseases. It helps build immunity against specific infections by introducing vaccines that prepare the body to fight off harmful germs.

Benefits of Immunization:

- Protects against diseases like measles, polio, tuberculosis, diphtheria, and tetanus.
- Reduces child mortality and long-term disability.
- Prevents the spread of infectious diseases in the community (herd immunity).
- Saves healthcare costs by reducing the need for treatment and hospitalization.

Vaccines help children's immune systems fight off specific diseases. They are among the most effective ways to prevent serious illnesses.

Common Vaccine-Preventable Diseases

- Measles
- Polio
- Diphtheria
- Tetanus
- Pertussis (Whooping cough)
- Hepatitis B
- Tuberculosis (BCG vaccine)

Symptoms and Risks

- **Measles:** High fever, rash and a runny nose and it may lead to pneumonia or brain inflammation.
- **Polio:** Muscle weakness or paralysis, sometimes permanent.
- **Tetanus:** Muscle spasms, difficulty in breathing, and high risk of death if untreated.

Pneumonia is one of the leading causes of death in children under 5, but it is preventable through vaccines and good hygiene.



Figure 12.1: Measles



Figure 12.2: Polio

Expanded program on Immunization

- Follow the national Expanded Program on Immunization (EPI).
- Vaccines should be completed by age five, with booster doses if required.
- Missed doses should be taken as soon as possible.

Ages	Vaccines	Target diseases
At birth	Hepatitis B, BCG, OPV	Hepatitis B, tuberculosis, Poliomyelitis
Sixth week (first dose)	OPV , Pentavalent , Rotavirus Anti-pneumococcal	Diphtheria Tetanus Whooping cough Hepatitis B Hemophilus B (Hib) infections Poliomyelitis Pneumococcal infections Rotavirus infections
Tenth week (second dose)	OPV Pentavalent Rotavirus Anti-pneumococcal	
Fourteenth week (third dose)	IPV Pentavalent Anti-pneumococcal	
Ninth month	MR YF	Measles - Rubella Yellow fever
15 months	MR	Measles - Rubella

Figure 12.3: Immunization Schedule

12.3 Nutrition Problems in Children

Good nutrition is essential for children's growth and immunity. Poor diets can cause under-nutrition or over-nutrition, both of which harm development.

Stunting (Short Height for Age)

Cause: Long-term lack of nutrients and frequent illness

Symptoms: Height below the standard for age

Management: Balanced diet with proteins, vitamins, regular monitoring

Wasting (Low Weight for Height)

Cause: Acute food shortage or infection

Symptoms: Visible thinness, fatigue, dry skin, thin brittle hair, frequent infections

Management: Ready-to-use therapeutic foods, clean water, medical care

Obesity (Overweight)

Causes: Overeating, processed foods, lack of physical activity

Symptoms: Excess weight, breathlessness, risk of early diabetes, joint pains.

Management: Healthy diet, outdoor activity, family involvement

BALANCED MEAL

A balanced meal contains the right amount of essential nutrients that the body needs to grow, stay strong, and remain healthy. For children, eating a variety of healthy foods every day supports brain development, physical growth, energy levels, and a strong immune system.

Main Components of a Balanced Meal:

- Carbohydrates: Provide energy. Examples are rice, roti, bread, potatoes.
- Proteins: Help build and repair muscles. Examples are eggs, meat, lentils, beans, milk.
- Fats: Needed in small amounts for energy and healthy cells. Examples are nuts, seeds, butter, cooking oil.
- Vitamins and Minerals: Keep skin, eyes, and bones healthy. Found in fruits, vegetables, and dairy products.
- Water: Keeps the body hydrated and helps digestion.

Stunting affects physical and brain development, and it is often permanent if not corrected early.

Tips for Building a Balanced Plate:

- Half the plate should be fruits and vegetables (colorful and fresh)
- One-quarter should be whole grains (like brown rice or whole wheat bread)
- One-quarter should be protein (like lentils, chicken, or paneer)
- Add a small amount of healthy fat (like olive oil or nuts)
- Include a glass of water or milk



Figure 12.4: A healthy eating plate

12.4 Long-Term Illnesses in Children

Some conditions in children are long-lasting and need ongoing care and lifestyle adjustments. These are known as chronic or long-term illnesses. Children with such conditions need support not just from healthcare providers, but also from families, schools, and their communities. Early diagnosis and consistent management are key to helping children live active, healthy lives. Two common chronic diseases in childhood are asthma and Type 1 diabetes.

Asthma

Cause: Asthma is caused by inflammation and narrowing of the airways in the

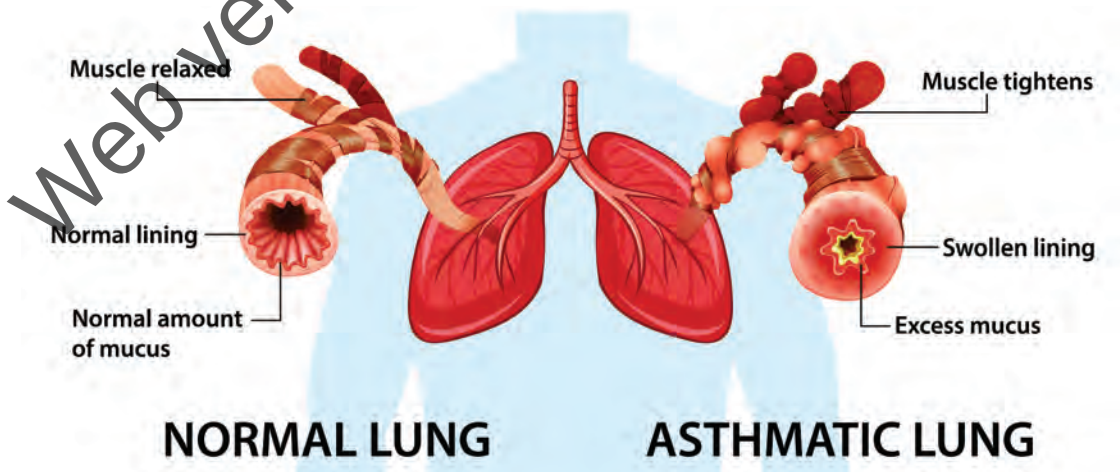


Figure 12.5: Normal vs Asthmatic Lung

lungs. It may be linked to genetic factors, allergies, exposure to air pollution, or early respiratory infections.

Symptoms: Coughing at night, wheezing, chest tightness, shortness of breath

Triggers: Smoke, exercise, cold air, dust mites, pollen, pets, strong smells

Management: Use prescribed inhalers (relievers and preventers), avoid known triggers, maintain a clean environment, regular medical checkups

Type 1 Diabetes

Cause: Type 1 diabetes is an autoimmune condition where the immune system mistakenly destroys the insulin-producing cells in the pancreas. The exact cause is unknown, but genetics and viral infections may play a role.

Symptoms: Constant thirst, frequent urination, sudden weight loss, fatigue, blurred vision

Management: Requires lifelong insulin therapy through injections or an insulin pump, regular blood sugar checks, and a balanced diet

Complications: Risk of low blood sugar (hypoglycemia), high blood sugar (hyperglycemia), and long-term complications like kidney or eye problems

Support: School staff should be trained in diabetes care. Children should carry emergency snacks, wear medical ID, and receive emotional support to manage the psychological impact

12.5 Prevention of Infections

Healthy habits protect children from disease and promote overall well-being. Personal and environmental hygiene are critical in preventing the spread of infections and keeping children healthy.

Benefits of Good Hygiene:

- Reduces the risk of infections like diarrhea, respiratory illnesses, and skin diseases.
- Promotes clean living environments at home, school, and in the community.
- Encourages lifelong healthy habits.

Important Hygiene Practices:

- Regular handwashing with soap and water.

- Brushing teeth twice daily.
- Using clean toilets and safe drinking water.
- Keeping nails trimmed and clothes clean.

12.6 Importance of Immunization, Nutrition and Hygiene

Together, immunization, nutrition, and hygiene form the foundation of child health. These practices not only prevent illness but also promote healthy growth, better school performance, and stronger futures. Ensuring these three pillars are followed is the responsibility of families, schools, and communities working together.

A clean environment—including clean toys, clothes, and surroundings—reduces the spread of germs in homes and schools.

- **Vaccination:** Shields children from dangerous diseases
- **Nutrition:** Fuels growth and mental development
- **Hygiene:** Prevents spread of germs & viruses.
- **Health Education:** Empowers families to care for children better.

12.7 Handwashing

Is one of the simplest and most effective ways to prevent the spread of infections. Germs can spread from hands to mouth, food, surfaces, and other people. Proper handwashing removes bacteria, viruses, and dirt, reducing the chances of illness in children and adults.

When to Wash Hands:

Before eating or preparing food, after using the toilet, after coughing, sneezing, or blowing the nose, after playing outdoors or with pets, after touching garbage or dirty surfaces.

Steps for Proper Handwashing:

- Wet hands with clean, running water (warm or cold).
- Apply enough soap to cover all hand surfaces.
- Rub hands together to make a lather. Scrub all parts of the hands, including:
- Backs of hands, between fingers, under fingernails.
- Scrub for at least 20 seconds.
- Rinse hands under clean, running water.
- Dry hands using a clean towel or air dryer.

How To Wash Your Hands

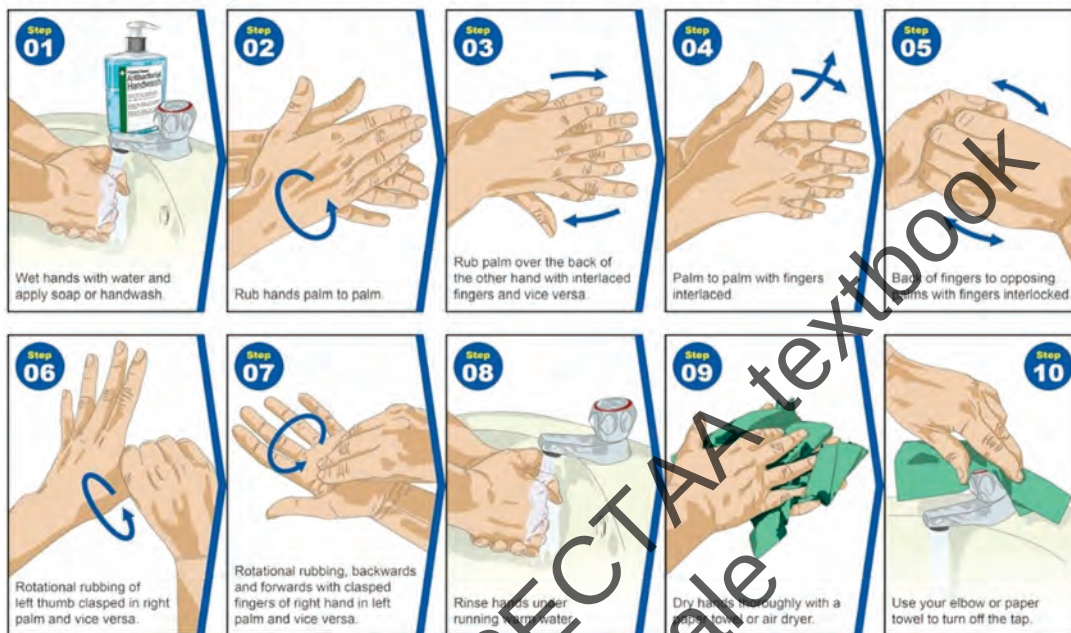


Figure 12.7: Handwashing technique

Exercise

A. Select the correct answers for the following questions.

1. Which of the following is a respiratory infection commonly found in children?

- | | |
|--------------|----------------|
| (a) Polio | (b) Bronchitis |
| (c) Diarrhea | (d) Typhoid |

2. What is the main cause of stunting in children?

- | | |
|-----------------------|--------------------------|
| (a) Too much exercise | (b) Chronic malnutrition |
| (c) Lack of sleep | (d) Exposure to sunlight |

3. Which disease is prevented by the BCG vaccine?

- | | |
|------------------|--------------------|
| (a) Tetanus | (b) Measles |
| (c) Tuberculosis | (d) Whooping cough |

4. Which of the following is NOT a symptom of asthma?

- | | |
|---------------------|--------------|
| (a) Chest tightness | (b) Wheezing |
| (c) Skin rash | (d) Coughing |

5. A balanced meal includes all of the following EXCEPT:

- (a) Protein
- (b) Carbohydrates
- (c) Candy
- (d) Vitamins

6. When should children wash their hands?

- (a) Only after meals
- (b) Only after school
- (c) After using the toilet and before meals
- (d) Once a day

7. Type 1 diabetes in children is mainly caused by:

- (a) Overeating
- (b) Autoimmune destruction of insulin-producing cells
- (c) Lack of exercise
- (d) Consuming sugar

8. Which food group builds and repairs body tissues?

- (a) Fats
- (b) Proteins
- (c) Sugars
- (d) Water

9. Which of these is a sign of wasting in children?

- (a) Height below average
- (b) Obesity
- (c) Thin limbs and weakness
- (d) Frequent urination

10. What does the EPI (Expanded Program on Immunization) focus on?

- (a) Building hospitals
- (b) Treating adults
- (c) Providing free medicine
- (d) Giving vaccines to children

B. Write short answers.

1. What are two common symptoms of gastrointestinal infections in children?
2. List key components of a balanced meal.
3. Why is hand washing important for children's health?
4. Name diseases prevented by routine childhood vaccination.
5. What is the primary cause of Type 1 diabetes in children?

C. Write answers in detail.

1. Explain the causes, symptoms, and treatment of respiratory infections in children. Give at least one example.
2. Discuss the importance of vaccination in children and describe how the

EPI program helps prevent disease.

3. Describe the differences between stunting, wasting, and obesity in children. Include their causes and how they can be managed.
4. Explain the proper hand-washing technique and its role in preventing the spread of infection among children.
5. Describe how chronic illnesses like asthma and Type 1 diabetes affect children and explain how they can be managed with support from families and schools

Group Activities

- Create a poster on the importance of childhood immunization.
- Write the challenges of managing childhood obesity.
- Write the challenges of managing Type 1 diabetes in children.



FIRST AID

Chapter 13

First Aid - II

After studying this chapter, students will be able to:

- Explain the steps to perform the Heimlich maneuver for choking victims.
- Describe the first aid measures for managing shock (e.g., lying down, elevating legs, keeping warm).
- Explain the first aid steps for poisoning (e.g., identifying the substance, calling for help) and bites (e.g., cleaning, immobilization).
- Describe the first aid measures for heatstroke (e.g., cooling) and hypothermia (e.g., warming).
- Learn the importance of a well-stocked first aid kit and emergency preparedness.
- Demonstrate the proper positioning of a patient in shock.
- Narrate the first aid response to a snake bite or insect sting.
- List the essential items in a first aid kit and their uses.

13.1 First Aid for Choking (Heimlich Maneuver)

Choking occurs when an object, often food, blocks a person's airway. Without quick action, this can lead to breathing failure.

Signs of Choking

- Inability to breathe or speak
- High-pitched or wheezing sounds
- Hands clutching the throat
- Blue lips or face
- Loss of consciousness

The **universal sign** of choking is hands clutched around the throat.

SIGNS OF CHOKING



Figure 13.1: Signs of Choking

Steps for the Heimlich Maneuver

1. Ask, "Are you choking?" If the person nods or cannot speak, take immediate action.
2. Stand behind them and wrap your arms around their waist.
3. Make a fist and place it just above their belly button.
4. Grasp your fist with your other hand.
5. Deliver quick, upward thrusts.
6. Repeat until the object is expelled or the person becomes unresponsive.
7. If they collapse, gently lower them to the ground, begin CPR, and call for help.

Note: For infants, pregnant individuals, or people with obesity, use modified technique:

- **Infants (under 1 year):**

Use **5 back slaps** and **5 chest thrusts**, alternating. Do **not** use abdominal thrusts.

- **Pregnant or Obese Individuals:**

Perform **chest thrusts** instead of abdominal thrusts. Place hands on the **center of the chest** and thrust backward.

Back slaps and chest thrusts are used instead of abdominal thrusts in infants **under 1 year**.

If the object cannot be dislodged by coughing - Call 000. Then do the back blow / chest thrust sequence.

SIGNS & SYMPTOMS

- Trying to breathe
- Gaspings, coughing
- Cannot speak or breathe
- No escape of air can be felt
- Hands held to throat
- Extreme anxiety, agitation

HAZARD = Panic. Complete obstruction.

RISK = Unconsciousness, Respiratory arrest, Cardiac arrest, Death.

BACK BLOW / CHEST THRUST SEQUENCE

POSITION THE CASUALTY

Reassure

USE THE
HEEL OF
YOUR HAND

Give up to
**5 SHARP
BACK BLOWS**
In the middle of the back
Check for removal
between blows

REPEAT

Until the
obstruction is
dislodged.

Still choking, give up to
**5 SHARP
CHEST THRUSTS**
In the middle of the chest
Check for removal
between thrusts

IF UNCONSCIOUS

Airway obstruction may not be apparent until assessing the airway and breathing.
Finger sweep if solid material is visible.
Commence CPR for cardiac arrest.

**Ensure Safety
for Self and Others**

**Dial Triple Zero (000)
for an Ambulance**

Child and adult: Back blows - lean forward. Chest thrusts - upright, use your other hand to hold them or position against a stationary/stable object so you don't knock them over (e.g. wall, in a chair etc.)

Infant: Back blows - head downwards so gravity will assist with expulsion. Across your lap/thigh or over your arm. Chest thrusts - turn over.



This is one method for infant - if having to act quickly where no seat is available to allow for positioning over the first aiders thigh.

Figure 13.2: First Aid for Choking

13.2 First Aid for Shock

Shock is a life-threatening condition where vital organs don't get enough blood. It can result from injury, allergic reaction, infection, or severe bleeding.

Common Causes

Major bleeding or burns, severe dehydration, allergic reactions, Heart failure, serious infections.

Shock can happen even without visible injury — always monitor breathing and pulse.

Signs of Shock

Pale, cool, or sweaty skin, fast breathing and heartbeat, confusion or dizziness, nausea or vomiting, fainting

First Aid Steps

- Call emergency services.
- Lay the person flat.
- Raise their legs (unless there's injury).
- Keep them warm and calm.
- Don't give them food or drink.



Figure 13.3: First Aid for Shock

13.3 First Aid for Poisoning and Bites

Poisoning may happen through swallowing, breathing in toxins, skin contact, or injections.

Common Poisons

- Household cleaning agents
- Medications (accidental overdose)
- Pesticides or insecticides
- Carbon monoxide
- Toxic plants or spoiled food

First Aid for Poisoning

- Identify the poison and how it entered the body.
- Call poison control or emergency services.
- Do not induce vomiting unless instructed.
- Move to fresh air if inhaled.
- Rinse eyes or skin for 15 minutes if exposed.
- Monitor breathing and alertness.

First Aid for Snake and Insect Bites

Some bites are mild, but others can be life-threatening.

Snake Bites

- Keep the person calm and still.
- Keep the bite area lower than the heart.
- Do not cut, suck, or apply ice.
- Seek emergency care.

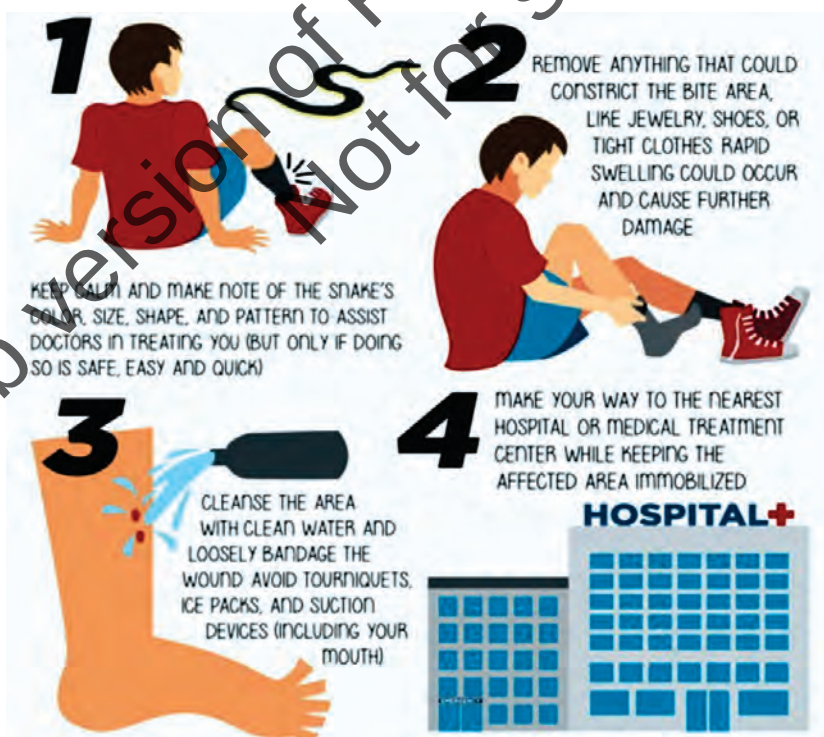


Figure 13.4: First Aid for Snake Bite

Insect Stings

- Gently scrape off the stinger.
- Wash with soap and water.
- Apply a cold pack.
- Watch for allergic reactions (e.g., hives, difficulty breathing).



Figure 13.5: Bee sting First Aid

Animal Bites

- Clean with antiseptic.
- Apply pressure to stop bleeding.
- Bandage the wound.
- Seek medical help for rabies or tetanus.

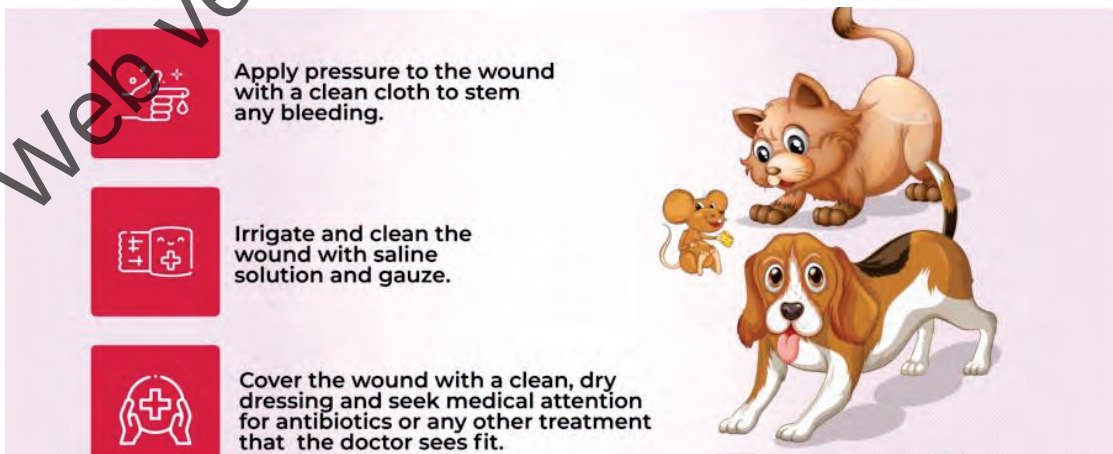


Figure 13.6: First Aid for Dog, Cat, and Rat Bites

13.4 Heatstroke and Hypothermia

These emergencies occur when the body gets too hot or too cold.

Heatstroke

Caused by long exposure to high temperatures and dehydration.

Signs

- Body temperature above 40°C (104°F)
- Hot, dry skin or heavy sweating
- Headache, confusion, dizziness
- Fast breathing or pulse
- Fainting

First Aid

- Move to a cool place.
- Remove heavy clothing.
- Use fans, cool cloths, or water.
- Offer small sips of water if conscious.
- Call for medical help.



Figure 13.7: Heat Stroke First Aid

Hypothermia

Occurs when body temperature drops below 35°C (95°F).

Symptoms

Shivering, pale, cold skin, drowsiness or slow thinking, slurred speech, weak pulse and shallow breathing

First Aid

- Move to a warm, dry space.
- Remove wet clothing.
- Wrap in warm blankets.
- Give warm drinks if alert.
- Do not use hot water bottles or direct heat.
- Seek immediate help.



Figure 13.8: Hypothermia Management

13.5 First Aid Kit and Emergency Preparedness

Having a ready first aid kit helps manage emergencies quickly.

Basic First Aid Kit Contents

- Gauze pads: for dressing wounds
- Band-aids: for small cuts
- Antiseptic wipes and cream: for cleaning
- Tweezers and scissors: for splinters and cutting tape
- Gloves: to maintain hygiene
- Thermometer: to check fever
- Pain relievers: such as paracetamol
- Burn ointment: for minor burns

- Eye wash: for chemical exposure
- CPR mask: for rescue breathing

Precaution

- Keep a kit at home, school, and in vehicles.
- Check items monthly for expiry.
- Learn and practice first aid regularly.
- Teach family members how to use the kit.

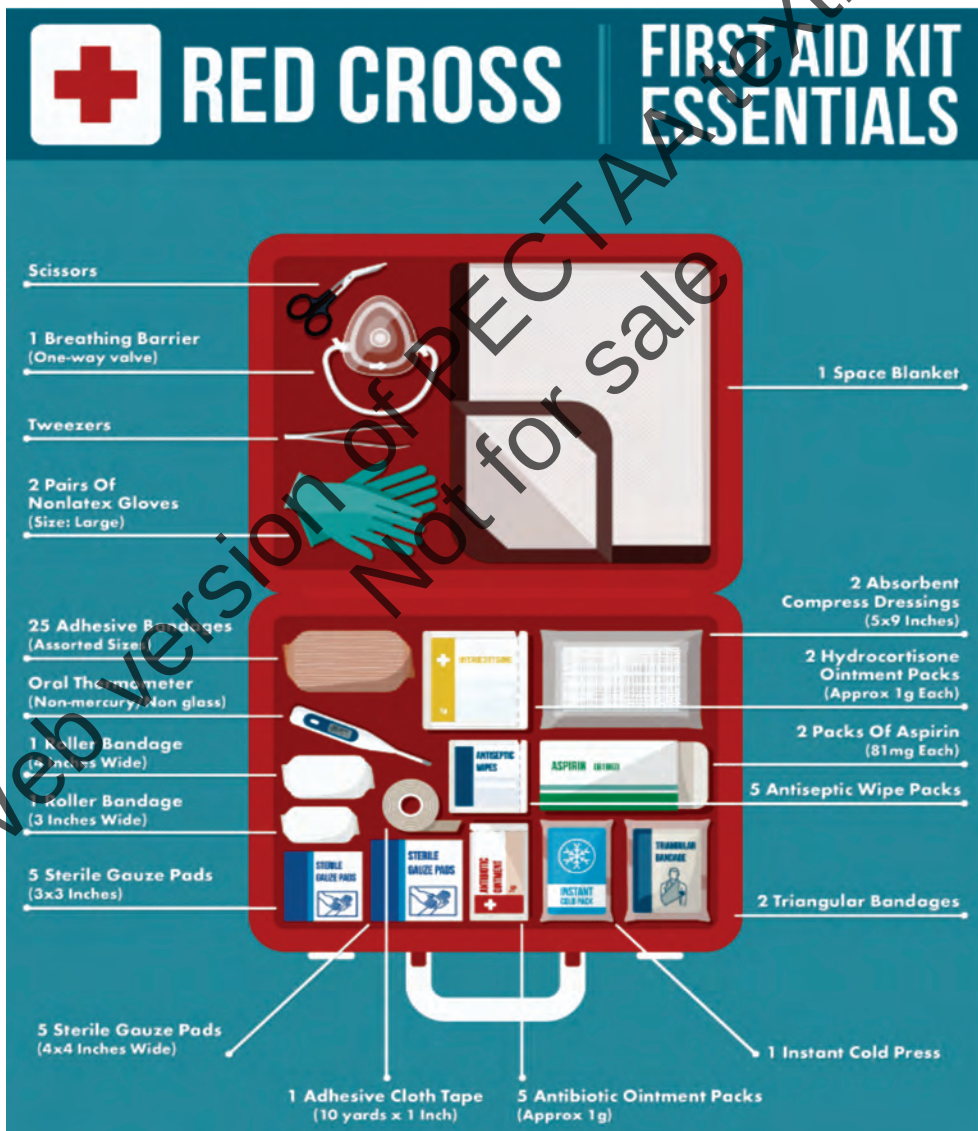


Figure 13.9: First Aid Kit

Exercise

A. Select the correct answers for the following questions.

1. What is the first step when you see someone choking?

- (a) Start CPR
- (b) Call for help
- (c) Ask, "Are you choking?"
- (d) Give them water

2. Where should your hands be placed for the Heimlich maneuver on an adult?

- (a) On the chest
- (b) Below the belly button
- (c) On the neck
- (d) Above the belly button

3. What is the best position for a person in shock?

- (a) Standing up
- (b) Sitting upright
- (c) Lying flat with legs raised
- (d) Lying on the stomach

4. What should be done first when someone shows signs of shock?

- (a) Give them water to drink
- (b) Call emergency services
- (c) Make them stand up
- (d) Cover their face

5. What should you do for a conscious infant who is choking?

- (a) Perform abdominal thrusts
- (b) Give water
- (c) Alternate back slaps and chest thrusts
- (d) Hang them upside down

6. When treating a heatstroke victim, you should:

- (a) Give hot drinks
- (b) Move them to a cooler place
- (c) Keep them wrapped in blankets
- (d) Wait for the fever to pass

7. For hypothermia, which action is WRONG?

- (a) Give warm fluids if awake
- (b) Remove wet clothes
- (c) Apply a hot water bottle directly to the skin
- (d) Wrap in blankets

8. What is the correct response to a snake bite?

- (a) Suck out the venom
- (b) Tie a tight band above the bite
- (c) Keep the person still and limb below the heart
- (d) Rub alcohol on the wound

9. Which of the following should NOT be in a first aid kit?

- (a) Antiseptic wipes
- (b) Candy
- (c) Bandages
- (d) Gloves

10. If someone is poisoned, you should first:

- | | |
|---------------------------------------|----------------------|
| (a) Induce vomiting | (b) Give them milk |
| (c) Identify the poison and call help | (d) Give painkillers |

B. Write short answers.

1. What are the signs that someone is choking?
2. List any three essential items found in a first aid kit.
3. What should you do immediately after a snake bite?
4. Give two key differences between heatstroke and hypothermia.

C. Write answers in detail.

1. Describe the complete steps for performing the Heimlich maneuver on an adult and explain how it differs for infants.
2. Explain the causes, symptoms, and first aid treatment of shock. Include the proper positioning of a patient.
3. Write a detailed note on the first aid management of poisoning and insect/snake bites.
4. Compare and contrast the symptoms and treatment of heatstroke and hypothermia.
5. Discuss the importance of emergency preparedness and explain how to assemble and maintain a first aid kit for home or school.

Practical Activities

- Practice Heimlich maneuver using a dummy or soft item.
- Simulate first aid for poisoning, snake, and insect bites.
- Demonstrate proper bandaging.
- Show emergency care for heatstroke and hypothermia.
- Conduct a mock drill to assess preparedness.

Group Work and Assessments

- Create posters outlining first aid steps.
- Role-play different emergency scenarios.
- List first aid items and explain their functions.
- Write case studies on temperature-related emergencies.
- Design a class-first-aid guidebook or comic strip.



Chapter 14

STERILIZATION

After studying this chapter, students will be able to:

- Define sterilization and differentiate it from disinfection and sanitization.
- Describe physical methods (e.g., autoclaving, dry heat) and chemical methods (e.g., ethylene oxide) of sterilization.
- Explain the steps involved in sterilizing surgical instruments and maintaining a sterile environment.
- Explain the sterilization protocols for hospital linens, equipment, and environments.
- Describe the factors that compromise the effectiveness of sterilization.

14.1 Introduction to Sterilization

Sterilization is the process of destroying all forms of microbial life, including bacteria, viruses, fungi, and spores, from an object or surface. It ensures safety and hygiene, particularly in medical and food-related environments.

Differentiation of Sterilization from Disinfection and Sanitization

Sterilization	Disinfection	Sanitization
Complete elimination of all microorganisms, including spores. Examples: • Autoclaving surgical instruments in hospitals. • Using dry heat ovens to sterilize glassware in laboratories	Reduces most microorganisms but does not eliminate spores. Examples: • Using bleach (sodium hypochlorite) to clean bathroom surfaces. • Applying alcohol wipes to disinfect a thermometer.	Lowers the number of microorganisms to safe levels as determined by public health standards. Examples: • Using hand sanitizers to reduce microbial load on hands. • Washing dishes with detergent in hot water at home.

14.2 Methods of Sterilization

There are two methods of sterilization.

1. Physical Methods
2. Chemical Methods

Physical Methods

Physical methods of sterilization involve the use of physical agents such as heat, radiation, or filtration to eliminate microorganisms, including spores, from objects and surfaces. These methods are commonly used in medical, laboratory, and industrial settings due to their effectiveness and reliability.

Following are physical methods used for sterilization.

1. Autoclaving:

An autoclave (as shown in Figure 14.1) is a specialized device that uses high-pressure saturated steam to sterilize medical instruments, laboratory equipment and other materials.

It is one of the most effective and widely used physical methods of sterilization that kills bacteria, viruses, fungi, and even heat-resistant spores.



Figure 14.1: Autoclave

Steam is introduced into a sealed chamber, creating high pressure (typically 15 psi or 103 kPa), raising the temperature to about 121°C (250°F) and maintained for 15–20 minutes to achieve effective sterilization.

2. Dry Heat Sterilization:

Dry heat sterilization (as shown in Figure 14.2) is a process that uses high temperatures in the absence of moisture to kill microorganisms, including bacteria, viruses, and spores, on various materials.

This method is suitable for items that can withstand high heat but might be damaged by moisture or steam.

It is suitable for items like glassware and metal tools.

Materials are placed in a dry heat oven and exposed to temperatures ranging from 160°C to 170°C for 2 hours or higher temperatures for shorter durations (e.g., 180°C for 30 minutes).



Figure 14.2: Dry Heat Sterilization

3. Radiation:

Radiation sterilization (as shown in Figure 14.3) uses high-energy radiation to eliminate microorganisms, including bacteria, viruses, and spores, from materials. It is a highly effective and precise method, often used for sterilizing heat-sensitive medical devices and materials.

Gamma Rays are high-energy rays emitted from radioactive sources (e.g., Cobalt-60) penetrate deep into materials, destroying DNA and microbial structures.

- **Ionizing Radiation (Gamma Rays):** Sterilizes medical devices and food.
- **Non-ionizing Radiation (UV Radiation):** Used for sterilizing surfaces and air in rooms.

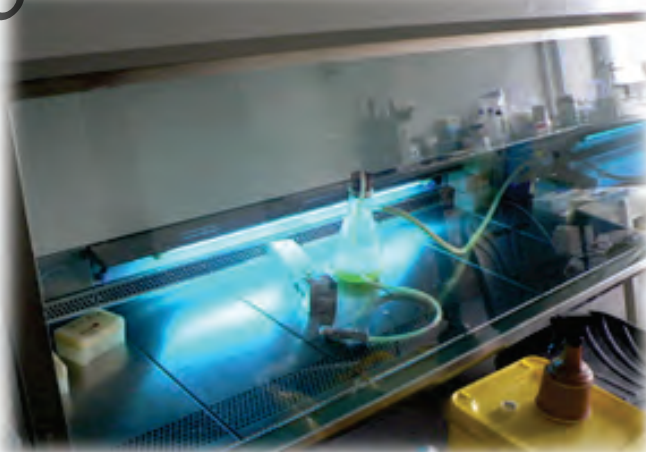


Figure 14.3: Radiation Sterilization

Chemical Methods

Chemical sterilization involves the use of chemical agents to destroy all forms of microorganisms, including bacteria, viruses, fungi, and spores, on surfaces, instruments, or within liquids. This method is particularly useful for sterilizing heat-sensitive materials.

Followings are the chemical agents use for sterilization.

1. Ethylene Oxide Gas:

It sterilizes heat-sensitive equipment such as catheters and electronic devices.

2. Hydrogen Peroxide Vapor:

It is effective for sterilizing surgical rooms and tools.

3. Alcohol and Chlorine Compounds:

It is used for surface and skin sterilization.

14.3 Sterilization in Surgical Setting

Proper sterilization of surgical instruments is essential to prevent infections and ensure patient safety.

Steps for Sterilizing Surgical Instruments

The process involves several steps, each critical to maintaining a sterile environment.

Preparation:

- Begin by removing visible debris such as blood and tissue from the instruments.
- Use enzymatic cleaners or detergents specifically designed for medical instruments.
- Rinse thoroughly with clean water to remove any remaining residue.

Packaging:

- Place instruments in sterilization pouches or wraps to protect them during the process.
- Ensure proper labeling of the packages, including the date and contents.

Sterilization Process:

- Load the instruments into an autoclave or other sterilization device. Ensure

that items are arranged to allow steam or gas to circulate freely.

- Select the appropriate cycle based on the material and type of instruments. For example, autoclaving uses steam at 121°C for 15-20 minutes under pressure.

Storage:

- Once sterilized, store the instruments in a clean, dry environment away from contaminants.
- Periodically check stored instruments to ensure they remain sterile until use.

Maintaining a Sterile Environment

Creating and maintaining a sterile environment is vital, especially in operating rooms and other medical settings. This involves consistent protocols and vigilant monitoring.

Cleaning and Disinfection:

- Regularly clean all surfaces, including floors, walls, and countertops, using hospital-grade disinfectants.
- Pay special attention to high-touch areas such as door handles and equipment controls.

Air Quality Control:

- Use High Efficiency Particulate Air (HEPA) filters and maintain positive air pressure in operating rooms to prevent contamination from outside.
- Install Ultraviolet (UV) lights to sterilize the air and reduce microbial load.

Personnel Hygiene:

- Medical staff must wear sterilized gowns, gloves, and masks during procedures.
- Practice proper hand hygiene, including washing hands with antimicrobial soap and using alcohol-based hand rubs.

14.4 Sterilization and Infection Control in Hospitals

Hospital Linens

Hospital linens include bed sheets, patient gowns, pillowcases, and surgical drapes. These items must be sterilized to prevent cross-contamination and infection.

Protocols:**1. Collection and Handling**

- Use designated bins for soiled linens to prevent contamination.
- Handle with gloves to minimize direct contact.
- Avoid shaking or agitating to prevent aerosolizing microorganisms.

2. Pre-Treatment

- Rinse off visible contaminants with cold water.
- Apply enzymatic or pre-wash detergents for heavily soiled linens.

3. Washing and Sterilization

- Wash linens in industrial washing machines with water heated to 71–80°C for 25 minutes.
- Use detergent with chlorine-based disinfectants.
- For surgical linens, sterilize using autoclaving at 121°C and 15 psi for 20–30 minutes.

4. Drying and Ironing

- Use high-temperature dryers to eliminate residual pathogens.
- Iron linens to ensure an additional layer of decontamination and remove creases.

5. Storage

- Store sterilized linens in clean, sealed, and temperature-controlled cabinets.
- Label and segregate sterile and non-sterile linens.

Medical Equipments

Sterilization ensures that medical devices are safe to use, especially reusable surgical instruments and diagnostic equipment.

Protocols:**1. Pre-Cleaning**

- Disassemble multi-component instruments if applicable.
- Rinse equipment under running water to remove blood, tissue, or debris.
- Use enzymatic cleaners and ultrasonic baths for hard-to-reach areas.

2. Sterilization

It is done by using these methods (Autoclaving, Dry Heat Sterilization, Chemical Sterilization, Radiation Sterilization)

3. Inspection and Assembly

- Inspect instruments for damage or wear before packaging.
- Reassemble instruments as necessary and package in sterile wraps or pouches.

4. Storage

- Store sterilized equipment in dedicated sterile storage areas.
- Maintain humidity and temperature controls.

Hospital Environment

Proper environmental sterilization minimizes the risk of nosocomial infections and ensures a safe space for patients and staff.

Protocols:

1. Routine Cleaning

- Clean high-touch surfaces (e.g., doorknobs, bed rails) daily with disinfectants like quaternary ammonium compounds or sodium hypochlorite.
- Use alcohol-based solutions for electronics and delicate equipment.

2. Air Filtration and Sterilization

- Install HEPA filters in critical areas like operating rooms and ICUs.
- Use UV-C light air sterilizers to reduce airborne pathogens.

3. Floor Cleaning

- Mop floors using hospital-grade disinfectants. Avoid dry sweeping to prevent dust particles from circulating.
- Use disposable mop heads for highly contaminated areas.

4. Waste Management

- Segregate medical waste into color-coded bins for proper disposal.
- Sterilize reusable waste containers with high-pressure steam or chemical disinfectants.

5. Periodic Deep Cleaning

- Conduct terminal cleaning of rooms after patient discharge.
- Use fogging machines with hydrogen peroxide vapor or ozone for hard-to-reach areas.

6. Monitoring and Audit

- Keep logs of cleaning schedules and sterilization cycles.
- Conduct regular environmental swab tests to monitor microbial load.

14.5 Challenges in Sterilization

Sterilization is a vital process used in hospitals and laboratories to kill all harmful microorganisms from instruments, surfaces, and equipment. However, there are several challenges that can make sterilization less effective if not handled properly.

1. Improper Cleaning Before Sterilization

If instruments are not cleaned properly before sterilization, blood, dirt, or tissue can protect germs from being killed. This reduces the effectiveness of the process.

2. Overloading Sterilizers

Placing too many items inside an autoclave or sterilizer at once can block the steam or heat from reaching all surfaces evenly. As a result, some germs may survive.

3. Wrong Temperature or Time

Each sterilization method requires a specific temperature and time. If the temperature is too low or the time too short, the process may not destroy all microbes.

4. Faulty Equipment

Old or poorly maintained sterilizers may not work properly. This includes broken temperature gauges or steam leaks, which make sterilization unreliable.

5. Improper Packaging

Instruments must be packed correctly before sterilization. If the packaging is too thick or not sealed properly, steam or gas may not reach the inside.

6. Contamination after Sterilization

Even after sterilization, items can become contaminated again if they are handled with dirty hands or stored in an unclean environment.

Exercise

A. Select the correct answers for the following questions.

1. What is the primary purpose of sterilization?

- (a) Clean surfaces only
- (b) Destroy all microorganisms, including spores
- (c) Reduce microbial load
- (d) Disinfect surgical instruments

2. Which physical method uses steam under pressure?

- (a) Dry heat
- (b) Gamma rays
- (c) Autoclaving
- (d) UV radiation

3. What type of radiation is used for sterilizing medical devices?

- (a) Gamma rays
- (b) UV light
- (c) Infrared rays
- (d) Visible light

4. Which chemical is commonly used to sterilize heat-sensitive equipment?

- (a) Alcohol
- (b) Ethylene oxide gas
- (c) Sodium hypochlorite
- (d) Hydrogen peroxide

5. Which factor does NOT affect sterilization?

- (a) Type of microorganism
- (b) Organic matter on the object
- (c) Material of the object
- (d) Size of the object

6. What is the typical temperature for dry heat sterilization?

- (a) 121°C
- (b) 160-170°C
- (c) 250°C
- (d) 100°C

7. Which step is NOT involved in sterilizing surgical instruments?

- (a) Cleaning with enzymatic cleaners
- (b) Storing instruments in open air
- (c) Packaging in sterilization wraps
- (d) Using autoclaves for sterilization

8. What is the role of HEPA filters in sterilization?

- (a) Sterilizing surgical tools
- (b) Filtering microorganisms from the air
- (c) Disinfecting surfaces
- (d) Cleaning hospital linens

9. How are hospital linens typically sterilized?

- (a) Dry heat sterilization
- (b) Washing with hot water and disinfectants
- (c) UV radiation
- (d) Gas sterilization

10. What happens if sterilization equipment is not maintained properly?

- (a) Sterilization becomes more effective
- (b) The process may lead to incomplete sterilization
- (c) The process speeds up
- (d) Maintenance becomes unnecessary

B. Write short answers.

1. Define sterilization and explain how it differs from disinfection.
2. What is the primary principle behind autoclaving?
3. List two chemical agents used for sterilization and their applications.
4. Why is it essential to pre-clean surgical instruments before sterilization?
5. How does organic matter affect the sterilization process?

C. Write answers in detail.

1. Explain the steps involved in sterilizing surgical instruments. Discuss

why each step is crucial for ensuring effective sterilization.

2. Describe the different physical methods of sterilization. Include examples of where each method is used and their advantages and limitations.
3. Discuss the chemical methods of sterilization.
4. Explain the factors that can compromise the effectiveness of sterilization.

Group Activities:

1. Identify situations where sterilization is necessary in healthcare settings.
2. Demonstrate proper hand hygiene and use of personal protective equipment in a hospital setting.

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Chapter

15

NURSING AND ELDERLY CARE

After studying this chapter, students will be able to:

- Describe the key responsibilities of nurses in elderly care settings.
- Explain the causes, symptoms, and management of hypertension, diabetes, arthritis, and dementia.
- Describe the risk factors, prevention, and management of these syndromes.
- Describe the causes, symptoms, and treatment of common infectious diseases (pneumonia and UTIs) in the elderly.
- Describe the recommended vaccinations (e.g., flu, pneumonia) and health screenings for older adults.

15.1 Introduction to Nursing and Elderly Care

Elderly care, also known as geriatric care, focuses on promoting the health, safety, and well-being of older adults. Nurses play a critical role in providing care that addresses the unique needs of this age group. They ensure that elderly individuals maintain a good quality of life, manage chronic conditions effectively, and prevent potential health risks.

Key responsibilities of nurses in elderly care settings include:

- **Monitoring health conditions:** Regularly checking vital signs and identifying any changes in the patient's health.
- **Administering medication:** Ensuring timely and accurate delivery of prescribed medications.
- **Providing emotional support:** Offering companionship and addressing the psychological needs of older adults.
- **Assisting with daily activities:** Helping with bathing, dressing, and mobility to ensure comfort and dignity.
- **Educating families:** Guiding family members about elderly care, nutrition, and managing chronic illnesses.

15.2 Common Health Issues in the Elderly

As people age, they are more prone to developing certain health conditions.

Understanding these issues is crucial for effective management:

1. Hypertension:

Causes: Age-related vascular changes and high salt intake and lack of exercise.

Symptoms: Often asymptomatic; may include, headaches, dizziness and blurred vision.

Management: Lifestyle changes (diet, exercise), regular monitoring and anti hypertensive medications.

Hypertension is often called the "**silent killer**" because it typically has no noticeable symptoms, even when blood pressure levels are dangerously high. Many people with hypertension are unaware they have it until they experience complications like heart attacks, strokes.

2. Diabetes:

Causes: Insulin resistance, decreased physical activity and obesity.

Symptoms: Increased thirst, frequent urination, fatigue, slow-healing wounds.

Management: Balanced diet, blood sugar monitoring, regular exercise and medications or insulin therapy.

3. Arthritis:

Causes: Wear and tear of joints (osteoarthritis) or autoimmune conditions (rheumatoid arthritis).

Symptoms: Joint pain, stiffness and swelling.

Management: Physical therapy, anti-inflammatory medications and maintaining a healthy weight.

4. Dementia:

Causes: Alzheimer's disease, vascular issues and brain injuries.

Symptoms: Memory loss, confusion, difficulty in communication, personality changes.

Management: Cognitive therapies (**Cognitive therapy** is a psychological treatment that helps people recognize and change negative thinking patterns to improve emotions and behavior.), Medications and Creating a safe, supportive environment.

15.3 Geriatric Syndromes

Geriatric syndromes are multi-factorial health conditions common in older adults, affecting their independence and quality of life. Major syndromes include:

1. Falls:

The unintentional events leading to a person coming to rest on the ground.

Risk Factors: Muscle weakness, poor balance and medications causing dizziness.

Prevention: Strength exercises and assistive devices and removing home hazards.

2. Incontinence:

The loss of bladder or bowel control is called incontinence.

Risk Factors: Weak bladder muscles, urinary infections and neurological issues.

Management: Bladder training, pelvic floor exercises and medications.

3. Frailty:

A state of increased vulnerability.

Symptoms: Weakness, slow walking speed and unintentional weight loss.

Management: Nutritional support, physical activity and Regular check-ups.

15.4 Infectious Diseases in the Elderly

Older adults are more susceptible to infections due to weakened immune systems. Common infectious diseases include:

1. Pneumonia:

It is an infection that inflames the air sacs (alveoli) in one or both lungs. These air sacs may fill with fluid or pus.

Causes: Bacterial or viral infections, often after respiratory illnesses.

Symptoms: Cough, fever, shortness of breath and chest pain.

Treatment: Antibiotics, bed rest and oxygen therapy if needed.

2. Urinary Tract Infections (UTIs):

It is an infection that occurs in any part of the urinary system, including the kidneys, ureters, bladder, or urethra. Most UTIs involve the lower urinary tract (bladder and urethra) and are caused by bacteria, particularly *Escherichia coli* (E. coli).

Causes: Bacterial infections, often due to poor hygiene or catheter use.

Symptoms: Frequent urination and burning sensation, cloudy urine.

Treatment: Antibiotics and increased fluid intake.

15.5 Preventive Care for the Elderly

1. Vaccinations:

- **Influenza Vaccine:** Annually to prevent seasonal flu.
- **Pneumococcal Vaccine:** To protect against pneumonia.
- **Shingles Vaccine:** For those over 50 to prevent shingles.

Vaccination is that it not only protects the individual receiving it but also contributes to **herd immunity**, which helps protect those who cannot be vaccinated, such as newborns, elderly individuals with weakened immune systems.

2. Health Screenings:

- Regular checks for hypertension, diabetes, and cholesterol levels.
- Cancer screenings (e.g., colorectal, breast, and prostate).

3. Lifestyle Recommendations:

- **Balanced Diet:** Rich in fruits, vegetables, and lean proteins.
- **Physical Activity:** Light exercises like walking or yoga to maintain mobility.
- **Mental Health:** Activities like puzzles or social interactions to reduce cognitive decline.

Exercise

A. Select the correct answers for the following questions.

1. Which of the following is a common cause of hypertension in the elderly?

- | | |
|---------------------------|-----------------------|
| (a) Excess protein intake | (b) High salt intake |
| (c) Low cholesterol | (d) Frequent exercise |

2. Which disease is often called the "silent killer"?

- | | |
|------------------|---------------|
| (a) Diabetes | (b) Arthritis |
| (c) Hypertension | (d) Dementia |

3. Which symptom is most commonly associated with dementia?

- (a) Frequent urination
- (b) Joint stiffness
- (c) Memory loss
- (d) Dizziness

4. What is the primary cause of most urinary tract infections (UTIs) in the elderly?

- (a) Fungal infections
- (b) Poor hygiene or catheter use
- (c) Viral infection
- (d) Immune overactivity

5. Which vaccine is recommended annually for older adults?

- (a) Shingles vaccine
- (b) Tetanus vaccine
- (c) Influenza vaccine
- (d) Hepatitis B vaccine

6. Frailty in elderly individuals is characterized by all except:

- (a) Unintentional weight loss
- (b) Fast walking speed
- (c) Weakness
- (d) Slow walking

7. What is a common symptom of arthritis?

- (a) High blood sugar
- (b) Blurred vision
- (c) Joint pain
- (d) Cough

8. Which is NOT a key responsibility of a nurse in elderly care?

- (a) Prescribing antibiotics
- (b) Administering medications
- (c) Educating families
- (d) Monitoring vital signs

9. Which infectious disease in the elderly causes inflammation of the lungs' air sacs?

- (a) Dementia
- (b) Pneumonia
- (c) Arthritis
- (d) UTI

10. Bladder training and pelvic floor exercises are used to manage:

- (a) Dementia
- (b) Falls
- (c) Incontinence
- (d) Hypertension

B. Write short answers

1. List any three responsibilities of nurses in elderly care settings.
2. What are the common symptoms of diabetes in older adults?

3. Define the term "incontinence" and give one cause.
4. What are two preventive measures to reduce falls in the elderly?
5. Why are older adults more susceptible to infections like pneumonia and UTIs?

C. Write answers in detail

1. Discuss the causes, symptoms, and management of hypertension and diabetes in the elderly.
2. Explain the concept of geriatric syndromes with examples. How can they be managed?
3. Describe the symptoms and treatment of common infectious diseases (Pneumonia and UTIs) in older adults.
4. Explain the role of preventive care in elderly health, including recommended vaccinations and lifestyle changes.

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Chapter 16

BEHAVIORAL SCIENCE

After studying this chapter, students will be able to:

- Define behavioral science and explain their relevance to clinical practice.
- Identify how behavior influences health outcomes.
- Describe common mental health disorders (e.g., depression, anxiety, bipolar disorder) and their symptoms.
- Explain healthy coping strategies (e.g., mindfulness, exercise, relaxation techniques).
- Describe the physical, psychological, and social impacts of substance abuse.
- Develop a plan to educate peers about the dangers of substance abuse.
- Describe how lifestyle modifications can prevent and manage chronic diseases.
- Develop a behavior change plan for someone at risk of a chronic disease.

Human health is not only about the body but also about the mind and behavior. In this chapter, you will learn how behavior affects health. You will also study some common mental health problems. We will talk about healthy coping methods that help us deal with stress. Another important part of this chapter is about the use of drugs, alcohol, or other harmful substances.

16.1 Introduction to Behavioral Science

Behavior is defined as the actions and reactions of a person or a group that can be observed and measured. Behavioral science is the study of human behavior. In behavioral science, we study;

- How people make decisions?
- How they react to stress?
- How their habits are formed?

In Pakistan, many patients ignore doctor's advice. They stop taking medicines once they feel better. This behavior often brings the disease back.

Relevance to Clinical Practice:

In clinical practice, doctors use behavioral science to understand patients' lifestyles and choices. For example, two patients with the same illness may recover differently. One may take medicines regularly, eat healthy food, and rest. The other may ignore the doctor's advice. The difference comes from behavior,

not from the medicine itself. This is why behavioral science is important for improving health care.

16.2 Effect of Behavior on Health Outcomes

Our behavior strongly influences our health. The following are the examples of positive and negative behaviors:

Positive behaviors - eating balanced meals, exercising daily, sleeping well, managing stress etc.

Negative behaviors - smoking, drug abuse, poor diet, ignoring medical advice etc.

Scientists believe that positive behaviors help prevent many diseases. On the other hand, negative behaviors cause serious health problems, including heart disease, diabetes, and mental stress. So, doctors cannot treat patients with medicines alone. They also need to guide patients toward healthy behaviors. For example, a diabetic patient must change eating habits and do regular exercise along with taking medicines. Without such behavior changes, medicines will not work properly.



Healthy Choices



Unhealthy Habits

FIGURE 16.1: Our choices shape our health

About 70% of chronic diseases (like diabetes and heart problems) are linked to lifestyle and behavior.

Table 16.1: Behavior and Health Outcomes

Behavior	Positive / Negative Health Outcome
Eating fruits and vegetables	Strong immunity, protection from diseases
Smoking	Lung disease, cancer, early death
Regular exercise	Healthy heart, better mood, strong muscles
Ignoring medical advice	Delayed recovery, serious complications
Managing stress (relaxation)	Lower blood pressure, better mental health

16.3 Mental Health and Mental Disorders

Mental health means the ability to think, feel, and behave in a balanced way. A

person with good mental health shows the following characteristics:

- | | | | |
|------------------|--------------------|-------------------|-----------------------------|
| • Thinks clearly | • Manages emotions | • Makes decisions | • Builds good relationships |
|------------------|--------------------|-------------------|-----------------------------|

Mental disorders are illnesses of the mind that disturb thinking, emotions, and behavior. They affect daily life just like physical diseases do. The following are some common mental health disorders:

1- Depression

Depression is a mental disorder in which a person feels sadness, hopelessness, and loss of interest in daily activities for a long time.

Causes: Stressful life events, loss of loved ones, poverty, long-term illness, imbalance of brain chemicals, lack of social support.

Symptoms: Constant sadness or low mood; loss of interest in hobbies or social life; low energy and tiredness; disturbed sleep and appetite; feelings of worthlessness.

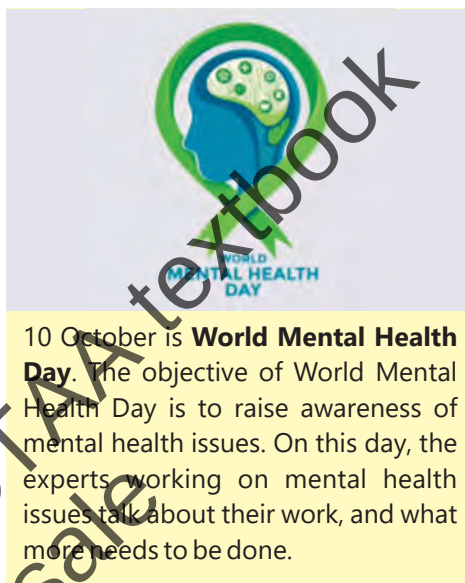
Management: Talking with trusted people or a counsellor; medicines prescribed by doctors; regular exercise and healthy sleep; positive activities such as hobbies and social interaction.

2- Anxiety

Anxiety is a mental disorder in which a person feels extreme and continuous fear or worry, even without a clear reason.

Causes: Stressful exams or jobs, trauma, family or financial problems, imbalance of brain chemicals, sometimes inherited.

Symptoms: Too much worry about small things; restlessness; fast heartbeat, sweating, shaking; difficulty sleeping or concentrating; stomach problems; headache due to worry.



10 October is **World Mental Health Day**. The objective of World Mental Health Day is to raise awareness of mental health issues. On this day, the experts working on mental health issues talk about their work, and what more needs to be done.



FIGURE 16.2: Mental Disorders

Management: Relaxation techniques like deep breathing or mindfulness; regular physical activity; healthy sleep and proper rest; Counselling or therapy sessions; medicines in severe cases

3- Bipolar Disorder

It is a mental illness where a person's mood changes between two extremes i.e., very high energy and happiness and very low sadness (depression).

Causes: Family history, brain chemical imbalance, stressful life events, trauma, and sometimes drug or alcohol abuse.

Symptoms: Periods of extreme happiness, too much energy, less need for sleep (mania); periods of sadness, hopelessness, and low energy (depression); difficulty managing school, work, or relationships.

Management: Mood-stabilizing medicines; Counselling and psychotherapy; balanced lifestyle (regular sleep, healthy food, avoiding drugs and alcohol); family and community support.

Anxiety can cause real physical symptoms like stomach pain, headache, or chest tightness, even when there is no physical illness.

A small amount of anxiety before exams or interviews is normal and can actually improve performance.

Table 16.2: Common Mental Health Disorders

Disorder	Definition	Causes	Symptoms	Management
Depression	Long-lasting sadness and loss of interest	Stress, loss, illness, brain imbalance	Sadness, hopelessness, disturbed sleep	Counselling, medicines, exercise
Anxiety	Continuous fear or worry	Stress, brain imbalance	Restlessness, fast heartbeat	Relaxation, medicines
Bipolar	Extreme mood swings (mania & depression)	Family history, brain imbalance, trauma	Happiness + depression, risky behavior	Medicines, therapy, lifestyle balance

16.4 Stress and Coping Mechanisms

Stress is the body's natural response to pressure or difficult situations. It occurs when a person feels that his responsibilities, problems, or challenges are greater than his ability to handle them. A small amount of stress can sometimes be helpful, for example before an exam or competition. It keeps us active and alert.

However, too much and longer stress is harmful for both the body and the mind. Stress can affect us in many ways.

- It may cause headaches, stomach pain, or tiredness.
- Mentally, it may lead to anger, sadness, or constant worry.
- If not controlled, it can result in serious health problems e.g., high blood pressure, heart disease, depression.



FIGURE 16.3: Effects of stress

Healthy Coping Strategies

Healthy coping strategies are methods to deal with stress in a positive way.

1- Mindfulness

One important coping strategy is mindfulness. It means focusing on the present moment instead of worrying about the past or future. Simple practices like slow breathing or paying attention to daily activities with calmness can reduce negative thoughts.

2- Exercise

Physical activities such as walking, running, offering prayers, and playing games reduce stress hormones and improve mood. Even half an hour of daily exercise can help us to feel more relaxed and energetic.

3- Relaxation Techniques

Stress can also be managed through relaxation techniques like deep breathing, spending time in nature, listening to soft music, or engaging in hobbies such as reading, painting, or gardening. These activities relax both the body and the mind.

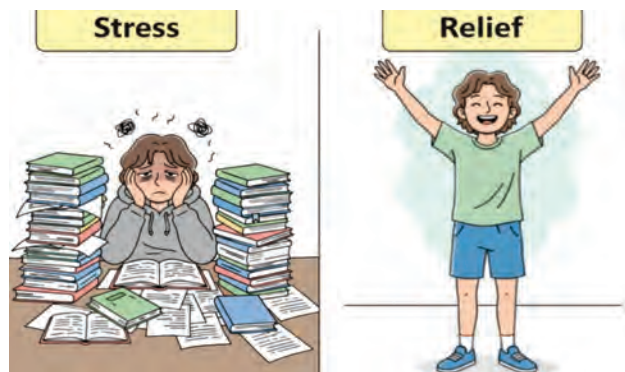


FIGURE 16.4: Exercise as stress coping strategy

Exercise increases “happy chemicals” (endorphins) in the brain that fight stress naturally. Laughter is also a natural stress reliever—it relaxes the body for up to 45 minutes!

Classroom Activity: "Two-Minute Calm Breathing"

Objective: To help students learn a simple breathing exercise that reduces stress and can be practiced anywhere.

Procedure (under the supervision of teacher):

1. Sit comfortably on chair with feet flat on the ground.
2. Gently close your eyes or look down to avoid distractions.
3. Place one hand on the stomach and the other on the chest.
4. Take a slow deep breath in through your nose for 4 seconds. Feel your stomach rise.
5. Hold your breath for 2 seconds. Then breathe out slowly through your mouth for 6 seconds. Feel your stomach fall.
6. Repeat this cycle four times (about 2 minutes).

Reflection:

After the activity, tell your teacher how you felt – more relaxed, calmer, or focused.

16.4 ADDICTION AND SUBSTANCE ABUSE

Substance abuse means the harmful or unsafe use of substances such as tobacco, alcohol, drugs, or even inhalants (e.g., glue sniffing). People may start using these substances because of curiosity, pressure from friends, or to escape stress, but over time they lose control and become addicted.

Addiction is a condition in which a person becomes dependent on a substance or activity and cannot stop using it even when it causes harm. It changes the brain in such a way that the person feels a strong need or "craving" for that substance.

"Drugs" are substances that alter the normal functioning of the brain and body, often leading to dependence. The following are the examples of drugs:

Heroin: A narcotic drug often injected or smoked. It causes euphoria at first but leads to severe dependence, lung damage, and HIV due to needle sharing.

Cocaine: A stimulant drug that gives a temporary sense of energy but causes aggression, hallucinations, and damage to brain cells.

Cannabis (Charas/Hashish): A widely used drug in Pakistan, often smoked. It can impair memory, concentration, and motivation.

Opium (Afeem): Extracted from poppy plants. Causes drowsiness and long-term health complications.

Alcohol: Long-term use leads to liver cirrhosis and mental health problems.

Prescription Drugs (misused): – Painkillers (like Tramadol) and sleeping pills are sometimes misused without a doctor's advice, leading to addiction.

Impacts of Addiction and Substance Abuse

Physical Impacts

Addiction affects the body's health in many harmful ways.

- Drug abuse can damage vital organs. For example, heroin damages the lungs and liver, while alcohol leads to liver cirrhosis.
- Tobacco use increases the risk of cancer and heart disease, which are already high in Pakistan.
- Drug users usually use shared syringes. It is one of the causes of infections like Hepatitis C and HIV.

Psychological Impacts

Substance abuse also harms the brain and emotions.

- Drugs such as ice (crystal meth), which is unfortunately becoming popular among students, can cause anxiety and aggression.
- Alcohol or opioid dependence leads to depression and withdrawal symptoms.
- Long-term use changes brain chemistry, making it very difficult for the person to quit.

University students using crystal meth often show mood swings, aggression, and decline in academic performance.

Social Impacts

Addiction affects not only the individual but also families and communities.

- Families suffer financial loss because money is spent on drugs instead of basic needs.
- Substance abuse increases crime rates, such as theft, robbery, and even violence.
- Communities face stigma, as addicted individuals are often isolated or discriminated against.

According to UNODC (United Nations Office on Drugs and Crime), more than 6.7 million drug users are in Pakistan, with cannabis and heroin being the most common.

16.6 Eating Disorders

Eating disorder is defined as a persistent disturbance of eating behaviour and weakening of physical or mental health. A person with an eating disorder may eat too little, eat too much, or have unhealthy habits about food. The following are

the major types of eating disorders.

1- Anorexia Nervosa

It is the disorder in which a person avoids food or eats very little because of fear of becoming overweight, even when already underweight.

Causes: Low self-esteem, social pressure about body image, emotional stress.

Symptoms: Extreme thinness, weakness, hair loss, dry skin, always feeling cold.

2- Bulimia Nervosa

It is the disorder where a person eats large amounts of food and then forces himself to vomit or use medicines to avoid weight gain.

Causes: Stress, poor body image, pressure from peers or media.

Symptoms: Swollen cheeks, sore throat, stomach problems, feeling guilty after eating.

3- Binge Eating Disorder

It is the disorder where a person regularly eats large amounts of food in a short time without control, and does not try to get rid of it afterwards.

Causes: Stress, depression, loneliness, or using food as comfort.

Symptoms: Obesity, diabetes, high blood pressure, feeling shame after overeating.

Impacts on Health

Physical: Weakness, heart problems, diabetes, stomach damage.

Psychological: Depression, guilt, poor self-esteem.

Social: Isolation from friends, family problems, difficulty in studies.

16.7 Behavioral Factors in Chronic Diseases

Chronic diseases are long-lasting illnesses such as diabetes, heart disease, high blood pressure, and cancer. They usually develop slowly and last for many years. Our behaviors and daily habits play a big role in causing these diseases.

Behavioral Factors in Chronic Diseases

Unhealthy Diet – Eating too much fast food, fried items, and sugary drinks can cause obesity, diabetes, and heart problems.

Lack of Physical Activity – Sitting for long hours

Teenagers who spend most of their time on mobile phones instead of exercising may develop early health issues.

and not playing sports makes the body weak and increases blood pressure and cholesterol.

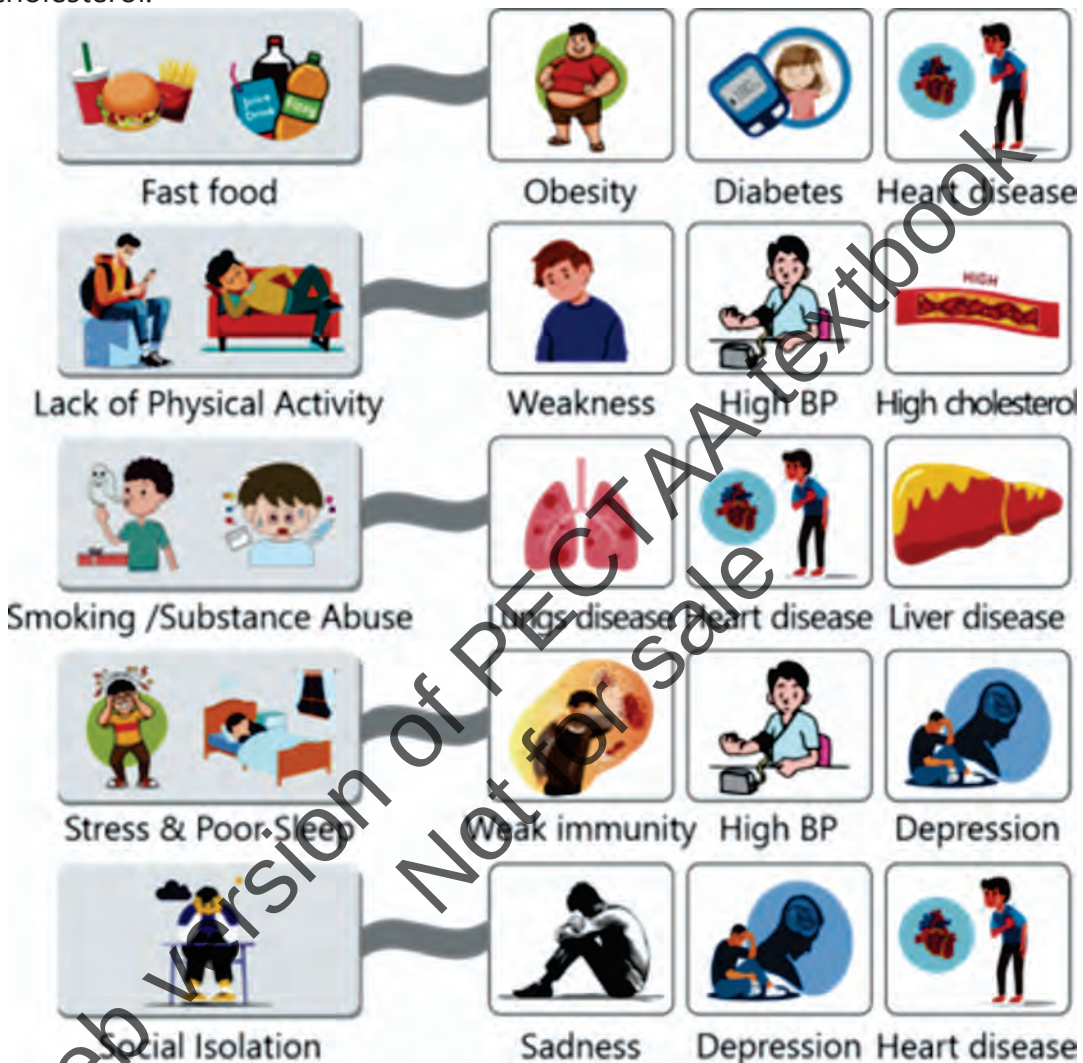


FIGURE 16.5: Behavioral Factors in Chronic Diseases

Smoking and Substance Abuse – Cigarettes, gutka, and other drugs damage the lungs, heart, and liver.

Stress and Poor Sleep – Constant stress or irregular sleep weakens the immune system and increases chances of hypertension and depression.

Social Isolation (Loneliness and Lack of Connections) – People who live alone or feel cut off from friends and family often experience sadness and loneliness. This can increase the risk of heart disease, and depression.

Prevention and Management

Healthy Eating: Choosing fruits, vegetables, pulses, and clean water instead of junk food.

Regular Exercise: At least 30 minutes of walking, running, or sports daily.

No Smoking or Drugs: Protecting the lungs, heart, and liver by avoiding harmful substances.

More than 25% of adults in Pakistan have high blood pressure, often linked with poor lifestyle.

Walking just 30 minutes daily can reduce the risk of heart disease by almost half.

Stress Management: Practicing deep breathing, relaxation, or spending time with family and friends.

Proper Sleep: 7–8 hours of good sleep each night.

Case Study: Ali's Lifestyle Change

Ali is a 16-year-old student. He loves eating burgers, fries, and drinking cola almost every day. He spends most of his time on his mobile phone. He rarely plays outdoor games. He also sleeps late at night.

After some time, Ali started gaining weight quickly. He often felt tired, had trouble concentrating in class, and sometimes felt pain in his chest. His doctor warned him that if he did not change his habits, he could develop diabetes and heart disease.

Ali decided to improve his lifestyle. He began walking every evening for 30 minutes, reduced fast food, and added fruits and vegetables to his meals. He also started going to bed earlier. Within a few months, he felt more energetic, his weight came under control, and he was healthier.

- Discuss in pairs: What bad habits do you see in Ali's life? Which healthy changes helped him?
- Write 2 lifestyle changes you can make in your life to prevent chronic diseases.

Classroom Activity: Designing a Behavior Change Plan

Objective:

Students will work in groups (of 4-5 students each). Each group will create a simple plan to help someone at risk of a chronic disease (like diabetes, heart disease, or high blood pressure) to make healthy lifestyle changes.

Case:

"Amjad is 15 years old. He loves junk food, spends hours on his mobile phone, and rarely exercises. His father has diabetes, so he is also at risk of developing the disease in future. How can we help Amjad change his behavior?"

Task for Each Group:

Discuss and write down:

- (a) Unhealthy behaviors Amjad has.
- (b) Chronic disease risks he faces.
- (c) A 3-step behavior change plan for him (e.g., healthier diet, daily physical activity, stress management).

Group Presentation:

Each group will share its plan in front of the class in 2 minutes.

Expected Outcome:

Students will learn that small and practical lifestyle changes can reduce risks of chronic diseases. They will also understand how to apply knowledge in real-life situations.

Exercise**A. Select the correct answers for the following questions.****1. Which is a common mental disorder?**

- a) Diabetes
- b) Anxiety
- c) Asthma
- d) Tuberculosis

2. Which symptom is most specific to depression?

- a) Sadness
- b) Persistent hopelessness
- c) Sweating
- d) Shaking

3. Bipolar disorder differs from depression because it includes:

- a) Only sadness
- b) Only worry
- c) Mood swings
- d) Stress relief

4. A student with constant worry, sweating, and rapid heartbeat may have:

- a) Depression
- b) Anxiety disorder
- c) Bipolar disorder
- d) Stress-free life

5. Anorexia nervosa is related to:

- a) Overeating
- b) Starving
- c) Smoking
- d) Sleepwalking

6. Which is a coping strategy for stress?

- a) Smoking
- b) Mindfulness
- c) Overeating
- d) Fighting

7. A student eats junk food daily and avoids games. He is at risk of:

- a) Anxiety
- b) Chronic disease
- c) Flu
- d) Addiction

8. A girl with bulimia nervosa keeps vomiting after meals. Which organ will suffer most?

- a) Lungs
- b) Heart
- c) Stomach
- d) Skin

9. A person takes medicines without a doctor's advice to feel calm. This is:

- a) Good habit
- b) Substance abuse
- c) Exercise
- d) Mindfulness

10. Which pair shows unhealthy behavior and its result?

- a) Exercise → Obesity
- b) Smoking → Lung disease
- c) Fruits → Diabetes
- d) Sleep → Stress

B. Write short answers.

1. Define addiction. Why it is considered a behavioral problem?
2. How does bipolar disorder differ from depression?
3. Differentiate between healthy eating habits and eating disorders.
4. How do depression and anxiety affect a person's daily functioning?
5. Describe how stress can contribute to physical health problems.
6. Give two examples of lifestyle factors that increase the risk of chronic diseases.
7. Match the disorder/condition in Column A with its correct feature in Column B.

Column A	Column B
Disorder/Condition	Feature
1. Depression	a) Normal reaction to pressure, harmful if prolonged
2. Anxiety	b) Alternating highs and lows
3. Bipolar disorder	c) Persistent sadness and hopelessness
4. Stress	d) Excessive fear and worry

1. How does peer pressure influence substance abuse among teenagers?
2. Suggest two lifestyle modifications that can prevent chronic diseases.
3. Why is social support important in managing mental disorders?

C. Write answers in detail.

1. Explain addiction and substance abuse. Describe their physical, psychological, and social impacts with examples.
2. Explain the causes, symptoms, and management of depression, anxiety, and bipolar disorder.
3. How does stress affect both mental and physical health? Discuss with examples.
4. Compare and contrast depression and anxiety in terms of symptoms and treatment approaches.
5. Discuss how coping strategies like mindfulness, exercise, and relaxation can reduce stress.
6. Explain the concept of eating disorders. Describe the causes, symptoms, and consequences of anorexia nervosa and bulimia nervosa.
7. Describe how behavioral factors contribute to chronic diseases such as diabetes and heart disease.
8. Suggest a behavior change plan for a person at risk of obesity and diabetes.
9. Discuss how substance abuse damages family relationships, education, and career opportunities.
10. Explain the relationship between stress, substance abuse, and mental health disorders. Give real-life examples.

Group Activities

1. Design a short awareness session on behavioral risks (addiction, stress, eating disorders) for students.
2. Write a short essay on the importance of behavioral sciences in healthcare.
3. Create a poster on the importance of mental health awareness.
4. Write a reflective note on personal stress management strategies.
5. Develop a plan to educate peers about the dangers of substance abuse.
6. Create a poster on the role of behavior in managing diabetes.



Chapter 17

ESSENTIAL LIFE SKILLS

After studying this chapter, students will be able to:

- Define communication and explain its importance in healthcare settings.
- Differentiate between verbal, non-verbal, and written communication.
- Identify barriers to effective communication.
- Explain the significance of active listening and empathy.
- Develop a patient information brochure with clear and simple language.
- List key personal and professional attributes required in the healthcare sector.
- Describe the basic steps of resume writing and job interviews.
- Create a resume and cover letter tailored for a healthcare job.
- Assess different career pathways in the health sciences based on personal strengths and interests.
- Evaluate the impact of technology and AI in healthcare advancements.
- Define decision-making and problem-solving in a healthcare context.
- Identify the steps involved in effective decision-making.
- Explain the role of ethical considerations in medical decision-making.
- Define leadership and its importance in health professions.
- Differentiate between various leadership styles and their applications.

Life is not only about studying books. We also need essential life skills. Essential life skills are a set of interpersonal, intellectual, and behavioral abilities that enable individuals to adjust and cope with the demands and challenges of everyday life. These skills include effective communication, employability skills, decision-making, problem-solving, leadership skills, and resilience. These skills lead to personal growth, improved well-being, and success in both personal and professional lives. In this chapter, you will learn how to communicate clearly, work well in jobs, make good decisions, and be a good leader and team member.

17.1 Communication Skills

Communication means sharing information, ideas, and feelings with others. It can be through words, writing, signs, or body language. Good communication helps people understand each other clearly.

Importance of Communication in Healthcare

In healthcare, communication is very important. Doctors, nurses, and other health workers should have effective communication skills because:

- It helps patients understand their illness and treatment.
- It builds trust between patient and healthcare worker.
- It reduces stress and fear of patients.
- It helps healthcare workers work together as a team.

Types of Communication

Communication can happen in different ways. Sometimes we speak, sometimes we write, and sometimes we just use expressions or pictures. There are four main types of communication: verbal, non-verbal, written, and visual.

1. Verbal Communication

Verbal communication means using spoken words. It is the most common type of communication. The tone of voice, speed of speaking, and choice of words are also very important.

2. Non-Verbal Communication

Non-verbal communication means sending messages without words. It includes body language, facial expressions, hand gestures, eye contact, and even silence. Sometimes non-verbal communication is stronger than words.

More than 70% of communication is non-verbal. People often believe body language more than spoken words.



FIGURE 17.1: Verbal communication



FIGURE 17.2: Non-verbal communication

3. Written Communication

Written communication means sharing information through letters, notes, prescriptions, charts, or digital messages. It is important because it provides a record that can be checked later.

4. Visual Communication

Visual communication means using pictures, charts, graphs, symbols, or posters. This type is very useful when people cannot read or speak the same language.

Traffic signals are one of the best examples of visual communication. Even if people cannot read or speak the same language, they understand the signals.



FIGURE 17.3: Written Communication



FIGURE 17.4: Visual Communication

Table 17.1: Types of Communication

Type	Description	Examples in Healthcare	Examples in Daily Life
Verbal	Using spoken words to share ideas	Doctor explaining medicine, nurse asking patient about health	Talking to a friend, asking a question in class
Non-Verbal	Using expressions, body language, eye contact	A doctor showing concern through facial expression, nurse smiling	Smiling to greet, frowning to show anger
Written	Sharing information through writing	Prescription, patient's medical history	Writing a note, sending a text
Visual	Sharing ideas through pictures, signs, or symbols	Handwashing poster, vaccination chart	Traffic signals, emojis

Barriers to Effective Communication

Even when people want to share information, sometimes they cannot understand each other properly. These difficulties are called barriers to communication. Barriers make communication weak, unclear, or confusing. The following are the common barrier to effective communication.

1- Language Differences

A language barrier happens when two people do not share the same language or use different words. For example, two classmates may not understand each other because they speak different dialects.

2. Using Difficult or Confusing Words

This barrier occurs when the speaker uses words that are too hard for others to understand. For example, a student may confuse friends by explaining a topic with very technical terms.

3. Noise and Distractions

Noise is a barrier because it makes the message unclear or incomplete. For example, friends may not understand each other while talking in a noisy bazaar.

4. Poor Listening

Poor listening is when someone does not give full attention to the speaker. For example, a friend may miss important details if he is busy checking his phone while you are talking.

5. Emotional Barriers

Emotional barriers are created when stress, fear, or anger stop people from sharing openly. For example, a student may feel too nervous to ask the teacher a question during class.

6. Cultural or Social Differences

Cultural differences become barriers when people follow different customs or habits. For example, looking directly into someone's eyes shows respect in one culture. On the other hand, it may seem rude in another culture.

7. Physical Barriers

Physical barriers occur when distance or environment blocks the message. For example, two students may struggle to hear each other while shouting across a large playground.

Table 17.2: Barriers and How to Tackle Them

Barrier	Effect	How to Overcome It
Language Difference	People cannot understand each other	Use simple words, ask for help
Difficult Words	Listeners feel confused	Explain in easy and clear language
Noise & Distractions	Message is not clear	Find a quiet place to talk
Poor Listening	Important points are missed	Pay full attention, avoid interruptions
Emotional Stress	Person hides or changes message	Stay calm, talk kindly and politely
Cultural Difference	Misunderstanding of behavior	Respect other traditions and habits
Physical Barriers	Message does not reach properly	Sit closer, use gestures, speak slowly

Active Listening and Empathy

Active Listening and empathy are important parts of strong communication. When people combine active listening with empathy, communication becomes more meaningful. It reduces barriers, clears doubts, and strengthens friendships, family bonds, and teamwork.

Active Listening

Active listening means giving full attention to the speaker and showing that you really understand his/her message. It is not just about hearing words, but also about focusing on the meaning, asking questions, and giving feedback.

Importance of Active Listening

Active listening helps to avoid misunderstandings. It makes the speaker feel respected and valued. For example, when a student explains a problem to a teacher, the teacher's careful listening shows support and care.

Empathy

Empathy means understanding another person's feelings and point of view. It is like "putting yourself in someone else's shoes." When you are empathetic, you try to feel what the other person is going through.



Importance of Empathy

Empathy helps in building trust and stronger relationships. For example, when a friend is upset, showing empathy by saying, "I understand you are sad, and I am here to help," can bring comfort and reduce stress.

17.2 Employability Skills

Employability skills are the abilities and qualities that help a person get a job, do it well, and keep it for a long time. These skills are not just about technical knowledge; they also include personal habits and attitudes that make someone a good worker.

Examples of Employability Skills

Communication Skills: Talking and writing clearly so others understand you.

Employers often say that soft skills like communication and teamwork are just as important as technical knowledge.

Teamwork: Working well with classmates or colleagues to reach a common goal.

Problem-Solving: Finding solutions when difficulties arise.

Time Management: Using time properly to finish tasks on schedule.

Adaptability: Adjusting to new situations or changes quickly.

Responsibility: Being honest and completing tasks without excuses.

Key Attributes in the Healthcare Sector

Healthcare is about caring for people with respect, dignity, and professionalism. Healthcare workers possess a combination of **personal attributes** (e.g., compassion and patience) and **professional attributes** (e.g., teamwork and time management). Important attributes in healthcare sector include:

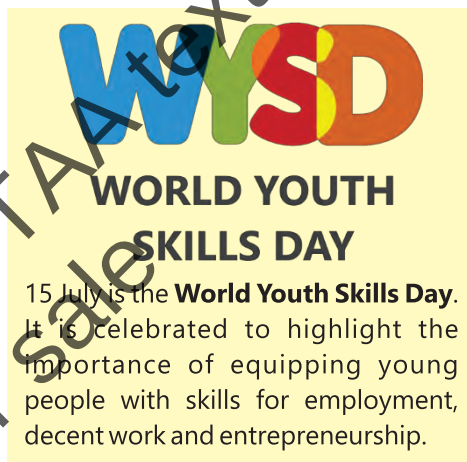
Compassion and Empathy: Compassion means showing kindness and understanding toward others. Empathy is the ability to imagine what the other person is feeling. For example, a nurse listens patiently to a patient's fears and behaves kindly.

Communication Skills: This involves expressing information clearly and listening actively. For example, a doctor explains a treatment plan in simple words so that the patient and their family can understand.

Teamwork: Healthcare requires people to work together with shared goals. Each team member's role is vital. For example, during surgery, the surgeon, anaesthetist, and nurses coordinate closely to save the patient's life.

Problem-Solving Ability: This means finding practical solutions quickly in urgent situations. For example, a paramedic immediately decides the safest way to move an accident victim to prevent further injury.

Adaptability: It the skill of adjusting to new technologies, policies, or unexpected conditions. For example, a hospital technician learns to use a newly introduced digital system for patient records.



Integrity and Ethics: Acting with honesty, confidentiality, and fairness is essential. For example, a lab assistant keeps patient test results private and shares them only with the authorized doctor.

Time Management: It includes managing workload effectively. For example, a nurse prioritizes giving medicines to critical patients first during a busy shift.

Emotional Stability: It means remaining calm under stress and handling difficult situations professionally. For example, a doctor keeps calm while dealing with multiple emergency cases after a road accident.

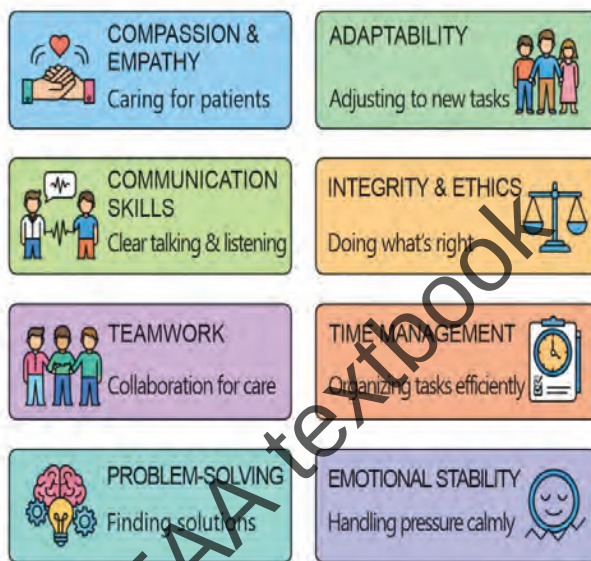


FIGURE 17.6: Personal and professional attributes in healthcare

Resume Writing

A resume is a short document that shows your education, skills, and experience. It helps employers know why you are suitable for a job. Attending a job interview is also an important step to get employment. A good resume and a confident interview can open the door to many opportunities, especially in the healthcare field where professional workers are always needed.

Basic Steps of Resume Writing

- 1. Personal Information** – Name, contact number, email, and address.
- 2. Career Objective** – A short statement about your career goals.
- 3. Education** – Your qualifications (matric, intermediate, diplomas, etc.).

FIGURE 17.7: Template of a one-page Resume

4. **Skills** – Abilities such as communication, computer skills.
5. **Experience** – Any work or volunteer service (if available).
6. **References** – Contact details of teachers or professionals who know your work.

Employers often spend less than 30 seconds reading a resume. This is why a resume must be short, clear, and well-organized.

Basic Steps of a Job Interview

1. **Preparation** – Research the hospital/clinic and review your resume.
2. **Dress Professionally** – Wear neat and clean clothes.
3. **Be Punctual** – Arrive on time.
4. **Good Communication** – Answer clearly and politely.
5. **Confidence with Respect** – Be confident but humble.

Activity: Create a Resume and Cover Letter for a Healthcare Job

Besides a resume, a cover letter is also very important. A cover letter is a short letter that you send with your resume. It tells the employer why you are interested in the job and why you are the right person for it.

Steps to Create a Resume for a Healthcare Job

1. Write your name and contact details at the top.
2. Add a short career objective (e.g., "To serve patients with compassion as a nursing assistant").
3. Write your skills (e.g., basic patient care, first aid, communication skills).
4. List your education (e.g., Matric in Science, Diploma in Health Sciences).
5. Add work experience or volunteer work (e.g., volunteer at a clinic).
6. Provide references from teachers or professionals.

Steps to Write a Cover Letter

1. Greeting – Address it to the employer (e.g., "Dear Hiring Manager").
2. Introduction – Mention the job you are applying for.
3. Body – Explain your skills and why you are suitable.
4. Closing – Thank the employer and show willingness to meet.

Signature – Write your name and contact.

Exploring Career Pathways in Health Sciences

Health sciences is a broad field with many career opportunities. Some careers involve direct patient care (like doctors, nurses, and paramedics), while others focus on supporting services (like laboratory technicians, pharmacists, and

radiographers). Some careers even involve administration, research, or education. To choose the right career, students need to match their personal strengths and interests (e.g., good communication, interest in research, patience, or teamwork) with the requirements of different jobs.

The World Health Organization (WHO) estimates that by 2030, the world will need 18 million more healthcare workers. This means students in health sciences have many opportunities ahead.

Table 17.3: Example: Matching Careers with Strengths

Careers	Key Strengths Required	Suitable for Students Who...
Nurse	Patience, empathy, teamwork	Like caring for people and working in teams
Lab Technician	Attention to detail, accuracy	Enjoy experiments and working with machines
Doctor	Problem-solving, communication	Want to lead in treatment and decision-making
Physiotherapist	Patience, physical activity	Like helping patients recover movement
Pharmacist	Knowledge of medicines, precision	Are detail-oriented and like science

Group Activity: Explore Career Pathways in Health Science

This is a group activity. Each group be of 4-5 students each.

Instructions

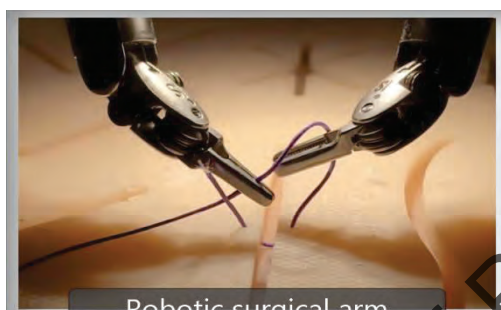
- Each group will be given a career card/paper with specific healthcare careers written on them (e.g., Nurse, Doctor, Pharmacist, Lab Technician, Physiotherapist, Public Health Worker, Hospital Administrator).
- Each group will discuss:
 - What does this career do?
 - What strengths are needed (e.g., patience, technical skill, leadership)?
 - What type of student might enjoy this career?
- Each group will match personal strengths of member with the given career.
- Groups will present their findings to the class. Individual students may also share which career they prefer and why.

Role of Technology and Artificial Intelligence in Healthcare

Technology and Artificial Intelligence (AI) are transforming healthcare by

improving accuracy, efficiency, and patient access. These tools are changing how doctors, nurses, and healthcare workers perform their jobs. The following are some examples of technology and AI Tools in healthcare:

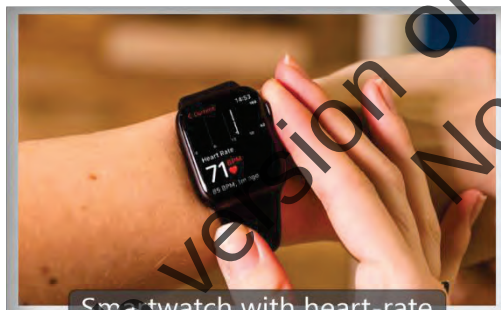
1. **Diagnostic Imaging Tools (AI-based):** AI systems read X-rays, CT scans, and MRIs to detect cancers, fractures, or brain injuries more accurately.
2. **Robotic Surgery:** Robots like the da Vinci Surgical System assist surgeons in performing complex operations with precision.
3. **Telemedicine Platforms:** Online consultation apps (e.g., Sehat Kahani in Pakistan, Teladoc internationally) connect patients to doctors remotely.



Robotic surgical arm



Telemedicine consultation



Smartwatch with heart-rate



3D-printed prosthetic hand

FIGURE 17.8: Technology and AI Tools in Healthcare

4. **Wearable Health Devices:** Smartwatches and fitness trackers (e.g., Apple Watch, Fitbit) monitor heart rate, sleep, and physical activity.
5. **Electronic Health Records (EHRs):** Digital systems store and manage patient data, reducing errors and improving coordination.
6. **AI Chatbots for Patient Support:** Virtual assistants answer patient questions, give reminders for medicines, and provide health support.
7. **3D Printing in Healthcare:** Printing of prosthetics, dental implants, and even artificial organs is done for patients.

Table 17.4: Benefits vs Challenges of Technology and AI in Healthcare

Benefits	Challenges
Faster and more accurate diagnosis (e.g., AI scans of X-rays)	High cost of advanced machines and software
Access to doctors through telemedicine, even in remote villages	Risk of job loss for some healthcare workers
Robots reduce human error during surgery	Machines may fail or malfunction in critical situations
Wearables help people monitor health daily	Privacy issues with personal health data
Better patient record management	Requires training for healthcare workers to use new systems

17.3 Decision-Making and Problem-Solving

Every day, people make choices - what to eat, what to wear, or how to spend time. This process of choosing between options is called decision-making. When a person faces a challenge and works to find a solution, it is called problem-solving.

These skills are very important in healthcare. Doctors, nurses, and other workers often need to make quick but careful decisions to save lives and solve medical problems.

Example in Healthcare

- A nurse decides the best way to calm a nervous patient (decision-making).
- A doctor works to find out the cause of a patient's fever and prescribes treatment (problem-solving).

Steps of Effective Decision-Making

Good decisions are not made in a hurry. There is a process that helps people think clearly before acting. The process of decision-making consists of the following steps.

- 1. Identify the Problem** – Clearly understand what the issue is.
 - Example: A patient is feeling weak all the time.
- 2. Collect Information** – Gather facts and data about the problem.
 - Example: Doctor asks about diet, medical history, and lifestyle.
- 3. List Possible Options** – Think of all possible solutions.

- Example: Patient may need a blood test, diet change, or rest.
- 4. Weigh the Options** – Compare the pros and cons of each choice.
 - Example: Blood test gives accurate result but may cost more.
 - 5. Choose the Best Option** – Select the most effective and safe choice.
 - Example: Doctor recommends a blood test first.
 - 6. Take Action** – Put the decision into practice.
 - Example: Patient goes for the blood test.
 - 7. Review the Outcome** – Check if the decision solved the problem.
 - Example: Blood test result confirms treatment plan.

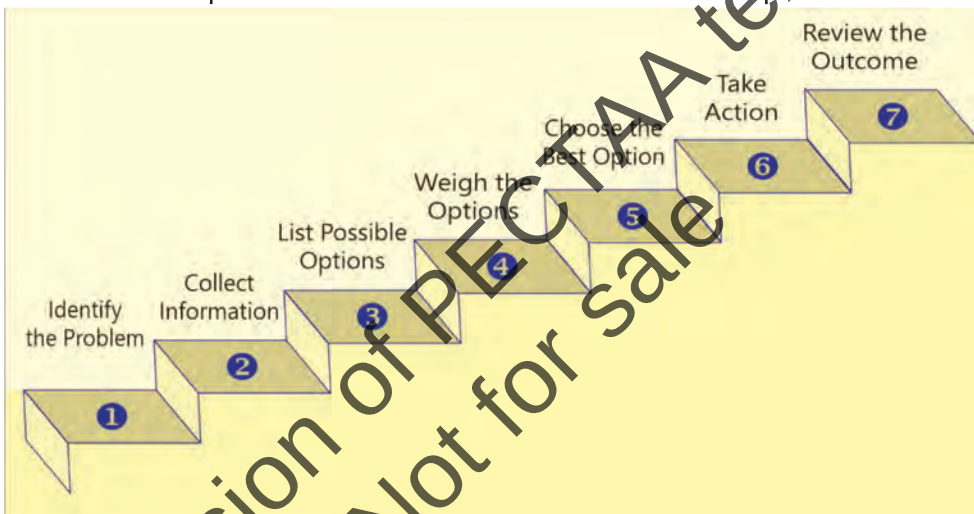


FIGURE 17.9: Seven steps of decision-making

Role of Ethical Considerations in Medical Decision-Making

In healthcare, not all decisions are easy. Sometimes, doctors and nurses face choices that affect people's lives deeply. In such cases, ethics - which means moral values of right and wrong - help to guide decisions. Ethical decision-making ensures that patients are treated with fairness, dignity, and respect. The following are the key ethical considerations considered during medical decision-making.

Hippocratic Oath is a historic oath for physicians. It focuses on professional ethics. The oath emphasizes the highest standards of care, respecting patient privacy and confidentiality, and collaborating with colleagues.

- 1. Respect for Life** - Every patient's life is valuable.

- Example: A doctor does everything possible to save ill patient.
- 2. Confidentiality** - Patient information must remain private.
 - Example: A nurse does not share test results with others without permission.
 - 3. Patient's Right to Choose** - Patients should be involved in decisions about their treatment.
 - Example: A doctor explains all treatment options and lets the patient decide.
 - 4. Fairness and Equality** - Every patient must receive equal care, no matter their background.
 - Example: Treating rich and poor patients with the same respect.
 - 5. Do No Harm** - Healthcare workers must avoid unnecessary harm.
 - Example: A doctor avoids giving strong medicine if a simpler treatment works.



FIGURE 17.10: Rich and poor receive equal care

17.4- Leadership and Teamwork

Leadership means guiding and influencing others to achieve a common goal. A leader provides direction, motivates the team, and ensures tasks are completed effectively. Teamwork is the cooperative and collaborative effort of a group. In teamwork, members contribute their skills and efforts to achieve shared goals. Without teamwork, achieving a goal may be difficult for an individual.

Leadership Styles and Their Applications

Different situations require different leadership styles. Understanding these styles helps healthcare workers choose the best approach for their team and patients. The following are the common leadership styles.

1- Autocratic Leadership

The leader makes decisions alone and expects others to follow. This style is useful in emergencies when quick decisions are needed. For example, a surgeon giving strict instructions during a critical operation.

2- Democratic Leadership

The leader involves team members in decision-making. This style is useful in planning or routine care where ideas improve outcomes. For example, a hospital administrator asking nurses and doctors for suggestions before making schedules.

Prophet Muhammad (ﷺ) always consulted his companions before making important decisions, even though he was divinely guided. This reflects the importance of consultation in leadership.

3- Laissez-Faire Leadership

The leader gives freedom and trusts the team to make decisions. This style is useful when team members are highly skilled and independent. For example, a senior researcher allowing lab scientists to design experiments on their own.

4- Transformational Leadership

The leader inspires and motivates the team with a vision for improvement. This style is useful for long-term projects and innovation. For example, a public health leader motivating staff to run awareness campaigns in villages.



Prophet Muhammad (ﷺ) distributed responsibilities according to each companion's strengths—for example, appointing Khalid ibn al-Walid (RA) as a military commander due to his exceptional strategic skills.

FIGURE 17.11: Leadership styles

Table 17.5: Leadership Styles

Leadership Style	Key Feature	Best Application in Healthcare
Autocratic	Leader decides alone	Emergency situations
Democratic	Team members share decisions	Planning patient care and hospital policies
Laissez-Faire	Freedom for team to decide	Skilled research of specialist teams
Transformational	Inspiring vision and motivation	Healthcare campaigns and innovation

Importance of Leadership in Healthcare

In healthcare, leadership and teamwork are very important because doctors, nurses, technicians, and support staff must work together in a fast and sometimes stressful environment. A good leader helps the team stay organized, focused, and confident.

1. Clear Directions – Leader guides his teams in emergencies.
2. Teamwork – Leaders encourage cooperation among staff.
3. Better Patient Care – Leader ensures that patient safety is always the top priority.
4. Motivation – Leader supports and inspires team members to do their best.
5. No Conflicts – Leader resolves misunderstandings and keeps harmony in the workplace.

During the construction of Masjid-e-Nabawi, Prophet Muhammad (ﷺ) personally carried bricks alongside his companions. It shows that a true leader works with his team instead of just giving orders.

Example: In a hospital, a senior nurse leading a ward team makes sure medicines are given on time, patients are monitored, and junior staff feel supported.

Exercise

A. Select the correct answers for the following questions.

1. Communication means:

- | | |
|------------------|-------------------|
| (a) Talking only | (b) Sharing ideas |
| (c) Arguing | (d) Writing only |

2. Which is an example of non-verbal communication?

- | | |
|-----------------------|----------------|
| (a) Lecture | (b) Phone call |
| (c) Facial expression | (d) Email |

3. Employability skills are:

- | | |
|---------------------------------------|-----------------------------|
| (a) Subject knowledge | (b) Job-related attitudes |
| (c) Personal + professional qualities | (d) Ability to explore jobs |

4. Resume is also called:

- | | |
|------------------|------------------------|
| (a) Bio-data | (b) Application letter |
| (c) Cover letter | (d) Identity card |

5. Empathy means:

- | | |
|----------------------------|-----------------------|
| (a) Being sympathetic | (b) Sharing resources |
| (c) Understanding feelings | (d) Giving advice |

6. Which skill is most needed during a job interview?

- | | |
|--------------------------|------------------|
| (a) Silence | (b) Confidence |
| (c) Avoiding eye contact | (d) Long answers |

7. First step in problem-solving is:

- | | |
|------------------------|-------------------------|
| (a) Choosing solutions | (b) Identifying problem |
| (c) Applying solution | (d) Evaluating result |

8. Which action best shows problem-solving in real life?

- | | |
|-----------------------------------|------------------------|
| (a) Avoiding the issue | (b) Waiting for others |
| (c) Discussing possible solutions | (d) Ignoring feedback |

9. A leader who invites ideas from team members uses:

- | | |
|-------------------------|----------------------|
| (a) Autocratic style | (b) Democratic style |
| (c) Laissez-faire style | (d) Passive style |

10. In teamwork, the best way to avoid conflict is:

- | | |
|---------------------|-------------------------|
| (a) Ignoring others | (b) Clear communication |
| (c) Blaming members | (d) Keeping silent |

11. A team succeeds when members:

- | | |
|-----------------------------|---------------------|
| (a) Compete with each other | (b) Work separately |
| (c) Share goals | (d) Avoid leaders |

B. Write short answers.

1. Define communication. How is it different from simple talking?
2. Differentiate between verbal and non-verbal communication with examples.
3. What is empathy? How is it different from sympathy?
4. Define employability skills. Give one example from personal life and one from professional life.
5. What is a resume? How is it different from a cover letter?
6. Differentiate between decision-making and problem-solving. How are they connected?
7. Describe one step of decision-making. Why is skipping this step harmful?
8. Define leadership. How is it different from simple management?
9. Differentiate between democratic and autocratic leadership styles.
10. Give two examples of AI in healthcare.

C. Write answers in detail.

1. Define communication and explain why it is important in personal, professional, and healthcare settings.
2. Describe the different types of communication with examples.
3. Identify and explain at least four barriers to effective communication.
4. What is active listening? Discuss its importance.
5. Explain employability skills in detail. Why are they important for students and professionals in the healthcare sector?
6. List and explain at least five key personal and professional attributes needed in healthcare. Give examples for each.
7. What are resume and cover letter? Describe the basic steps of writing an effective resume and a cover letter for a healthcare job.
8. Describe the major steps involved in decision-making.
9. Discuss the role of ethical considerations in medical decision-making.
10. Define leadership. Compare different leadership styles. Explain which style is most effective in healthcare and why.
11. Evaluate the impact of technology and AI in healthcare.

Group Activities

1. Conduct group discussion on the importance of active listening and empathy.
2. Express emotions using only body language, testing interpretation skills.
3. Create your resumes and prepare for mock interviews.
4. Invite healthcare professionals to discuss workplace expectations.
5. Draft and refine job application materials.
6. Perform the assigned healthcare roles (doctor, nurse, administrator) and work through a day's schedule.
7. Analyse ethical dilemmas (assigned by the teacher) in healthcare.
8. Work in teams to solve healthcare challenges.
9. Solve a crisis together performing the assigned roles (doctor, nurse, administrator).
10. Evaluate your leadership traits and discuss strengths and weaknesses.

Pairing Scheme / Instructions for Preparation of Exam Paper of Health Sciences for Class-10

ESSENTIAL INSTRUCTIONS FOR PAPER SETTERS

The paper of Health Sciences for class 10 will consist of 40 marks. Timing of the paper will be two hours. The paper will be made as per following details:

Part-I: Objective:	Q-1: 10 Multiple Choice Questions. The detail is as follows:										$1 \times 10 = 10$
	Chapter	9	10	11	12	13	14	15	16	17	
	No. of Short Questions	1	1	1	2	1	1	1	1	1	

Part-II:
Subjective: **Q-2:** 4 short answer questions have to be answered out of 6. The detail is as follows: $2 \times 4 = 8$

Chapter	9	10	11	12
No. of Short Questions	1	2	1	2

Q-3: 4 short answer questions have to be answered out of 6. The detail is as follows: $2 \times 4 = 8$

Chapter	13	14	15	16	17
No. of Short Questions	1	1	1	1	2

Part-III:
Subjective: This section will contain three questions bifurcated in two-part a & b (carrying 4 & 3 marks each) and students have to attempt 2 questions The detail is as follows: $2 \times 7 = 14$

Q-4:

Chapter	13	12
Part	a	b

Q-5:

Chapter	16	14
Part	a	b

Q-6:

Chapter	15	17
Part	a	b

MODEL PAPER OF HEALTH SCIENCES FOR CLASS-10

Objective Type

Time allowed: 15 Min.

Max. Marks: 10

Note: Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle with marker or pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1. Which diagnostic test is most useful for identifying CNS infections?

- (a) Blood pressure test
- (b) CFS analysis
- (c) ECG
- (d) Renal Function test

2. Which disease is caused by low bone density?

- (a) Rickets
- (b) Osteoporosis
- (c) Arthritis
- (d) Cramps

3. Which hormone helps prepare the body for stress?

- (a) Insulin
- (b) Estrogen
- (c) Cortisol
- (d) TSH

4. What does the EPI (Expanded Program on Immunization) focus on?

- (a) Building hospitals
- (b) Treating adults
- (c) Providing free medicine
- (d) Giving vaccines to children

5. What is the main cause of stunting in children?

- (a) Too much exercise
- (b) Chronic malnutrition
- (c) Lack of sleep
- (d) Exposure to sunlight

6. What should be done first when someone shows signs of shock?

- (a) Give them water to drink
- (b) Call emergency services
- (c) Make them stand up
- (d) Cover their face

7. What type of radiation is used for sterilizing medical devices?

- (a) Gamma rays (b) UV light
(c) Infrared rays (d) Visible light

8. Which symptom is most commonly associated with dementia?

- (a) Frequent urination (b) Joint stiffness
(c) Memory loss (d) Dizziness

9. Bipolar disorder differs from depression because it includes:

- (a) Only sadness (b) Only worry
(c) Mood swings (d) Stress relief

10. Communication means

- (a) Talking only (b) Sharing ideas
(c) Arguing (d) Writing only

Subjective Type (Part I)**Time allowed: 1.45 Hrs.****Max.****Marks: 16****Q. 2: Write short answers to any Four (04) questions****8**

1. Differentiate between ischemic and haemorrhagic strokes.
2. Which diagnostic tool is better for seeing muscles: X-ray or MRI? Explain briefly.
3. Why are children more likely to develop rickets than adults?
4. How is blood glucose monitoring useful for a diabetic patient?
5. Why is hand washing important for children's health?
6. Name diseases prevented by routine childhood vaccination

Q. 3: Write short answers to any four (04) questions:

1. List any three essential items found in a first aid kit.
2. Why is it essential to pre-clean surgical instruments before sterilization?

3. Define the term "incontinence" and give one cause.
4. How do depression and anxiety affect a person's daily functioning
5. Describe one step of decision-making. Why is skipping this step harmful?
6. Define leadership. How is it different from simple management?

Subjective Type (Part II)

Note: Attempt any two questions.

(14)

- Q.4:** (a) Write a detailed note on the first aid management of poisoning and insect/snake bites.
- (b) Explain the proper hand-washing technique and its role in preventing the spread of infection among children.
- Q.5:** (a) How does stress affect both mental and physical health? Discuss with examples.
- (b) Discuss the chemical methods of sterilization.
- Q.6:** (a) Explain the role of preventive care in elderly health, including recommended vaccinations and lifestyle changes.
- (b) Discuss the role of ethical considerations in medical decision-making.