401

BASICS OF HEALTH

The Foundation for Research in Community Health

3 & 4, Trimiti B Apts., 85, Anand Park, Aundh, Pune - 411007
Tel: (020) 25887020, Fax: (020) 25881308
Email: frchpune@giaspn01.vsnl.net.in

BASICS OF HEALTH

INDEX

1.	Functions of the body	01 - 08
2.	We and Our Health	09 - 13
3.	The Structure of the Body	14 - 21
4.	The Relationship between Structure and Function of the Body	22 - 28
5.	The body - A Complete/Whole Unit	29 - 35
6.	Cell and Tissue	36- 42
7.	Joints and Fluid Tissues	43- 50
8.	The Circulatory System	51 - 63
9.	The Digestive System	64 - 72
10.	Introduction to the Respiratory system	73 - 81
11.	The Respiratory System	82 - 89
12.	Glossary	90 - 90

Lesson 1
Functions of the body

Summary

1) The body produces energy with the help of food material and oxygen. Energy is used to do the basic functions of the body (digestion of food, respirations, heart beat etc). But human beings use the extra energy for other tasks like construction of buildings, scientific inventions, creation of literature and finding out remedies for illnesses. The body works like a factory.
2) The body collects/ gathers details about the nature / environment with the help of sense organs (eyes, nose, skin, ears, tongue). This information is stored in the mind. It can be recalled whenever necessary. The mind works faster and better than any computer.
3) The body takes care of itself. It fights against attacks.
4) The body keeps itself fit and fine. It grows new skin over an injured part of the body.
5) The body reproduces to preserve the human race through new generations.
6) Internal balance.
7) The various systems (digestive, respiratory etc.) coordinate with each other to keep the body alive. The body processes, organs and the smallest unit namely the cell need a stable environment to function. This stability is created to controlling temperature, amount of water, minerals etc. Such control is achieved by the interaction of several systems including the nervous system. It consists of many small but complex steps.
8) Illness disturbs the internal balance of the body.

Aims

Reading this lesson will make you understand.

1. The functions of the body
2. How the body works as a unit

Knowledge

You will get to know

- How the body functions

Skill

You will learn

- How to simplify difficult ideas

Perspective

You will realize

- How to spread information and awareness among people.
- How the body works as a whole / single unit.

Introduction

When you talk to people in their language, it is easy for them to understand and this makes the health worker's task easy.

In this lesson we will come to know how the body functions.

This morning Radha's neighbour asked Ayushi to come to Radha's house. Radha is Ayushi's friend. Radha had high fever. Ayushi gave her medicine, wiped her body with a cold, wet towel. Just when she was wiping her body, Radha's mother-in-law scolded her, saying, "What is she doing? Do you wish to kill my daughter-in-law? Has any one ever heard of wiping the body with cold water during fever?" Ayushi informed her that she was doing exactly what she was taught in the primary health center during training.

But Radha's mother-in-law said that she would not allow her to do such things. Ayushi felt very bad but she was more worried about Radha, in case her fever rose higher creating some difficult problem. Just then Asha, Radha's 10-year-old daughter came and told her grandmother that Ayushi is doing the right thing. The school-teacher had also taught them the same thing. When Radha's mother-in-law scolded her, she said, "Grandma, if you wish you can open my school book and read for yourself." Grandmother complained that Asha was purposely mentioning the schoolbook because she knew she couldn't read.

Asha questioned grandmother why would Ayushi be taught wrong things during training. She wondered whether she could have cured so many patients with her medicines if she had learnt anything wrong. She also added that if mother didn't get better even two hours after Ayushi's treatment, she would take her to the government hospital.

Grandmother couldn't do anything against her, so Ayushi got a chance to give her treatment. Radha's fever came down.

But this experience taught Ayushi that when children are given information they grasp it quickly because **they are not prejudiced.**

So Ayushi thought that she would give information about the human physiology to children from fifth to seventh classes during the summer vacation. She informed the school before the vacation and discussed this with the teacher. When the children reported this at home many women sent messages that they would also like to know more about the body.

So Ayushi decided to hold discussions with these women every Friday evening. She realized that her task would become easier when people were given information by her.

When Ayushi invited the women to gather at the Samaj Mandir, some senior and old women also showed interest. Ayushi welcomed them too. But they all had some suspicion.

Ayushi asked them to tell her about their problems. Kusum chachi said," I am not able to read or write, can I learn anything about the body?"

Radha's mother-in-law said, "Whatever you are learning about this body, this will turn into dust again; talk about the soul and God. Talk about after death."

But Kusum chachi wanted information about the body. She didn't have any children and her relatives always blamed her body for it. She wanted to know what her shortcoming was. So she told Radha's mother-in-law "Bhabhi, if you don't want to learn, don't come, But I must know about my body which is my identity".

Kusum chachi asked Ayushi whether she had any difficulty in learning about the body. Ayushi replied that she didn't have any problem because her mother was a mid-wife and she had observed deliveries since childhood. But many of her friends got upset while studying the science of the body when they heard names like urine, stools etc.

Kusum chachi said, "This body is a terrible thing. It is the source of illness, it is unhealthy but we must know about it.

However, Ayushi felt that our body gives us a lot of joy not just sorrow, so why should we hesitate to know about it?"

If you think about the conversations between Ayushi, Kusum chachi and Radha's mother-in-law, what comes to your mind? You can make a list of the common notions about the body, what are the proceptions? You may wonder where to collect this information. Sit with some old women and ask them what the body is made of, can they name the organs and their locations? Is the woman's body different than a man's body? How do they look after their body? If not, why?

Answers to these questions will lead to many more questions. This will form a picture about the body in front of you. This will contain many beliefs.

If we analyse the above conversations, we will realize that the following are the issues in getting information about the body –

- The body is very complex. You need education to understand it.
- What is the use of knowing about the body which is perishable, since we know only the soul is in imperishable?
- Repulsion towards the fluids and the excreted materials of the body.

Your list may contain some more points. There may be a positive point of view towards the body.

On the first day Ayushi tried to remove the women's prejudice against the body being very difficult to understand. To remove their fear, she asked them to explain the functions of the body. They said, "How do we know what our bodies do? She said, "Tell me, what have you done since morning ?" This was the list.

- Cleaned the teeth.
- Had a bath.
- Swept and mopped the house
- Cooked food
- Cleaned utensils
- Washed clothes.
- Worked in the field.
- Had meals.
- Got the children ready, etc.

Ayushi asked, " Is there any one who has not given out waste materials from the body? Did anyone forget to breathe? Is there anyone who did not see or hear anything today?" The women began to laugh and questioned whether seeing or hearing is "work"? They wondered how breathing could be a "function" of the body.

Ayushi asked them. Why they didn't consider these things as genuine tasks done by the body?. Surekha felt that these actions happen by themselves and do not use any energy.

Ayushi reminded Surekha that she scolded her son for tiring his eyes when he read too many books on one day. This meant that eyes work and need rest. The same is true

of the ears. And what would happen if breathing stops? Everyone knows.

This shows that the body is constantly working. Our heart continues to beat and we keep breathing even during sleep.

Then Ayushi asked, "What does a bus need to keep running?" "Diesel" was the answer; just as a fire needs wood. This means that fuel is necessary to produce energy. We also require energy to sweep and mop, to clean utensils. How then, is energy created in our body?

The body burns food with oxygen, to produce energy. This energy is used to carry out different activities. That is why the body works well if it gets proper food and there is no fatigue.

Then Ayushi enquired, "Kusum chachi, you learnt embroidery from your mother. But she has been dead since 20 years, then how can you still do embroidery?"

Kusum chachi wondered whether anyone stops embroidery work after one's mother's death!

"No," clarified Ayushi, "What 'I meant, is, now who tells you how to do embroidery?"

"Oh" replied Kusum Chachi," My mind! Our mind stores all information and we remember it whenever we need it."

Radha who sat next to her, added, " If our mind didn't work, we would forget to eat, how to do farming, how to move about, in fact everything. No one tells us daily how to cook the vegetables or how to work in the fields. Why are you asking us?"

"Right", said Ayushi, "We get all this information through our ears, eyes, nose, taste and touch. We collect it in our mind. There must be some system in the body to do all this, to order which activity is to be done when and in what way, etc. So the body uses a simple arrangement which we make in our kitchen. When the tins containing salt or grains become empty, they show us that we need to buy those items. When the containers are full, we know that we don't require anything from the market. This is called positive and negative channel.

Ayushi's daughter Shubha came there. Looking at her, Ayushi said, "We preserve the human race by giving birth to children. This too, is a function of the body. "

Nirmala (Radha's mother –in-law) asked, Haven't the activities of the body been covered/ completed yet?" Ayushi informed them that 2 or 3 tasks yet remained.

"If you fall ill do you take medicines immediately? Don't you get well even without medicine?" Nirmala replied that she had taken medicines only twice in her life of 50 years. "Medicine is not necessary for ordinary ailments."

Ayushi explained, "That means the body can itself fight against disease. If there is a small cut or a wound, the body heals it on its own"

Radha wanted to know, " If the body has the capacity to cure, why does it take so long for fever to come down?"

Ayushi clarified, "If an ordinary person like me comes and slaps you, you can hit me back. But if a stronger person strikes you, or if many of us together attack you, can you defend yourself? Whoever is more powerful, wins. In the same way, if the illness is more powerful than one's energy, the body needs outside help to get well again."

As in farming, we all know that if you want a good crop, the rainfall should be neither too much nor too little. If plants get the correct amount of water, minerals and sunlight, they grow well. If they do not get it, they will wither. Similarly, the body has to maintain a limited temperature, pulse rate, breathing etc. to live and remain healthy.

In the end Ayushi concluded, " We will recapitulate what we have learnt today, and meet again next Friday. Pay attention to your body, and observe it . We will discuss your observations next time.

Self-assessment

1. How is energy created in the body?
2. Give the significance of internal balance / control
3. Discuss the ideas and notions about the body with five women and write what common people think.
4. Write in your own words the new information received by you. (Knowledge gained) reading this lesson / chapter.

Exercise

Choose the correct alternatives

1) Which of these helps our body to produce energy ?
   i) Blood
   ii) Air
   iii) Food material and oxygen
   iv) Oxygen

2) Information about the body should be given to people
   i) For teaching
   ii) To take preventive measures
   iii) To understand causes of diseases /illness
   iv) To develop a positive attitude towards the body.

Fill in the blanks with the following

1. Nervous system 2. body temperature, pulse rate and rate of breathing 3. disease 4. internal control.

1. The various processes, organs and cells maintain the _____ of the body.
2. The systems of the body are controlled by _____.
3. _____ is caused by internal imbalance.
4. The body has to maintain _____ to remain alive.

Answers:
(Blanks) 1-4, 2-1, 3-3, 4-2.

Lesson 2
We and Our Health

Summary

- Man and other units of nature are interdependent. None are great or small. All are equally important.
- Nothing is wasted in Nature. However we create a lot of garbage in the world. Wherever we go, we find plastic bags lying around. The soil cannot absorb this waste.
- There is balance in Nature.

OBSERVE:

- How do you feel when you walk or work in the hot sun?
- How do you feel while harvesting your grain in the field or working very hard?
- What happens when you fast?
- What happens if you cannot fall asleep for a day or two?

Aims

On reading this lesson you will understand

1. The basic principles of health
2. Our basic relationship with health
3. Should morals be accepted while giving information about any subject

Knowledge

You will know about

- The principles of health
- The relationship between our health and us

Skill

- You will learn to observe

Perspective

You will understand that.

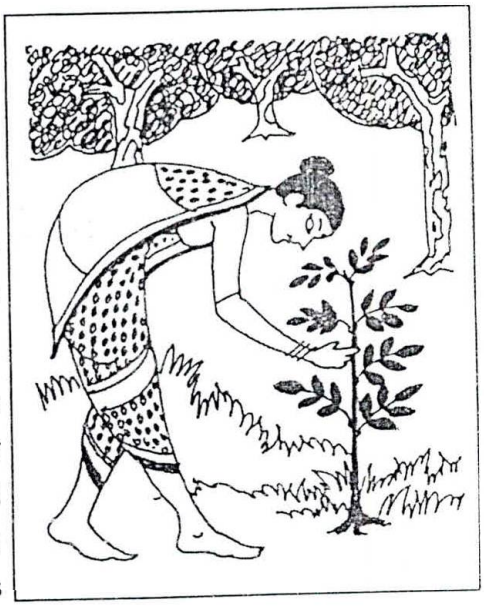
- Body language can be understood with a little effort
- The destruction of our health results in our destruction

Introduction

In this chapter you will realize that the activities of our body are similar to the activities of nature (or - the activities of our body are similar to those in nature). That is why the saying " Aham Bramhasmi" meaning thereby that if you know yourself, you know the world. Observation is necessary to understand oneself. We have to learn this fully. This lesson will also tell us how we are related to nature.

The number of women who came the next Friday was less than expected. There were many reasons for this. Some forgot to come, some had guests in their house; some felt the information was of no use. Ayushi was disappointed. Kusum chachi suggested, "Ayushi, if you are calling the women every Friday, why don't you narrate some religious story about a god or goddess before anything else? This will attract the women.

Ayushi wondered whether it would be right for a health worker to talk about religion. But the women felt there was nothing wrong.



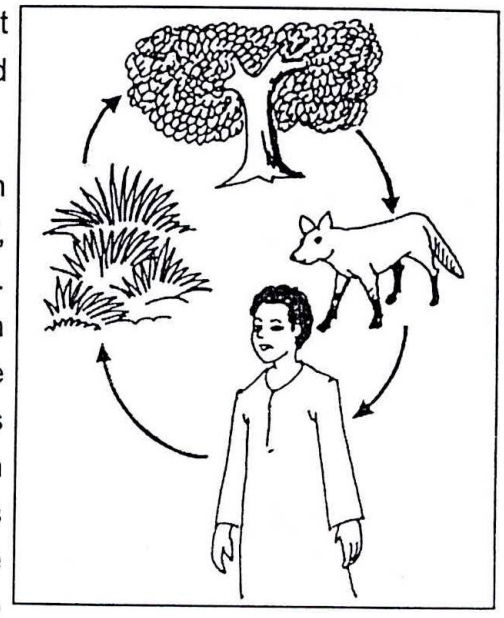
Savitri was the daughter of a great king. She was very intelligent and talented. It was difficult to find a suitable groom for her. So the king sent a minister with her to select a suitable husband of her own choice. She travelled through many states but didn't approve of any particular one. While passing through a forest, she noticed Satyavan. She was attracted to his life with nature and got married to him.

Satyavan's parents were blind. He himself fell ill. He had just one more year left to live. Savitri looked after the whole family. She made efforts to search for medicinal plants in the forest to treat Satyavan's disease. Finally, with her wisdom, she succeeded in saving her husband's life from the clutches of 'Yama' i.e. death.

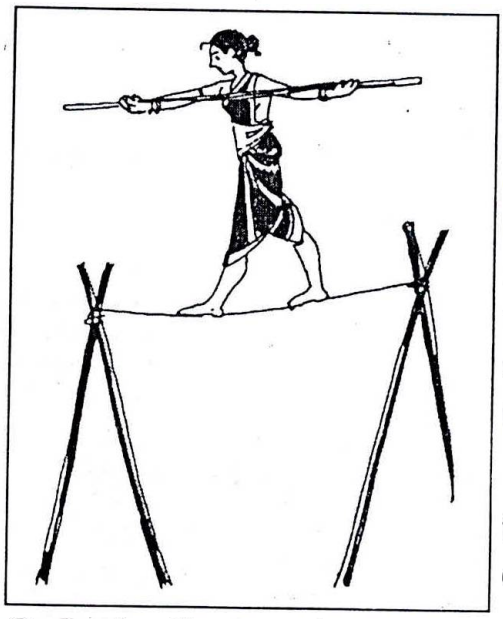
We must think about a princess selecting a husband with a life in the forest. Savitri, being sensible, had realized that we are part of nature. Our health improves when we are in contact with nature; we find happiness in that. Ayushi reminded them that life had started on earth long before man. Plants and animals were already existing on the planet before man came into being.

Our body has a structure that needs plants and animals to survive. Without plants we can neither breathe, nor get food to eat. May be, that is why our ancestors began worshipping plants and animals. They wanted us to remember that we are dependent on them and to

remain grateful to nature. But we forgot this important fact. We just continued rituals of worship on the one hand and destroyed them on the other.



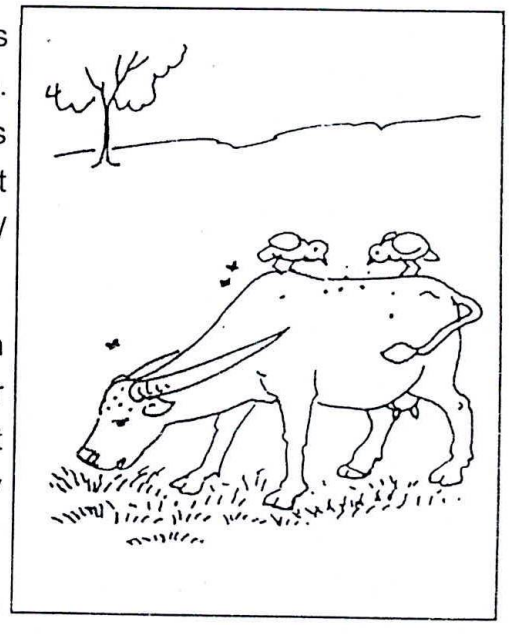
One of the rules of nature is that all its units remain connected with each other. If this balance gets disturbed, some plants and animals become extinct forever e.g. If carnivorous animals like the tiger get reduced in strength, the herbivorous animals like deer will grow in number. More grass and plants will be eaten, leading to soil erosion. While there will be a constant increase in the number of deer etc, the amount of flora will keep diminishing, soon these animals will also disappear. Nature tries to maintain a balance.



Our body also maintains its balance of constant temperature, amount of oxygen etc. If this balance is disturbed, we fall ill and a person may even die.

Organization and re-use of units

Nothing is useless in nature. e.g- fruits, though trees don't use their fruit, animals and human beings eat them. Similarly, the excretions of men and animals feed plants in the form of manure and gases. Since we are a part of nature our waste products are part of the food cycle/ chain in nature.



Interdependence: - All beings in nature depend upon each other. No unit exploits the other. Plants need their seeds to be dispersed into the soil by those who eat their parts. Man and animals require food prepared by plants. Thus everyone in nature is interdependent.

We have seen that the same rules that operate in nature are also found in the functions of our body. Man feels very proud that he has conquered nature. But we must realize that we can be safe only if we protect nature. This will make

us humble before nature.

Kusum chachi enquired why Ayushi was saying all this instead of giving information about the body. Ayushi clarified, "This is the relationship between nature and the body. Unless I explain how the body is a gift of nature, how can we understand about it?

Ayushi told them that the next time they would first discuss these questions and then she would narrate the story of Mahishasur.

- Why do you think Ayushi revealed the name of the next story?
- What can be the reason for scheduling the story in the middle and not at the beginning for next time?
- What do you feel?

We think that she wants to make the women eager to come to listen to the story. Also till they wait for the story to start, they can be involved in the earlier discussion.

- Do you think this is the right approach?

Self-assessment

1. List the festivals related to the worship of nature in your community.
2. Which of our actions cause damage to nature?
3. Find out and explain some examples of interdependence in Nature.
4. Make the observations suggested by Ayushi.

Exercises

Fill in the blanks

1. Know the world by knowing yourself, 2. Self-observation, 3. Interdependence, 4.Nature.

1. All the units of nature are related to each other by _____.
2. We are all units of _____.
3. We need to carry out _____ to understand others.
4. The meaning of 'Aham Bramhasmi ' is _____.

Answers

1-3, 2-4, 3-2, 4-1.

Lesson 3
The Structure of the Body

Summary

In this lesson we see that observation of the body helps us to understand whether our own body is functioning properly. We can identify the symptoms of illness easily. We will be able to find out which organ has a problem.

Aim

On reading this lesson you will understand

1. The aim and method of observing the body
2. The structure of the body

Knowledge

You will know about

- The location of the parts in the body
- Their names
- The importance of observing the body

Skill

You will learn

- To observe
- A simple way to give information to people

Perspective

You will understand

- The body is not too difficult to understand
- All people can understand the parts of the body
- Everyone has some knowledge about the body

Introduction

In the last lesson we saw the work done by the body and the method used by it to run functions smoothly as one unit. Here we will study the different parts and organs briefly. We will also understand the structure from a cell to the system.

Many women had come this Friday. All were eager to listen to the tale of Mahishasur. Ayushi was also determined to narrate it after the discussion. She began by recapitulating what was learnt in the previous discussion.

- We are a part of nature.
- The simple rules of nature are also followed in the human body
- The body carries out several functions like producing energy, remembering, offering resistance, reproduction etc.
- There are two systems or channels to conduct all these activities.
- The body sends positive or negative messages about the quantity of chemical or secretion to be produced by the organ.
- Internal control : The body maintains its balance of temperature, amount of minerals, alkali and acid to keep alive cells and keeps the system stable enough to work efficiently.

Ayushi suggested that they all share their experiences of observing the body.

Ayushi : Since we were sowing paddy in our fields, we had to stand continuously in the rainwater and bend a lot while working so we have a lot of bodyache.

Kusum Chachi : I was fasting on Tuesday Each time I am on fast, I get a headache later and feel relieved only after vomiting.

Nirmala : This time we didn't have a good crop. So whenever I think about how we will make the two ends meet this year, I get headache or palpitation and I can't sleep.

Radha : I couldn't sleep a whole night because my son was ill. Naturally I felt tired throughout the day and was in low spirits.

Sunita : When I go out to the fields to work, I don't drink the water outside. Therefore I suffer constipation the next day.

Archana : My father-in-law is an alcoholic so he always has stomach-ache and looks ill.

Rama : I love spices and pungent food but now it gives me a stomachache.

Lajo : I enjoy fish. Nowadays we get fish or crabs everyday in the paddy fields. So I am very happy.

Ayushi asked whether they had any problems while making observations.

Sunita : We faced no difficulty but couldn't understand what you expected.

Lajo: I have been experiencing all the matters discussed here even before, but was not aware that these were called observations.

Radha: We always spoke about our conditions but did not relate them to our activities. Like Rama, only now could she state that her stomachache was caused by eating spices. Careful observations helps to relate things.

Sunita: I knew my father-in-law is suffering but only when I discussed it with my mother-in-law, did I realise that drinking was the factor responsible for his problem.

Kusum Chachi: I now understand what makes me happy. I always wanted to study since childhood and the information received during the last two weeks delighted me.

Nirmala: Studying in old age is useful because it is never too late to get a job.

Kusum Chachi: I don't know if people learnt only for getting jobs or for knowledge.

Radha: Getting information is useful to understand the body and thus identify illness on time.

Sunita: Understanding the health problems would help in treatment.

Kusum Chachi : Ayushi should teach not just the women but also the children. It would benefit them all.

This discussion convinced Ayushi that she had succeeded in arousing enough curiosity in them to understand and observe the body. She declared that now they would always make observations.

She had to fulfil her promise of telling the story.

There was a demon named Mahishasur. He meditated very hard, appealing to Bramha. Finally Bramha was pleased and blessed him with a boon. Mahishasur wanted eternal life. Bramha reminded him that in nature every being that is born had to die, that his death was certain.

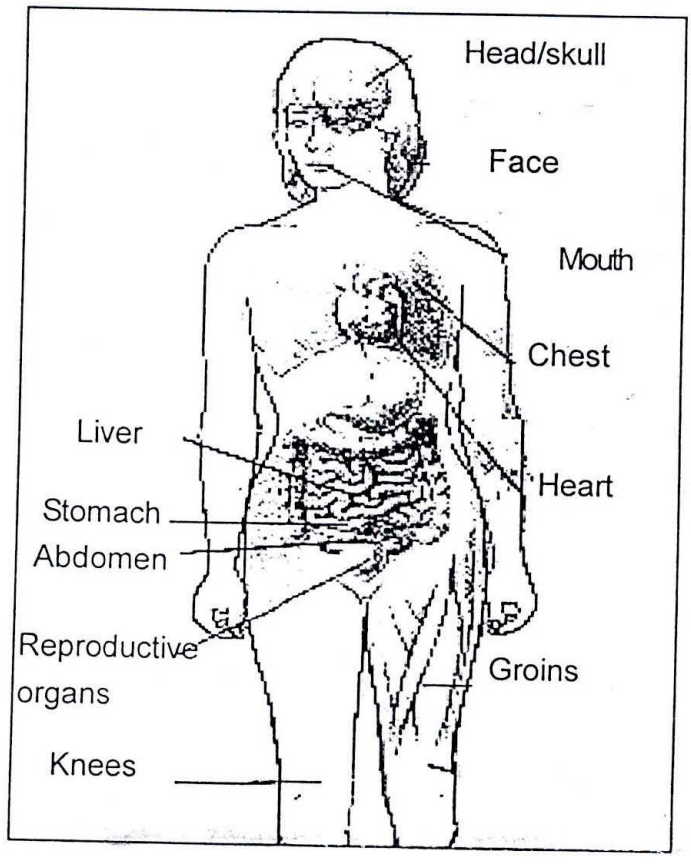
Mahishasur was worried that his meditation would be wasted. So he made a plan and asked for death at the hands of a woman. He thought that he was so mighty that no woman could kill him.

Feeling very proud, Mahishasur started harassing people. He thought that no one could oppose him. At last, Durga was born. She developed her strength and studied the body carefully. She wanted to find out the weak points which could be attacked.

Finally she was victorious and was able to destroy Mahishasur. We worship her as the "incarnation of strength". But do we try to grow strong like her? Do we try to understand the body?

At the end of the story, Ayushi started gathering details about where the parts of the body are?

What is inside the head? The brain
What is within the chest? Heart and lungs

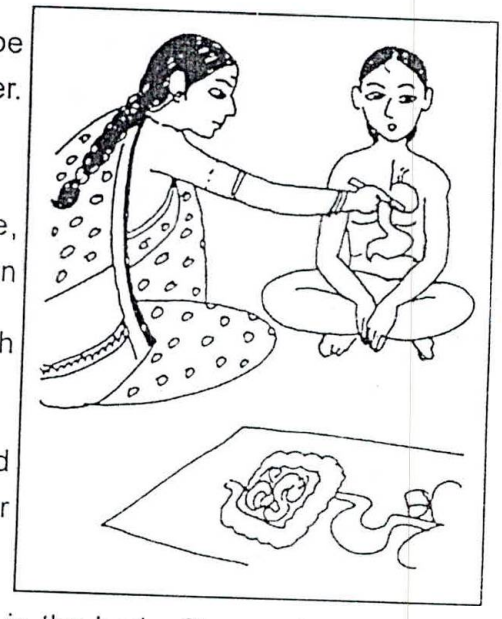


What lies in the abdomen? Stomach, intestines

What parts lie below the stomach? Reproductive organs

The women knew quite a lot but the list was incomplete. Ayushi filled it up on the blackboard

Head/skull - Brain
Backbone - Spinal Cord
Face - Eyes, nose, mouth etc.
Chest - Lungs, heart, wind pipe, food-pipe
Abdomen - Stomach, pancreas, spleen, liver. Small - Intestine , part of large intestine, kidneys, urinary bladder
Lower abdomen - Parts of large intestine, rectum, urinary bladder, overies in case of women



Then Ayushi drew the structure of the body with Rangoli and showed each organ in the diagram.

She explained the locations with a poster. She asked Jyoti to remove her kurta and drew the organs on her body with a chalk.

Thus the women understood where each organ is in the body. She made them show each other's organs with chalk. The women said that in future, when they had any pain, they would realise which organ was involved. Then Ayushi explained the structure of the body to them.

The structure of the body

Three hollow areas are created by bones, they are joined by the back bones. The bones of the hands and legs are connected to this.

The enclosure in the top part (head) is called skull. The next hollow area is the chest and then the lower abdomen (hips)

The bony cases protect the delicate important organs of the body.

Skull - Brain

Chest - Heart & lungs
Abdomen - Reproductive organs and urinary bladder,

The digestive organs of the body consist of flesh and skin. They are in the abdomen. That is why they are made of tough tissues/cells. The advantage of not having hollow bony cases for all organs is that the body is not too heavy, is "flexible" and it can bend, turn, twist etc.

The smallest unit that makes up our body is the cell just as a brick makes the wall. A cell contains all the features required by the body, for example, producing energy, self-defence and reproduction. These are the fundamental functions of a cell. A cell cannot be expected to function if broken down any further because it is a complete whole.

Ayushi asked the women whether they would like to meet again next Friday. When they consented, she informed them that they would dissect a hen and observe the parts of its body. She would give some information too. When asked about the name of the story she would narrate, she kept it a secret for those who would attend the next time!

Self assessment

1. Draw a diagram of the human body showing the following organs - brain, lungs, heart, stomach, uterus.
2. What is the role of the hollowness of bones?
3. Why should the body be observed?
4. Write down your observations.
5. Show the villagers the chart of the human body. Ask them to show where different organs are and write a report of this activity.

Exercise

1. Functions of the body, 2. Reproduction, 3. Hollowness of bones

1. _____ is a function of our body.
2. _____ helps in reducing our body weight and facilitates free movement.
3. Observing the body gives us information about _____.

Match the following :

1. Cell	1. Spinal cord
2. Stomach	2. Chest
3. Back bone	3. Small unit
4. Heart	4. Abdomen

Answers to exercises

Blanks

1-2, 2-3, 3-1

Correct pairs

1-3, 2-4, 3-1, 4-2

Lesson 4
The Relationship between Structure and Function of the Body

Summary

The structure of the body is suited to its functions. An organ which has to expand and contract, cannot be delicate. Similarly, a part which has to absorb something, must be porous.

Secondly the organs are located according to the order of their work. If teeth are meant for chewing food, they cannot be placed after the stomach!

We should use our knowledge about the body in our day-to-day life. The school bag should be packed such that the book needed in the first period must be placed right at the top.

Aim

On reading this lesson you will understand that

1. The structure of the body is related to its functions
2. Information about the structure of the body can be exchanged and discussed at the village-level.

Knowledge

You will know about

- How the structure and functions of the body are inter-related
- The organs and their functions

Skill

You will learn

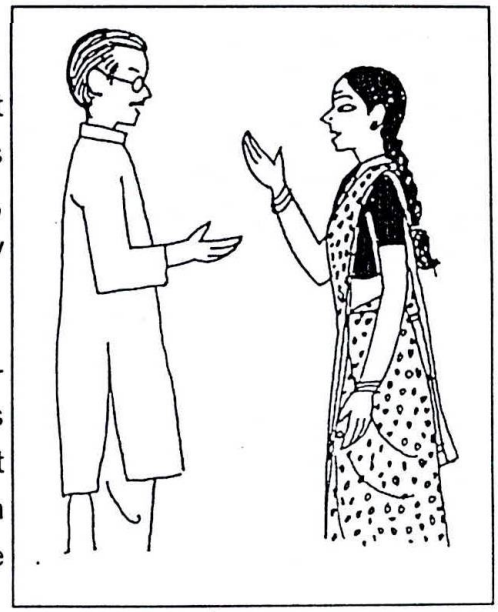
- How to relate to the people while doing one's work
- How to converse while receiving or seeking co-operation from people.

Perspective

You will understand that

- A village consists of people with varied capacities. Their qualities should be recognized and identified.
- Children too can be well-informed and often it is easier to impart new knowledge to them.

Introduction

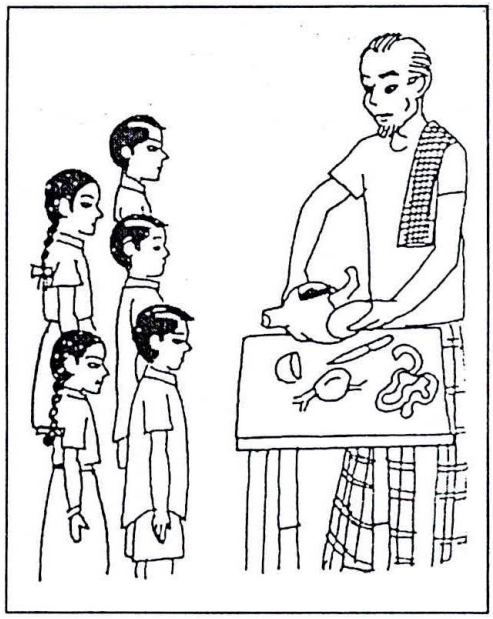


In the previous lesson Ayushi introduced the different parts of the body to the women. In this chapter she is going to pass on the information to the school children, as suggested by Kusum Chachi. She will tell them how the body is a combined whole from smaller units.

Ayushi conveys her intention of giving the school-children some information about the body. The teacher asks her the purpose of doing this. When she explains that her aim is to remove misinformation about the body from their minds, he suggests that she should start with the children in the fifth and sixth standards.

When Ayushi began talking to the children, she realised that they knew the names of many systems and organs. She thought about the ways and means of increasing this knowledge.

With the teacher's permission, she called Javed the local butcher and asked him to show the children the internal organs of a chicken carved by him. The teachers felt they could have dissected a mouse or frog in the school. But Ayushi felt that children were more familiar with the fowl as they had them at home and knew about the parts of their bodies.



Ayushi pointed to the bag-like organ called the gizzard (crop). She explained that the fowl eat stones and seeds to help in grinding their food in this bag. Our teeth do the same function.

Ayushi: Children, feel this bag with your fingers.

Alok: Its thick.

Amit: And quite hard

Asha: If you look carefully you will notice the teath within mesh with each other.

Ayushi: What you say is right about this action. Its purpose is to grind the food. That's why you see it expanding and contracting again and again.

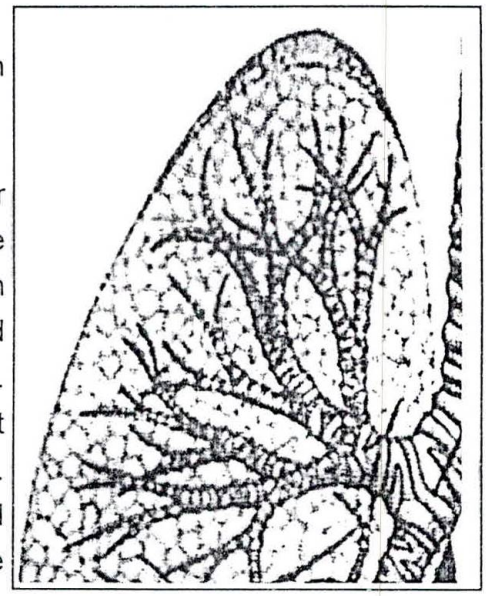
Then they were shown two tubes. Ayushi explained that the one against the skin was

the wind-pipe which has a firm structure so that it wouldn't get compressed easiy by external force.

When the wind-pipe goes into the chest, it divides into two branches leading to the lungs. Ayushi asked them to describe the lungs.

Jyoti: Soft and pinkish red in colour

Ayushi: They look like the nest of the weaver bird.



Teacher: The lungs look pinkish red because they contain a lot of blood.

Ayushi: The tiny sacs in the lungs contain the fresh air inhaled from outside. This is given to the blood and the unclean gases from it are given out of the body through the lungs. Do you the function of the bony cage around the lungs? It contains a muscle called the diaphragm. This is a pressure muscle. When it contracts, the chest expands. The inner air is reduced and outer air enters. When the diaphragm is relaxed, the chest box is reduced which increases the pressure of the air inside. Now the air is sent out.

Teacher: What is function of the chest box?

Amit: To protect the lungs and heart.

Chacha Javed: I'll show you the heart. It is a triangular firm bag, reddish in colour. Why is it firm?

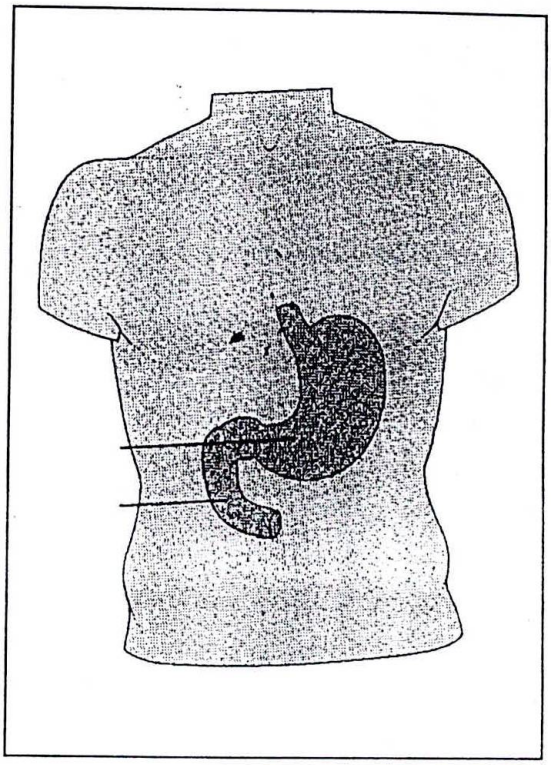
Children: Because it has to expand and contract repeatedly. The heart supplies blood containing oxygen to the body. Blood containing carbon dioxide is sent to the lungs.

Then Chacha Javed showed the stomach to the children. It resembled the English letter 'J'. It is connected to the food-pipe at the top and the intestine at the bottom.

Ayushi: Why is the stomach shaped broader in the middle, do you know? Because food should stay in it for about two hours Since the ends are narrow it will not return to the food-pipe; it should directly move into the intestine. The muscles at these ends are circular. If necessary the outlet can be relaxed to push the food out of the stomach.

Ayushi showed them how the stomach is to the left below the ribs.

Uncle Javed showed them the liver on the right side. Many children said they loved the liver. Some stated that it was also offered to gods. Uncle Javed explained that it contained a lot of strength because it was the godown of the body. It stored vitamins, iron and fat to be used when necessary.



Javed Chacha: Can you see this greenish bag below the liver? This has to be thrown away before cooking the chicken. Otherwise it gives a bitter taste.

Alok: Why is that so?

Ayushi: It stores bile to digest fat. This juice is bitter Sometimes we taste it when we vomit.

Then uncle Javed showed the long and soft tubes called intestines. Ayushi explained that food is digested inside them. Just as sugar-cane is crushed to give a glass of juice, the digested food matter fills up the blood. The remaining waste-matter is thrown out of the body. The small intestine is longer because it has to absorb the digested food. The large intestine is broader because it has to absorb the water before it excretes the unwanted refuse.

Chacha Javed turned back the hen to show two kidneys shaped like beans.

Ayushi explained that kidneys work likes sieves. They sift the waste from the blood and throw it out with the water. Ayushi promised to return to the school a month later. Till then she asked them to spread word to their families about the parts of the body systems and the functions of the organs.

Self-assessment

1. What is the function of the lungs?
2. Why is the stomach strong?
3. What is the function of the kidneys?
4. Why is the small intestine long?
5. What is the function of the liver?
6. Write your observations about this lesson with reference to the following points.
    a. Does a health worker need to know the structure of the human body?
    b. Should more information be given?
    c. Is it difficult to convey information about health to people?
    d. You may give other examples or write about your difficulties.
7. How and why did Ayushi use resources at the village level?

Exercise

A. Fill in the blanks

1. _____ is necessary to digest fatty food.
   1. Bile 2. Acid from the stomach 3. Pancreatic juice 4. Blood
2. Digested food is absorbed in _____.
   1. Small intestine 2. Large intestine 3. Liver 4. Spleen.
3. Vitamins/Iron/Fats are stored in the _____
   1. Liver 2. Stomach 3. Spleen 4. Small intestine
4. The structure of organs of our body is according to their _____
   1. Weight 2. Shape 3. Function 4. All of three

B. FIll in the blanks from the list below :

1. Lungs and heart are inside_____
2. The heart is _____in colour.
3. The shape of the stomach is _____.
4. The godown of our body is _____.
5. The colour of the gall bladder is _____.

   1. Liver 2. Red, 3. Green 4. Like the letter 'J' 5. The bony cage

C. Match the following

1. Diaphragm	1. Pink colour
2. Lungs	2. Godown
3. Liver	3. Reaching pure blood/oxygen to the body
4. Heart	4. Absorbing digested food
5. Stomach	5. Bean shaped
6. Kidney	6. Like the letter 'J'
7. Small intestine	7. In contraction and expanding the chest box

Answers

A. 1-1, 2-1, 3-1, 4-3

B. 1-5, 2-2, 3-4, 4-1, 5-3

C. 1-7, 2-1, 3-2, 4-3, 5-3, 6-5, 7-4

Lesson 5
The body - A Complete/Whole Unit

Summary

Our body has different systems in it. They are all interdependent. So a problem in one organ affects the whole body. We should try to understand this inter relationship.

Aim

On reading this lesson you will

- be able to describe the symptoms in case of any complaint/problem with the body.
- know that even if one organ has a problem, symptoms may be noticed in other parts too.
- be able to give the names of the different systems of the body with their parts.

Knowledge

You will know about

- The condition of the organs of the body and their interrelationship
- Different systems with their units

Skill

You will learn

- The use of local language to inform common people
- Use of local resources.
- Use of local customs to attract people to attend.

Perspective

You will understand

- The body as a unit
- Necessity for information about the body.

Introduction

Our body works as a unit. The digestive system absorbs food essential for the whole body. The blood carries oxygen to all the parts. No organ or system is more important than the rest (All are equally important!) All are interdependent. They work in coordination, not competition. Therefore in case of any problem, its effect is seen on the whole body. We will remain healthy only if the body works well.

It's Friday today, Ayushi had informed Javed Chacha in the morning, about dissecting a chicken during the women's meeting. She was wondering, which tale to narrate.

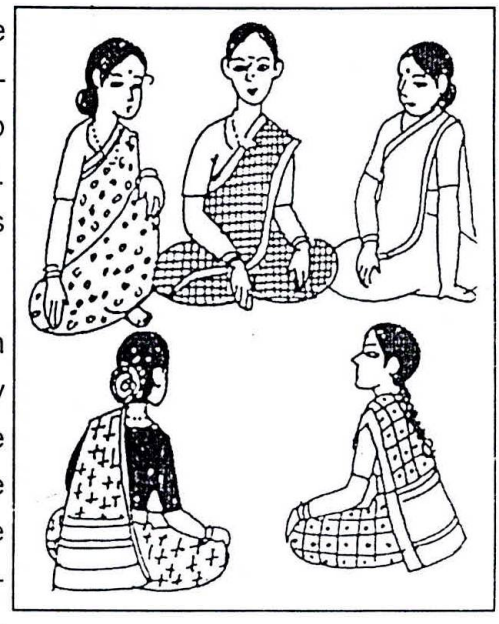
By the time the women gathered in the afternoon, most people had come to know how Ayushi had discussed the parts of the body by demonstration of the bird's organs.

Ayushi said that she would recapitulate her conversation with the children briefly :

1. The body has a defence mechanism as follows:
   - The skin prevents the germs from entering the body.
   - The hair inside the nostrils prevent dirt and dust from entering the nose. The fluid produced in the nose also obstructs dirt.
   - An acid produced by the stomach destroys germs.
   - A network of nerves (tiny branches connected to each other and to the brain spread all over the body) gives us the sensations of heat/cold, pricking, burning etc. from the environment and helps us react to our environment.
   - Our body defends itself very well. But many times we eat the wrong things or our life style causes some problem in our body. Our body tells us that something is wrong. The means used by the body to indicate a problem are * Pain * Fever * Swelling, redness, lumps * extra production of secretions * vomit * fast breathing * fatigue * palpitation * reduction or discontinuation of the function of some organ * feeling sad, lack of will to work * not being able to concentrate on anything etc.

     When Javed Chacha cuts open the bird today, observe carefully where the organs are located. Note the interrelationship between them. It is necessary to know this in order to understand which other organs will be affected in case of some problem in one part of the body.
   - For e.g. - patients of loose motions have a problem in their intestines which occupy a lot of space, giving them the feeling that the stomach is aching
   - If germs attack the wind-pipe or lungs, the outer cover of the lungs is affected causing pain in the chest as a whole.
   - In case of appendicitis, the pain begins in the navel.

- During menstruation, the covering along the wall of the uterus gets detached and flows out. Cycles of female hormones cause this by contraction and expansion of the uterus. The female organs are located below the navel, pain is felt in the lower back and thighs.
- Blood circulates in the whole body. It carries food and oxygen to the cells. It contains red cells which have iron in them. If the quantity of iron in the body is reduced, we feel fatigue, palpitation and cramps in the hands and feet. This illness is called anaemia.
- During typhoid, germs reach the intestine and grow there. So there are loose motions with pain. There is fever and sharp headache. Many times lungs get infected. Germs cause pneumonia which causes pain in the chest.



Ayushi asked Javed Chacha to dissect the chicken in a way suitable to show the digestive and respiratory tracts. He followed her instructions and showed the women the organs. After this, Ayushi explained the systems with the help of posters. Sunita asked the meaning of "system". Ayushi explained that when different organs coordinate to complete one process, the activity is called a "system".

There are many different systems in our body. According to their function, they can be classified as follows:-

1. **The system of movement**
   All the organs connected to movement e.g. - muscles, bones and joints together make this system.
2. **Circulatory system**
   This consists of blood vessels, blood, heart and glands
3. **Digestive system**
   The digestive tract, organs and glands constitute the digestive system
4. **Respiratory system**
   Inhaling oxygen and exhaling carbon dioxide involves the respiratory tract, lungs, and alveoli form the respiratory system.
5. **Urinary system**
   All the organs forming urine and excreting it from this system.

6. **Nervous system**

Collecting sensations from all parts of the body, sending commands according to them and controlling the functions of the organs together, constitutes the nervous system. This involves the brain, the spinal cord and the nerves.

7 **Sensory system**

Reviewing perceptions from the environment by the sense organs like, ear, nose, eyes, skin and tongue is the sensory system .

8. **Endocrine system**

This consists of glands located in different parts of the body to control different functions. Then, Ayushi went on to explain that the systems are connected to each other although they are independent.

- The respiratory system obtains oxygen but the circulatory system carries it to all parts of the body. Similarly the carbon dioxide produced by cells is carried by blood to the respiratory organs which then throw it out.
- The network of nerves receive the hot/cold sensation obtained by touching and command us to move away from it. Thus they defend the muscles, skin and bones etc.

Ayushi explained that in this way we have to look at the body as one whole unit. She thought she would narrate the story of Vanadevi that day.

She introduced it with idea of having different gods and goddesses in each area. In the same way, Vanadevi (Goddess of the forests) is there to protect the forests and we worship her. Long ago, all kings hunted wild animals for sport. The goddess Vanadevi was pained to see this. She requested Adishakti for protection of wild animals. She said that if tiger strayed into human civilization by mistake once in a while, she could tolerate its killing for defence. But no animal should be killed for game. If man destroyed tigers without reason, trees would soon vanish. The water in the forest is safe due to the presence of tigers. Otherwise, men would rush freely into the forests and cut trees, grass and other creatures. Bit by bit, the forests would disappear. Though she had the creative energy, forests cannot be created as fast as man destroys them.

Adishakti remarked that man had become too proud to understand anything. She wanted to punish him. But Vanadevi begged to preserve humanity because all life is interdependent.

She decided to free man from the curse of not being able to recognize his inner voice. She declared that man would have to work hard for a living. His efforts would give him the vision of life and this would also bless him with strength.

Ayushi reminded everyone that we all are suffering today because we don't look at our bodies in totality. We must understand that whenever one part of a unit is affected, the whole is disturbed in relation to it.

Self Assessment

a. Fill in the blanks

1. White blood cells destroy _____
2. Acid produced in the stomach kills _____
3. The pain of appendicitis starts _____

b. What symptoms will suggest that there is some problem in the body?

c. Give some examples of the defence mechanism of the body.

d. Write the names of the organs of the different systems of the body.

e. Describe an experience when you as a family member, suffered during illness affecting the whole body and not just one part.

Exercises

A. Fill in the blanks

1. Our body works like a _____.
   1. Unit 2. System 3. Cell 4. all the above.
2. There is a relation of _____ in all our systems.
   1. Coordination 2. Competition 3. Dependence
3. Appendicitis causes pain in the _____.
   1. Navel 2. Stomach 3. Abdomen 4. Small intestine
4. The organs in the system of movement are _____
   i. Hands, legs, knees, muscles.
   ii. Bones, skin, blood vessels, muscles
   iii. Muscles, bones, joints.
   iv. All the above.

B. Fill in the blanks 1. Nervous system, 2. Circulatory system

1. The heart, blood vessels, blood and glands together form the _____.
2. The spinal cord is a part of the _____.

C. Match the following

1. The nervous system	1. Skin
2. Sense organs	2. Perceiving sensations
3. Heart	3. Unit
4. Body	4. Circulatory System
5. Glands	5. Respiratory system
6. Lungs	6. Endocrine system
7. Green motions	7. Appendix
8. Pain at the navel	8. Typhoid
9. Pain	9. Pain below the navel
10. Menstruation	10. The expression of the body

Answers

A 1-1, 2-1, 3-1, 4-3

B 1-2, 2-1

C 1-2, 2-1, 3-4, 4-3, 5-6, 6-5, 7-8, 8-7, 9-10, 10-9

Lesson 6
Cell and Tissue

Summary

1. The one-ness of the body -A single cell carries out all the functions carried out by an organism. A minute part of the body conducts the same activities that are carried out by the whole.
2. Nature has created the body very wisely. While hard bones protect the inner delicate organs where ever necessary, other parts are left flexible and free for movement. Thus the body is stable as well as flexible.
3. We have seen that there are many cells in the body. All cells carry out the basic functions and transform themselves for particular activities.
   Although we all are human beings, each one looks different and has different likes and dislikes. Thus, we are similar but different. We must respect this diversity in our lives too. Even if some people believe in different religions or belong to different groups, we continue to share our unity as human beings.
4. Types of tissues
   1. Epithelial Tissue
   2. Muscle Tissue
   3. Connective
   4. Nerve Tissue

Aims

On reading this lesson you will understand

1. The structure of the cell
2. What a tissue is and types of tissues.

Knowledge

You will know about

- The parts and functions of a cell
- The purpose of cell differentiation

Skill

You will learn the

- Use of local resources to help children or villagers.

Perspective

You will understand

- Inspite of outward differences things in nature are basically similar.

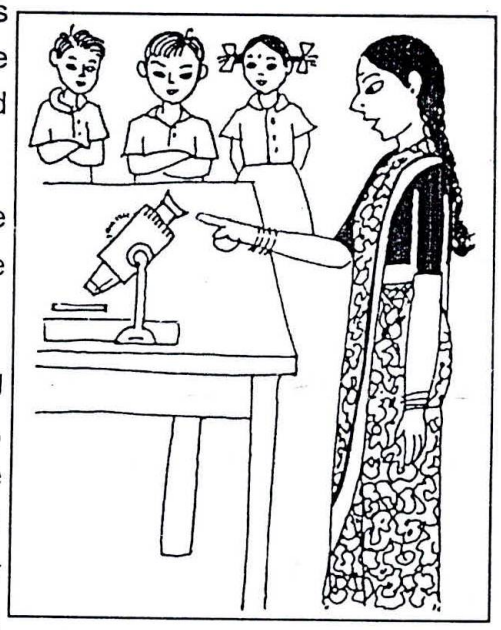
Introduction

In the last chapter we saw that Ayushi describes the structures and systems of the body briefly to the women. In this chapter we shall observe how she extends her discussion with the children and informs them about different groups of cells.

Ayushi had asked the children to write the names of the organs of the different systems. They handed her the lists.

Today she will discuss with the school children again. She saw the textbooks of class six and seven. Then she thought that since they are familiar with the cells, they would be benefited by adding to their information.

Ayushi reached the school. She carried some leaves and an onion with her. She demonstrated the skin of the onion under a microscope to the children. They saw it looked different through the microscope. Many tiny rectangles were seen in the peel. Ayushi also showed them the leaves under its lens. Here too, the children observed little rectangles.

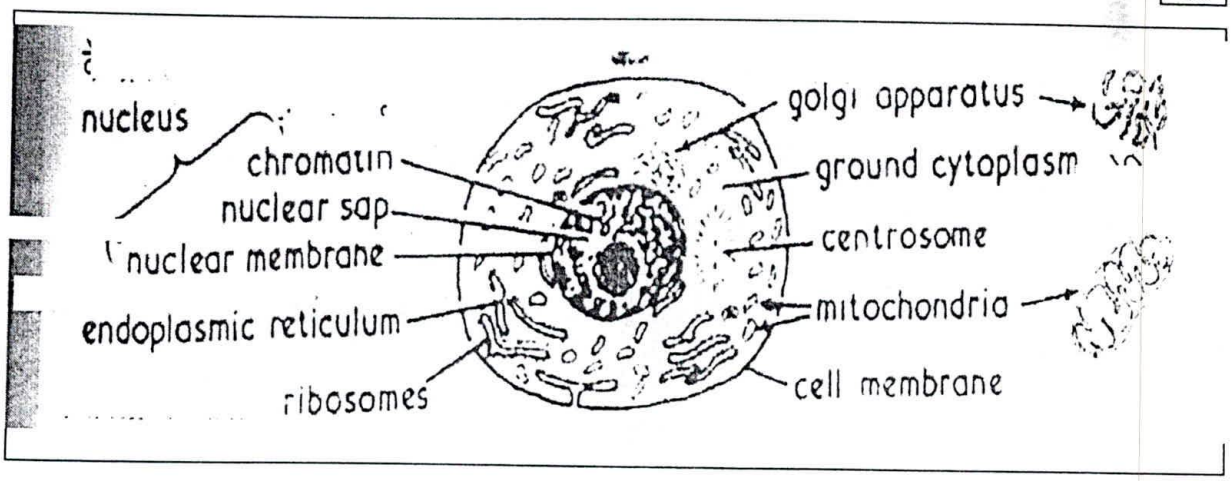


Ayushi told them that the tiny rectangles seen were cells. These were the units of which all living beings are formed.

Some organisms consists of a single cell. Among these, the cell does all the functions of digestion, production of energy, resistance and reproduction. Nature first created single-celled beings and then multi-celled organisms. If we consider the example of a factory or business, in the beginning only one person does all the tasks of production, marketing, accounting and cleaning etc. More people are involved in the business as necessity arises. Then there is division of labour. Some do the production work, some keep accounts, some look after the cleaning and some selling etc. Multi-cellular living beings have a similar arrangement.

The total work done by a single cell is managed by one organism. Therefore the work is divided among cells. They are transformed according to function, leading to structural differences.

Every cell consists of protoplasm, nucleus, mitochondria lysosome, along with golgi bod-



ies and endoplasmic reticulum. Every cell is self-sufficient.

Nucleus / centre of the cell
Lysosome
Endoplasmic reticulum
Ribosome
Golgi Apparatus
Cytoplasm
Mitochondria
Cell membrane

The Parts of a cell

The following are the different parts of a cell

1. Cytoplasm, water, minerals, organic compounds (carbon, hydrogen, and oxygen) constitute a cell.
2. New cells are created by division of chromosomes in the nucleus
3. Endoplasmic Reticulum - It absorbs proteins, digestive juices and other substances which are sent to different parts of the cell.
4. Golgi Apparatus transform proteins and carbohydrates.
5. Lysosome breaks down waste products, often it can also destroy the cell itself.
6. Mitochondria - It creates energy in the cell.
7. Ribosomes - They recreate proteins.

We have already seen that structures of cells vary according to their functions. Thus there are 4 main types of cells in our body.

1. Membranes
2. Nerves
3. Muscular/Fleshy cells
4. Connecting cells.

No cell can complete a particular function alone. Similar cells acting together are called tissues. 4 types of cells form 4 kinds of tissues. Cells having the same structure and function

form a unit.

Particular tissue and their functions

Epithelial Tissue (Covering Tissue)- Our skin is formed of this tissue. Hollow/Empty spaces are also covered with it. Its main function is defence.

1. Protects the inner parts of the body from injury.
2. Prevents the inner fluids of the body from oozing out.
3. Prevents absorption of outer liquids coming in contact with skin.
4. Prevents germs from entering. There is an inner tissue lining organs. This inner tissue lining is named differently according to its location.

Mucous membrane (this produces a protective fluid). Mucous is found in the digestive, respiratory and reproductive systems as well as in some organs.

Synovial membrane - This covers joints of bones. It creates the sinovial fluid. This prevents friction in joints, making movement easy.

The children didn't understand the meaning of friction. Ayushi explained to them that friction is what makes it difficult for us to walk on sand. If we don't oil our bicycle, friction obstructs its smooth movement.

Serous Membrane - Some organs have a double lining. This becomes necessary because they have to contract and expand. A serous fluid occupies the space between the two layers. This membrane is found around the following organs; lungs, heart, some organs of the alimentary canal lying below the chest but above the hips.

1. When this membrane covers the lungs it is called Pleura.
2. The membrane around the heart is called Pericardium.
3. The Peritoneum covers the organs of the digestive system.

Ayushi hinted that she would describe 3 more tissues next time, namely the muscular tissue, the connective tissue and nervous tissue.

Your responsibility as health workers

1. Spread information among people.
2. Find out simple ways of giving information.
3. Remember that it must reach all classes of people
4. Not to hesitate giving information thinking that it is difficult.

Self Assessment

1. What are the different parts of the cell?
2. Name 4 types of tissues.
3. Give the functions of the Epithelial Tissue
4. Serous membrane is found in _____, _____, _____.
5. Where is the Synovial membrane found_____.
6. Name the location of mucous membranes
7. Give examples of unity in diversity in nature

   Muscle, Nerve, Joint, Tissue

Exercises

1. The smallest part of our body is _____
   1. Cell 2. Tissue 3. Organ 4. Nerve

2. Proteins are recreated by the cell in the
   1. Nucleus 2. Ribosome 3. Lysosome 4. Golgi body

3. A tissue is _____.
   1. A group of cells 2. Nucleus 3. Cell fluid 4. Ribosome

4. Which of the following is made of epithelial tissue in our body ?
   1. Skin 2. Organ 3. Cell 4. Bones

5. Which membrane contains the Synovial fluids?
   1. Mucous 2. Serus 3. Synovial 4. Epithelial

6. What is the function of Serus membrane?
   1. Preventing friction between organs.
   2. Producing protective fluid.
   3. Help in contraction and expansion of organs
   4. Prepare fluids.

Match the following

1. Serous Fluid	1. Prevention of friction in bones
2. Synovial fluid	2. Serous membrane
3. Pleura	3. Pericardium
4. Heart	4. Lungs

Answers

Correct alternatives

1-1, 2-2, 3-1, 4-1, 5-3, 6-3

Correct pairs

1-2, 2-1, 3-4, 4-3

Lesson 7
Joints and Fluid Tissues

Summary

1. Tissues are of 4 different types.
2. Blood is a type of connective tissue
3. Deficiency of red blood cells causes Anaemia
4. Blood fights germs to protect our body.

Aims

On reading this lesson you will understand

1. The parts and functions of cell
2. The main 4 types of cells in our body
3. The parts and functions of blood

Knowledge

You will know about

- Parts and functions of cell.
- Parts and functions of blood
- The causes of Anaemia
- How white blood cells protect the body

Skill

You will learn

- The symptoms of anaemia
- Simple methods of giving information to people

Perspective

You will understand

- A single person cannot keep all available information
- Information can be gathered as needed.

Introduction

In the last chapter, we studied the structure of the cell, its different parts and the types of tissues. This chapter is about connective tissues. You might wonder whether all this information is necessary.

Today, there is an explosion of information about every subject. No one can go through all of it in one life. That's why it is rather difficult to decide how much information we need.

If we think that we should gather only as many details as is useful for our work, we will be wrong. Many times we realise that the work we are doing is beyond our knowledge, so we need a specialist. That's why our information should not he limited according to our functions but should also include areas that enable us to recognise the framework of our duties, its references.

The information given in this chapter may not help us in our day to day work, but it will increase our understanding.

Ayushi described the structure of a cell briefly. She compared it with the structure of a house. Just as different locations inside the house are used for particular functions i.e. food is cooked in the kitchen, people bathe inside the bathroom, guests are received in the drawing room and plants are grown outside the house in the garden, the regions of activities are definite.

The functions of the organs of our body are also definite i.e. we walk with our legs, see with our eyes, hear with our ear etc. This definiteness can also be observed in our cells.

Ayushi introduces them to the different parts of tissues by pointing out the references shown in the poster. (Fig. 1)

This is the cell-wall. Just as our body is covered with the skin, this covering gives shape

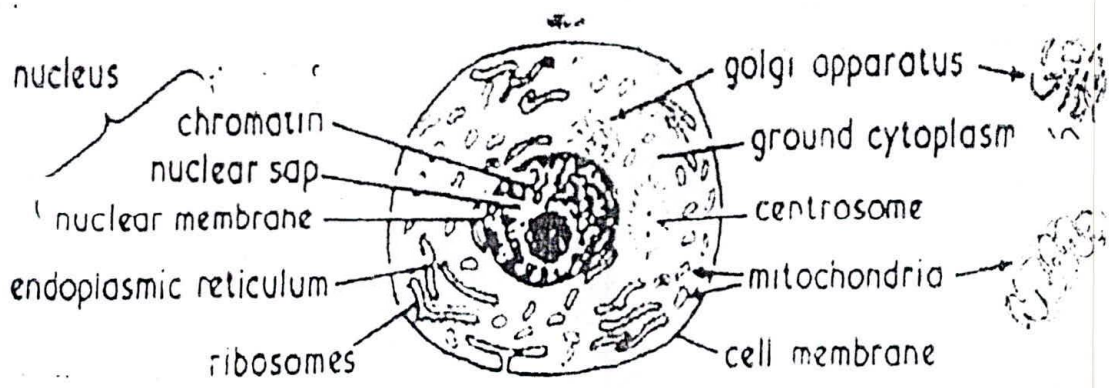


Fig. 1

to the cell. The cell-wall is porous so that some material enters through it into the cell, while unwanted substances are given out. The size of the pores determines which matter can pass through them. The area inside the cell-wall is full of fluid parts which form the cell. This is called the protoplasm which keeps all the constituents together and allows exchange of substances among them.

The nucleus lies at the centre of the cell. Chromosomes occur in it, just as songs are recorded on a cassette. Chromosomes contain all the instructions needed for the functioning of a cell. The nucleus undergoes division to create many new cells.

The endothelial reticulum and golgi apparatus are parts of the cell that resemble a kitchen. Here the food is converted into a form that can be absorbed.

The mitochondria is the area of generation of energy. The energy is used for the basic functions.

The lysosome is the part which destroys the unwanted material from the cell. This is similar to the production of compost in our fields.

There are 4 main types of tissues in our body-

1. Epithelial tissue
2. Connective tissue
3. Muscular tissue
4. Nervous tissue

We need tissues with particular structures for certain functions. That is why the 4 types of tissues differ from each other. Just as a house may have two rooms, the kitchen needs an outlet for smoke whereas the bathroom needs an outlet for waste water; our tissues have also differentiated themselves as required.

There are connective tissues in our body. They resemble the role of women in families who maintain the bonds, between members and relatives Every tissue has a common structure and function.

Following are the types of tissues.

1. Areolar Tissue
2. Elastic Tissue
3. Lymphoid tissue
4. Mucoid tissue
5. Adipose tissue

6. Fibrous tissue
7. Cartilaginous tissue
8. Bone tissue

1. Areloar Tissue - This is found below the skin of the body. It covers the blood vessels muscles, nerves and other organs (like liver, stomach intestines)

2. Elastic tissue - This is found in the pipes or tubes (circulatory, respiratory tracts) and muscular groups. It makes the parts flexible.

3. Lymphoid tissue - It consists of lymph cells. It produces resistant substances to destroy germs. In this way it protects the body.

4. Mucoid tissue - It is found in the eyes and the umbilical cord. It lubricates the organ. This tissue clings to other parts and minimizes friction between organs.

5. Adipose tissue - It occurs below the skin. It contains fat and water. It supports the organs and maintains their condition. It helps to create energy and to maintain the body temperature.

6. Fibrous tissue - It supports the organs to which it is connected. Bones are wrapped by this tissue and so are muscles.

7. Cartilage - This is bluish-while in colour, hard but not as much as the bone. It occurs in joints and along the longer bones. The backbone contains it and so do the nose and ears.

8. Bone tissue - This is the toughest tissue. It is of two kinds - 1. Compact Bones and 2. Cancellous Bones. Compact bones can be seen among long and flat bones. Cancellous bones are spongy and can be seen at the ends of long bones and between two layers of compact bones. All these tissues give shape to the body. The significant among them are -

1. Bones
2. Ligaments

Blood

Today we shall discuss a fluid tissue called 'Blood'.

Blood flows through our whole body. It consists of Red blood cells, white blood cells, platelets and plasma.

Plasma

It occurs in the form a fluid. The blood cells and platelets float in it. It consists of water, proteins and other nutrients.

Protein retains water in the blood cells. It maintains blood-pressure in the vessels. If we are deficient in proteins, water oozes out of the vessels, causing swelling. Children lacking protein have swellings but mothers think they are fat and healthy.

Platelets

They are shaped like discs. Platelets cause clotting whenever the body suffers a cut or an injury by which blood starts flowing out of the vessel. The clot prevents the blood from leaving the vessel.

White blood cell

White blood fight germs and function in 2 ways -

1 - by surrounding the germs, breaking them up and engulfing them

2- by creating agents to kill the germs.

These agents are called anti-bodies.

Red blood cells

They are red in colour as suggested by the name. They are minute and round. Their life span is about 120 days. They are constantly being created and destroyed. They are created inside the bones and destroyed in the spleen.The red blood cells contain red particles consisting of protein and iron, called haemoglobin. It carries oxygen. Deficiency of haemoglobin causes less oxygen to be carried. Shortage of oxygen causes fatigue, dizziness, loss of appetite and palpitation. This condition is called anaemia. A nutritive diet can improve it by creating red particles with iron through food like green leafy vegetables, jaggery, moong, dates, meat, liver, egg-yolk, apples etc.

Sometimes the red blood cells, are sickle-shaped instead of round. This is a hereditary disease which destroys red blood cells faster than production. This causes an acute condition of anaemia called sickle-cell anaemia. Some tribals in our country suffer from this disease. It is the main health problem in such areas.

When Ayushi completed giving this information, the women asked what they should eat to overcome the deficiency of blood. Ayushi reminded them about the iron-rich food i.e. green vegetables, jaggery and nutritive organs of animals like liver and heart.

The women insisted on listening to a story after the information. So Ayushi narrated the tale of Kali Mata.

There was a proud king named Shumbha. Since he was very powerful, he ruled all the three worlds - the earth, heaven and hell. He had two generals in his army, Chand and

Munda. Shumbha had meditated long and hard to win a boon that a single drop of his blood on the ground would create many forms of himself.

He drove the Gods out of heaven. They took refuge in the Himalayas and prayed to Goddess Durga. She appeared before them as Ambika and offered a blessing. The Gods asked her to destroy Shumbha.

Chanda and Munda were keeping a watch over the Gods. They found Ambika beautiful enough to be their queen. They reported her great beauty to Shumbha.

He asked them to fetch her. They presented his proposal of marriage before Ambika. She replied that she had vowed to marry the one who was brave enough to defeat her in war. They explained to her that he was known to be valiant. But she remained firm.

Chanda and Munda fought against her with their army. Then Kali came to her aid. When Shumba came to fight, Ambika attacked him and blood flowed from his body to the ground. Many versions of Shumbha were created from it. Kali told Ambika to kill him while she drank his blood. Thus Shumbha was destroyed.

Ayushi called on the women to support each other just as Kali supported Ambika. She added that Shumbha must have been a creature that spreads through blood. That's why his blood had to be destroyed.

Self Assessment

1. Write the names of 4 kinds of tissues
2. List the constituent cells of blood.
3. Why is swelling caused in the body?
4. Explain the condition called Anaemia
5. Explain how white blood cells defend the body.

Exercises

Choose the correct alternatives

1. The red blood cell survives for _____ days.
   1. 120 days 2. 100 days 3. 100-120 days 4. 120-130 days
2. Meaning of anaemia
   1. Plasma 2. Shortage of platelets 3. Less red blood cells
   4. Deficiency of white cells
3. Protein Deficiency causes swelling because
   1. Amount of blood increases
   2. Water flows out of blood vessels
   3. Drinking excess water
   4. All the above

Fill in the blanks

1. Bones, 2. White, 3. golgi apparatus, 4. mitochondria, 5. Areolar , 6. elastic, 7. adipose
   1. _____ creates energy in the cell.
   2. _____ tissue is found beneath the skin.
   3. _____ tissue occurs in blood vessels
   4. _____ tissue stores fat and water
   5. _____ is the kitchen of the cell
   6. _____ cells resist germs and produce antibodies
   7. Red cells are formed inside the _____ .

Match the pairs

1. Adipose tissue	1. Muscle
2. Fibrous tissue	2. Fat/water collection
3. Ligaments	3. Back-bone
4. Abnormal red cells	4. Like a disc
5. Platelets	5. Protein and iron
6. Haemoglobin	6. Sickle-shaped

Answers

Right alternatives
1-1, 2-3, 3-2,

Fill in the blanks:
1-4, 2-5, 3-6, 4-7, 5-3, 6-2, 7-1

Match the pairs
1-2, 2-1, 3-3, 4-6, 5-4, 6-5

Lesson 8
The Circulatory System

Summary

1. Blood carries food and oxygen to all parts of the body. It takes waste materials formed in the cells and carbon dioxide to the excretory organs which are lungs, skin and kidney.
2. The heart and blood vessels together carry out circulation.
3. If you do not understand any unnatural symptoms you should take the patient to the doctor.
4. Our life style can often be responsible for causing heart attack e.g. smoking, tobacco abuse, over eating, lack of exercise, tension and stress.

Aims

On reading this lesson you will understand

- The circulatory system.
- Where and how to check the pulse.
- The symptoms of ailments regarding circulation.
- The lymphatic system

Knowledge

You will know about

- The structure and function of the circulatory system
- Illnesses related to circulation and their symptoms.
- The relationship between lymphatic and circulatory system.

Skill

You will learn and

- Know how to check the pulse
- Understand when to send a patient to the doctor after observing the symptoms.

Perspective

You will understand that

- Often lifestyle is the cause of illness.
- Illness is not caused by ghosts or spirits, or magic or spells.

Introduction

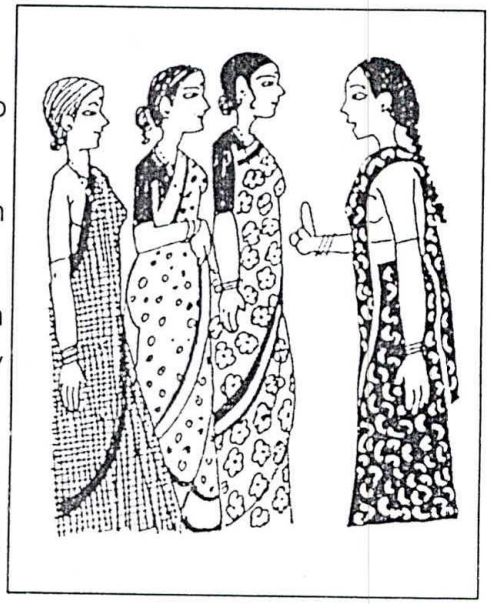
In the previous chapter Ayushi gave information about the units of blood.

There was a death in the village that week. Kishorilal had died at the age of 40. The whole village was in mourning.

The women gathered for the Friday meeting.

Ayushi: We have had a tragedy in the village. We all must try and help Kishorilal's wife and two children.

Nirmala Mausi: A woman who gave birth only to female children and also couldn't keep her husband alive doesn't deserve any help.



Ayushi: Kishorilal died of a heart-attack.

Radha: The women's saving group should help her to start some business.

Kusum Chachi: What exactly had happened to the man who died.

Ayushi: Whenever there is bleeding, a person experiences weakness. This is because he loses energy through blood. Blood contains energy.

Savitri: The energy is given to blood by God since birth.

Shabana: Why energy tablets are required if Allah provides energy.

Madhuri: When I take tablets during pregnancy, she stopped suffering from fatigue.

Renuka: We can increase the energy of blood.

Ayushi: Right, you can increase the energy in our blood. Please tell me what are these blue lines on our arms and legs.

Urmila: These are blood vessels.

Ayushi explained that blood flows through vessels in the whole body. If it comes out,

Blood contains a yellow-coloured substance called 'fibrinogen' that is made of protein. In case of damage to the blood vessel, this is converted into 'fibrin'. The platelets are caught in its strands and a clot is formed on the wall of the blood vessel. It prevents further blood from flowing out.

it clots. This is a good example of how nature finds solutions for self-defence. If there is bleeding, energy will be reduced. So the blood contains substances that prevent it from flowing by clotting whenever the blood vessel is ruptured. Just as we prevent the flow of water by raising a bund, the blood forms a 'bund' at the injured point. This stops blood from flowing out.

Nirmala Chachi: You say blood has energy required for our work. Where is the source of wanted to know the source of energy in our blood ?

Ayushi: Blood contains material that creates energy and not the energy itself. Blood carries this material to the cells. Energy is produced inside the cells using it.

Nirmala Chachi: How does this material enter the blood ?

Ayushi: The food we eat is digested just as juice is extracted from sugarcane. Digestion not only extracts juices and material from our food but also transforms it into suitable chemicals through reactions.

Nirmala Chachi: What is the meaning of chemical reaction ?

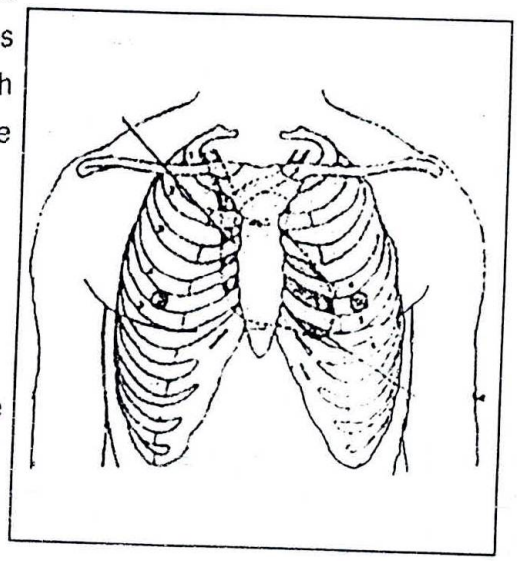
Ayushi: What happens if you add lime juice to iodised salt ?

Shabana: It will turn blue.

Ayushi: A new substance is created by a chemical reaction. This is different from ordinary physical changes caused during freezing of water to ice or grinding something into powder. A chemical change makes a change in the basic structure of the substance.

Nirmala Chachi: Is making pickle a chemical change ?

Ayushi: Yes, it is. Our food is changed both physically and chemically in the body. It moves with the blood and is transported to all the cells in the body through the blood vessels. This is called the circulatory system. It can be compared with the water supply system of the village which provides clean water to every home and drainage system which carries away the waste water. Our blood behaves like the water in the village pipe.



The parts of the circulatory system are

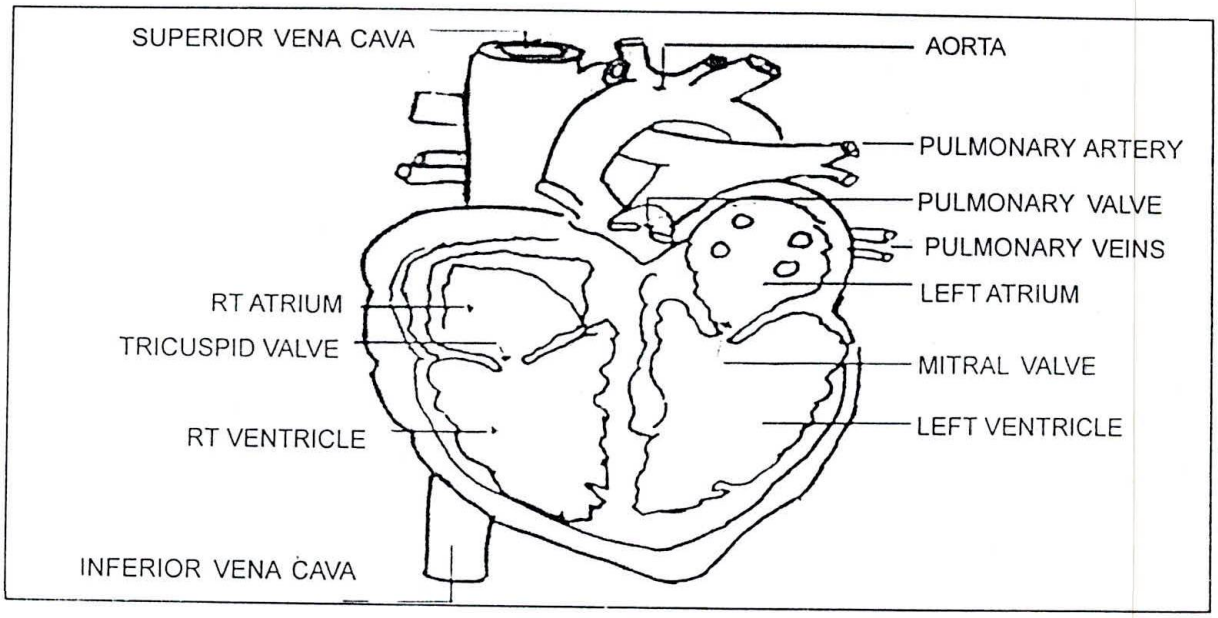
1. Heart 2. Blood Vessels 3. Blood

The position of the heart

1. Heart - It is shaped like a conical bag. It works like a pump, so it is made of strong muscles. It is located behind the breast bone within the chest between the two

lungs, one-third of it is on the right-side and two-thirds is on the left side. It is constantly expanding and contracting.

The heart reaches upto the 5th rib on the left. It is about 12 cm long, 8/9 cm broad and 6 cm thick. A strong septum divides it into two halves- right and left. The impure blood is collected in the right part and pure blood in left part. The two are always kept apart



Another division divides each part into 2 sections. Thus the heart has 4 sections.

1. Right Atrium (Right top portion)
2. Right Ventricle (Right lower area)
3. Left Atrium (Left upper area)
4. Left ventricle (Left lower portion)

The Aorta arises from the left ventricle. Just as the main pipe line brings water to a village and its branches and sub branches carry it to each road and every house, the arteries and capillaries of the aorta carry blood to each cell.

While the Aorta is large in size the arteries are smaller. Capillaries are very fine.

While arteries carry pure blood, veins carry impure blood. Capillaries have porous walls. Water, oxygen and food material passes through them into cells. Carbon dioxide and other unwanted material from the cells enter the capillary from the cell. Just as the waste water from each house flows into the gutter and then into the common drainpipe of the village, the impure blood goes to Vena Cava. From there, it enters the right atrium. Then it is sent to the lungs so that carbon dioxide is given out and oxygen is taken in. The oxygenated blood comes into the left atrium though the Pulmonary veins, then from left ventricle into the aorta which sends it to the rest of the body. This circulation continues constantly.

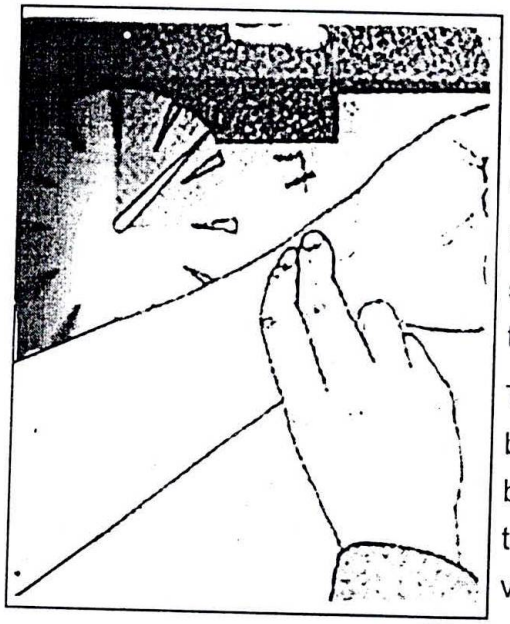
Factors affecting blood pressure-

i) Heart Rate - Normally the heart beats 60-90 times per minute.

ii) Volume of blood- We have about 5-6 litres of blood in our body. Whenever there is bleeding inside or outside the body, the volume and pressure of blood is decreased.

iii) Size of blood vessels - Many times cholesterol present in the blood sticks to the walls, thereby reducing the size of the vessels. This compressed size increases the blood pressure.

iv) Consuming excess of salt makes the body retain more water in it. This in turn leads to higher blood pressure.



Just as we squeeze a bottle to squirt water, the sections of the heart transports the blood into the lower section and then into the blood vessel.

When the blood returns to the heart, the heart expands in the same way as we release the handle of syringe slowly outside, increasing the inner size. The blood is then drawn into it.

The upper section of the heart contracts first, to send the blood into the lower parts. When the lower section, contracts, blood enters the blood vessel. To prevent it from going back to the atrium there is a valve to control movement. If the valve is damaged, the flow can go backward. This reverse movement can be heard with the help of a stethoscope.

Pericardium and Myocardium

The heart is covered with a double layer called pericardium. There is a fluid between the two layers to prevent friction. The heart muscle is called myocardium, which is involuntary.

Blood Pressure

The pressure of the blood flowing through the vessels is called blood pressure. When the blood enters arteries on contraction of the heart, it has a higher pressure which is called 'systolic pressure'. The walls of smaller blood vessels are muscular and have their own pressure.

This pressure which prevents the blood from going out of the vessel is called 'diastolic pressure'. Normal blood pressure is 120/80 mm Hg. It can differ according to age.

Less than standard pressure (90/60 mm mercury/Hg) or more (140-90 mm mercury/Hg) can be a symptom of illness.

Pulse - When the heart contracts, blood goes out of the heart with greater pressure. This pressure is transferred to the arteries. When an artery passes over a bone or below the skin, we can feel the sensation of pressure by touching it. This wave of pressure is called pulse.

The pulse can be checked as follows -

The index finger, middle finger and ring finger are to be used. The first one gives pressure to the blood vessel, the second one senses the pressure thus increased behind it, as the blood tries to rush ahead. The third one allows it to go forward. The thumb and the little finger are not used.

The pressure wave is measured for a period of one minute. The normal heart rate ranges from 60 to 90 times per minute and so the pulse rate will also be the same. A faster or slower pulse rate indicates illness. This rate changes according to age.

1. Infants - about 140/m
2. 1 year old - 120/m
3. 1-2 years - 110/m
4. 2-5 years - 96-100/m
5. 6-10 years - 80-90/m
6. Adults - 60-90/m

Bleeding

If an artery is ruptured, pressure will cause the blood to flow out fast and with force. It doesn't come out continuously, but in spurts. When the heart contracts, it flows out with force. If the Vena Cava is cut, it will bleed continuously with low pressure and less speed. In this case we should press the injured point with a clean cloth.

But if an artery is bleeding, we should press the area just above the injured point to stop the flow. It is necessary to seek medical aid in case of haemorrhage of artery.

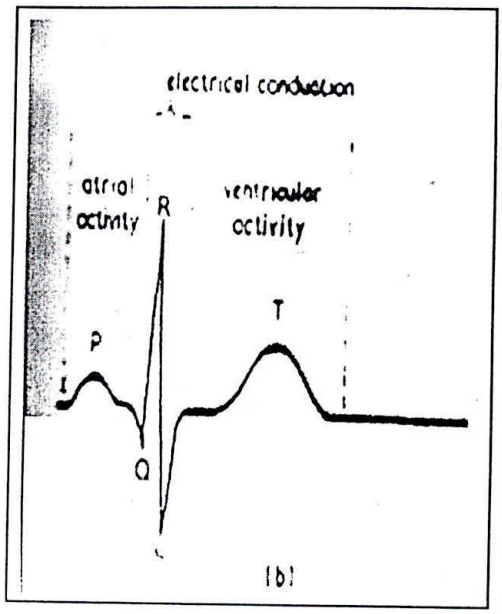
Coronary Artery

There are two coronary arteries supplying blood to the muscles of the heart- the left and the right coronary artery. If one of these or their branches get obstructed, the blood will not be able to reach that part of the heart. Consequently that part will be deprived of oxygen and food and will start getting damaged. The working of the heart will be affected.

If a large area of the heart doesn't receive oxygen, the person may even die. This kind of a death is called a heart - attack. Often the left coronary artery gets obstructed.

Ayushi concluded that Kishorilal had suffered the same illness. (Heart attack)

Nirmala Chachi asked why heart attacks occur? Ayushi explained that it is due to the coronary artery getting obstructed. As mentioned before, cholesterol found in fats often gets deposited along the inner lining of blood vessels. Other reasons are smoking, sedentary life style or excessive consumption of fatty food. All these can cause a heart attack.



E. C. G.

This is the short form of the word Electro Cardio Gram. It is the graph of the electric waves emerging from the heart. The heart continuously contracts and expands, which creates electric waves. These are recorded graphically. This graph tells us -

- Whether the heart rate is normal.
- Whether the heart has any disorder

Though the heart works by itself sometimes the nervous system also instructs it to beat faster as for example when we are frightened, we can hear our own heartbeat. Here are the symptoms which tell us that we must go to the doctor.

1. **High blood pressure** - indicated by headache, palpitation, breathlessness, giddiness, pain in the chest, hazy vision.
2. **Low blood pressure** - indicated by fatigue or dizziness.
3. **Valve disorders** - indicated by breathlessness while working, sudden breathlessness during sleep at night, feeling of suffocation, palpitation, cough, repeated respiratory disorders among children.
4. **Heart attack** - indicated by sharp pain in the middle of the chest, pain spreading to the left arm, sudden breathlessness, palpitation, sweating, unconsciousness, getting a death-like feeling.
5. **Reducing of Heart Function**

   If the heart functions less than normal, the body gets less oxygen. Less amount of blood returns to the heart. This frequently leads to swelling of legs. This condition may be noticed also in other heart problems like high blood pressure, prolonged breathing ailments, pericarditis and myocarditis etc.

Other indications are swelling on legs, breathlessness, giddiness, hazy vision, turning blue, chest infections.

6. **Pericarditis** - The outer layer of the heart's covering may be affected. Symptoms are chest-pain, turning blue in the face, breathlessness, swelling on legs, fever, low blood pressure.
7. **Myocarditis** - Fever, chest pain, breathlessness and increased heart rate are the symptoms of this disorder.

Pulmonary oedema-

This is also called cardiac asthma. It is a symptom of disorder of the left side of the heart. Some blood returns to the left atrium, increasing its pressure. This pressure is passed on to the blood vessels of the lungs, forcing some blood back to the lungs. In turn the capillaries of the lungs develop greater pressure which pushes out water into the lung-sacs. This is pulmonary oedema or swelling of the lungs. Its symptoms are - breathlessness, cough, wheezing cough with pinkish phlegm, breathlessness while sleeping at night, suffocation, fatigue, turning blue, limbs getting cold, respiratory infections. Swelling in the lungs -

Disorder of the left side of the heart
↓
Heart unable to pump all blood to body vessels
↓
Blood retained in left atrium
↓
Increased pressure in left atrium
↓
Increased pressure in vessels from heart back to lungs
↓
Increased pressure in pulmonary veins
↓
Rushing of fluid from lung vessel to lung sac
↓
Swelling of the lungs
(Pulmonary oedema)

Excessive administering of saline can also cause pulmonary oedema.

Ascites

Blood containing food material comes from the intestines to the liver through the Portal Vein. It reaches the liver cells through capillaries where the food is absorbed to create energy. If the liver has a disorder, the cells will not successfully absorb all the food. This increases pressure in the capillaries of the liver. This transfers the force to the intestines where water is given out from the capillaries. This water causes swelling of the abdomen. This is called ascites. It may often be accompanied by swelling on the legs too. There are many other causes of ascites.

Lymphatic System

This consists of the lymph glands, lymph vessels and spleen. Cells have fluids all around. It enters tiny vessels called lymph vessels. They carry the lymph to lymph glands. From there it is carried to larger vessels. The Thoracic duct is the largest lymph vessel. It is connected to the superior Vena Cava. From there, the lymph goes to the heart and forms a part of the circulatory system. Lymph glands are scattered all over the body.

Lymph glands prevent germs from spreading in the body. The germs are trapped in the glands. So many times, a wound to one's finger leads to a swelling in the arm-pit or a leg injury causes a swelling near the groins.

The spleen is to the left rear of the stomach. Its functions are -

1. Disintegration of old blood cells.
2. Producing antibodies to destroy germs
3. The spleen cells engulf germs

The Lymphatic system and Circulatory system are inter related.

After giving the information, it was story time. Pandu was the father of the Pandavs. He had two queens Kunti and Madri. He was brave and loved hunting.

Once he went to the forest. He sent an arrow in the direction of a sound. It hit a Rishi when he was with his wife. He cursed Pandu that he would die the moment he touched his wife. Pandu got disturbed. He lost his appetite. He spent sleepless nights and got tired easily. His face turned pale. He had get anaemia. The illness got its name related to him as

"Pandu Rog" (Anaemia) i. e. the illness which Pandu had. He lived in the forest with his wives and sons.

One day he happened to touch Madri. The next instant he died. Madri felt guilty and insisted upon giving up her life as 'Sati', with her dead husband. People held her responsible for his death, but is it right?

Kunti tried to dissuade her but Madri remained determined to finish herself.

Kunti treated Madri's children with the same care as she did her own. It is a good example of women having strong ties with each other.

Criticizing without knowing the cause of anyone's illness is wrong.

Your role as a health worker

1. If you notice any abnormality in the pulse rate or blood pressure of your patient, you should send him/her to the doctor.
2. Check the blood pressure of people above forty regularly.
3. Inform people about illnesses related to the heart and circulatory system.
4. Tell people to abstain from smoking. Explain the ill-effects of consuming excess of salt.
5. Describe the importance of physical exercise to people.

Self Assessment

1. The normal pulse rate of adults is _____ per minute
2. The normal blood pressure of adults is _____ mm Hg.
3. List the symptoms of heart attack.
4. Give the reasons for High blood pressure.
5. What is the difference between the bleeding of Aorta and Vena Cava? Explain how to treat them

Answer Briefly

6. Describe the circulation of blood.
7. The reason why a cut to the finger leads to a swelling in the arm pit.

Exercises

Correct alternatives

1. ECG means
   1. The graph of the heart rate
   2. The graph of the electric waves of the heart
   3. The graph of the pulse-rate
   4. The amount of blood.

2. The symptoms of headache, palpitation, breathlessness, giddiness hazy vision indicate:
   1. Low blood pressure
   2. High blood pressure
   3. Valve disorder
   4. Pulmonary oedema

3. Which illness is indicated by an enlarged stomach and swollen legs?
   1. Pericardiatis
   2. Bronchitis
   3. Ascites
   4. Valve disorder

4. The type of pain in a heart attack.
   1. Like pricking
   2. Slow flowing of blood
   3. Sharp pain
   4. Dull pain

5. The meaning of blood pressure
   1. Amount of blood
   2. Pressure of blood entering the heart
   3. The pressure of blood flowing in the vessels.
   4. The pressure of the blood leaving the heart

Fill in the blanks with one of the following:

1. Disintegration of old blood cells
2. Producing antibiotics
3. Destruction of germs
4. Heart, blood vessels.
5. Like a cone

6. Pump
7. Septum
8. Right
9. 5-6 L
10. Pure
11. 120/80 mm Hg
12. Impure
13. 60-90 m

Fill in the Blanks

1. _____are the organs of circulatory system.
2. The shape of the heart is _____.
3. The heart works like a_____
4. The _____section of the heart receives impure blood.
5. _____ keeps pure and impure blood apart.
6. The Vena Cava carries _____blood.
7. Our body contains _____ blood.
8. The aorta carries _____ blood.
9. The normal heart rate is _____.
10. The normal Blood pressure is _____.
11. The function of the spleen is _____.

Match the pairs

1. Kidney	1. Help to stop blood flow
2. Heart	2. Abdominal swelling
3. Ascites	3. Blood circulation
4. Sickle cell anaemia	4. Sickle shaped RBC
5. Fibrinogen	5. Excretory system

Answers

Correct alternatives

1-2, 2-2, 3-3, 4-3, 5-3

Fill in the blanks

1-4, 2-5, 3-6, 4-8, 5-7, 6-12, 7-9, 8-10, 9-13, 10-11, 11-3

Match the pairs

1-5, 2-3, 3-2, 4-4, 5-1

Lesson 9
The Digestive System

Summary

1. Complex chemical compounds, are transformed into glucose, amino acids and fatty acids. Cells can absorb these (latter) materials.
2. The diet should be simple and fibrous.
3. One should drink 8 - 10 glasses of water everyday.

Aims

On reading this lesson you will understand and

- Name the organs of the digestive system
- Explain the functions of the glands related to the digestive system.

Knowledge

You will know about

- The process of digestion
  and understand the chemical and physical reactions.

Skill

You will learn

- How through digestive system ingested food reaches upto the cells ?

Perspective

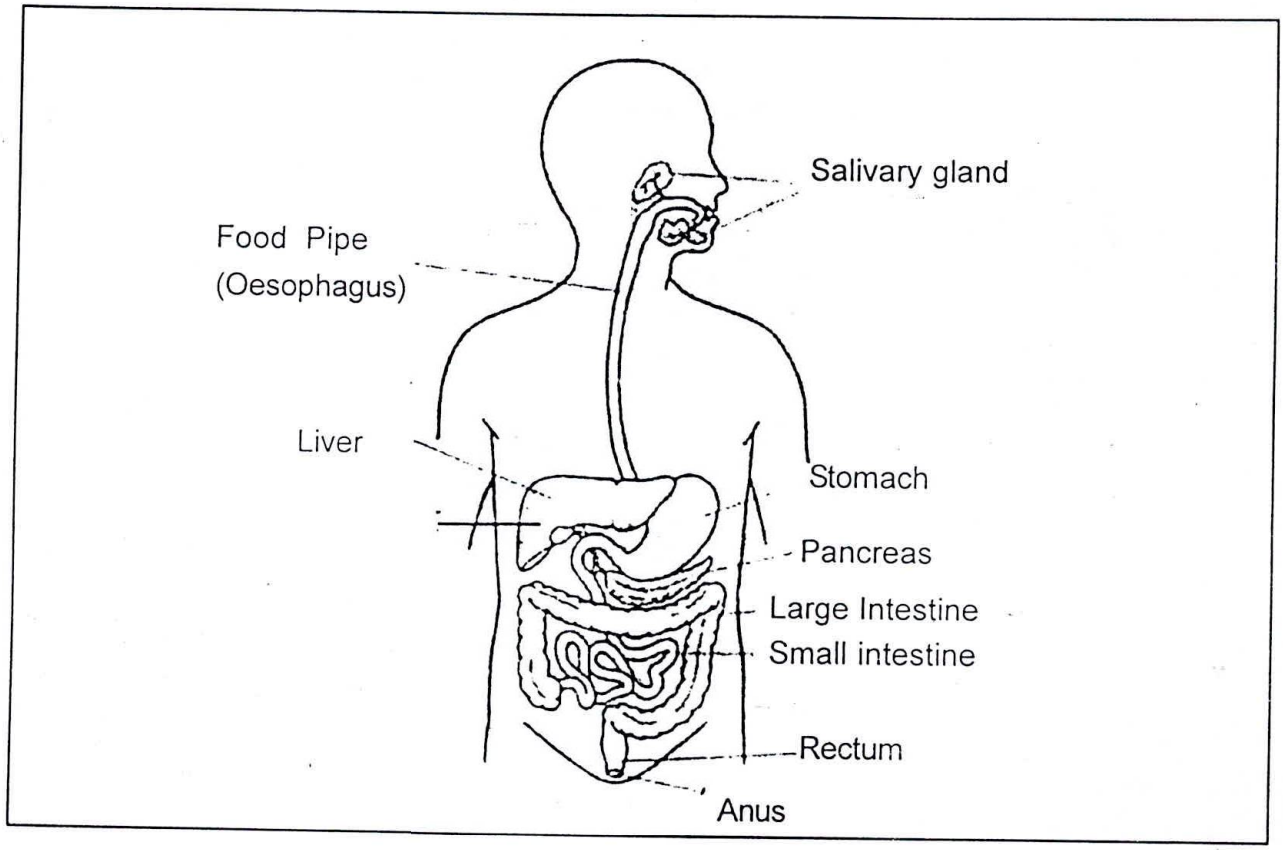
You will understand

- The relationship between one's mind and the digestion of one's food.
- How certain serious illnesses are connected with the digestive system?

Introduction

In this chapter we will learn about digestion. We will follow what happens to the food we eat and how the juices / extracts of our food reach the cells. We will know the organs of the digestive system with their functions.

Ayushi told the school children that they would revise the organs shown by Javed Chacha earlier to them. They wrote the names on the black board.



Organs of Digestive System

The Alimentary Canal

- Mouth
- Food Pipe
- Stomach
- Small Intestine
- Large Intestine
- Rectum
- Anus

Glands

- Salivary Gland
- Liver

Gall Bladder
Pancreas

Helping Organs

Teeth
Tongue

All of you know the organs of the digestive system. So first let us understand about the Glands. What is their function? To produce a fluid and carry it upto the organ for which it is created, by a duct. Some glands are ductless and transport secretions through blood. They are called endocrine glands. Glands having ducts are called exocrine glands.

The Glands related to digestion are exocrine. They all carry their secretions by ducts to specific points and are important.

There are two types of actions on food during digestion.

1. Physical
2. Chemical

The physical action changes the form e.g. extraction of fruit juice in a mixer-blender (physically) or like grinding green spices into chutney using stone. Ayushi explained that such physical change is not sufficient to digest food. We need to change the basic chemical structure so that the food can be absorbed by the body. Everything is made up of parts, whether living or non-living.

Water consists of hydrogen and oxygen. Atoms combine to form molecules which in turn form compounds. Our food is composed of combinations of atoms of carbon, oxygen, nitrogen, hydrogen, iron, calcium, magnesium and zinc. The compounds are

1. Carbohydrates
2. Proteins
3. Fats
4. Vitamins

They have to be broken up into simpler forms for our cells.

Cells can absorb only glucose, amino acids and fatty acids. Exocrine glands help in the breaking up of complex compounds from our food.

Carbohydrates - Wheat, bajra, rice, potatoes
Proteins - Lentils, beans, fish, meat.
Fats - Oil, ghee etc.

1. Carbohydrates are converted into sugar.
2. Proteins are converted into amino acids.
3. Fats are converted into fatty acids.

The chemical reaction begins in the mouth. Saliva from the salivary glands contains 'ptyalin' which reacts with carbohydrates. That is why chewing a potato leaves a sweet taste in the mouth. Teeth break food physically into small bits which pass through the food pipe into the stomach. The food pipe is behind the wind-pipe. The muscles of the stomach are very strong and churn the food after it reaches there, till it becomes fine and liquid. The stomach produces an acid which destroys germs that the food contains. The stomach is below the left ribs of the chest. If excess of acid is produced there, the stomach gets inflammed, becomes reddish and causes pain.

This condition is called gastritis. It may be caused by consuming excess of spices, drinking, smoking, mental stress or taking pain-killers. The symptoms are pain in the upper abdomen, vomiting and indigestion.

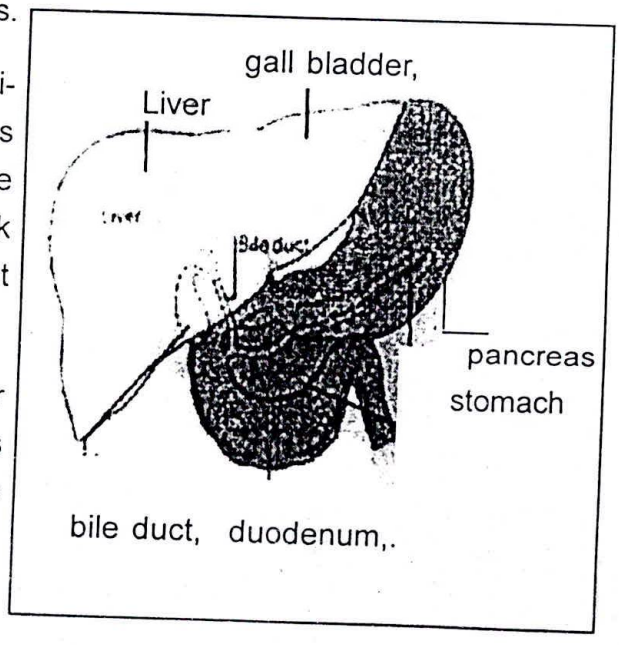
Indigestion -Bloated feeling, gases, nausea, sour belches etc. These symptoms can be observed among pregnant women, people with loose motions or excessive smokers, obese people or those with mental stress. This condition may be created by consuming cabbage, apples, onions, cucumbers, cold-drinks or alcohol. These should be avoided. If the indications or complaints persist, medical help is necessary.

The small intestine looks like letter 'C' from the stomach which then coils like a snake. Its 'C' shaped part receives secretions from the liver and pancreas.

The liver is like a factory. Bile produced by it collects in the gall bladder which sends it into the intestine by a duct. It digests fatty foods.

The pancreas creates different types of digestive secretions, which digest carbohydrates and proteins. The digestion is completed in the small intestine. The Vena Cava has a network of capillaries and veins in the small intestine. It absorbs the digested food material.

The Water and the undigested food matter goes into the large intestine. Water and minerals are absorbed here. The remaining useless material is excreted.



If you drink less water, it will be difficult to give out the solid waste. So you should drink 8 to 10 glasses of water everyday. Also, you should eat sufficient fibrous foods like vegetables and fruits. Fibres also help in pushing out the excreta just as sandy soil helps to push clay soil out of a rubber tube.

The food remains in the digestive tract for about 24 hours. It is pushed forward, gravitation helps its downward movement. The movement to pass food downward is called "peristalsis". There is contraction and relaxation along this tract. When the upper part is compressed, the lower one is expanded so that food from above goes below. Later the alternate parts repeat the procedure and food proceeds in the downward direction like a wave. This peristaltic movement can be heard on the stethoscope.

If we don't consume sufficient water and fibrous food, the waste products create high pressure on the edge of the anus. This causes some capillaries to swell and emerge from the opening end. This condition is called 'piles'. If food is chewed well till it becomes fine, it is easy to give it out otherwise the digestion will be difficult.

Eating excess of spices or chillies can destroy the cells along the walls of the intestines. This can cause ulcers.

Worry leads to improper chewing which again obstructs proper digestion. That is why we should be calm when we eat and pay attention to our food.

Stomatitis

If your mouth suffers from ulcers, the cause may be tobacco, alcohol, spicy or pungent food, deficiency of nutrients like B complex and iron, infection or due to sharp teeth. One should apply Gentian Violet for this.

Functions of the liver

1. Storing of different vitamins and nutrients to be released into the blood from time to time.
2. Processing of toxic material in the blood to be given out with food waste.
3. Production of vitamin "K" required for clotting of blood.

Cirrhosis

This is a serious illness of the liver in which its functions are reduced drastically. The main cause is alcoholism. The symptoms are lack of appetite, loss of weight, restlessness, vomiting, fatigue, indigestion, swelling of abdomen, jaundice. In advanced stages, reduction of blood clotting capacity causes blueness of injured parts. There is trembling of limbs and blood in vomiting. Other indications are discontinuation of menstruation among women or infertility.

Gall Stones

Sometimes the bile juice forms stones. These cause sharp pain, fever, vomiting especially after eating fatty food. The pain spreads upto the right shoulder.

A - This ailment is more common among women, specially obese women or those who have indigestion. It may occur around the age of 50.

B - Murphy's indication - The patient is made to lie or sit down. Some pressure is exerted by the hand below the right ribs as the patient is asked to take a deep breath. If the pain is felt while breathing, it is Murphy's indication of gall stones. Often stools are white in this condition.

Stones in the Pancreas

Excessive drinking of alcohol may cause stones inside the pancreas. The symptoms are great pain in the middle of the abdomen. This is experienced after heavy meals or drinking alcohol. The pain spreads at the back, upto the waist. It is accompanied by vomiting, fever and chest pain. Two other important indications are turning blue of the area around the navel and waist. This condition needs medical attention.

Self Assessment

I. 1. The function of acid produced by the stomach is

a. _____ b) _____

2. The bile digests _____

3. Ptyalin acts on _____

II Explain the meaning of 'exocrine glands' and name them.

III Describe briefly 1. Pancreas 2. Liver and gall bladder 3. Stomach

IV Describe how the food is absorbed and reaches the Liver.

V Give the symptoms of the following disorders.

1. Loose motions
2. Piles
3. Gall stones
4. Ulcer
5. Cirrhosis

Exercises

1. These are the organs of the digestive tract
   a. Mouth, food pipe, stomach, small intestine, large intestine, rectum, anus.
   b. Mouth, nose, throat, stomach, intestine, anus.
   c. Mouth, windpipe, oesophagus, intestine, anus
   d. Mouth, wind-pipe, liver, anus

2. This gland is a part of digestive system
   a. Tonsil
   b. Pancreas
   c. Lung
   d. Stomach

3. Pain in the upper area of the stomach with vomiting and indigestion is a symptom of -
   a. Gastritis
   b. Stomatitis
   c. Cirrhosis
   d. Ulcer

4. Excessive consumption of pungent or spicy food may damage this organ-
   a. Stomach
   b. Small intestine
   c. Pancreas
   d. Liver

5. A person suffering from unbearable pain after eating, with vomiting and pain spreading upto the right shoulder may be an indication of
   a. Cirrhosis
   b. Gall stones
   c. Stones in the Pancreas
   d. Appendicitis

6. If an alcoholic suffers from lack of appetite, fatigue, indigestion and enlarged abdomen, this may be an indication of -
   a. Cirrhosis
   b. Gall stones
   c. Appendix
   d. Stone in Pancreas

Fill in the blanks

1. Carbohydrate / protein
2. Liver
3. Bile & Pancreatic
4. Acid
5. Fatty Acid
6. Amino acid
7. Physical
8. Chemical
9. Endocrine
10. Exocrine

1. Glands that transport their secretions to organs through blood are called _____ glands.
2. _____ glands help in digestion.
3. Breaking up of food into small pieces/bits for digestion is a _____change.
4. Converting carbohydrates into glucose is a _____ change.
5. Proteins are converted to _____.
6. Fatty foods are broken up into _____.
7. The stomach has _____ in it to destroy.
8. _____ and _____ are secretions that help in digestion.
9. Bile is produced in the _____.
10. Pancreatic secretion digests _____ and _____.

Match the following pairs.

1. Stomach	1. Fatty acid
2. Fatty food	2. Gastritis
3. Peristalsis	3. Gall stones
4. Vitamin K	4. Pushing the food in the alimentary canal
5. White stools	5. Liver

Answers to exercises

Correct alternatives :

1-q, 2-b, 3-a, 4-a, 5-b, 6-a

Blanks

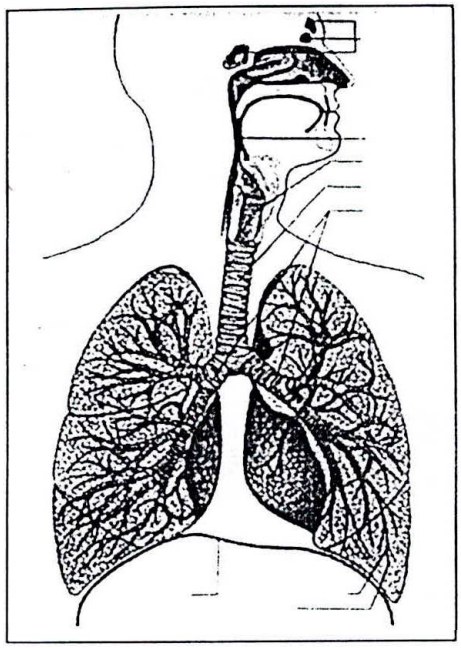
1-9, 2-10, 3-7, 4-8, 5-6, 6-5, 7-4, 8-3, 9-2, 10-1

Correct pairs

1-2, 2-1, 3-4, 4-5, 5-3

Lesson 10

Introduction to the respiratory system



Aims

On reading this lesson you will be able to understand

1. List the organs of the respiratory system in their order.
2. Tell which chemical action goes on inside the cell and which substances are produced.
3. Explain our relationship with plants.
4. Describe the connection between pollution and the direction of development.
5. Give the reasons causing disorders of the respiratory system.

Knowledge

You will know about

- The structure and function of the respiratory system.
- Cellular respiration.

Skill

You will learn to

- Describe the condition in case of inflammation of different parts of the respiratory system.

Perspective

You will understand

- The significance of the respiratory system and its functions.

We all know the differences between the living and non-living. Living beings can produce energy for their own development as well as to grow grains, run industries, for welfare activities and even for destructive purposes. But the body cannot create energy without oxygen (O_2).

We take oxygen from the atmosphere to produce energy. During this production of energy, carbon dioxide (CO_2) is also produced, which is given out into the atmosphere. Plants use this CO_2 and sunlight to prepare their own food. The O_2 created during their production of food is released into the atmosphere. We use this to create our energy. In this way we have a very close-knit relationship with the plants and atmosphere. Though this cannot be seen, we will be unable to survive if it breaks down.

We worship plants. Because our forefathers have been giving importance to this relationship since time immemorial . The Tulsi, Banyan and Peepal plants are connected to our rituals. We offer particular leaves and fruits to various gods and goddesses. Human beings are used to caring for plants in nature. But today we have forgotten this relationship due to our rat-race of development. Today our idea of progress is limited to sky-scrapers, industries, roads, vehicles and money. We are destroying nature while increasing all these things. We have neglected an important cultural value of 'live and let live' . Gandhiji had taken this value further by using not just 'live and let others live' but adding 'and help others to live', to it.

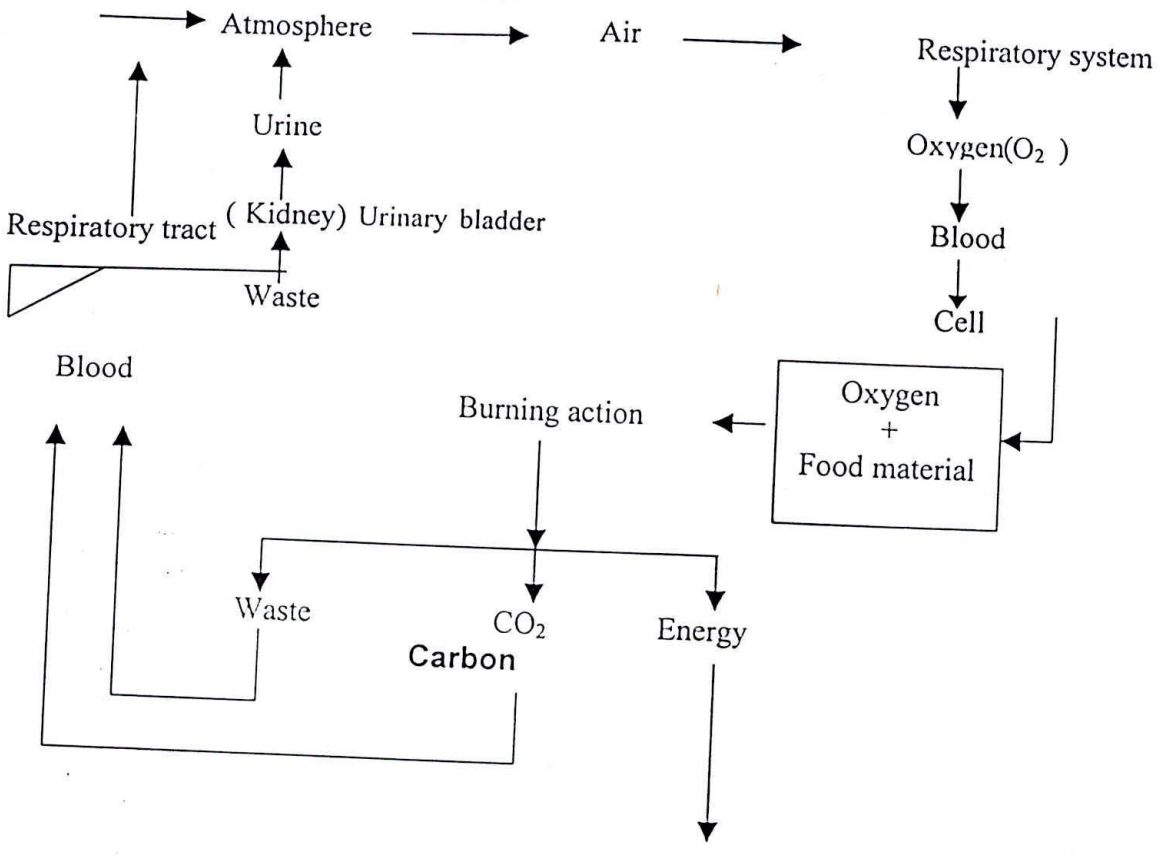
Unfortunately modern man lives like a master of nature. He is destroying plants and animals that have been living on the earth even before mankind! If this damage continues, our destruction is inevetable.

Constructing new roads, buildings, factories and vehicles has polluted, even our air, water and food. We cannot live without food beyond a few months, without water for a few days but without air just a few minutes! New born babies and infants are being forced to breathe in polluted air. We will realize the significance of clean and pure air only if we understood how we use this air to produce energy.

Our body is multi-cellular. A cell of the body is like the brick of a building - the smallest unit. We need energy to create the cell, its growth, its production of internal secretions and maintaining the body temperature. The cell conducts the burning of food material and oxygen to produce energy.

Blood carries oxygen and food material to each cell and take away the CO_2 to the lungs and waste products to the rectum.

If polluted air enters the respiratory system, the respiratory organs are damaged. This reduces the amount of oxygen in the air.

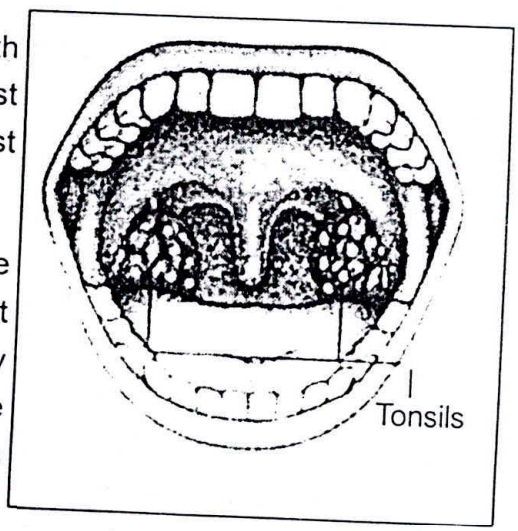


1. To maintain body temperature
2. To produce secretions
3. For functioning etc.

$$\text{Food material} + O_2 \longrightarrow CO_2 + \text{waste} + \text{Energy}$$

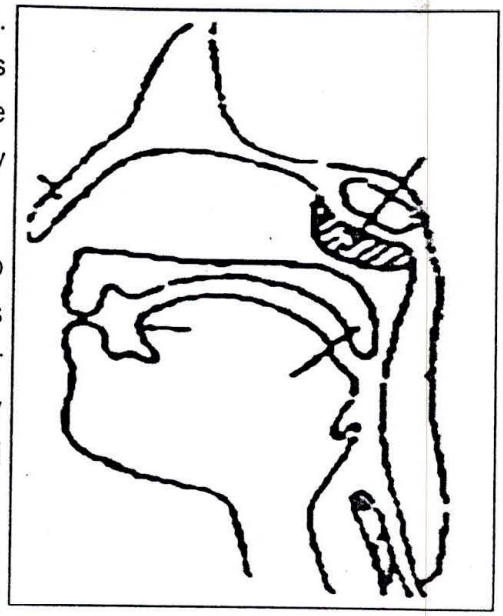
The Respiratory System

Let us find out about our respiration. It begins with the nose. The tiny hair inside the nostrils filter the dust from the air. The fluid in the nose makes the air moist and prevents germs and dirt from passing through.

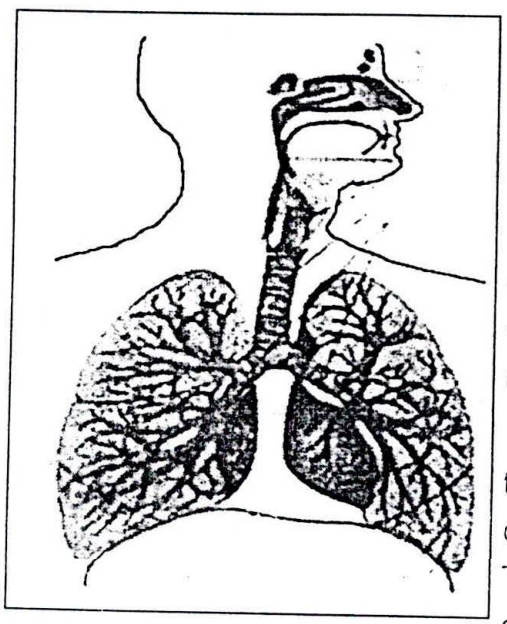


Through the nose, the air enters our pharynx. The tonsil glands are present on either side of the inner part of the tongue. They protect us from being attacked by germs. They produce white blood cells. The tonsils are our main weapons of resistance due to them the germs don't attack the organs. We can feel them if we touch the outer area of our throat. If they are not working properly, the germs may reach the lungs which are delicate organs.

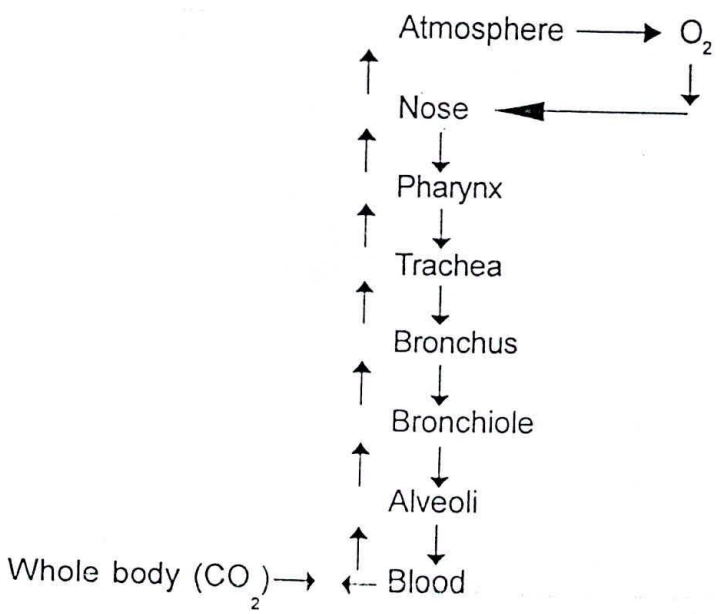
The adenoid glands are situated behind the nose. The air enters the wind-pipe, also calls trachea. It is situated in the neck in front of oesophagus. It is made of strong flexible muscles which are not compressed by slight pressure applied outside it.



At the second rib, the trachea is divided into two parts - right and left bronchus which enter the lungs on either side. Each bronchus is divided into smaller branches called bronchioles. The lungs consist of tiny sacs called alveoli which contain air. Fine capillaries have a network around them. There is a continuous give and take action here. Oxygen from the air is exchanged with carbon-dioxide from the blood. The oxygen is carried to every cell by the blood, while the CO_2 is given out through the respiratory tract. Oxygen reaches cells through blood.



Right since birth, the lungs of a person have to continuously expand and contract to continue the exchange of gases. Therefore lungs need pure air to remain fit. The lungs have a double layered cover called pleura which contains a fluid to prevent friction.



The Breathing Action

Air always moves from a high pressure area to a low pressure area. If we have to breathe in air from the atmosphere, we have to change our pressure because the atmosphere pressure is constant. Our lungs carry out this function of bringing about change of pressure.

To breathe in, our chest expands, the lungs and their covers also expand. The air pressure inside the lungs is reduced as the atmospheric pressure is high and air is drawn into the body. When the lungs contract, the air pressure inside is increased and the air rushes out into the atmosphere.

The respiratory tract has an inner covering called mucus membrane which produces a fluid to moisten the air. Dust and germs are also trapped in it, to be thrown out through the nose. This is one of the way of protection.

If some foreign body enters our body, that portion produces a greater amount of fluid, the organ swells up and appears reddish. This is our natural way of resisting infection. The illness caused is identified by adding 'itis' to the name of the organ as shown below:

Common name	Scientific name	Name of illness
Nose	Rhine	Rhinitis
Throat	Pharynx	Pharyngitis
Tonsils	Tonsils	Tonsillitis
Wind pipe	Trachea	Tracheatis
Branch of wind pipe	Bronchus	Bronchitis
Fine branch of wind pipe	Bronchiolus	Bronchiolitis
Lungs	Lungs	Pneumonia
Covering of lungs	Pleura	Pleuritis

Reasons for inflammation

1. Germs
2. Dust
3. Pollen
4. Chemicals

Inflammation caused by germs

1. Virus
2. Bacteria
3. Worms

Our body has a structure which is always equipped to fight illness. Germs reach many people through air but all of them don't fall ill, when the body is healthy, the resistance is also good.

Conditions to keep the body healthy

1. Sufficient nutritive diet
2. Living in clean, fresh air
3. Doing regular exercise
4. Working regularly
5. Staying in a stress-free atmosphere, and enjoying some means of entertainment.

In our country, is it possible for all the people to fulfil the above conditions? As health workers, it is our long-term goal to provide all these things to people along with education. But in the meanwhile people should be told how to save themselves from falling ill. Let's refer to some tips regarding keeping a healthy respiratory system.

- Balanced diet
- Use of smokeless stove at home.
- Proper ventilation in the house (doors, windows, facing each other)
- Doing 'pranayama' exercise.
- Keeping some indoor plants especially in the kitchen, to reduce pollution
- Lesser intake of spicy and pungent food.
- Ensure that industries like stone-crushing, brick-kilns or those involving pollutants follow guidelines to maintain the health of workers.

Responsibilities of health worker

- Provide information about the respiratory system to the school children.
- Discuss with people how development work should be done.

Exercises

Correct Alternatives

1) Which gas is needed for breathing
   1. Hydrogen 2. Nitrogen 3. O_2 4. CO_2

2) What do we need most to remain alive?
   1. Food 2. Water 3. Air 4. CO_2

3) The smallest unit of our body is _____
   1. Cell 2. Tissue 3. Organ 4. Blood

4) Burning is conducted inside this ____
   1. Cell 2. Blood 3. Heart 4. Lung

5) The organs of the respiratory system are _____-
   1. Nose, mouth, trachea , alveoli
   2. Nose, pharynx, trachea, bronchioles lung
   3. Nose bronchus, lung
   4. Nose, mouth lung

6) Functions of tonsils
   1. Helping to swallow food
   2. Producing white blood cells
   3. Producing white blood cells, resisting infections
   4. All the above

7) The task of carrying oxygen and food to all cells, waste after burning, to the kidney, and CO_2 to the lungs is carried out by
   1. Blood 2. Cells 3. Heart 4. Respiratory system

8) While breathing
   1. Oxygen is absorbed and CO_2 is exhaled
   2. CO_2 is taken in and Nitrogen is given out
   3. Oxygen is taken in and Nitrogen is given out

9) Meaning of inflammation

1. Pain in an organ
2. Swelling
3. Fever
4. Swelling, turning red and painful due to infection

Fill in the blanks

(inflammation, pleuritis, tonsil, resistance, pleura)

1. The covering of the lungs is called _____
2. Swelling, redness, pain and excess secretion in a part is called _____.
3. _____ helps to fight illness.
4. In the respiratory system, _____ helps to resist infection of germs
5. Inflammation of the outer layer of lungs is called

Match the following

1. Bronchitis	1. Oxygen
2. Oxygen	2. Inflammation of bronchus
3. Carbon dioxide	3. Planting trees
4. Polluted air	4. Necessary for plants
	5. Inflammation of pharynx

Answers

Correct Alternatives

1-3, 2-3, 3-1, 4-1, 5-2, 6-3, 7-1, 8-1, 9-4

Fill in the blanks

1-5, 2-1, 3-4, 4-3, 5-2

Match the following

1-2, 2-3, 3-4, 4-5

Lesson 11
The Respiratory System

Aims

On reading this lesson you will understand and

1. Learn how to enquire about the case history for ailments of the respiratory system.
2. Be able to tell what related information needs to be collected about the respiratory system.
3. Interpret the information obtained by description and identify what it suggests.

Knowledge

You will know about and

- Necessary basic points while questioning the patient.

Skill

You will learn and

- Know how to question a patient of the respiratory system disorders.
- Know about the method of conversation

Perspective

You will understand that

- Complete enquiry about the patient is important for diagnosis and treatment of patient.

Introduction

We have to take care not to give any suggestion or indication to the patient while asking about description of the case. Otherwise the patient may give a particular point great attention thinking it is important.

You have only to prepare the patient to narrate the symptoms and not point out any particular symptom yourself.

If you ask whether the patient has cough, he/she may think it is a necessary symptom. Cough may occur even without illness, due to dust or smoke. But your question may make the patient think it is the main indication and focus on it all the time while answering you.

In fact we need the symptoms which disturb the patient more.

So, what you should do is merely ask the patient about what problems he/she has.

Another factor to be careful about is the sense of pain. Since there is no way of measuring pain the patient should be allowed to describe what type of pain or how much pain he feels, in his own way. This chapter will tell you which questions to ask regarding the respiratory system and how to ask them.

Diagnosis of ailments related to the Respiratory system.

Description

I. **About the patient**

What is your name?
What is the name of your town/village
What is your address?
How old are you?
Sex
Education
Marital Status

a. Married b. Unmarried
c. Widow/widower d. Divorcee

Financial Status
About your house -
What kind of a roof does your house have?
Does your house have a chimney?
Bathroom/Toilet

Use of fuel-

1. Wood 2. Coal 3. Stove using rock-oil 4. Gas

Nature of work

Where do you work?

1. In the fields 2. At home 3. Do a job

What kind of work do you do?

II. Previous history of illness

Immunization of children

Whether allergy to any medicine or food

III. About the present diagnosis- description

A patient suffering form same respiratory ailment is likely to have 3 main symptoms

1. Phlegm/Cough
2. Difficulty in breathing
3. Pain in the chest

If the patient complains of any on these, it should be considered the main indication of which the description must be obtained

I. Cough

When a patient comes with a complaint about cough, he should be asked the following group of questions-

- Since how long/how many days have you been suffering from cough?
- How is the cough? What type?
- When (at what time/period) do you cough the most?
- If the cough is wet
- what is the colour of the phlegm?
- Is the phlegm thick or watery?

It is necessary to know the period (duration) of cough.

- Cough may be caused by germs, pollution or allergy
- Cough induced by infection is cured on its own within 8 to 1o days. If the cough/cold persists even after a week in spite of giving antibiotics, consider the 5 diseases- Tu berculosis, cough due to cancer, cough caused by worms, by smoking and farmer's cough.
- What type of cough do you have?

(Dry Cough)

This may be caused by allergy, worms in the abdomen or infections caused during farming.

(Wet Cough)

Phlegm coming up from the lungs through Bronchioles is thick while that from the upper respiratory tracks is watery. The thick phlegm is greenish yellow, caused by bacteria. Watery phlegm is caused by virus.

If the thick phlegm has traces of red, it may be an indication of TB, pneumonia or lung cancer.

When does the patient cough the most?

A patient with a chronic respiratory problem gets more cough in the mornings The amount of phlegm, may be from a teaspoon, right upto a cupful.

II. Breathing problem - Ask for the following details if a patient complains about breathing.

1. What exactly do you suffer while breathing? The patient may mention chest pain or breathlessness.
2. In case of breathlessness - It is natural for all human beings to get breathless during exercise, but the condition gets controlled after some time. If a person often suffers during inhaling or exhaling, there is a disorder in the respiratory system. The condition is serious if the problem occurs while lying down (horizontal position) or continuously. This may be caused by heart trouble and the patient must be sent to a doctor
3. What action gives you relief?

   If breathlessness is caused by a respiratory disorder, nothing gives relief to the patient.. When the breathing is disturbed by heart trouble, the patient gets relief in the sitting position.
4. Since when are you suffering from breathlessness'. Is the problem growing or reducing?

   If respiratory disorder causes breathing problems, the suffering increases gradually and the patient faces it by changing his life style.
5. So he/she should be asked whether he/she can still do all the activities that he could do the year before?

II. If the patient complains of chest-pain, he should be asked the following group of questions. He should describe the nature of the pain in the chest in his own words. Inflammation of the covering of the lungs causes a sharp cutting pain.

Heart trouble causes a heavy pain that feels like a weight on the chest. Where does the patient feel the pain?

Pneumonia causes pain in the lungs at definite points. The location of the disease is closely connected to the place where pain is felt. If chest pain is caused by heart trouble, it may spread to the left, upto the shoulder. This is not accompanied by fever. But pain caused by TB or pneumonia is accompanied by fever.

The trachea is situated in the middle of the chest. Therefore inflammation of trachea causes pain at the centre of the chest.

Swelling of pharynx, tonsils or larynx causes pain in the throat. If pain in the larynx increases by touching the outside of the throat, it may be caused by inflammation of the tonsils.

1. Tonsillitis	Pain while swallowing
2. Inflammation of larynx	Increased pain on pressing throat
3. Inflammation of bronchus	Pain in the middle of the chest
4. Pneumonia / TB	Sharp pain
5. Heart trouble induced	Feeling weight, pain from chest spreading to left shoulder and arm.

Ask the group of questions related to the main complaint of the patient. Then ask him 2 other sets of questions. In addition, get the following details from the patient.

1. Do you have fever and rigors (shivering)? These can be caused by bacterial infection.
2. Are you taking any medicine?
3. Are you allergic to any medicine?
   Allergy can also cause breathlessness.
4. Do you feel tired all the time?
5. Are you losing weight?
   If the answer is yes to the last two questions, you cansee that the illness is not sudden. Probably the cause is TB, heart trouble, anaemia or emphysema. The patient must be sent to a doctor.
6. Do you smoke?
   Smoke increases inflammation of the respiratory tract , causes cough. Find out about domestic pollution, which fuel does the patient use at home.
7. What work do you do ?
   Dust or fine particles go in while breathing in case of certain occupations. This may cause inflammation of the respiratory tract or ailments like fibrosis.

The following trades damage the respiratory system

- Stone workers
- Workers engaged in making slate pencils.
- Those working with cotton.
- Traffic police

8. Does any family member have the same complaints?

If there is a TB patient at home, there is a chance that others may also get it. Children of asthma patients are likely to develop the same disease.

Exercises

Correct Alternatives

1. The patient with respiratory disorder must be asked about his/her occupation
   a. To know how much he works.
   b. To know about the method and habits of working
   c. To known means of treating the patient/about income.
   d. The patients complaints are likely to be related to his occupation.

2. If a person is a smoker, is losing weight, has cough with thick phlegm and fever for a long time, he is likely to suffer from
   1. Virus 2. Bacteria 3. Allergy 4. Worms

3. A person feeling pressure at his chest, is likely to suffer the diseases of
   1. Pneumonia 2. TB 3. Heart trouble 4. Asthma

4. Breathlessness in lying position may be caused by the disease of
   1. Pneumonia 2. Heart 3. TB 4. Bronchitis

5. Breathless or dry cough due to dust may be
   1. Asthma 2. Allergy 3. Pneumonia 4. Cough

Fill in the blanks

1. TB, cough, breathlessness, chest pain, 2. Virus, 3. Bacteria, 4. cutting sharp, 5. inflammation of trachea

1. _____ is the main symptom of respiratory disorder.
2. There is pain _____in pneumonia
3. _____ infection causes thick greenish yellow phlegm
4. A patient having cough accompanied by pain in the middle of the chest may have _____.
5. Cough caused by _____ stops by itself
6. _____ is an infectious disease of the respiratory system.

Match the following

1. Dry cough	a) Breathing difficulty
2. Asthma	b) Allergy
3. Cough	c) TB
4. Thick reddish phlegm	d) Infection of respiratory system
5. Wet cough with greenish yellow phlegm	Symptoms of serious heart trouble
6. Difficulty in breathing when lying down	Bacteria
	e) Pneumonia
	f) Bronchitis

Answer

Correct alternative: 1-d, 2-2, 3-3, 4-4,5-2.

Fill in the blanks: 1-2, 2-5, 3-4,4-5, 4-6, 5-3, 6-1.

Match 1-b, 2-a, 3-d, 4-c, 5-e, 6-f

Key

Glossary

Tonsils : Two glands occurring in the pharynx. Prevents germs entering through nose.

Gland : A delicate soft organ that produces secretions.

Signs : Information obtained by health worker that is useful for diagnosis by examination.

Symptoms: Information about the patient's complaints

Diagnosis is made with signs and symptoms

Fibrosis : Disorder caused by production of fibrous tissue in an organ

Diphtheria: An infectious disease causing a layer along the pharynx and its glands.

Inflammation :

Redness or swelling of a part of the body along with fever.

Stomach : Organ containing gastric juices

Stomatitis : Cuts inside the mouth

Appendix : A part in the digestive tract

Appendicitis : Inflammation of appendix

Valve : A structure controlling one-way flowing of blood

Aorta : A blood vessel

Ventricle : A cavity inside the heart

Atrium : Cavity inside the heart

Gall bladder : An organ below the liver storing bile juice.

Pancreas : An organ secreting digestive juices

Gastritis : Inflammation of mucous membrane of the stomach