Unit 5. Human Health, Nutrition, and Disease

Contents	Learning Competences
5.1What is food? 5.2 Nutrition 5.3 Nutrients 5.4 Balanced diet 5.5 Deficiency diseases 5.6 Malnutrition 5.7 Substance abuse 5.8 Types of diseases 5.8.1. Infectious diseases 5.8.2. Non-infectious diseases 5.9 Renowned Nutritionists in Ethiopia	• Define nutrition • List the types of nutrients • Describe the role of a balanced diet especially for children, nursing mothers, athletes, and people with HIV/AIDS • Describe with examples the sources and deficiency diseases of vitamins and minerals. • Define malnutrition • Discuss the feeding habits that may lead to obesity • Examine the effects of smoking, alcohol use, chewing khat, cannabis, and other drug use, on the health, social, economic, cultural, and psychological wellbeing • Explain the modes of transmission and prevention of infectious and noninfectious diseases • List and appreciate renowned nutritionists in Ethiopia

5.1. What is food?

Objectives

At the end of this section, the student will be able to:

- *Explain about food*

Food is any beneficial substance that is eaten, drunk, or otherwise taken into the body to sustain life, provide energy, promote growth, etc. It is consumed to provide nutritional support for an organism. Food is usually of plant, animal, or fungal origin, and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals.

The importance of food in living things:

Growth: Food is the source substances necessary for making new cells, tissues and organs.

Energy: living things undergo different biological and chemical reaction in their bodies. These reactions in living things produce at the same time require energy.

Food is the sources of energy that fuel all the biological activities. Running, jumping, moving, growing, reproducing, and all other activities require energy.

Replacement of damaged tissues: Food is required for making new cell and used to replace damaged cells of the body.

Protect from diseases: There are different types of diseases caused by the shortage of specific groups of foods. Our body requires these food groups to protect our body from deficiency diseases and to become healthy.

5.2 Nutrition

Objectives

At the end of this section, the student will be able to:

- *Explain about nutrition*

Nutrition is the process of taking in food and converting it into energy and other vital nutrients required for life. Energy obtained from food is important for different activities of the body. The food we eat keeps us alive and provides the nourishment for growth, repairs of our body cells and maintain good health.

5.3. Nutrients

Activity 5.1: Group work

1. Discuss the difference between organic and inorganic nutrient.
2. What is difference between nutrition and nutrients?
3. Explain the function of food

Objectives

At the end of this section, the student will be able to:

- *list important nutrients*
- *explain about the importance nutrients and their deficiencyy*

Nutrients: are important chemical substances that are found in foods. In human body, we need nutrients for growth, source of energy and stay healthy. We obtain these nutrients from the foods we eat. The five important classes of nutrients are: carbohydrates, proteins, lipids (Fats and oil),vitamins, minerals and water.

Macronutrients and Micronutrients

The three nutrients, carbohydrate, protein and fats are required in large quantities. Such nutrients are called macronutrients. In contrast, minerals and vitamins are needed in very small quantities and are called micronutrients.

Vitamins are organic compounds, whereas minerals are inorganic compounds. Vitamins and minerals do not supply energy but they play an important role in the regulation of the metabolic activity in the body and help in the utilization of proteins, fats and carbohydrates.

Minerals are also used for the formation of body structure and skeleton.

Carbohydrates

Carbohydrates are types of nutrients that provide energy for the human body. They are composed of three elements, carbon, oxygen and hydrogen. The human body gets carbohydrate from green plants. These green plants prepare carbohydrate in the form of starch by the process of Photosynthesis. They combine carbon dioxide and water using energy from the sun in order to produce carbohydrate. Such carbohydrates are the major sources of energy in our diet. Starch is abundant in potatoes, bread, maize, rice and other cereals. Sugar appears in our diet mainly as **sucrose** (table sugar) and is added to drinks and many prepared foods such as biscuits and cakes. Sugars also occur naturally in many fruits and some vegetables. One gram of carbohydrate can provide, on average, 16 kilojoules (kJ) of energy.

An unavailable or indigestible carbohydrate provides dietary fiber that does not serve as a source of energy. This indigestible part is a product of plant's cell walls that consists mainly of cellulose. Human body does not have any enzymes for the digestion of this cellulose. Therefore, the plant cell walls reach the large intestine (colon) without being digested. This undigested part of the diet is called fiber or roughage. The colon contains many bacteria that can digest some of the substances in the plant cell walls to form fatty acids.

The fibre and the bacteria, which multiply from feeding on it, add bulk to the contents of the colon and help it to recollect water. This softens the feces and reduces the time needed for the undigested residues to pass out of the body. Both effects help to prevent constipation and keep the colon healthy and increase bowel movement. It is found in vegetables, fruits, and grains.

There are three types of carbohydrates

- Monosaccharide The simplest carbohydrate is simple sugar or monosaccharide which include glucose, fructose and galactose. These three monosaccharide each have six carbon atoms, so they are also known as hexose sugars. Their molecular formula is $C_6H_{12}O_6$.
- Disaccharide: Similar to other carbohydrates, disaccharides are comprised of hydrogen, carbon, and oxygen, and the ratio of hydrogen atoms to oxygen atoms is often 2:1. it is the combination of two simple sugars to form a complex sugar called disaccharide. These are maltose(Glucose+ Glucose), sucrose (Glucose+ Fructose and lactose (Glucose+ Galactose). The general chemical formula of disaccharides is $C_{12}H_{22}O_{11}$.

Attention

The energy produced from the raw materials is usually measured in units known as calories; one calorie is the amount of energy needed to raise the temperature of 1 g or cubic centimeter (cc) of water in 1°C. The calorie units usually referred to in biology and nutrition are kilogram-calories (Kcal); each is 1,000 gram-calories.

Activity 5.2: Home work

Referee to biology books in the library or search from the internet in order to list example food that belong to fructose, sucrose, starch etc.

In which group of carbohydrate do honey and table sugar belong?

- Polysaccharide, which is formed when many simple sugar join together. They are substances whose molecules contain hundreds or thousands of monosaccharaides linked together into long chains. polysaccharides are found in plant cell as cellulose and starch. In addition it stored in animals as glycogen. Polysaccharide are not soluble in water. The general formula of $(C_6H_{10}O_5)_n$.

Fats and Oils

Fats and oils are high-energy nutrients that provide 35 to 45% of caloric intake. One gram of lipid gives 37 kJ of energy. Like carbohydrates, fats and oils are composed of three elements, carbon, oxygen and hydrogen. Fats are obtained from animal source and are solid at room temperature while oils are from plant source and liquid at room temperature. The major sources of fat are meat, milk, cheese, butter and egg-yolk. We obtain oils from fruits, seeds(e.g. sunflower seed). In human body, lipid is used to make fatty tissue, **adipose tissue**, under the skin forms a layer that can reduce heat losses from the body. Besides satisfying metabolic energy needs, dietary fat, also serve as a vehicle for the absorption of the fat soluble vitamins (A, D, E and K).

Activity 5.3: Think-pair-share

Compare the amount energy obtained from one gram of carbohydrate and the same amount of lipid. Discuss with your friend next to you and share your idea with the other classmates.

Proteins

Proteins are nutrients, which provide growth of the body and build a new cell. It is made up of amino acid composed of carbon, hydrogen, oxygen and nitrogen. In all living things, the structural part of the cell is composed of protein.

The major sources of dietary proteins from animals are meat, fish, eggs, milk and cheese. Plants such as beans, chickpea, soy beans and nuts are also important protein sources.

Table 5.1: Source and function carbohydrate, protein and fats.

Nutrient	Good food sources	Use in the body
Carbohydrate	Barley, wheat, potato, bread, sugary foods like honey	storage; source of energy, An unavailable or indigestible carbohydrate provides dietary fiber that does not serve as a source of energy.
Lipids (Fat/oil) oils are liquid at room temperature, but fats are solid	Butter, cheese, animal fat, groundnuts (peanuts)	source of energy (twice as much as carbo-hydrate); insulation against heat loss; some hormones; cell membranes; insulation of nerve fiber
Protein	Meat, fish, eggs, soya, groundnuts, milk	Growth; tissue repair; enzymes; some hor-mones; cell membranes; hair; nails; can be broken down to provide energy

Vitamins (Types)

Vitamins are nutrients, which are essential in small quantities for human body. They are organic substances needed for chemical reactions of human cells. Plants can make these vitamins in their leaves, but animals as well as human have to obtain many of them ready-made either from plants or from other animals. If any one of the vitamins is missing or deficient in the diet, the vitamin- deficiency disease may develop. Examples of vitamins: are vitamin A, vitamin E, thiamine (vitamin B1) and riboflavin (vitamin B2), and vitamin C.

Activity 5. 4: Group work

Make a group each of with four or five students and have a discussion on: List some foods, which are the source of minerals and vitamins.

Minerals

Minerals are inorganic substances, which are essential in small quantities for human body. The major minerals, which are necessary for human body, are Calcium, Iron, phosphorous and Iron.

Calcium is used to build teeth and bones, it make muscles to contract and help for the transmission of nerve impulses. The important sources of calcium are milk, cheese etc.

Iron is a mineral which synthesizes the hemoglobin of red blood cells. Hemoglobin is a molecule, which carries oxygen in blood. The sources of iron in the diet are red meat, liver, kidney, eggs, groundnuts, Tikur teff etc.

Iodine is a mineral, which makes thyroid gland to work properly. The source iodine is iodized salt and seafood.

Phosphorus is a mineral required to build bones in animal as well as humans body.

Water

Body fluids such as blood, lymph and tissue fluid are mainly composed of water. The transportation of digested food into the body cell and excretion of excess salt and urea out of the body is possible because of water. Thus, water acts as a solvent and as a transport medium for substances throughout the body.

Activity 5. 5: Group work

Use reference books or your text book to fill the following table

Nutrient	Sources	Use in the body	Deficiency disease
Vitamin C			
Vitamin D			
Vitamin A			
Iron			
Iodine			
calcium			

Key Terms

Nutrients: are chemical substance found in food and used by the human body for growth, or to provide energy.

Carbohydrates: are types of nutrients that provide energy for the human body. One gram of carbohydrate can provide, on average, 16 kilojoules (kJ) of energy while

Fats and oils: types of nutrients divided into fats (solid at room temperature) and oil (liquid at room temperature). One gram of lipid gives 37 kJ of energy.

Proteins: are nutrients used for growth of the body and build a new cell. It can also provide energy. One gram of protein can provide 17 kJ of energy.

Vitamins: are nutrients that are essential in small quantities for human body. They are organic substances needed for chemical reactions inhuman cells. The major vitamins are: Vitamin A, vitamin B, Vitamin D, Vitamin C

Minerals: are inorganic substances, which are essential in small quantities. The major minerals are Calcium, Iron, phosphorous and Iron.

Fiber: is the indigestible part of the vegetables and other plant material, prevent constipation and keep the colon healthy.

5.4. Balanced diets

Objectives

At the end of this section, the student will be able to:

- *explain the meaning of balanced diet*
- *list types of food which make a balanced diet*

Ethiopia has multicultural societies. These diverse societies have different types of cultural foods. All these foods are different in their preparation, flavor and ingredients. In addition, different people prefer different food types. Some may prefer to feed on vegetables; others may carbohydrate, animal protein etc. Different food or diet may contain important composition of the above important nutrients. In contrast, some diet may result in health problem because it may contain high amount of fat or high amount of animal protein etc.

Figure 5.1. Ethiopian cultural foods

The diet that contains all of the nutrients in the correct amount and proportion is termed as a balanced diet. A balanced diet must contain enough proportion of carbohydrates and fats to meet our energy requirement. It should also contain enough protein of the right kind to provide the amino acids to make new cells and produce tissues growth. The diet must also contain vitamins and mineral salts, plant fiber and water for normal functioning of the body. Therefore, a balanced diet gives us all the essential substances that we need in the right quantities.

Figure 5.2. Balanced diet

Key Terms

Diet: the food that you eat

Balanced diet: the diet that contains all of the nutrients in the correct amount and proportion

Deficiency disease: disease occurs when a person does not have enough amount of one particular nutrient and suffers health problems.

Balanced diet depends on age, sex, activities and lifestyles

The feeding habit of people depends on where they live, their social issues, their age, their sex their personal activity and physiological conditions etc. For example, a pregnant woman should eat more food for the development and growth of her baby. She should get more minerals like calcium for the development of bone and teeth of her baby. Children have a greater energy requirement than adults because they are still in the process of growth. Young children also need more protein than adult does because they are constantly developing and making new cells. Elderly people generally have lower energy and protein needs. However, they need to eat a balanced diet in order to stay healthy.

Activity 5.6: Think – Pair – Share

Discuss with a friend next to you and share your idea with the other classmates. Do you think that that our body needs energy when we are resting, such as lying on our bed?

If your answer is yes, why do we need food when we lying on our bed?

Naturally, female have a relatively higher fat content in their bodies than male. Fat in female body is stored in fat tissue, such as under the skin. These fatty tissues have a lower metabolic rate than muscular tissue, so women generally have a lower energy requirement than men. Therefore, men should eat relatively more energy food than women should. Some jobs that involve physical activity require more energy than less active jobs. People who are usually work physical exercise such as athletes also require high energy and high protein diets. The extra protein is required for muscle development.

Table 5.2: Energy requirement by the body depends on age, sex, activities and lifestyles

Different groups of human	Energy used in a day/kJ	
	Male	Female
8-year-old child	8 500	8 500
Teenager, aged 14	12500	9 700
Adult office worker	11 000	9 800
Adult manual worker	15 000	12500
Pregnant woman		10 000
Breast-feeding mother		11 500

Activity 5.7: Group work

Make a group of four or five students and:

Compare the daily energy requirements of the people shown in table 5.2 and explain what makes the differences in their energy requirement.

5.5 Deficiency diseases

Objectives

At the end of this section, the student will be able to:

- *explain the meaning of deficiency disease*
- *list the main deficiency diseases caused by different diets*
- *identify different diet as a source balanced diet*

Human body requires a balanced diet for normal functioning of the body. If food intake in human body is inadequate in carbohydrate, proteins, minerals or vitamins, it causes deficiency diseases. A deficiency disease occurs when a person does not have enough amount of one particular nutrient and suffers health problems as a result. Examples of deficiency diseases are Kwashiorkor, Marasmus, Anemia, Rickets and Scurvy etc.

Kwashiorkor

Kwashiorkor is a deficiency disease caused by inadequate protein content in human body especially in children. Some symptoms of kwashiorkor are dry or flaky skin, swelling of leg and abdomen, and changes of the hair color, weakness and irritability. Protein deficiency can often be cured or prevented by an intake of protein.

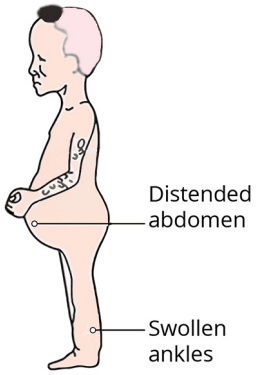

Figure 5.4. Child suffering from kwashior

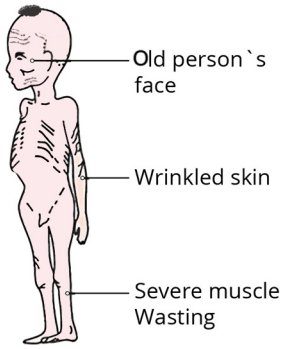

figure 5.5. child suffering from Marasmus

Marasmus

Marasmus is a deficiency disease caused by inadequate carbohydrate content in the human body. Like kwashiorkor, the incidence of ma rasmus increases in children. The symptoms of marasmus are thin arm and leg, little muscle, old-looking face. Peoples with this disease are extremely thin with reduced fat and muscle tissue. Their skin is thin and hangs in folds. Treatment involves delivery of an energy rich, balanced diet.

Attention

The term 'marasmus' is a Greek word, meaning decay.

Diseases caused by deficiency of minerals and vitamins.

Anemia

Anemia is a deficiency disease caused by the lack of iron. A human adult should take enough amount of iron, which is important for the normal functioning of the body. A human body could not produce enough hemoglobin if the amount of iron in the blood is insufficient. Less hemoglobin in the body results in less oxygen transportation. If the oxygen level of blood became less, it results in less respiration producing less energy. The symptom of anemia includes feeling weak, tired and irritable. It can treat or protect by using iron capsules and by consuming iron rich food.

Activity 5.8: Think-pair-share

Discuss with your friend next to you and share your idea with the other classmates.

i. What is the function of vitamin D in the human body?

ii. What is the main source of vitamin D?

Rickets

Deficiency disease caused by the shortage of vitamin D is called Rickets. It results in deformed bones in the legs of children. Vitamin D is the only vitamin that the human body can make upon exposure of the skin to sunlight. In addition, oily fish, butter, milk, cheese and

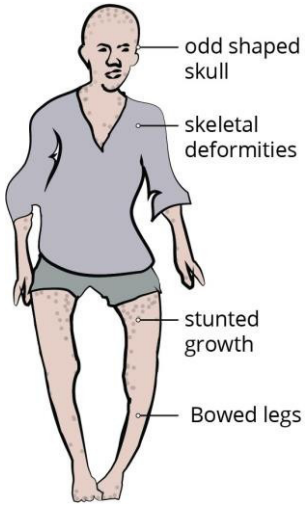

Figure 5.6. child suffering from rickets

egg-yolk are some foods that provide vitamin D. Vitamin D help in the absorption of calcium and phosphorus through the gut wall, which is important to build bone and teeth.

Scurvy

Scurvy is a deficiency disease caused by a lack of vitamin C (ascorbic acid). This deficiency disease occurs when fibres in the connective tissue of skin and blood vessels do not form properly. This disease causes bleeding under the skin, particularly at the joints, bleeding gums and poor healing of wounds. Vitamin C can't be stored in the body therefore, it is important to take it daily. The good sources of vitamin C are oranges, lemons, grapefruit, tomatoes, fresh green vegetables.

Figure 5.6. an individual suffering from scurvy

Table 5.3: Summary of the major nutrients and their deficiency diseases.

Name	Rich food sources	Use in body	Deficiency disease
Protein	Meat, fish, eggs, soya, groundnuts, milk	To build cell structure, growth and repair.	Kwashiorkor
Carbohydrate	Barley, wheat, potato, bread, sugary foods like honey	Provide energy	Marasmus
Vitamin C	oranges, lemons, other citrus fruits	tissue repair, resistance to disease	bleeding gums (scurvy)
Vitamin D	fish oil, milk, butter (also made by skin in the Sun)	strengthens bones and teeth	soft bones, legs bow outwards (rickets)
Iron	liver, meat, cocoa, eggs	used in formation of haemoglobin in red blood cells for transport of oxygen	tiredness, lack of energy (anemia)
Calcium	milk, fish, green vegetables	strengthens bones and teeth	weak, brittle bones and teeth (rickets), muscle weakness and cramps

5.6 Malnutrition

Objectives

At the end of this section, the student will be able to:

- *explain the meaning of malnutrition*
- *differentiate problems relating to malnutrition*
- *discuss how stunting, wasting, underweight and micronutrient deficiency*
- *explain what cause obesity*
- *explain about body mass index (BMI)*

Activity 5.9: Think-pair-share

Discuss with your friend next to you and share your idea with the other classmate.

Sometimes a person can eat a lot of food, can this cause malnutrition?

Malnutrition is defined as the insufficient, excessive or imbalanced consumption of nutrients, which leads to health problems. The causes of malnutrition can be poverty, famine due to drought or flood, soil erosion, wars, too little land for too many people, ignorance of proper nutritional requirements.

The dual burden of malnutrition consists of both under nutrition and overweight and obesity, as well as diet-related non communicable diseases.

Under nutrition the most common form of malnutrition is caused by under nutrition of protein and dietary energy (Carbohydrate, lipids). If the total intake of food is not sufficient to meet the body's need for energy, it leads to loss of weight, muscle wastage, weakness and ultimately starvation. Extreme reduction of diets, such as carbohydrate foods can result in the deficiency disease like marasmus. The victims of malnutrition due to food deficiencies have reduced resistance to different types of diseases. Under nutrition addresses the following four broad groups of conditions :

Wasting (low weight-for-height) is defined as low weight-for-height. It often indicates recent and severe weight loss, although it can also persist for a long time. It usually occurs when a person has not had food of adequate quality and quantity and/or they have had frequent or prolonged illnesses. Wasting in children is associated with a higher risk of death if not treated properly.

Stunting (low height-for-age), is defined as low height for age. It is the result of chronic or recurrent under nutrition, usually associated with poverty, poor maternal health and nutrition, frequent illness and/or inappropriate feeding and care in early life. Stunting prevents children from reaching their physical and cognitive potential.

Underweight (low weight-for-age) is defined as low weight-for-age.

Micronutrient deficiencies are a lack of vitamins and minerals that

Key Terms

Malnutrition: the insufficient, excessive or imbalanced consumption of nutrients, which leads to health problems.

Wasting : low weight for hight

Stunting; low height for age

Underweight: low weight for age

Obesity: can be caused by a high intake of fatty foods, foods containing a lot of added sugar plus the effects of too little exercise.

are essential for body functions such as producing enzymes, hormones and other substances needed for growth and development.

In contrast, when the diet contains too much fat it causes diseases like coronary heart disease. If fatty substance builds up in the arteries, it reduces the diameter of these blood vessels which results in blood clots and leads to heart attack.

Obesity: If you eat more food than you want, your body stores the extra food as fat. Then the stored fat results in obesity (overweight). People with overweight may use diet contains fattening foods, such as high fat foods and foods with a lot of sugar.

Obesity is caused because of an imbalance between the energy store in human body and the energy released. An increase in consumption of high-energy foods, without an equal increase in physical activity leads to an unhealthy increase in weight. In other way, decreased levels of physical activity can also result in an energy imbalance and lead to weight gain.

People who are overweight and obese are at high risk to have health problems such as, heart disease, high blood pressure, diabetes and arthritis (worn joints).

Activity 5.10: Group work

Make a group, each with four or five students and discuss in group about:

Which of the following activities may cause or may not cause obesity?

Why does it may or may not cause obesity?

i. Sitting and watch TV

ii. Playing football in the field

iii. Playing computer games

iv. Going to school by Walking

v. Going to school by taxi

vi. Eating breakfast with high fats and sugars contents

Fig 5.7 Persons with obesity

Obesity can be controlled by

- Eating less high energy foods (lower energy intake)
- Taking more exercise (increase energy output).
- Eating a balanced diet with a lower intake of energy

Attention

There are two ways in which people can identify being obese:

- being 20% above the recommended weight for his or her height
- having a body mass index (BMI) greater than 30. Body mass index = body mass (kg) / height2 (metres2)

A person with a BMI Status below 18.5 is underweight,18.5–24.9 normal weight,25.0–29.9 overweight, 30.0 and above obese.

Adolphe Quetelet, a Belgian statistician and scientist, developed BMI in the 19th century. He based the formula on measurements of thousands of soldiers. It provided a useful guide to check on a healthy body mass, but it may not tell the whole story. Fitness training builds up larger muscles, which weigh more than fat and can make the BMI of a very high therefore, athlete with a large frame appear in the 'overweight' category.

Activity 5.11: Class work / Individual assignment

Calculate the BMI of a person who has a body mass of 80 kg and he is 1.85m tall. Is he/she likely to be obese?

5.7. Substance abuse

Objectives

At the end of this section, the student will be able to:

- *describe the effects of tar and carcinogens in tobacco smoke on the gas exchange system*
- *describe the short-term effects of nicotine and carbon monoxide on the cardiovascular system*
- *explain the social and psychological effect of chewing Khat*

Activity 5.12: Think-pair-share

Discuss with your friend next to you and share your idea with the other classmate.

i. What are drugs?

ii. List some drugs which have medicinal value

iii. Can we get drugs from food ? if your answer is yes list some of them

iv. List some stimulant drugs which are taken for recreational purpose.

Drugs

A drug is any substance taken into the body that change and affects chemical reactions in the body. It can be taken legally to reduce a symptom such as a headache or to treat a different types of infection, this is called medicinal drugs. There are also other drugs which could also be one taken illegally in order to provide stimulation or induce sleep or create hallucinations (recreational drugs).

Can drugs be found in our food?

Drugs are present in many food products such as: tea, coffee, energy drinks and alcoholic drinks. Though they have many useful medicinal properties their stimulant properties can produce caffeinism, a nasty condition that can readily addict.

What is substance abuse?

Substance abuse is using legal or illegal drugs (substances) in the wrong way or in the excess amount. Some of the drugs are medical

drugs taken legally to reduce a symptom and pain of diseases. These drugs designed to suppress pain, treat and cure diseases. In addition to medical substances, other legal substances are present in many products such as:

- tea, coffee and 'energy drinks' (caffeine)
- tobacco(nicotine)
- alcoholic drinks (alcohol)

Although these substances are legal, they can cause serious effects when taken excessively or over long periods of time.

Peoples are using drugs illegally to provide stimulation, induce sleep, or create hallucinations (recreational drugs) example of such drugs are: alcohol, tobacco, Khat, heroin etc. Peoples are also using alcohol, nicotine and caffeine for their pleasurable effects, to help them relax or concentrate. Some of the commonly practiced drugs in our country include:

1. Cigarettes smoking

Cigarette is made up of a plant called tobacco (Nicotiana tobacum) which originally cultivated and used in Central America. People use cigarette in order to stimulate their body or because they are addicted to it.

The chemical composition of cigarette leads to addiction and problem in human health. The main components of cigarette or tobacco are tar, carbon monoxide and Nicotine.

Activity 5.13: Group work

Make a group of four or five students and make a discussion on some of the common smokers reaction or their habits during smoking.

i. **Tar**

Tar is the black sticky substance found in cigarette that collects in the lungs when the smoke cools. The health effect of tar can be chronic bronchitis, lung cancer etc.

Chronic bronchitis

When people smoke cigarette, the chemical substance called tar accumulates in the bronchioles. Tar irritates the lining of the bronchioles and stimulates the production of excess mucus. The function of cilia in our lung is to remove dust, dirty and excess mucus from the lining of lungs. However, when cilia damaged by smoking, it will be difficult for cilia to remove the excess mucus and dirt. This leads to the collection of dirt, bacteria and viruses that block the bronchioles. This stimulates smoker's to cough which is an effort to move the mucus, the bronchioles and bronchi becomes thicker. This thickening of the bronchioles causes them to narrow and makes it difficult to breathe, this leads to infections such as pneumonia. This damage and obstruction of the airways is chronic bronchitis.

Attention

Currently, The smoking of a flavored tobacco called shisha has become fashionable among young people. However, the social, economic and psychological effect of shisha is similar to that of ordinary cigarette.

In addition, there are different chemical compounds in tar such as carcinogen (produce cancer) compounds. Cancer starts because of the changes in the epithelial cells of the lungs that lead to the development of a mass of cells, known as a tumor. It is this tumor which results in cancer.

Emphysema

Smokers usually have weakened alveoli wall because of the above action of tar that result in coughing. During coughing, some of the weakened alveoli burst. Then the amount of alveoli decrease as well as absorbing surface of the lungs is greatly reduced. Then the smoker cannot oxygenate his or her blood properly and the least exertion makes the person breathless and exhausted. Bronchioles collapse during expiration, trapping air in the alveoli, which often burst. This condition is called emphysema.

ii. Carbon monoxide

Carbon monoxide is a poisonous gas found in cigarette. During cigarette smoking, the carbon monoxide enters to lung. This carbon monoxide diffuses across the walls of the alveoli and diffuses into red blood cells where it combines with hemoglobin to form the compound carboxy-hemoglobin.

The carbon monoxide combines permanently with hemoglobin. Then no more oxygen is carried by hemoglobin that results in the reduction of the volume of oxygen in blood. Therefore, less oxygen is supplied to the heart. In this case, the heart beat increases to get more oxygen. Carbon monoxide may also damage the lining of the blood vessels. In this case, smokers put the health of their cardiovascular system at risk. The damaging of the walls of arteries may lead to the build-up of fatty tissue and the reduction of blood flow. This may result coronary heart disease (CHD) and stroke. These diseases are a major cause of death and disability in the world.

iii. Nicotine

Nicotine is a compound found in cigarette. It is a stimulating and relaxing compound which has a molecular structure that allows it to interact with our nervous system. In addition to its stimulating effect, nicotine is a compound which produce addiction.

When people smoke cigarettes, nicotine from cigarette is absorbed through the alveoli to enter the Blood stream. Then it is able to go to the brain through blood circulation.

In the brain, nicotine activates the release of dopamine, the natural neurotransmitter substance associated with our experience of pleasure. Long-term exposure to nicotine eventually comes to have the reverse

Activity 5.14: Think-pair-share

Discuss with your friend next to you and share your idea with the other classmate.

What is the function of hemoglobin?

How does carbon monoxide reduce amount of oxygen in smokers lung?

effect, actually depressing the ability to experience pleasure. So more nicotine is needed to 'satisfy', and cigarettes become addictive. Smokers find it increasingly hard to quit the habit.

Nicotine also increases the heart rate and blood pressure. It narrows the arterioles, which increases blood pressure. It decreases the blood flow, particularly in the hands and feet, and it makes blood clotting more likely. It also increases the stickiness of blood platelets that promote blood clotting.

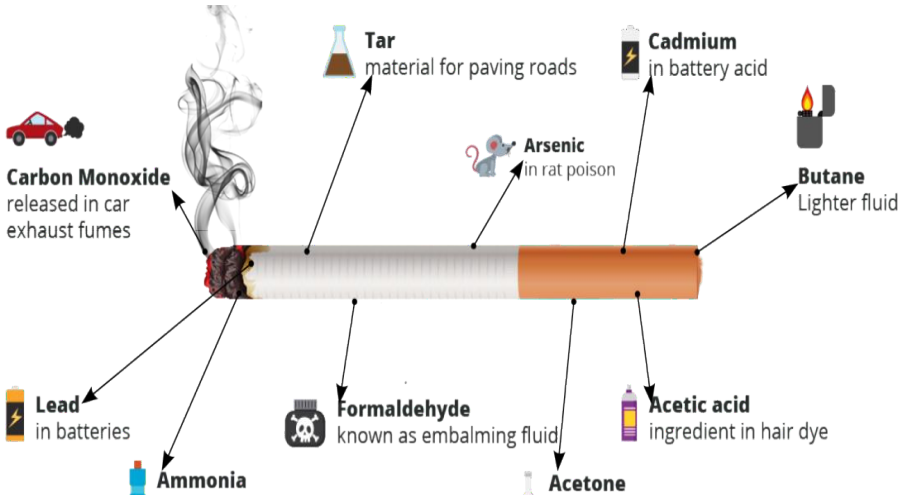

Figure 5.8 Substances in tobacco smoke

2. Drinking Alcohol

Alcohol is a socially acceptable drug in many countries including Ethiopia. In Ethiopia, there are different types of alcohol drinks such as Tella, Arekie (Katicala), Beer, Wine. When human body consumes alcohol, it is absorbed through the wall of the stomach and small intestine and it is absorbed into the blood. Alcohol gets distributed through- out the body by the help of blood circulation. It is absorbed by liver cells and broken down by liver enzymes, There- fore its concentration in the blood decreases gradually.

Attention

The breaking down of alcohol by liver enzyme happens more quickly in men than in women because men have more of these enzymes and their enzymes tend to be more active. They also have more water and less fat in their bodies than women do, which tends to cause the concentration of alcohol in the blood to decrease more quickly.

Alcohol is a depressant. It affects the brain by slowing down the transmission of nerve impulses. Consuming larger quantities of alcohol leads to:

i. Loss of coordination,
ii. Loss of self-control.
iii. Loss of judgment and control of movements
iv. Slower reaction times(the interval between receiving a stimulus and making a response)loss of judgment and slower reaction times

Alcohol drink and addiction

Some people become dependent upon alcohol and they are referred to as alcoholics. They feel tense and irritable. It is hard to cope with

everyday problems without drinking they develop a tolerance as more enzymes that metabolize alcohol are made in the liver. They therefore need to take greater quantities of alcohol to get the same effect. Alcoholics can cause their families pain and unhappiness. They can become aggressive after drinking and spend a lot of money on drink. There are also other social problems such as crime, family disputes, marital breakdown, child neglect and abuse, absenteeism from work, vandalism, assault and violent crime including murder.

Activity 5.15: Group work

Discuss with your friend next to you and share your idea with the other classmate.

What is the common reaction of alcohol drunken man?

Why is everybody discouraged from drinking particularly when driving?

Long-term effects of alcohol

Drinking large quantities of alcohol over a number of years can lead to stomach ulcers, heart disease and brain dam- age. In addition, large amount of alcohol damage the liver tissue and replaced by scar tissue known as cirrhosis. This condition may leads to death unless the person stops drinking.

3. Heroin

Heroin is a powerful depressant that slows down the nervous system. It has a chemical structure that is similar to endorphins, a group of chemicals that are found in the brain. Endorphins are made naturally in the brain and pro- vide relief when the body experiences pain or stress.

Attention

The liver is the site of the breakdown of alcohol and other toxins. Drugs are broken down in the body by enzymes and the products are excreted. The breakdown products can be detected in the urine, and this is why urine tests are carried out to see if people have been taking drugs. Athletes taking part in competitions and car drivers who have been in accidents are routinely tested for drugs.

Endorphins work on the synapses in the brain and preventing neurons from transmitting impulses from pain receptors, so they producing pain relief. When a person takes heroin, the heroin molecules bind to the endorphin receptor sites, blocking nerve transmission. This mimics the function of natural endorphins. Therefore, by using heroin, the feeling of pain disappears and addiction produced. People practice to take heroin to reduce the pain. This is how the body develops a tolerance to the drug, and it has to be taken in ever-greater quantities in order to feel euphoria or just to reduce the pain.

4. Cannabis

Cannabis is the most commonly used illegal drug in the world. It is drug from Cannabis plant. Mostly it is the flower of cannabis plant, harvested, dried, and used as drug. Some people named this drug as weed, some call it pot, and others call it marijuana. This cannabis plant has been used as a drug for both recreational and traditional medicines for a long period. This drug contains a stimulant or psychoactive component called Tetrahydrocannabinol (THC). Peoples used this cannabis by smoking, vaporizing, together to food and as extract.

Figure 5.9 Cannabis

Cannabis causes: enjoyment, different states of mind and sense of time, difficulty concentrating, reduced short-term memory and body action relaxation and it results in an increase in appetite. The effect of

cannabis in human body last for two to six hours, based on the quantity of the drug used. When cannabis is taken at high amount, it causes mental effects like: nervousness, panic, false beliefs, hallucinations, suspicion, and psychosis.

5. Chewing khat

Khat (*Catha edulis*) is bushy plant whose leaves are chewed for its stimulant effect. This plant is grown in southern Arabia and Eastern Africa including Ethiopia, Somalia, and Kenya. Khat is usually supplied as a bundle of leaves and fresh shoots wrapped in false banana leaves.

Figure 5.10. Khat

Khat contains a chemical compound known as cathinone, which affects central nervous system (CNS). This cathinone can be found only in fresh Khat leaves. Chewing khat releases Cathinone into the saliva that can be absorbed to the body easily. Only fresh leaves are chewed, because cathinone soon degrades into old in dry plant material.

Although khat can be ingested as an infusion or smoked, the most common route of administration is to chew the fresh plant. The juice of the masticated material is swallowed, while the residues are spat out. In some places, teas from dried leaves are also consumed.

Activity 5.16: Group work

Make a group of four or five students and make a discussion on some of the social, economic and behavioral problems of chewing chat.

What are the common reactions of a person after chewing chat? Why ?

Ethiopia is one of the country where large number of people with the habit of chewing chat. In the previous years, it was mainly cultivated in eastern part of the country. However, currently, it is grown and consumed in all parts of the country.

This current increment in khat consumption brings socio-economic, psychological and physical health consequence on the individuals involved. Chewing khat induce a state of joy and feelings of increased alertness and stimulation. At the end its consequence results in a depressed mood, irritability, loss of appetite, gastritis and peptic ulcer, disease and difficulty sleeping. In addition, the habit of chewing khat leads to some social problems like family fragment, multiple sexual practices and the spread of sexually transmitted infections (STIs) due to unprotected sex. Early initiation of sexual activity was also reported among Khat chewers.

6. Doping

The term “doping” refers to the use of prohibited medications, drugs, or treatments in competitive sports . It is practiced in athletes with the intention of improving athletic performance. Performance enhancing drugs (PEDs) is another term used to for drugs used by athletes to improve their athletic performance.

The World Anti-Doping Agency (WADA) uses a battery of blood

and urine tests to determine if athletes are cheating. A key tool is the biological passport program, which tests all athletes for doping and performance enhancing drugs.

Attention

The word doping is probably derived from the Dutch word dop, the name of an alcoholic beverage made of grape skins used by Zulu warriors in order to enhance their prowess in battle.

Why is doping such a big deal?

The most important reason doping is a big deal is the fact that many of these substances can have harmful and long-lasting side effects which may include :

Cardiovascular: irregular heart rhythm, elevated blood pressure, heart attack, sudden death.

Central Nervous System: insomnia, anxiousness, depression, aggressive behavior, suicide, headache, addiction with withdrawal, psychosis, tremor, dizziness, stroke

Respiratory: nose bleeds, sinusitis

Hormonal: infertility, gynecomastia (enlarged breasts), decreased testicular size, low sex drive, acromegaly (coarse bones in face, hands, and feet), cancer

The second issue is more of a moral dilemma. These banned substances are used to gain an unfair advantage which significantly diminishes the spirit of competition.

The World Anti-Doping Agency (WADA), has a program which has a purpose, to protect the athletes' fundamental right to participate in doping-free sport and thus promote health, fairness and equality for athletes worldwide.

What substances are banned from use?

Some drugs are banned both in and out of competition due to their performance enhancing properties, while others are only banned during competition. Another reason for banning a drug is due to their ability to mask the presence of a different banned drug during testing.

In general, the following classes of drugs are banned: Street drugs, stimulants, anabolic steroids, peptide hormones (i.e. human growth hormone [hGH]), alcohol and beta blockers (for archery and rifle shooting only), diuretics, beta-2 agonists, anti-estrogens, blood doping, and gene manipulation.

Key Terms

Drugs: refers to any substance taken into the body that modifies or affects chemical reactions in the body.

Heroin is a powerful depressant affecting the nervous system. It is taken into the body in the form of injection. People often share needles for injection. Sharing needles can result in infections such as HIV/ AIDS

Nicotine: it is also a stimulant, it increases pulse rate and narrows blood vessels which can cause damage

Emphysema: walls between alveoli break making large sacs, reducing surface area massively and making difficult to breathe.

Carbon monoxide: irreversibly bonds with hemoglobin which can lead to oxygen starvation

Cannabis: stimulant or psychoactive component called Tetrahydrocannabinol (THC) Chewing khat contain a chemical compound known as cathinone it's consequence results a depressed mood, irritability, loss of appetite, gastritis and peptic ulcer disease and difficulty sleeping

Doping is the use of prohibited medications, drugs, or treatments in competitive sports.

Prohibited list: some drugs are listed on Prohibited list which is thedocument identifying the substances and methods that are prohibited in competition, out of competition, and in particular sports.

The criteria for adding a substance to the prohibited list are:- Must meet any 2 of the following 3 criteria:

- It has the potential to enhance or enhances sport performance;
- It represents an actual or potential health risk to the athlete;
- It violates the Spirit of Sport.

Substances & methods prohibited at all times: all prohibited substances in this class are non-specified substances anabolic agents are prohibited, ptide hormones, growth factors, related substances, and mimetics, growth factors and growth factor modulators, beta-2 agonists, hormone and metabolic modulators, diuretics And gene doping, masking agents, blood doping, Substances & methods prohibited in competition: Stimulants, narcotics, cannabinoids, glucocorticoids

Prohibited in particular sports:- Beta-blockers

For athletes who need a banned drug for legitimate medical reasons, the anti-doping programs offer a way to request a therapeutic use of exemption (TUE) so the athlete can use the drug. The athlete must have a physician complete a TUE form that states the athlete needs the drug to treat their medical condition and that an alternative non-banned drug is not available or insufficiently treats their condition. The TUE is reviewed by a medical committee, which either allows the athlete to take the drug or denies the athlete's request.

Doping Consequences

1. Physical and Mental Health: - Physical health: depending on the substance, the dosage, and the consumption frequency, doping products may have particularly negative side effects on health. Some damages to the body are irreversible and may lead the athlete's life to be in great danger. The following section will outline the possible health consequences and sports benefits to using certain groups of doping substances.

Steroids: General side effects:

- Increased risk of liver disease
- Increased risk of cardiovascular disease
- High blood pressure
- Acne
- Baldness

In Males: Shrinking testicles, sexual side effects (reduced sperm production, impotence, libido disorders) Breast growth

In Females: Deepening of voice Excessive hair growth on face & body abnormal menstrual cycles

Enlarged clitoris

Erythropoietin (EPO)

Increased blood viscosity (thickness/stickiness)

- Pulmonary embolism
- Increased risk of heart attack and stroke
- General weakness
- High blood pressure

Human Growth Hormone

- Severe headaches
- Loss of vision
- High blood pressure and heart failure
- Diabetes and tumors
- Crippling arthritis
- Irreversible acromegaly
- Enlargement of the hands & feet
- Protruding forehead, brow, skull & jaw
- Heart enlargement
- Water retention
- Liver and thyroid damage

2. Psychological health- Some doping substances may not be detrimental to the body but exercise an impact on mental health. It has been scientifically evidenced that anxiety, obsessive disorders, or psychosis are direct consequences of doping.

- Psychological dependence
- Increased aggression
- Mood swings

3. Social consequences- The existence of an athlete who was held guilty of doping may be completely disrupted. Indeed, doping may represent a danger to health, but it may also be prejudicial to fame, respect, and creditworthiness. Even in the future negative findings are regularly questioned by the media and the entourage. The poor image will remain in the collective unconscious and the athlete could remain isolated.

4. Financial consequences:- As regards high-performance sports, an infringement of anti-doping rules often leads to a loss of income, the reimbursement of prize money, and of sponsorship money. An athlete

suspended for several years, or even life-banned, cannot earn his/her living as usual and can be forced countries loss foreign treasures from athletes even banned countries from any sport competition in the world.

5. **Sporting consequences:-** A doping violation may mean loss of results, rankings, medals, and qualification places at events. It could also have an impact on members of a team causing medals to be lost a day-to-day basis.

6. Legal consequences:- Doping may have major legal consequences. A doped athlete may be suspended, i.e., he/she may not take part in a sports competition on or in organized training sessions.

Problems of using drugs

Peoples start using substances because of different reasons. Some people taking substances for stimulation, some for recreational value, and others use it because of the pressure from other people. Whatever the reason, the effect is almost similar among all the users. When substance users first start taking a substance, users may think they can control how much they use. However, when time passes, they may want more of the drug to get the same feeling or effect. Over time some people can reaches beyond abuse to addiction. Addiction can produce health, social, economic and cultural problems. Some of the problems that drug users faced are:

» Eat more or less than normal
» Change their friends a lot
» Stop taking care of themselves
» Sleep at unusual hours
» Lack concern in things they used to love
» Have problems at work or with family
» Spend more time alone than they used to
» Switch quickly from feeling good to bad
» Financial problems – stealing, loss of job
» Strong desire to use the substance
» difficulty to keep a job,
» family breakdown and homelessness, tendency to avoid friends and families,
» Preferring the company of other addicts, and so they become isolated from the society

How people recover from drug addiction?

Addictions are treatable. With the right plan and resources, recovery is possible. The following are important steps in recovering.

Anyone who is addicted for any drug should admit to his friends, and to himself, that he has a problem.

- Find support from others.
- Rewrite daily routine.
- Enjoy the small successes.
- Recognize and avoid relapse.
- Reach freedom, and stay there

5.8. Infectious and noninfectious diseases

Objectives

At the end of this section, the student will be able to:

- *identify infectious and non-infectious diseases*
- *list the major infectious diseases*
- *explain about modes of transmission and prevention of infectious diseases*
- *explain about COVID-19*

Activity 5.17: Group work

Make a group of four or five students and discuss about

i. The difference between infectious and non-infectious diseases

ii. List two infectious and non-infectious diseases that occur in respiratory and circulatory systems.

iii. List some diseases that occur in your surrounding and arrange them in the following table.

Name of the disease	Infectious	Non infectious	causes
1.			
2.			
3.			

Disease is a condition in which the body does not function normally, and which produces symptoms such as: headache, increased body temperature, pain, distress or feeling weak. There are two types of diseases are called infectious and non-infectious diseases.

5.8. 1. Infectious diseases

Infectious diseases are diseases that are caused by disease causing organisms. These types of diseases can be transmitted from person to person such as HIV-AIDS, tuberculosis, malaria etc. Disease causing organisms are organisms, which cause diseases. Examples of disease causing organisms are bacteria, virus, protozoa, and fungi.

There are different types of infectious diseases that caused by different

Attention

Endemic: This disease is occurring when disease-causing agent exists permanently in specific place or population, For example malaria is endemic in Afar region.

Epidemics are diseases that occur suddenly and then spread in a specific area or within a specific population group, For example, in 2015 Ebola was epidemic in west Africa.

Pandemic is an epidemic that spreads far more widely throughout the whole world. It affects a huge number of people. Example COVID-19

disease causing organisms. Their difference is based on:

- the type of host that they infect, some infect human, some infect only plant etc.
- their mode of transmission, some are transmit by insects, some by contaminated water/food etc.
- type of disease causing organisms, some are caused by viruses, some by bacteria etc.
- the severity of the disease, such as the common cold, measles and influenza, only affect us for a short period of time. Others, such as tuberculosis (TB), human immune deficiency virus (HIV) infection may last a much longer time.

Transmission of infectious diseases

An understanding of the biology of the pathogen and its mode of transmission is essential to control and prevent the disease. Different infectious diseases have different mode of transmission.

- Some infectious diseases are transmitted from one per- son to another by direct contact with a patient.
- Other infectious diseases are transmit by drinking contaminated water or by eating contaminated food, (food or water contains disease-causing organisms like bacteria and virus). This is because the infectious organisms can survive in water, human food, faeces
- Some infectious diseases are transmitted by insect bite.
- Some infectious diseases are transmitted by sexual inter-course etc.

Preventing infections and control methods of infectious diseases

Control is an attempt to break transmission cycles by removing the conditions that favor the spread of the disease causing organisms.

1. Vaccination: is a major control measure for many infectious diseases; it works by making the body to defend against disease causing organisms.
2. Personal hygiene; people of all ages should wash their hands after using the toilet and before handling or eating food; this protects the entrance of disease causing organisms into our body.
3. Hygienic food preparation: food should be covered to keep flies away, kitchen surfaces should be cleaned to kill bacteria, and food should be cooked exhaustively to make sure any bacteria are killed.
4. Boiling cooking and/or drinking water to kill the pathogens

5. Proper waste disposal: household waste should be put
6. into covered bins and collected at regular intervals.
7. Sewage treatment: toilet waste is a serious health threat if it is not disposed properly. Water pipe should be arranged far from toilet drainage. For example, the disease causing organism that cause giardia and cholera are transmitted through contamination of drinking water by faeces and sewage.

Human immune deficiency virus infection/ acquired immunodeficiency syndrome (HIV- AIDS)

Acquired immunodeficiency syndrome is caused by the human immunodeficiency virus (HIV).HIV infection rates are especially high sub-Saharan Africa including Ethiopia. Peoples who have HIV in their body are called HIV-positive or HIV carriers. Usually, these HIV positive people do not show any symptom of the disease for several years after infection. Infection of HIV starts when the virus infects and enters to T-lymphocytes. These are cells that defend our body from diseases.

Activity 5.18: Think – Pair – Share

Discuss with your friend next to you and share your idea with the other classmate.

Explain the difference between being HIV-positive and having AIDS

HIV replicates and survives in human T-lymphocyte cells. During its replication HIV, destroys these T-lymphocytes cells. As a result the number of T-lymphocytes gradually decrease which leads to declining of disease resistant mechanism of the body. When the body reduced in its dis- ease resistant mechanism, it causes acquired immunodeficiency syndrome (AIDS). AIDS is the result of opportunistic diseases like pneumonia, TB, cancers; weight loss, diarrhoea etc.

Transmission of HIV- AIDS

HIV can be passed from one person to another by direct exchange of body fluids such as:

- Fluid transfer from one person to another during sexual intercourse
- Blood transfusion from one person to another, during blood donation
- Sharing needles in intravenous drug users
- Mother to fetus across placenta, more often, through the mixing of blood during birth
- Mother to infant in breast milk

Prevention and control of HIV-AIDS

There are no cure drug for HIV-AIDS and no vaccine for HIV, therefore it is very important to prevent this disease by the following methods.

Attention

T- Lymphocyte cells (Immune cells) have another name called T-helper cells that defend our body from infection. Opportunistic diseases: disease caused by different disease causing organisms that occurs when the body diseases resistance mechanism.

Retroviral drugs are drugs that are used to stop or reduce viral replication in human, but they don't kill the virus.

- All blood should be tested before transfusions in activity of blood donation
- Needles used by intravenous should be sterile and used only once.
- People should avoid multiple sexual activity
- Using condoms, If condom is properly used, it can pre-vent the virus transmission from carrier to healthy per-son
- HIV-positive mother should be treated with appropriate retroviral drugs. These retro-viral drugs can also significantly increase the length of time between a person be-coming infected with HIV and developing symptoms of AIDS and can significantly prolong life.

Tuberculosis (TB)

Tuberculosis is another example of infectious disease caused by the bacterium called *Mycobacterium tuberculosis* and rarely by*Mycobacterium bovis*. These bacteria live inside human cells, mainly in the lungs. TB has many symptoms like cough, chest pain, shortness of breath, fever, sweating, weight loss etc. After infection, some people develop TB quite quickly, while in others the bacteria remain inactive for many years. This difference is because of the difference in disease resistance ability between peoples.

TB transmission

TB bacteria can enter the lungs in airborne droplets. It spread when infected people with the active form of the illness cough or sneeze. The bacteria are carried in the air in tiny droplets of liquid. Transmission occurs when people who are uninfected inhale (breath in) the droplets. These happen rapidly in places where many people are living in crowded conditions such as very crowded public transportation.

The other transmission way is by consuming undercooked meat and unpasteurized milk. This type of transmission mainly occurs for the TB transmits from infected animals.

Prevention and control of TB

There are drugs and vaccines that are important to treat and prevent this disease

Treatment of TB: A person, who shows symptoms relating to TB, should his/her sputum sample tested for the presence of TB bacteria. If a person is positive for TB, then patients should be isolated while they are in the most infectious stage (which is at two to four weeks). The treatment involves using several drugs to ensure that all the bacteria are killed. The treatment also need about six to nine months. If the bacteria not killed by treatment, it may be because of drug resistance TB.

Key Terms

Drug resistance bacteria: are bacteria that does not killed by commonly used drugs. More powerful called second line drugs are important to kill these resistant bacteria.

Vector: is an organism that carries a disease-causing organism and transmit from one person to another or from an animal to a human. For example Anoph-

eles mosquito.

Vaccine: The only vaccine available for TB is the BCG vaccine, which is derived from animal TB bacteria and protects up to 70–80%of people who receive it. This vaccine is given during early child or infant stage. The effectiveness of the vaccine decreases with in old age.

TB is relating to reduced immunity of the body, increasing standards of people who are living with HIV and treating HIV infected people help to reduce the incidence of TB.

Avoid overcrowding; TB is a disease transmitted by inhales the bacteria when infected person cough and sneeze therefore, good ventilation is important to prevent this disease. Avoid eating undercooked meat and avoid drinking unpasteurized or not boiled milk. This is important to prevent TB transmission from animal to human.

Activity 5.19: Group work

Make a group, each with four or five students and discuss in group about:

i. The causes of malaria,
ii. If you are living in malaria endemic area observe your surrounding and discuss how malaria is transmitted from patient to healthy person (If your living area is not endemic for malaria, please use reference or internet to answer this question).
iii. What is vector?
iv. How can we prevent malaria?

Malaria

Malaria is caused by protozoa known as plasmodium Protozoa. Malaria is found in many parts of the world where *Anopheles* mosquito species that can act as vectors are found. It is very common in tropical and subtropical regions where humidity is high, a comfortable environment for mosquito breeding. Female Anopheles mosquitoes feed on human blood to obtain the protein they need to develop their eggs. If the person they bite is infected with Plasmodium, they will take up some of the plasmodium together the blood meal. When the mosquito feeds again another healthy person, she injects the plasmodium with her saliva. Then the parasites enter the red blood cells, where they multiply.

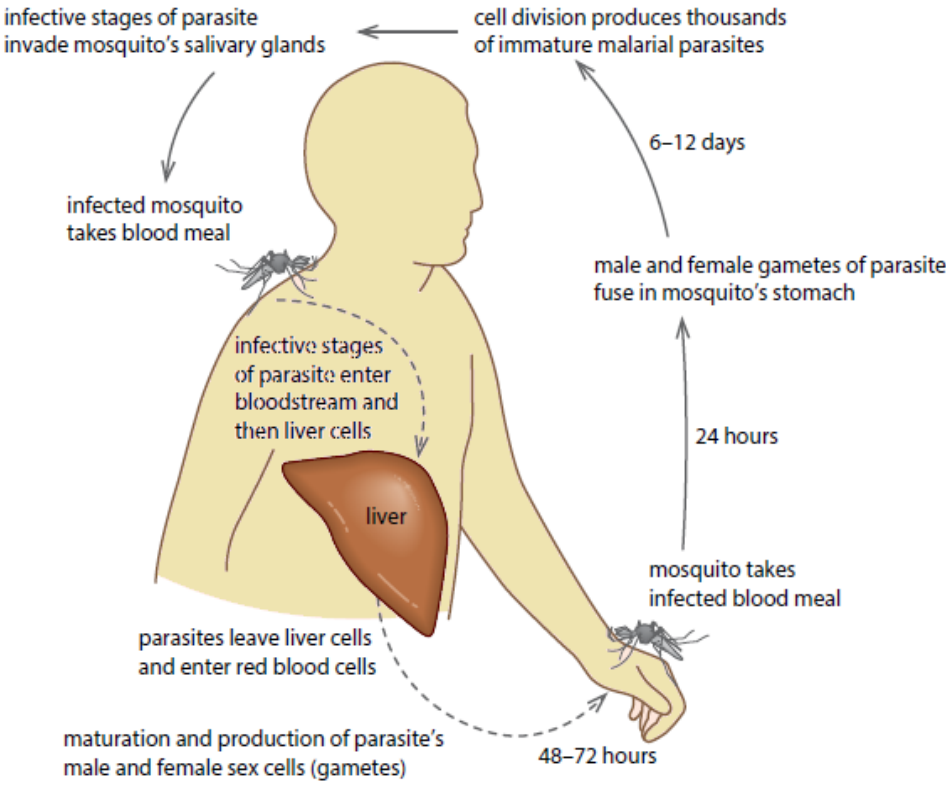

Figure 5.11.Life cycle of malaria

The life cycle of Plasmodium. Plasmodium has two hosts which are human and mosquito. The reproduction of plasmodium taken place in both hosts, sexual reproduction in mosquito and asexual preproduction in human .

Prevention and control of malaria

There are three main ways to control malaria:

- Reducing the population of mosquitoes. This can be done by removing sources of water in which they can breed. Sometimes, it is possible to use Biological controls like fish which feeds on the larva of the mosquito. In addition using insecticide to kill mosquito is another way to reduce the number of mosquito.
- Avoiding mosquitoes bite: This can be done by sleeping under a mosquito net, or using insect repellant.
- Using anti-malarial drugs such as quinine and chloroquine to treat infected people. However, in many parts of the world Plasmodium has evolved resistance to some of these drugs. Chloroquine resistance is widespread in parts of South America, Africa; newer drugs such as mefloquine are used in these areas.

Activity 5.20: Individual / Home work

Construct the table that shows the cause, method of transmission, and prevention and control methods for infectious diseases like Ameba, Giardia,. Typhoid fever.

Coronavirus disease 2019 (COVID-19)

Corona virus large family of viruses belongs to family coronaviridae which cause diseases in mammals and birds. This virus has extracellular covering structure called lipid envelop. The virus also has club shaped spikes proteins on the outer surface of the virus.

The viral envelope is made up of a lipid bilayer membrane (M), envelope (E) and spike proteins(S). The E and M protein are the structural proteins that combined with the lipid bilayer to shape the viral envelope and maintain its size. S proteins are needed for interaction with the host cells.

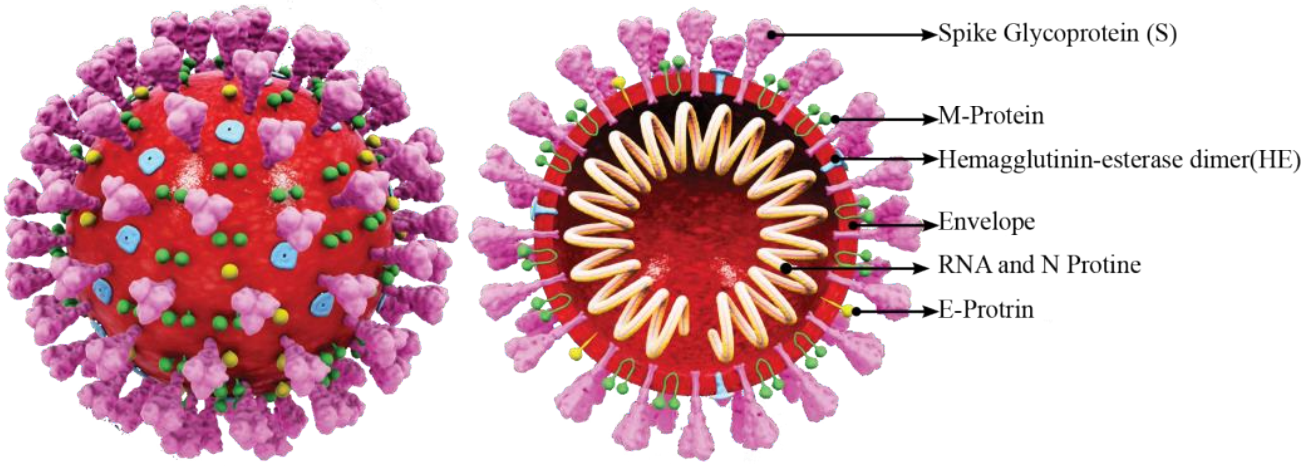

Figure 5.12 structure of COVID-19

While SARS had occurred in 2003 in China, MERS occurred in Middle East countries in 2012. COVID-19 virus (previously called novel coronavirus) is a new strain of a coronavirus that first emerged in China in December1, 2019. The first case of pneumonia outbreak was reported in Wuhan, China. On 31 December 2019, the outbreak was traced to a novel strain of coronavirus that was given the name SARS-COV-2 by the international committee on Taxonomy of Viruses.SARS-CoV-2 may have originated in an animal and changed (mutated) so it could cause illness in humans. In March 2020, the World Health Organization (WHO) declared COVID-19 as a pandemic. The disease caused by SARS-COV-2 known as coronavirus disease 2019 (COVID-19).

Most people infected with the COVID-19 experience mild to moderate respiratory illness and recover without requiring special treatment. Older people and those with underlying medical problems

Key Terms

"coronavirus" : is derived from Latin corona , meaning "crown" or "wreath", itself a borrowing from Greek

Incubation period: is a period from the time of exposure or entrance of infectious agent up to the time of the appearance of signs or symptoms of the disease.

like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness.

Activity 5.21: Think- pair-share

Discuss with a friend next to you and share your idea with the other classmate. What is pandemic?

Fig. 5. 13 Pandemic of COVID-19

How does the coronavirus spread?

The COVID-19 virus spreads primarily through the droplets and virus particles released into the air when an infected person breathes, talks, laughs, sings coughs or sneezes. When many people are gathered and if there is poor ventilation, these droplets can be inhaled or land in the mouth, nose or eyes of a person close. It can also spread, if a person touches a surface with the virus on it and then touches his or her mouth, nose or eyes.

What are the symptoms of COVID-19

COVID-19 symptoms can be very mild to severe. Even some people have no symptoms. The most common symptoms are fever, cough, and tiredness, shortness of breath, muscle aches, chills, sore throat, headache, chest pain, and loss of taste or smell. This list is not all inclusive. These symptoms may appear two to fourteen days after exposure.

How is COVID-19 diagnosed?

COVID-19 is diagnosed or tested by taking fluid sample from nose or mouth and testing it through a laboratory test. Laboratory testing is important because some people with the coronavirus do not have symptoms at all.

Prevention and control of COVID-19

There are many steps you can take to prevent yourselves from getting the COVID-19 virus and spreading it to others.

- Follow important precautions or instructions:
- keep at least 6 feet (2 meters) of distance between
- yourself and people outside your household.
- avoid crowds and indoor places that have poor ventilation.
- wash your hands often with soap and water for at least 20 seconds, or use an alcohol based hand sanitizer that contains at least 60% alcohol.
- wear a mask in public places, especially when social distancing is difficult.
- cover your mouth and nose with your elbow or a tissue when you cough or sneeze.
- Throw away the used tissue. Wash your hands rightaway.
- avoid touching your eyes, nose and mouth
- clean and disinfect surfaces you often touch on a daily basis.

Vaccine: currently there are different type's vaccines produced by different countries. Examples of these vaccines are AstraZeneca's AZD1222 BioNTech's BNT162 etc. Currently, large number of people in different country including Ethiopia receives these vaccines.

Figure 5.15. Vaccine for corona

If you are suspect COVID-19 or if you are ill withCOVID-19 take the following precautions to avoid spreading the COVID-19 virus:

- stay home from school and public areas, except to get medical care.
- avoid public transportation, taxis and ride-sharing if possible.
- wear a face mask around other people.
- isolate yourself as much as possible from others in your home.
- use a separate bedroom and bathroom if possible.
- avoid sharing dishes, glasses, bedding and other household items.

5.8. 2 Non-infectious diseases

These are disease caused by malnutrition, chemical effect, inherited or genetic factor etc. These diseases are not caused by disease causing organisms. Some of the non-infectious diseases that you have learnt previously in this chapter are:

- diseases caused by malnutrition like Kwashiorkor, Scurvy, night blindness marasmus etc.,
- disease caused by cigarette smoke like lung cancer , Chronic bronchitis etc.
- In addition there are other examples of sickle cell anemia, cancer, allergies, kwashiorkor, marasmus, diabetes, podoconiosis, etc.

5.9 Renowned Nutritionists in Ethiopia

Nutritionists are researchers or scientists who study nutrition.

Activity 5.22: Home work /Individual assignment

Using Internet and books as a source of information write a paragraph on known nutritionists In Ethiopia.

Unit review

- **Nutrition** is the process of taking in food and converting into energy and other vital nutrients required for life. The important function of food in living things: Growth, repair, energy, Replacement of damaged tissues, Protect from diseases.
- **Nutrients** are important chemical substances in food. These important nutrients are:
- **Carbohydrates**: are one type of nutrients which provide energy for the human body. One gram of protein can provide 16 kJ of energy
- **Protein**: Proteins are nutrients used for growth of the body and build a new cell when it is damaged. It is made up of amino acid composed of carbon, hydrogen, oxygen and nitrogen. One gram of protein can provide 17 kJ of energy
- **Lipids (Fats and oil)** another nutrient which provide energy, composed of carbon, hydrogen oxygen. One gram of protein can provide 37 kJ of energy
- **Vitamins**: are nutrients organic substances which are essential in small quantities for human body.
- **Minerals**: Minerals are inorganic substances which are essential in small quantities
- **Water**: Major composition of body fluid
- **Fiber**: help to prevent constipation and keep the colon healthy.
- The diet which contains all of the nutrients in the correct amount and proportion is called a **balanced diet.**
- A **deficiency disease** occurs when a person does not have enough amount of one particular nutrient and suffers health problems as a result. Examples of deficiency diseases are kwashiorkor, marasmus, anemia, rickets and scurvy etc. Malnutrition is caused by under nutrition.
- Obesity is overweight which is caused as a result of an imbalance between the energy in human body and the energy he or she released.
- Substance abuse is using of legal or illegal drugs/ substances in the wrong way or in the excess amount. The three important substances found in cigarette are: tar, carbon monoxide and nicotine.
- Tar is a black sticky substance found in cigarette produce chronic bronchitis and lung cancer Carbon monoxide is a poisonous gas found in cigarette which can produce heart disease and stroke.
- Alcohol gets distributed throughout the body by the help of blood circulation. It is absorbed by liver cells and broken down by liver enzymes, Therefore its concentration in the blood decreases gradually.
- Khat is bushy plant whose leaves are chewed for its stimulant effect. The scientific name of this plant is known as *Catha edulis* plant which is grown in southern Arabia and Eastern Africa, including Ethiopia, Somalia, and Kenya.
- A disease is an illness or disorder of the body or mind that leads to poor health; each disease is associated with a set of signs and symptoms.
- Infectious diseases are diseases that are caused by causative agent organism.
- Non-infectious diseases are not caused by pathogens. They are inherited or genetic diseases and others are deficiency diseases.

Review Questions

I. Choose the correct answer for the following questions.

1. Which of the following nutrient provide more energy?
   a. Protein b. Carbohydrate c. Lipids d. Vitamins
2. Which of the following is not belong to deficiency diseases?
   a. Kwashiorkor b. Diabetes c. Marasmus d. Scurv
3. Which of the following diet is composed of carbon, hydrogen, oxygen and nitrogen?
   a. Carbohydrate b. Lipids c. Protein d. all
4. Which of the following minerals are used to synthesize the hemoglobin of red blood cells?
   a. Iodine b. Calcium c. Iron d. Phosphorus
5. Which of the following group of people needs high amount of balanced diet?
   a. Athletes b. Pregnant women c. Children d. All
6. Which of the following is not the result of obesity?
   a. heart disease b. high blood pressure c. diabetes d. Marasmus
7. Substance abuse is.....
   a. using legal drugs in the wrong way b. using illegal drugs/ in the wrong way
   c. using legal or illegal drugs for medical purpose d. a and b
8. What are the chemicals found in tobacco?
   a. Carbon monoxide b. Nicotine c. Tar d. All
9. What type of drug is alcohol?
   a. Depressant b. Stimulant c. Activator d. all
10. What is the stimulant or psychoactive component found in cannabis....
    a. Tetrahydrocannabinol b. Cathinone c. Nicotein d. Tar

II. Fill in the blank space with appropriate words

1. Tuberculosis is caused by the bacterium called
2. Deficiency disease caused by the shortage of vitamin D is

III. Answer the following questions

1. Discuss the feeding habits that may lead to obesity
2. Examine the effects of smoking, alcohol use and chewing khat, on the health, social, economic, cultural, and psychological wellbeing
3. Explain the modes of transmission and prevention of infectious and non infectious diseases
4. List the components of a balanced diet and give a good source of each one.