Federal Democratic Republic of Ethiopia
Ministry of Health

Non-Communicable Diseases, Emergency Care and Mental Health Part 1 Chronic diseases and emergencies

Blended Learning Module for the Health Extension Programme

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Ministry of Health

The Ethiopian Federal Ministry of Health (FMOH) and the Regional Health Bureaus (RHBs) have developed this innovative Blended Learning Programme in partnership with the HEAT Team from The Open University UK and a range of medical experts and health science specialists within Ethiopia. Together, we are producing 13 Modules to upgrade the theoretical knowledge of the country's 33,000 rural Health Extension Workers to that of Health Extension Practitioners and to train new entrants to the service. Every student learning from these Modules is supported by a Tutor and a series of Practical Training Mentors who deliver the parallel Practical Skills Training Programme. This blended approach to work-place learning ensures that students achieve all the required theoretical and practical competencies while they continue to provide health services for their communities.

These Blended Learning Modules cover the full range of health promotion, disease prevention, basic management and essential treatment protocols to improve and protect the health of rural communities in Ethiopia. A strong focus is on enabling Ethiopia to meet the Millennium Development Goals to reduce maternal mortality by three-quarters and under-5 child mortality by two-thirds by the year 2015. The Modules cover antenatal care, labour and delivery, postnatal care, the integrated management of newborn and childhood illness, communicable diseases (including HIV/AIDS, malaria, TB, leprosy and other common infectious diseases), family planning, adolescent and youth reproductive health, nutrition and food safety, hygiene and environmental health, non-communicable diseases, health education and community mobilisation, and health planning and professional ethics.

In time, all the Modules will be accessible from the Ethiopian Federal Ministry of Health website at **www.moh.gov.et**; online versions will also be available to download from the HEAT (Health Education and Training) website at **www.open.ac.uk/africa/heat** as open educational resources, free to other countries across Africa and anywhere in the world to download and adapt for their own training programmes.

Dr Kesetebirhan Admasu

State Minister of Health

Ethiopian Federal Ministry of Health

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Contents

Continued in Part 2

Introduction to the *Non-Communicable Diseases, Emergency Care and Mental Health* Module

The national health strategy for Ethiopia emphasizes the provision of effective health promotion and disease prevention services at the community level. Substantial progress has been made in recent years in expanding coverage of community health services and reducing infant and child mortality rates in the country. The prevention and control of major communicable diseases, such as HIV/AIDS, tuberculosis and malaria has also received considerable attention and action. The significant progress in tackling the major communicable diseases, however, can potentially be spoiled by the steady rise in the burden of chronic physical and mental diseases within Ethiopia, and elsewhere in the developing world.

As deaths from infection decline and people live longer, so their vulnerability to the chronic non-communicable diseases of old age increases. Chronic conditions such as cardiovascular diseases, diabetes, obstructive lung disease and cancers are on the increase all over the world, but particularly in low- and middle-income countries. For example, more than half of the 8 million deaths from cancers every year and over 80% of the 17 million deaths from heart disease and strokes now occur in developing countries. Also increasing across the world are the numbers of deaths and injuries from traffic accidents and violence: over 90% of the 1.3 million traffic-related deaths and 20-30 million serious injuries from collisions with a vehicle occur in developing countries; the poorer parts of the world are also disproportionately affected by injuries requiring emergency care as a result of other accidents and interpersonal violence. Mental health conditions are also responsible for high levels of mortality and disability, accounting for 8.8% of the deaths and 16.6% of the total burden of disease in low- and middle-income countries.

Taking these trends into consideration, the Ethiopian Federal Ministry of Health has included this Module on *Non-Communicable Diseases, Emergency Care and Mental Health* in the education and training of its Health Extension Practitioners, who provide health promotion and diseases prevention services throughout the rural areas of the country. In addition to addressing chronic conditions such as cardiovascular diseases, diabetes, cancers, and lung disease, Part 1 of this Module also covers oral disease, cataracts and injuries to the eyes and ears, and the provision of first-aid life supportive care for emergencies such as head injuries and abdominal obstruction. Part 2 focuses on the immediate and longer-term effects of common mental health problems such as depression, psychosis, and substance abuse, and the early detection and community support for adults and children whose lives are affected by mental disorders. The aim is to focus equal attention and action to improve the mental health and wellbeing of community members as on sustaining their physical health. The Module ends by discussing community-based rehabilitation of some common physical and mental disabilities. Effective diagnosis, treatment, referral and prevention of all these non-communicable conditions is vital to reducing the death and disability rate, which in turn reduces the burden on the national economy, individuals, families and the local community.

Study Session 1 Cardiovascular Diseases

Introduction

This study session is the first in the Module on *Non-Communicable Diseases, Emergency Care and Mental Health*. Part 1 of the Module describes some important physical diseases and impairments, and the emergency care that you may be called upon to give to someone with a life-threatening condition. Part 2 covers the mental health issues that you may meet in your community. Although this first study session deals with one particular group of physical illnesses (the cardiovascular diseases), it introduces several themes that are shared by all **chronic** (long-term) **conditions**, including diabetes, cancers, lung diseases, visual impairment, deafness and other physical disabilities. As you will see, all of these conditions can affect the patient's mental health.

Cardiovascular diseases are a major problem all over the world, including in developing countries such as Ethiopia. They are in the top three killers in almost every country. In this study session you will learn about cardiovascular diseases, beginning with the function and composition of blood, the anatomy and physiology of the heart and the blood vessels, the pulse, and the blood pressure. We will then describe the major cardiovascular diseases (hypertension and heart failure), and the community approach to decreasing the risks of these conditions. Finally we describe how you can help people with cardiovascular diseases by advising them about their diet.

Learning Outcomes for Study Session 1

When you have studied this session you should be able to:

1.1 Define and use correctly all of the key words printed in **bold**. (SAQs 1.1 and 1.2)

1.2 Briefly describe the function and composition of blood. (SAQ 1.1)

1.3 Describe the basic anatomy and physiology of the heart at a level sufficient to support your understanding of cardiovascular diseases in your community. (SAQ 1.2)

1.4 Know how to measure the pulse and blood pressure. (SAQs 1.3 and 1.4)

1.5 Describe the signs and symptoms of hypertension and heart failure, and the risk factors for these conditions. (SAQs 1.4 and 1.5)

1.6 Describe the management of hypertension and heart failure that you will provide for your community, including supportive care for stress and depression, and recommended diet. (SAQs 1.4 and 1.5)

1.1 Function and composition of blood

We begin this study session by describing the function of blood. The blood is considered by some to be the very essence of life itself. Before modern medicine, blood was viewed as magical. Today, blood still has enormous importance in the practice of medicine. Clinicians examine it more often than any other tissue when trying to determine the cause of a disease or a disorder.

In an adult human, blood accounts for approximately 7–9% of body weight. So for a person weighing 70 kg, some 5 to 6 litres of blood circulate around the body. The blood transports nutrients, oxygen and waste molecules from one place to another within the body.

Every living cell needs a continuous supply of oxygen and nutrients, and a means to remove waste products. Performing these needs is the primary function of the blood.

1.1.1 Blood cells and plasma

The blood cells all have medical names, but in this module we will use the names that will mean more to your clients. But for your own information, the medical name for red blood cells is *erythrocytes* and for white blood cells it is *leukocytes.*

Blood is a fluid comprising red blood cells (see Figure 1.1), several types of white blood cells and small fragments of blood cells called **platelets**, which are involved in the blood clotting process. These cells are all suspended in yellowish or straw-coloured liquid called **plasma.** The **red blood cells** contain a protein called **haemoglobin,** which is red in colour and contains a lot of iron. The haemoglobin picks up oxygen as the blood passes through the lungs and distributes it around the body.

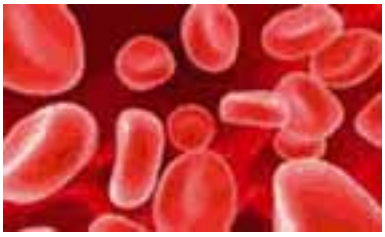

Figure 1.1 Diagram of a group of red blood cells. Notice their unusual shape.

■ What do you think is the main function of the red blood cells?

□ To transport oxygen and deliver it to the body's tissues. It is the haemoglobin in the red blood cells that plays a central role in delivering oxygen to the tissues of the body.

White blood cells are cells of the immune system involved in defending the body against infectious diseases. The number of white blood cells increases whenever someone is infected by disease-causing bacteria or viruses; the increase in number shows how seriously the disease is being fought against by the white blood cells.

The number of red blood cells and white blood cells and the concentration of haemoglobin is an important indicator of a person's health. The levels can be determined from a blood sample analysed at the higher health facilities, including counting the cells by looking at them with a microscope. Table 1.1 shows the typical values for a healthy person.

Table 1.1 Blood analysis data.

Blood component	Healthy values
Red blood cells	Male 4.3–5.9 × 10^{12}/litre Female 3.5–5 × 10^{12}/litre Or approximately 300 to 600 million red blood cells in every 1 ml of blood plasma
White blood cells	3.8–9.8 × 10^{9}/litre Or approximately 400 to 1,000 million white blood cells in every 1 ml of blood plasma
Haemoglobin	Male 13.8–17.5g/decilitre Female 12.1–15.3g/decilitre Every 1 ml of blood contains between 1–2 grams of haemoglobin

10^{12} is a mathematical abbreviation for 1,000,000,000,000.

One decilitre is one-tenth of a litre (the same as 100 ml).

1.2 Anatomy and physiology of the heart

The heart is the source of power, the pump that drives blood through the network of blood vessels throughout the body. Together the heart and blood vessels form the **cardiovascular system**. In fact, the heart consists of two pumps that serve two separate systems of blood vessels: the **pulmonary circulation**, which goes through the lungs, and the **systemic circulation**, which goes through the rest of the body (see Figure 1.2).

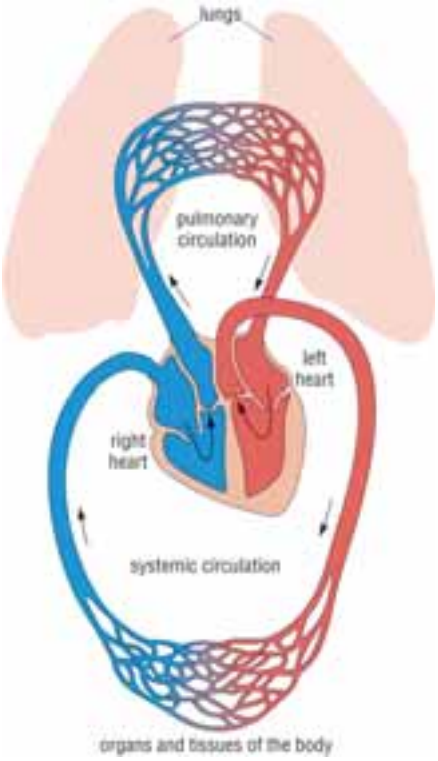

Figure 1.2 The pulmonary circulation to the lungs and the systemic circulation to the rest of the body.

1.2.1 The circulation of blood

The heart is a large four-chambered muscular bag on the left side of the chest. In order to appreciate how the heart works, remind yourself of the primary function of the cardiovascular system: to deliver oxygen and nutrients and to remove carbon dioxide and other waste products. When you breathe in, the lungs are filled with air, of which about 21% is oxygen. To collect this oxygen, the blood has to be pumped through the lungs by the heart.

Oxygenated blood (blood rich in oxygen) from the lungs, which is bright red because oxygen has bound to the haemoglobin, returns to the heart and is then pumped around the body to supply the tissues. Blood returning from the body to the heart is rich in waste products such as carbon dioxide and is short of oxygen. This oxygen-depleted blood (dark red in colour) is termed **deoxygenated blood** and is pumped through the lungs again to release carbon dioxide and, of course, to collect more oxygen.

The design of the heart and associated blood vessels ensures that blood going to the lungs is kept separate from that going around the body. The heart prevents the mixing of oxygenated blood with deoxygenated blood by using two separate but parallel circuits of blood vessels: the pulmonary circulation and the systemic circulation.

Because of its four-chamber design, the heart can serve both circuits at once, using its two pumps to simultaneously push blood from one circuit through one half of its structure and blood from the other circuit through its other half (see Figure 1.3).

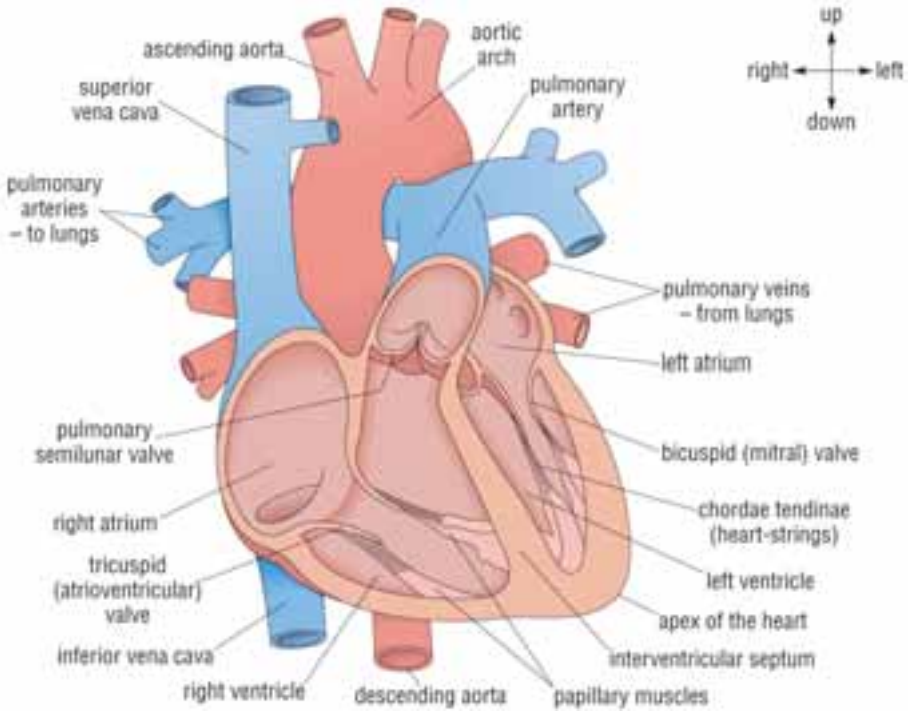

Figure 1.3 Anatomy of the heart.

The muscular part of a heart is called the **myocardium** ('myo-' means 'muscle' and '-cardium' means 'of the heart'). The heart muscles are very special because they keep beating (contracting and relaxing) spontaneously throughout our whole lives without any conscious decision from us to make them beat.

As you can see from Figure 1.3, the heart is shown in cross-section, illustrating the position of the atria, ventricles and major veins and arteries. The left and right sides of the heart are separated by a muscular wall (called the *septum*), and each side is divided into a small chamber, the **atrium** (plural, atria), and a larger chamber, the **ventricle** (plural, ventricles). The atria are connected to the ventricles via a valve that ensures a one-way flow of blood. Deoxygenated blood returns from the body through two main 'great' veins, the **inferior** and **superior vena cava** (superior means 'at the top' and inferior means 'at the bottom' as you can see from their positions in Figure 1.3).

The atrium is a thin-walled chamber that expands with little resistance as the blood enters. Blood from the right atrium flows down into the right ventricle, through the tricuspid valve. You can imagine the valve operating in a manner similar to a swing door that only opens in one direction. When blood enters the right atrium, the valve opens and blood flows into the right ventricle. When the ventricles contract, the back pressure of the blood forces the valve to close to prevent any backflow of blood into the atria.

1.2.2 The heartbeat

What is a heartbeat? In the previous section we have been using the terms pumping, beating and contracting of the heart. You have learnt also that the heart is a muscular organ which beats all the time in our life. If you want to hear how your own heart beats you could use your stethoscope, or place your ear against the left side of someone else's chest around the nipple on the left side in men and under the left breast in women. The heart has got a special property to beat in a coordinated manner, and a normal heart beats between 60–80 beats per minute.

1.2.3 The blood vessels

There are five types of blood vessels (see Figure 1.4):

1 **Artery** (plural arteries) is subjected to higher blood pressure than any other vessels and the blood flow in them 'pulses', meaning that the blood pressure and the rate of blood flow vary with the pumping action of the heart. Arteries have layers of muscular and elastic tissue in their walls, which allows the vessels to expand with the contraction of the heart, and contract again as the heart refills with blood.

2 Arterioles are smaller vessels that distribute the blood into the network of capillaries (capillary beds). They too have layers of muscle in their walls; this is very important, because it controls how much blood goes into the capillaries.

3 **Capillaries** are the smallest blood vessels in the body, having an internal diameter hardly larger than the diameter of a single red blood cell.

4 Venules collect blood from the capillary networks. The blood pressure in these vessels is low, and they do not pulse.

5 **Veins** are the larger collecting vessels. They may run deep in tissues such as muscles, or superficially, just beneath the skin. Veins have valves to prevent the blood from running backwards or pooling.

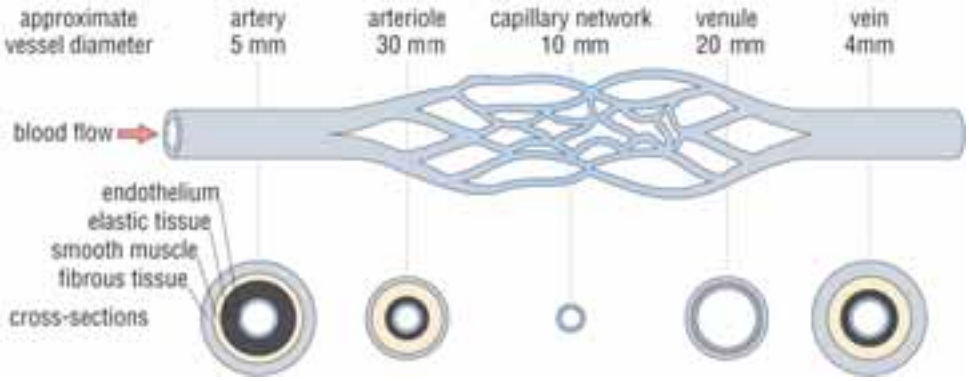

Figure 1.4 Diagrams of the different types of blood vessels.

1.2.4 The pulse

The pulse is a pressure wave of the heart that travels along the arteries and arterioles every time the left ventricle contracts and forces blood out. It can be felt where an artery can be pressed against a bone. You can do this most easily by feeling the big artery on the left or right side of the neck, or the artery in the wrist (see Figure 1.5). The pulse rate measured at the wrist is about 60 to 80 beats per minute. If the pulse rate is less than 60 beats/minute, the pulse is considered to be 'slow', and if it is more than 80 beats/minutes it is considered to be a fast pulse.

Figure 1.5 Pressure points where you can feel the pulse.

1.2.5 Blood pressure (BP)

Figure 1.6 A healthworker measuring blood pressure. (Photo: Basiro Davey)

Blood pressure (BP) refers to how hard the blood is pushing on the major blood vessels as it is pumped around the body by the heart. It is measured in millimetres (mm) of mercury (a liquid silver metal, which has the chemical symbol Hg), so blood pressure measurements are expressed as a number followed by mmHg. The technique of measuring blood pressure (Figure 1.6) was described first in the *Antenatal Care* Module, Study Session 9, and you have learned it in your practical skills training. Figure 1.7 reminds you how to measure the blood pressure at two points in time: when the heart contracts and when it relaxes.

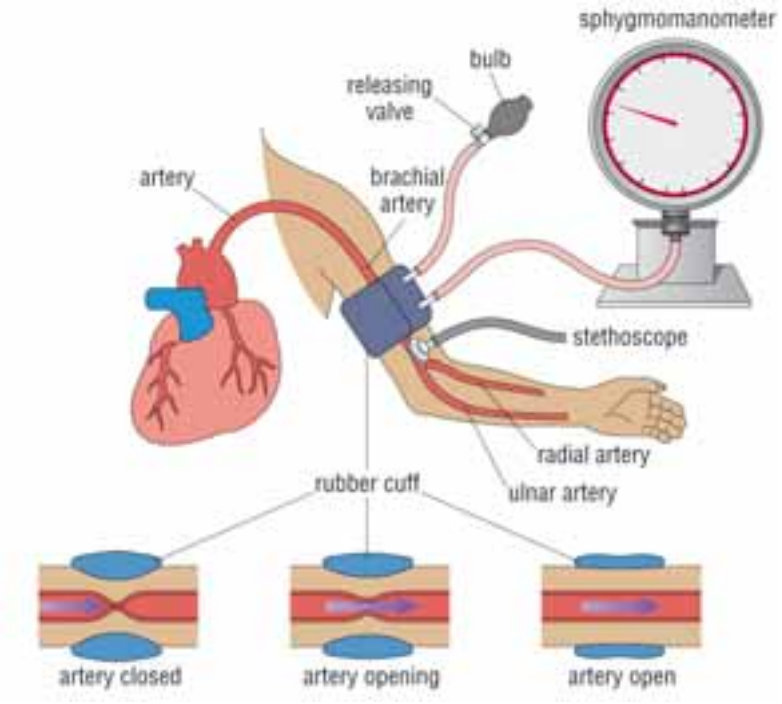

Figure 1.7 The pressure in the cuff is increased until the blood flow stops, and then the flow gradually returns as the cuff is slowly deflated. This enables you to measure the blood pressure when the artery is closed by pressure from the cuff, and when the artery is fully open.

A blood pressure measurement is two numbers written one above the other. The top number tells you the **systolic pressure**, which is the pressure at the moment the heart beats and pushes blood into the body. The bottom number tells you the **diastolic pressure** when the heart relaxes between each beat so it can refill with blood. Healthy blood pressure stays at or above 90/60 mmHg, but should not reach as high as 140/90 mmHg.

1.3 What are cardiovascular diseases (CVDs)?

Cardiovascular diseases (CVDs) are major health problems all over the world. They are a group of diseases that involve the heart and the blood vessels (arteries and veins).

If there is an interruption of blood supply due to diseases of the vessels taking blood to the heart, the heart might be seriously damaged due to lack of oxygen and nutrients to fuel its muscular contractions. Medically this damage is referred to as a **heart attack**. If the same type of situation happens in the brain, and lack of oxygen disrupts the normal function of the brain, this is referred to as a **stroke**.

Heart attacks and strokes are usually **acute** life-threatening events ('acute' means they start suddenly and rapidly get worse). They are mainly caused by a blockage that prevents blood from flowing to parts of the heart or brain, which are seriously damaged by the lack of oxygen. The most common reason for the blockage is a build-up of fatty deposits (called *plaques*) on the inner walls of the blood vessels that supply the heart or brain. Strokes can also be caused by bleeding from a blood vessel in the brain or from blood clots blocking an artery.

1.3.1 What are the risk factors for cardiovascular diseases?

The most important risk factors for heart disease and stroke are unhealthy diet, physical inactivity and tobacco use. These are called **behavioural risk factors** because they are due to people's behaviour; these factors are responsible for about 80% of cardiovascular diseases.

The effects of unhealthy diet and physical inactivity may show up in individuals as raised blood pressure, raised blood glucose, raised blood fats (lipids), and being overweight or obese – all of which make a heart attack or stroke more likely.

- Can you explain why?

- High fat, high sugar diets, being overweight and obesity lead to the build up of the fatty deposits (plaques) inside blood vessels that eventually block them, causing a heart attack or stroke.

Unhealthy diet is one direct cause of CVDs but there are also indirect reasons why people might be unable to eat healthily, or avoid stress and other direct causes of CVDs. These are the social, economic and cultural conditions of people's lives, especially poverty and stress.

As a Health Extension Practitioner you should advise your community members to engage in regular physical activity, avoid tobacco use, choose a diet rich in fruit and vegetables and avoiding foods that are high in fat, sugar and salt, and maintain a healthy body weight. You might say that rural people exercise all the time in the fields and fetching water; their diet has very little fat or sugar, and they are usually thin. So why are they at risk of heart disease? The reason is *stress* factors in the lives of people who have few resources. And if rural people move into towns, the other risk factors for CVDs increase.

1.3.2 Heart failure

Heart failure is when the heart cannot pump efficiently and is unable to generate sufficient blood flow to meet the demands of the body for oxygen and nutrients, either at rest or during exercise.

Acute heart failure occurs rapidly, typically as a result of heart attack. Chronic heart failure occurs more slowly, building up through time due to disease of the heart or blood vessels leading from the heart.

Symptoms of heart failure

A person with heart failure is usually short of breath even when sitting still; they breathe faster than normal and may 'gasp' for breath if they do anything that requires strength or movement. They often cannot sleep without using many pillows because, if they lie down, the blood that cannot be pumped away from the heart collects in the vessels in the chest, which makes them even more breathless. They also complain of tiredness and weakness.

If you come across a person with the symptoms of heart failure, refer him or her to the nearest health centre as soon as possible.

■ Can you suggest why people with heart failure gasp for breath and feel tired and weak?

□ The weak heart cannot supply the body with the oxygen it needs, so the person breathes quickly to try to suck more oxygen into their lungs. They feel tired and weak because there isn't enough oxygen or nutrients being pumped around the body.

1.3.3 Hypertension (high blood pressure)

High blood pressure is medically known as **hypertension**. There are many causes of hypertension, including kidney diseases, narrowing of the aorta (the biggest artery leaving the heart), diabetes, the excessive use of alcohol and some medical drugs. However, in most cases of hypertension the cause remains unknown and this is called *essential* hypertension.

■ Can you name any other causes of hypertension from a previous Module?

□ Pre-eclampsia and eclampsia were described in the *Antenatal Care* Module.

Risk factors for hypertension

Having a high level of fat (cholesterol) in the blood, old age, poor nutrition, being overweight or obese, excessive alcohol intake, diabetes, taking oral contraceptive pills for many years, being physically inactive and, most importantly, being a cigarette smoker – are all risk factors for hypertension. Most of these factors are preventable by teaching the community to change their behaviour to healthier ways.

■ What could a person *stop* doing in order to reduce their risk of developing hypertension?

□ He or she could stop smoking cigarettes, stop over-eating and drinking excessive amounts of alcohol, and (for women) stop taking oral contraceptive pills and change to another method of birth control after a few years.

■ What could a person *start* doing in order to reduce the risk?

□ He or she could start eating a healthier diet, start losing weight if already obese, and start taking more exercise.

Signs and symptoms of hypertension

A person with hypertension might come to you with complaints of headaches, blurring of vision, chest pain, nose bleeds and restlessness. You should measure their blood pressure to see if it is high. Refer to Table 1.2 to see the normal and abnormal blood pressure values.

In your Health Post you are supposed routinely to check the blood pressure of your clients, using the blood pressure apparatus supplied to you. Whenever the systolic pressure is greater than 140 mmHg and the diastolic pressure is greater than 90 mmHg, it is advisable to refer the person to the nearest health centre for further evaluation. See Table 1.2 to determine the category of hypertension.

Table 1.2 Blood pressure levels for adults

Category	**Systolic (mmHg)**	**Diastolic (mmHg)**	**Advice**
Normal	Less than 120	Less than 80	None
Pre-hypertension (before hypertension starts)	120–139	80–89	You should advise people with hypertension to make changes in what they eat and drink, to be physically active, and lose extra weight. If your client also has diabetes, refer him or her.
Hypertension	140 or higher	90 or higher	This person has high blood pressure. Refer him or her to a higher health facility.

1.4 Community approaches to decrease the risk of cardiovascular diseases

In the community you are working in, the risk of CVDs could be reduced by advising people to reduce the salt intake in their diet, since excessive salt could cause hypertension. They should also avoid or stop smoking.

1.4.1 Action by individuals

People should also be advised to minimise the stress in their lives for three reasons. Firstly, stress is often associated with an increase in health-damaging behaviours. It is possible that people under stress might smoke more, drink more alcohol, chew *khat*, indulge in comfort eating and neglect any potentially protective physical activity – all of which increase their risk of developing a CVD. Secondly, there may be direct links between physiological changes that are associated with stress, such as the release of certain hormones – adrenalin and corticosteroids, for example – that might directly affect the heart as the arteries that bring oxygen to the heart muscle. Thirdly, people under stress might neglect to seek appropriate medical attention. Understanding the above will help you in resolving your clients' cardiovascular problems.

1.4.2 Action at national and community level

In prevention of cardiovascular diseases, the habits of people within a population can, to some extent, be controlled by the actions of their government. The best example of this, particularly in relation to cardiovascular diseases, is the way in which various governments attempt tobacco control.

The most common types of government activity are through the use of taxation, by banning smoking in public places, by banning tobacco advertising and by choosing to finance health education campaigns. As a community health worker you should think of a project within your *kebele* to promote smoking reduction and decrease salt intake.

1.4.3 Dietary approach to stop hypertension (DASH)

An important approach to reducing hypertension is called DASH – Dietary Approach to Stop Hypertension. It advises people that high blood pressure can be controlled if you take the following steps:

- Maintain a healthy weight.
- Be moderately physically active on most days of the week.
- Follow a healthy eating plan, which includes foods lower in salt.
- If you drink alcoholic beverages, do so in moderation.
- If you have high blood pressure and are prescribed medication, take it as directed.

1.5 Mental health and chronic illness

When you are caring for somebody who has a chronic (long-term) life-threatening non-communicable disease, such as a cardiovascular disease, it is also important to think about their mental health. You will learn about mental health and mental illness in detail in Part 2 of this Module. However, you may not have thought about the stress experienced by a person who is living with a CVD, or another chronic illness, such as diabetes, cancer, a chronic respiratory disease, or a disability such as blindness, deafness or physical paralysis. Having one of these conditions is stressful for patients and their families, and their mental health can suffer. You should bear in mind that:

- People with a chronic illness may become sad or depressed about their condition. This can sometimes develop into a mental health problem, e.g. deep depression and suicidal thoughts, especially if they are in pain or their normal life is severely impaired by their illness.
- On the other hand, people with a severe mental illness are at increased risk of developing cardiovascular diseases or diabetes due to the stressful nature of their disordered mental state.
- Undetected and untreated depression can make chronic illness worse:
    - Depression can interfere with a person taking their medication correctly and making important lifestyle changes, like improving their diet.
    - Partly as a result of this, when depression AND chronic illness are present together, patients will be more impaired, they will not respond so well to treatment, and they may be at greater risk of dying from their chronic illness.

Therefore, detecting and treating depression and other mental health complications of chronic illness can improve the quality and the quantity of life for people with CVDs and other chronic illnesses.

In conclusion

Now that you know a lot about cardiovascular diseases, we can move on in the next session to teach you about diabetes. Dietary approaches to prevention are very similar in both conditions and diabetes is a risk factor for cardiovascular diseases, so the two are interrelated. Mental health problems can also result from the stress of managing diabetes.

Summary of Study Session 1

In Study Session 1, you have learned that:

1 Cardiovascular diseases are a major cause of death and morbidity all over the world.

2 Blood transports oxygen, nutrients and other substances such as hormones around the body to where they are needed, and it removes waste products, including carbon dioxide.

3 Blood consists of a liquid called plasma, containing suspended red blood cells, which carry oxygen attached to haemoglobin; white blood cells, which fight infection; and platelets, which help in blood clotting.

4 The heart and blood vessels (arteries, arterioles, capillaries, venules and veins) form the cardiovascular system.

5 The heart pumps blood around the pulmonary circulation through the lungs (collecting oxygen and releasing carbon dioxide in the breath), and around the systemic circulation through the rest of the body. It has four chambers, which separate the oxygenated blood returning from the lungs and the deoxygenated blood returning from the rest of the body.

6 The pulse refers to the pressure wave that travels along the arteries and arterioles every time the left ventricle of the heart contracts; measuring the pulse rate in the major arteries can be an indicator of an abnormal heartbeat.

7 Blood pressure measurements produce two numbers: the systolic pressure measured when the heart contracts and the diastolic pressure measured when the heart relaxes. The measurement is in mmHg.

8 Cardiovascular diseases include heart attack, when diseased blood vessels serving the heart muscle starve it of oxygen and nutrients; stroke, when lack of oxygen reaching the brain causes brain damage; heart failure, when the heart cannot pump efficiently; and hypertension (high blood pressure).

9 The risk factors for cardiovascular diseases include being overweight, old age, poor nutrition, smoking, lack of exercise and excessive alcohol intake.

10 Community approaches to reducing the risk of cardiovascular diseases include supporting people to lose weight, live a less stressful lifestyle and give up smoking, for example by using DASH – the dietary approach to stop hypertension. Reducing salt intake also helps to reduce hypertension.

11 Chronic illnesses such as CVDs increase the risk of patients developing mental health problems; and people with mental health problems have a greater risk of developing a CVD or other chronic, non-communicable disease.

Self Assessment Questions (SAQs) for Study Session 1

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 1.1 (tests Learning Outcomes 1.1 and 1.2)

Which of the following statements is *false?* In each case, say what is incorrect.

A In an adult human, blood accounts for approximately 7–9% of total body weight.
B A person weighing 70 kg has got 10–15 litres of blood circulating around the body.
C The primary function of the blood is to transport oxygen nutrients and as a means to remove waste products from the tissues.
D Red blood cells contain a protein called haemoglobin, which is red in colour and contains a lot of iron.
E Haemoglobin picks up oxygen as it passes through the heart and distributes it around the body in the blood.

SAQ 1.2 (tests Learning Outcomes 1.1 and 1.3)

Look back at Figures 1.2 and 1.3. What would happen if there was a hole in the wall that separates the two ventricles of the heart? How would this affect a baby born with such a hole in its heart? (This sometimes happens.)

SAQ 1.3 (tests Learning Outcome 1.4)

Where can you feel the pulse most easily in an adult? Write down the normal ranges of pulse and blood pressure in a healthy resting adult.

SAQ 1.4 (tests Learning Outcomes 1.4, 1.5 and 1.6)

Read Case Study 1.1 and then answer the questions that follow it.

Case Study 1.1 Mr Tilahun's story

Mr Tilahun is a 60-year-old farmer who asked you to visit him because he has begun to feel very breathless, even when he is lying in bed at night. He also feels tired and weak all the time. He was taking medication for hypertension for the past several years, but he used his last tablets three weeks ago and has not been to the health centre to get more.

(a) What do you check first when you see Mr Tilahun?
(b) What do you think is the most likely cause of his symptoms?
(c) What measures would be appropriate for good management of his condition?

SAQ 1.5 (tests Learning Outcomes 1.5 and 1.6)

Read the following case study and then answer the question at the end:

Case Study 1.2 Mrs Yared's story

Mrs Yared is a Health Extension Practitioner in a rural community. She notices that a lot of older people are having raised blood pressure when she gives them a health check.

- What health education messages should she give to help to reduce the risk of cardiovascular diseases in her community?

Study Session 2 Diabetes Mellitus

Introduction

Diabetes is currently becoming a common problem in developing countries like Ethiopia, at a time when the burden of diabetes is rising very quickly in wealthier countries. **Chronic diseases** such as diabetes, heart disease, cancers and chronic respiratory diseases are by far the leading causes of mortality in the world, representing 60% of all deaths.

Chronic diseases are those that develop slowly, get progressively worse unless they are treated effectively, and cause long-term health problems.

In this study session you will learn about diabetes, the parts of the body involved, and the signs and symptoms that will allow you to recognise if someone in your community is suffering from the disease. You will also learn how to recognise the different types of diabetes and their risk factors, as well as how to educate the community to reduce these risks.

Learning Outcomes for Study Session 2

When you have studied this session, you should be able to:

2.1 Define and use correctly all of the key words printed in **bold**. (SAQs 2.1, 2.2, 2.3, 2.6 and 2.7)

2.2 Describe how the pancreas, liver and muscles, and the hormones insulin and glucagon, are involved in regulating blood glucose levels. (SAQs 2.1, 2.2 and 2.5)

2.3 List the signs and symptoms of diabetes and distinguish between Type 1, Type 2 and gestational diabetes. (SAQs 2.1 and 2.3)

2.4 Describe the test that you would do to confirm a diagnosis of diabetes. (SAQ 2.4)

2.5 List the risk factors for diabetes. (SAQs 2.5 and 2.7)

2.6 Explain how to interpret the Body Mass Index (BMI) and its significance for diabetes. (SAQ 2.6)

2.7 Describe the basic features of diabetic self-care and a suitable diet for someone with diabetes. (SAQs 2.1, 2.5 and 2.7)

2.1 What is diabetes mellitus?

Diabetes mellitus is a condition in which the level of **glucose** (the simplest type of sugar) in the blood is poorly controlled, so that sometimes it rises too high and at other times it falls too low. Both these extremes can have serious consequence, for the diabetic person. Later in this study session we will explain how glucose is normally regulated and how it goes wrong in diabetes. People with diabetes mellitus are usually very thirsty, so they drink a lot of fluids and as a consequence they produce large amounts of urine. There is another type of diabetes, called *diabetes insipidus*, but it is very rare. Diabetes insipidus shares the name 'diabetes' because it also results in the production of large quantities of urine, but this has nothing to do with how the body manages glucose. This study session will focus only on diabetes mellitus, and from this point that is what we mean when we mention 'diabetes'.

Diabetes mellitus has been known for thousands of years, having been described by the Ancient Egyptians and the Romans. The word 'mellitus' comes from the Latin word for 'honeyed' – meaning 'sweet'.

Diabetes mellitus, therefore, describes a condition that produces 'sweet urine' (Figure 2.1). This production of sweet urine occurs as a result of a high glucose level in the blood, which results in glucose leaking into the urine when the kidneys filter the blood to remove impurities.

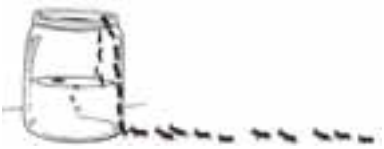

Figure 2.1 Ants are attracted to sugar in the urine of someone with diabetes.

■ Describe a simple way to test urine or a sign of diabetes.

□ Anyone can test their own urine by urinating into a clean container like a pot or a cup, and leaving the container outside. If ants climb into the container (Figure 2.1), there is probably sugar in the urine. (Did you remember this from your study of the *Antenatal Care* Module? It was in Study Session 9, Figure 9.14).

2.2 How the body regulates blood glucose levels

Understanding how the body controls and uses glucose in a normally healthy person will help you to understand what happens when diabetes develops. First we will briefly introduce the main cells, tissues and hormones involved in glucose regulation.

2.2.1 Hormones in glucose regulation

10 ml is called a 'decilitre' (dcl); blood glucose levels are usually expressed in mg/dcl of blood.

The main role of glucose in the body is like fuel in a car: glucose is a source of energy in human beings. When you are in good health the body controls the level of blood glucose and doesn't allow this to become very high or very low. The normal range is 75–115 mg (milligrams) of glucose in every 10 ml of blood. Glucose control is due to the action of hormones.

Hormones are signalling substances produced by collections of cells, called **endocrine glands**, which release their hormones into the blood. **Cells** are the tiny building blocks of the body, which can only be seen through a microscope. In the human body there are many different types of cell doing many different tasks. Hormones are carried around the body in the blood and on that journey they interact with whichever 'target tissue' is receptive to their signals. There are many different hormones acting throughout the body. *Insulin* and *glucagon* are the two most important hormones involved in the control of blood glucose levels. Other examples of hormones that you encountered in the *Antenatal Care* Module are the male and female reproductive hormones: testosterone, progesterone and oestrogen.

2.2.2 The pancreas

The pancreas is a 'leaf-shaped' organ found deep inside the abdomen. The **abdomen** is the part of the body between the chest and pelvis. The abdomen contains such organs as the stomach, liver, spleen, pancreas, intestines and other structures (see Figure 2.2).

Alpha and beta are the first two letters in the Greek alphabet; they can also be written as the Greek symbols α and β.

The pancreas has a short connecting tube (the pancreatic duct, see Figure 2.3), which opens into the small intestine so that pancreatic juices can help with the process of digestion (as you learned in the *Nutrition* Module). Specialised cells in a part of the pancreas called the islets of Langerhans (after its discoverer) produce the hormones insulin and glucagon. The beta cells produce insulin and the alpha cells produce glucagon. When the body is healthy these two hormones help to keep the amount of glucose in the blood at the right level. If the pancreas is severely damaged or removed by operation, the production of insulin and glucagon will stop and diabetes will result.

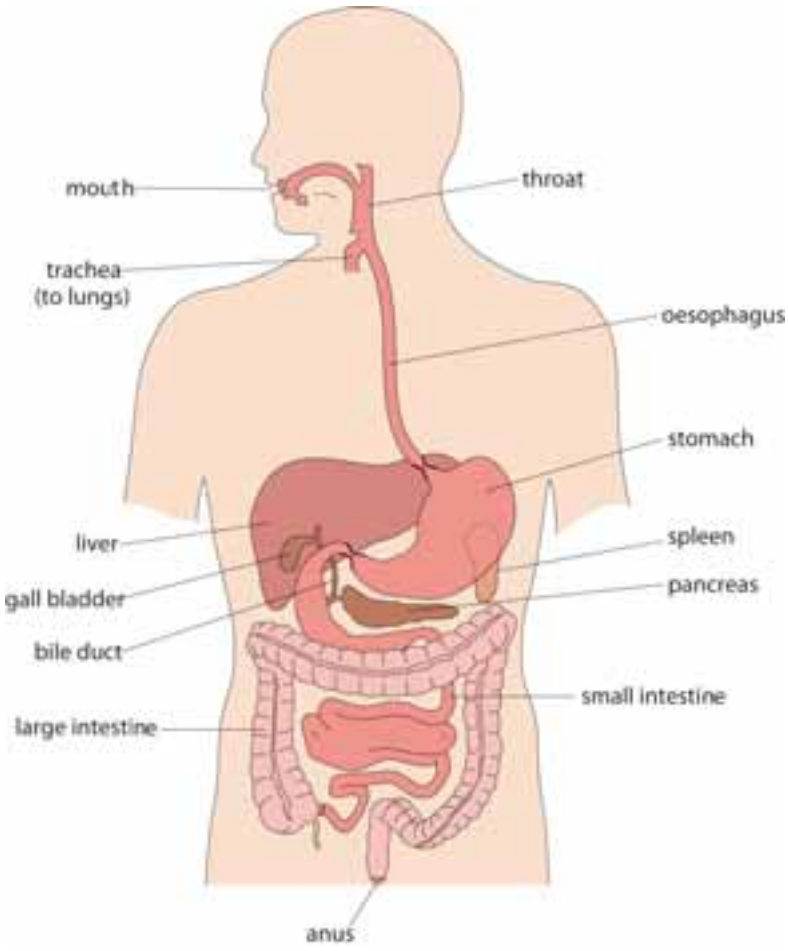

Figure 2.2 The **digestive tract** (or **gastrointestinal system**) is the tube-like passage from the mouth, through the stomach and intestines to the anus, together with the organs that connect with it (e.g. the liver and pancreas). (Source: The Open University, 2006, *Living with Diabetes*, Figure 2.1)

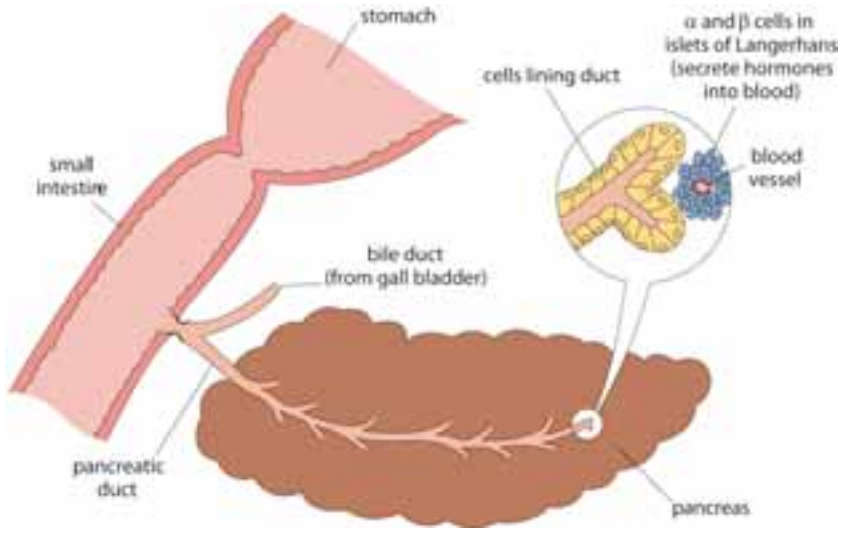

Figure 2.3 Cells in the islets of Langerhans in the pancreas produce insulin and glucagon. (Source: The Open University, 2006, *Living with Diabetes*, Figure 2.2)

2.2.3 Insulin and its role in glucose regulation

Insulin has many functions, but its main role is to help glucose enter into the body's cells, so they can use it as a fuel for all the processes that need energy. The pancreas releases insulin into the blood when we eat a meal.

■ Can you suggest why this timing is important?

□ As we digest our food, the level of glucose in the blood rises as it is absorbed from the intestines. It makes sense for insulin levels also to rise in response to the increase in blood glucose.

Insulin not only enables glucose to be transported into the cells that need it as a source of fuel, and it also prevents the glucose level in the blood from rising too high when we eat a sugary meal. It acts on the liver, muscles and body fat, stimulating them to take up *excess* glucose and store it, and it stops stored glucose from being released from these tissues when the level in the blood is already too high.

■ Between meals and overnight the insulin level in the blood falls. If this did not happen, what would be the effect on the blood glucose level, and why?

□ It would become too low, because insulin would go on stimulating the body's cells to take up glucose from the blood and to store it in the liver, muscles and body fat.

So, adjustments in the amount of insulin released by the pancreas regulate the blood glucose level to stay within the tight range that the body needs to function normally. In a person with diabetes mellitus, problems in insulin production result in poor regulation of blood glucose, with serious effects, as you will see later in this study session.

2.2.4 Glucagon

The action of the hormone glucagon works in the opposite direction to insulin. **Glucagon** causes the blood glucose level to *rise* if it has fallen too low. It does this by stimulating the liver, muscles and body fat to release their stored glucose back into the blood.

You may wonder why the body needs a hormone to increase glucose levels. Besides regulating the blood glucose level so that it does not rise too high, the body also needs to be protected from glucose levels that are too low. The brain does not function properly if glucose levels in the blood drop even a small amount below normal, and if they drop further still the person becomes confused and eventually becomes unconscious. Brain damage and eventually death results if the brain is starved of glucose for a long period.

2.3 Digestion of the main food groups

The glucose in the blood is one of the most important breakdown products from a wide range of the foods we eat in our diet. In this section, we briefly summarise the significant points about digestion and the main food groups, so you understand how to counsel a person with diabetes about selecting a suitable diet for their condition. The main food groups are:

- **Proteins** such as meat, fish, egg yolk and soya products
- **Fats** such as butter and oil, and within foods such as cheese, cream and fatty meat

- **Carbohydrates** such as *injera*, bread, potatoes, rice and cereals, as well as within sugary foods and drinks
- **Vitamins and minerals** (such as vitamin A and iron) are found in many foods, especially in fruits and vegetables.

The foods that we eat are broken down as they pass through the digestive tract (look back at Figure 2.1) by chemicals known as enzymes. **Enzymes** are chemical substances produced by cells in the body, which cause a particular chemical reaction to happen while not being changed themselves. They are particularly important in digestion. The enzymes that are released into the stomach and intestines cause the breakdown of food into the tiny molecules of which it is constructed.

Figure 2.4 summarises the digestion of the main food groups by digestive enzymes. Notice that they break down proteins into *amino acids*, carbohydrates into *glucose*, and fats into *fatty acids*. These smaller components can then be absorbed through the wall of the small intestine and transported in the blood to various parts of the body to provide energy. The level of glucose in the blood is altered by what and how much we eat.

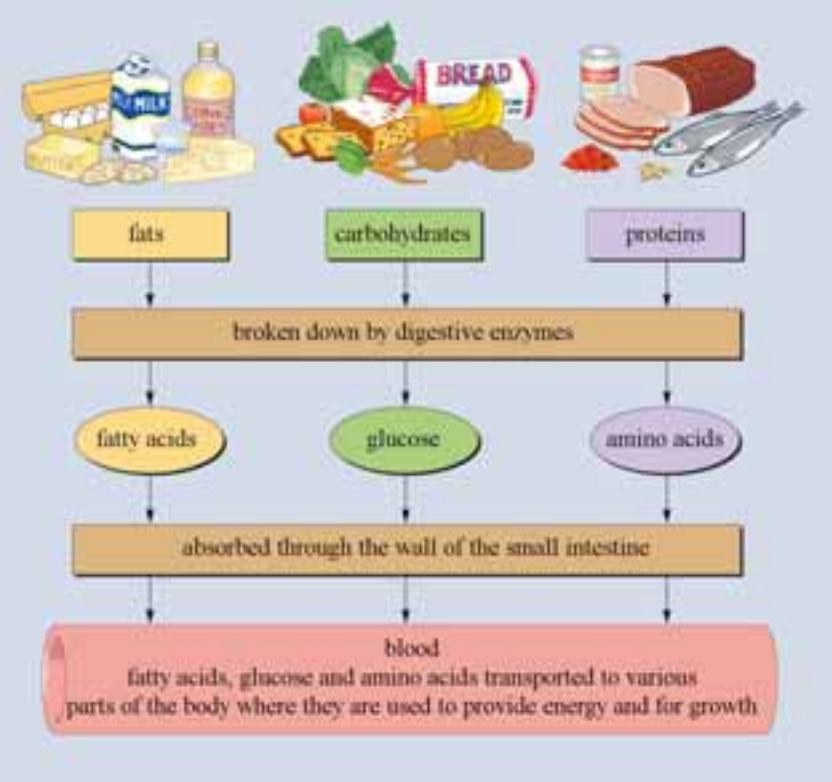

Figure 2.4 Diagram showing how food is broken down into smaller units and then absorbed through the wall of the small intestine and into the blood. (Source: The Open University, 2006, *Living with Diabetes*, Figure 2.3)

■ Which food item do you think will result in more glucose in the digestive tract: a carbohydrate-rich meal or a protein-rich meal?

□ If you eat a meal that is mainly carbohydrate, your digestion will produce more glucose.

Next we will discuss the importance of the liver and muscles in controlling blood glucose levels.

2.3.1 The liver in glucose regulation

The liver is a large and important organ, with many functions, which lies across the top and towards the right of the abdomen (look back at Figure 2.2). As you already know, it is important in helping to control glucose levels, by storing excess glucose and releasing it back into the blood when the level falls too low. Insulin stimulates the liver to take up glucose and change it into **glycogen**, a substance made of chains of glucose units stuck together. You can think of glycogen as a storage form of glucose.

If there is plenty of glucose in the blood, the body makes glycogen to use later, at times when glucose is scarce. For example, to keep the blood glucose level constant in the body overnight (when one is not eating), the liver slowly releases glucose from its glycogen stores. After a meal when there is plenty of glucose in the blood, the liver stores glucose as glycogen again. Similarly, when you exercise and need additional fuel, the liver can slowly release glucose to provide energy.

2.3.2 The muscles in glucose regulation

There are different sorts of muscles in the body and they have different functions. **Skeletal muscles** are the ones used for movement, for example in your arms and legs. The *involuntary muscles* are the ones over which we have no conscious control, for example the muscles in the walls of the stomach and intestines that move food through the digestive tract.

Like the liver, skeletal muscles store glucose as glycogen and are able to use glucose as a fuel. Insulin stimulates muscles to take up glucose. When the muscles are active (for example, while exercising), the absorbed glucose is used to fuel muscular activity.

2.3.3 Fats and diabetes

Fats in the body have an important role in diabetes. Being overweight or obese increases the health risk for people who are already diabetic, and it is a significant risk for developing diabetes in later life. We say more about this later. The breakdown of fats in the body as an alternative source of fuel to glucose is more likely to occur in people with diabetes, because their cells cannot take up glucose easily when insulin levels are low. When fats are broken down to be used as fuel, one of the side-effects is the production of small molecules called *ketones*. They can build up to dangerously high levels in a person with diabetes, making the blood too acid (the condition is called *ketoacidosis*), and the person's breath has a distinctive 'fruity' smell.

Ketoacidosis is pronounced 'kee-toh-assid-oh-siss'.

2.4 Symptoms and signs of diabetes

A person who has untreated diabetes is likely to complain of symptoms like feeling thirsty all the time, drinking a lot of water and passing large amounts of urine, weight loss (some patients describe a feeling of emptiness in the stomach and wanting to eat frequently), and tiredness. The person may report that at times they have felt faint or dizzy and may even have 'blacked out' (become unconscious). This can happen if the blood glucose levels fall too low to support normal brain function.

If you detect sugar in a person's urine you should suspect diabetes and refer them to the nearest higher level health facility.

If you do a urine dipstick test and find evidence of sugar, this is a strong sign of diabetes because some of the excess glucose in the blood is filtered out by the kidneys and passes into the urine.

- Can you suggest another sign of diabetes, which you might be able to detect on the breath of a diabetic person?

- When the level of ketones rises in the blood of a person with diabetes, their breath has a distinctive 'fruity' smell.

Another sign of uncontrolled diabetes that has gone on for a long time is numbness in the fingers and toes, or gradual loss of vision. This is because persistently high levels of glucose damage the delicate blood vessels (capillaries) serving the extremities and the eyes, so they become starved of oxygen and nutrients and can no longer function normally.

2.5 Classification of diabetes

There are several types of diabetes, including two that are common: Type 1 and Type 2. Worldwide, about 90% of people with diabetes have Type 2 and about 10% have Type 1. Gestational diabetes accounts for very small numbers of cases during pregnancy. We will look at each type in turn.

2.5.1 Type 1 diabetes

Type 1 diabetes was previously called insulin-dependent diabetes. This is because in people with Type 1 diabetes their pancreas fails to produce enough insulin due to the destruction of the cells that make insulin. Without enough insulin, glucose cannot enter the tissues and cells, and so the blood glucose level rises damagingly high. People with Type 1 diabetes are dependent on taking insulin every day – either in tablet form or injecting it.

Although there is plenty of glucose in the blood, it cannot enter the tissues and, because of this, it cannot be used as a fuel source. Instead, the body breaks down fats and protein to use as fuel. As a result, the person often loses weight very rapidly due to loss of fluid, an inability to use glucose as a fuel, loss of muscle as protein is broken down, and loss of glucose in the urine. A person with Type 1 diabetes should never stop taking their insulin, even when they are unwell and not eating. Type 1 diabetes can develop at any age, although it most commonly begins in children and young adults.

2.5.2 Type 2 diabetes

Type 2 diabetes was previously called non-insulin-dependent diabetes, because the pancreas still produces insulin, though the amount reduces over time. The main problem is that the body cells become increasingly resistant to the action of insulin, so it does not stimulate the cells sufficiently to take up glucose from the blood. Symptoms such as thirst and passing large amounts of urine may be absent. Type 2 diabetes may be present for many years before a diagnosis is made, because some people have few symptoms or take no notice of them, e.g. they may not see their thirst or getting up at night to pass urine as a problem. Having Type 2 diabetes for several years before a diagnosis is made can mean that complications of diabetes, which take years to develop, may already be present at the time of diagnosis.

Over-eating and lack of exercise are two particularly important factors thought to be contributing to the rapidly increasing numbers of people worldwide with Type 2 diabetes. Although it is most often a condition that develops in adults, particularly those aged over 40 years, it is beginning to be diagnosed in younger adults and even in teenagers who are obese.

The amount of insulin that is produced in someone with Type 2 diabetes often decreases over a period of years, and eventually insulin treatment is required. Treatment generally starts with changes in the amounts and types of food eaten and an increase in physical activity, before progressing to tablets and then onto insulin injections.

2.5.3 Gestational diabetes

A pregnant woman can develop diabetes in pregnancy, due to chemical changes in her body. This is known as **gestational diabetes** (also known as pregnancy-induced diabetes). The common symptoms are the same as for Type 1 and Type 2 diabetes (thirst, frequent urination), but she may also complain of itching and an unpleasant smell coming from her vagina due to infection, and wounds that are slow to heal.

Gestational diabetes commonly goes away after the baby is delivered, but you should be aware that a few mothers will have undiagnosed Type 2 diabetes, or have developed coincidental Type 1 diabetes. Also, having had a diagnosis of gestational diabetes, a woman is more likely to develop diabetes in future pregnancies and is also more likely subsequently to develop Type 2 diabetes. During the pregnancy, the woman should be treated for diabetes by changes to her diet and exercise, with or without prescribed insulin.

2.6 Injecting insulin

As a community health worker you are expected to teach people with diabetes how to inject themselves with insulin if it is ordered by a doctor. In Study Session 4 of the *Immunization* Module you learned about giving **subcutaneous injections** (see Figure 2.5a), i.e. an injection where the tip of the needle penetrates just below the skin into the fatty layer beneath. Insulin is injected subcutaneously using a short fine needle. The usual sites for injection are the thighs, hip area, abdomen or outer arms (Figure 2.5b).

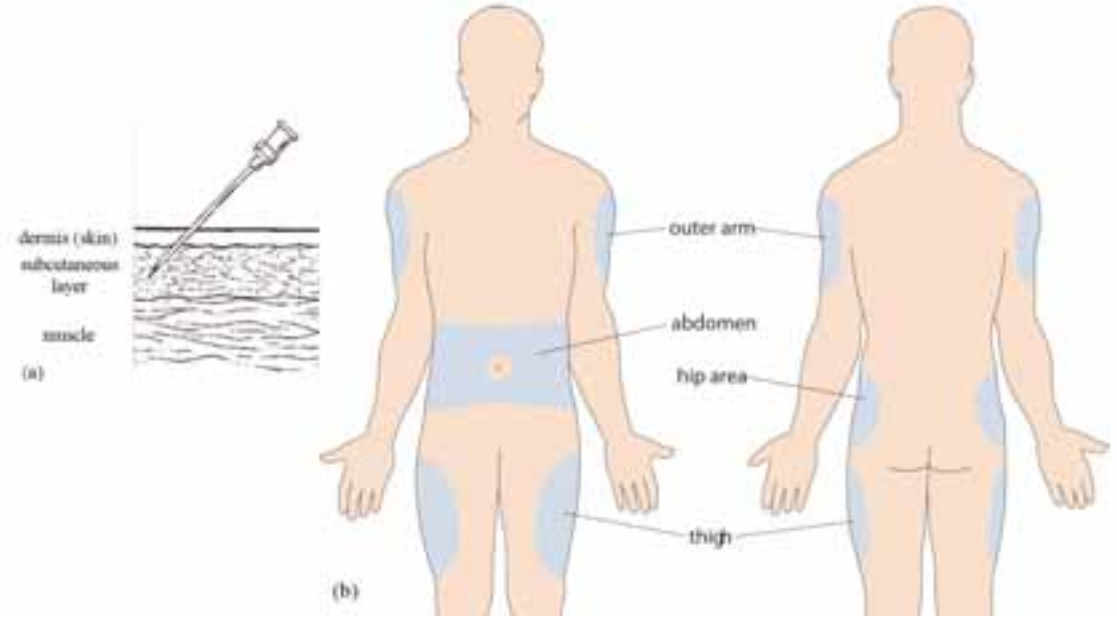

Figure 2.5 (a) Diagram showing the penetration of a subcutaneous needle for injecting insulin. (b) Preferable injection sites for insulin. (Sources: (a) WHO/UNICEF, 2009, *Immunization in Practice Modules for Health Workers*; (b) The Open University, 2006, *Living with Diabetes*, Figure 4.2)

2.7 Risk factors for diabetes

It is important to have a good understanding of the **risk factors** associated with diabetes, that is, the circumstances that make it more likely that diabetes will develop. Knowing these risk factors can help you make a diagnosis, especially of Type 2 diabetes, and introduce treatment at an early stage. The main risk factors for Type 2 diabetes are listed below:

Note that even if all the risk factors are present in the same person it doesn't mean that they will certainly develop diabetes.

- A family history of diabetes (genetic factors).
- Being overweight or obese; the distribution of body fat also appears to be important, with fat around the abdomen seen as more of a risk than fat hips.
- Lack of exercise.

There is some indication that a virus infection in early childhood might lead to Type 1 diabetes in some cases; the theory is that the virus in some way causes the person's own immune system to destroy the insulin-producing cells in their pancreas.

2.7.1 Body Mass Index (BMI)

As mentioned above, being overweight is a risk factor for developing Type 2 diabetes. However, simply weighing someone may not accurately determine if they are overweight.

■ Explain how it is possible for one person who weighs 80 kg to be obese, and another person who also weighs 80 kg to be a healthy weight.

□ The key point is their difference in height. One may be taller and assessed as an average weight for their height, whereas the other is assessed as obese because they are much shorter.

The relationship between weight and height is determined by calculating the person's **Body Mass Index** (**BMI**). Your BMI is defined by your weight in kilograms divided by your height in metres and the result is divided again by your height in metres.

BMI is an indicator of how healthy a person's weight is. Figure 2.6 (on the next page) is a chart that will help you to calculate a person's BMI and to use this to determine whether they are a healthy weight, underweight, overweight, obese, or extremely obese.

Directions: Find your weight in kilograms (or pounds) along the top of the table and your height in metres (or ft and inches) along the left-hand side. Your BMI is the value at the point in the table where they intersect. **NB The chart does not apply to athletes, children, pregnant or lactating women.**

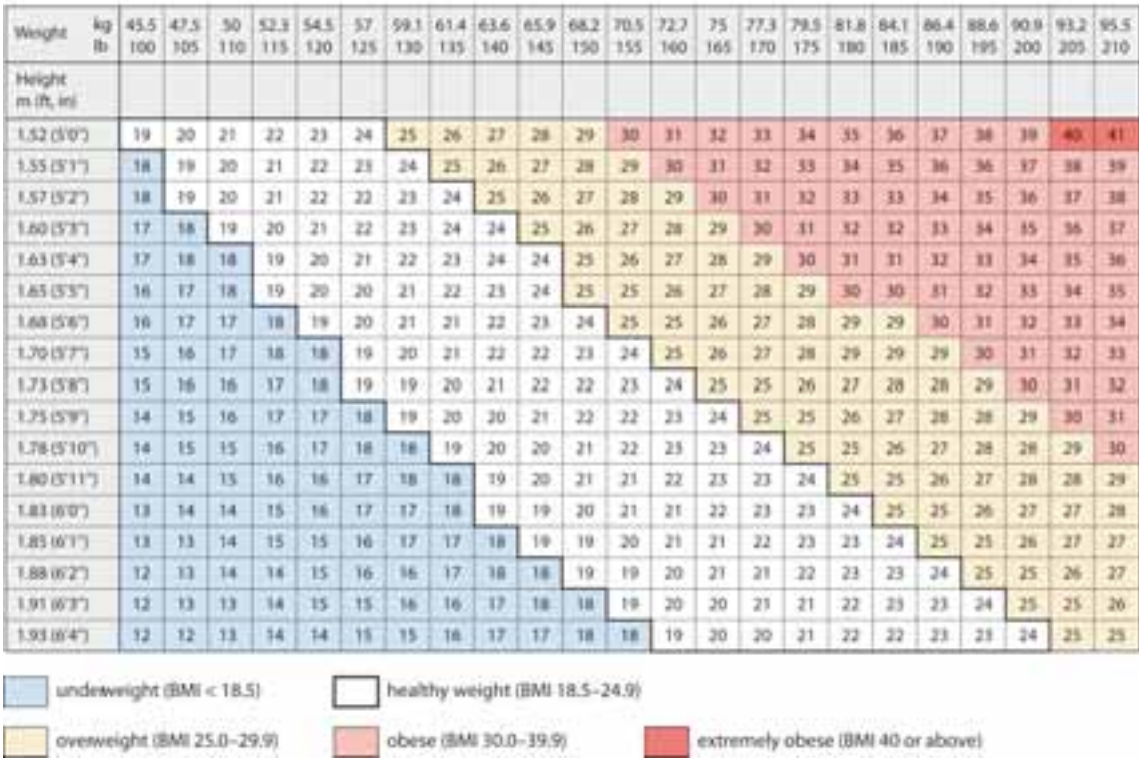

Figure 2.6 Body Mass Index chart. (Source: The Open University, 2006, *Living with Diabetes*, Figure 4.9)

■ Mr Aseged is 1.70 m tall and weighs 68 kg. Mr Abera is also 1.70 m tall but weighs 93 kg. Use Figure 2.6 to estimate their BMI. What does the BMI of each man indicate about the risk of developing Type 2 diabetes?

□ Mr Aseged's BMI is 23, so he is a healthy weight for his height, which does not increase his risk of developing Type 2 diabetes. However, Mr Abera's BMI is 32, which means he is obese and therefore at increased risk of becoming diabetic.

2.8 Self-care and diet for someone with diabetes

How can you support the people with diagnosed diabetes in your community? If they are already taking insulin or other drugs to treat their condition, you should advise them to take their medication regularly. Everyone with diabetes, regardless of treatment, should:

- attend regular medical checkups
- be aware of possible wound infection if they hurt themselves and seek urgent treatment if this occurs
- always wear shoes that fit correctly; wounds, blisters or sores on the feet can lead to tissue damage that is difficult to heal
- have an eye test once every year to check for early signs of eye damage
- always include exercise as a routine part of their lifestyle
- attend health education classes (if they are available) for people with diabetes to learn about self-care.

2.8.1 Maintaining a healthy diet

Maintaining a healthy diet is one of the most important aspects of treatment for diabetes. Table 2.1 summarises the recommended diet for a person with diabetes, but it is also the healthy balanced diet that everyone would benefit from eating.

Table 2.1 Recommended diet in diabetes.

Foods	**Can be eaten in moderate amounts**	**Limited to small occasional amounts**
Carbohydrates	Complex (starchy) carbohydrates should be the main part of any meal, e.g. *injera*, bread, other cereals, rice, potatoes, etc. Starchy carbohydrates are broken down slowly into sugars, so the glucose levels in the blood rise slowly.	Foods containing sugar are not encouraged, particularly if the person needs to lose weight, because sweet foods are energy-rich and 'fattening'. Sugary foods and drinks can put up blood glucose levels very quickly and have very little or no nutritional value.
Fats	Fats, such as those in olive oil and avocados, are good for maintaining a healthy weight. Grilling, baking and steaming cooking methods produce less fattening foods than frying.	Fats should be limited to help control body weight, especially 'hard' fats such as butter and animal lard.
Proteins	Protein is found in meat, fish, eggs, nuts, pulses and dairy products, and is recommended in a healthy diet.	Avoid 'fatty' sources of protein such as fatty meat, or a lot of egg yolks.
Vitamins, minerals and fibre	Fruits and vegetables are an excellent source of dietary fibre, vitamins and minerals; try to eat five portions of fruit and vegetables each day, e.g. 'gommen' or kale, cabbage, carrots, spinach, tomatoes, mangoes.	Fruit contains sugar and tends to increase blood glucose levels. People are often surprised at this because fruit is a healthy eating option.
Salt	A small amount of salt daily is all that is needed; this can mostly be obtained from fresh natural foods.	Most people eat more salt than is required by the body; food should be tasted before salt is added, if necessary, at the table. Limiting salt intake can help decrease blood pressure.

You will learn more about all aspects of diets in the *Nutrition* Module.

Summary of Study Session 2

In Study Session 2, you have learned that:

1 Diabetes is a condition in which the level of glucose in the blood is poorly regulated; it is often too high, but may also fall too low.

2 Becoming very thirsty, drinking a lot and producing large amounts of urine are symptoms of diabetes; sugar in the urine is a diagnostic sign.

3 Insulin and glucagon are hormones produced by cells in the pancreas, with opposite actions, which regulate blood glucose levels within a narrow range.

4 Foods are broken down in the digestive system, and nutrients, including glucose, are absorbed into the blood and transported around the body; glucose is used as a fuel for cellular activity.

5 Excess glucose is converted into glycogen and stored in the liver, muscles and body fat; it is released back into the blood if glucose levels begin to fall.

6 Diabetes is classified as Type 1 (insulin-dependent), Type 2 (non-insulin-dependent) and gestational (pregnancy-induced) diabetes.

7 Family history of diabetes, being overweight, and lack of exercise are among the main risk factors for Type 2 diabetes.

8 Body Mass Index (BMI) is calculated using a chart in which weight and height are used to determine whether a person is a healthy weight for their height. A high BMI is a risk factor for diabetes.

9 A person with diabetes should be advised to take their medicine regularly, attend follow-up medical examinations, actively participate in learning about self-care, maintain a healthy diet, and engage in regular physical exercise.

Self-Assessment Questions (SAQs) for Study Session 2

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering the following questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Supporting Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of the Module.

SAQ 2.1 (tests Learning Outcomes 2.1, 2.2 and 2.6)

Which of the following statements is *false*? In each case, explain why it is incorrect:

A Diabetes is a condition in which the blood glucose level is always too high.

B Diabetes is becoming more common in developing countries like Ethiopia.

C Excess glucose is stored in the liver until it is needed.

D Insulin stimulates the liver to release stored glucose when the body needs more fuel.

E Exercise is not recommended for people with diabetes because it depletes the low level of glucose in their blood.

SAQ 2.2 (tests Learning Outcomes 2.1 and 2.2)

Match each internal organ named in List A in Table 2.2 with the correct description in List B.

Table 2.2 Internal organs and their functions.

A	B
Pancreas	Stores glucose in the form of glycogen and slowly releases glucose from its glycogen stores
Liver	Produces many substances including hormones like insulin and glucagon
Digestive tract	Used for movement, e.g. in the arms and legs
Skeletal muscles	Breaks down foods into smaller nutrients which can be absorbed into the blood

SAQ 2.3 (tests Learning Outcomes 2.1 and 2.3)

Mr Tajebe is a 65-year-old man who developed diabetes two years ago. His condition is controlled by diet alone at the present time. What type of diabetes does he have? Explain the reasons for your answer.

SAQ 2.4 (tests Learning Outcomes 2.3 and 2.4)

List the main symptoms of diabetes that a typical patient could describe to you. How would you test for a diagnostic sign of diabetes?

SAQ 2.5 (tests Learning Outcomes 2.2, 2.3, 2.5 and 2.7)

Which of the following statements is *false*? In each case, explain why it is incorrect.

A Type 1 diabetes might be caused by a virus infection.
B A family history of diabetes increases the risk of developing diabetes.
C People who eat a lot of rice are at high risk of developing diabetes.
D Glucagon is the form in which excess glucose is stored in the body.

SAQ 2.6 (test Learning Outcomes 2.1, 2.5 and 2.6)

Mrs Aster is 1.6 metres tall and weighs 75 kg. What is her BMI and how would you categorise her weight? Is she at increased risk of developing diabetes?

SAQ 2.7 (tests Learning Outcomes 2.1, 2.3 2.5 and 2.7)

You are asked to produce a poster on reducing the risk of developing Type 2 diabetes. What points do you make on your poster?

Study Session 3 Cancers

Introduction

This study session is about cancers – a complex group of more than 100 non-communicable diseases. **Cancers** are characterised by the rapid creation of abnormal cells which grow beyond their usual boundaries, invading adjoining parts of the body and spreading to other organs. Cancers can develop in any part of the body. Over 11 million new cases of cancer are diagnosed every year around the world and at least 25 million people are currently living with the disease. In 2008, cancers were responsible for about 7.6 million deaths worldwide, accounting for 13% of all deaths in that year – more than the total dying from HIV/AIDS, tuberculosis and malaria combined.

The World Health Organization (WHO) estimates that over 70% of all cancer deaths are in low- and middle-income countries. This is mainly because specialist equipment for cancer diagnosis and treatment, and anti-cancer drugs, are very expensive and many poorer countries cannot afford enough for their populations. In Ethiopia there are no official data on cancer rates, but hospital reports suggest that cancer of the female cervix may be the leading type, followed by breast cancer.

In this study session you will learn how cancers develop from normal cells, the effects of cancers on the human body and the risk factors for cancer. Then we will focus on screening for breast and cervical cancer, and conclude with palliative care for a person who is dying with advanced cancer.

Learning Outcomes for Study Session 3

When you have studied this session, you should be able to:

3.1 Define and use correctly all of the key words printed in **bold**. (SAQs 3.1, 3.2, 3.4, 3.5 and 3.6)

3.2 Explain what cancer is, describe how normal cells become cancer cells and summarise their effects on the human body. (SAQs 3.1, 3.2 and 3.3)

3.3 Describe the main risk factors for cancers and the main strategies for preventing them. (SAQ 3.4)

3.4 Describe the signs and symptoms of breast cancer and cervical cancer, and explain how to educate women in your community on early detection of these cancers and what actions they should take. (SAQ 3.5)

3.5 Describe the main features of palliative care for the person who is terminally ill with advanced cancer. (SAQ 3.6)

3.1 Cells and cancer

As the definition of cancers in the Introduction stated, cancers are characterised by the rapid creation of abnormal cells. So we have to begin this study session by reminding you about what cells are and how new cells are created. All living organisms, including bacteria, protozoa, fungi, plants and animals, are organised into distinct functional and structural units termed **cells**. The outer surface of every cell is a **cell membrane** that separates the inside of the cell from the external environment. Inside the cell membrane is a jelly-like fluid (the **cytoplasm**, or *cytosol* in modern biology textbooks), and tiny structures with specific functions arranged in a particular way.

A diagram of a typical cell found in the human body is shown in Figure 3.1.

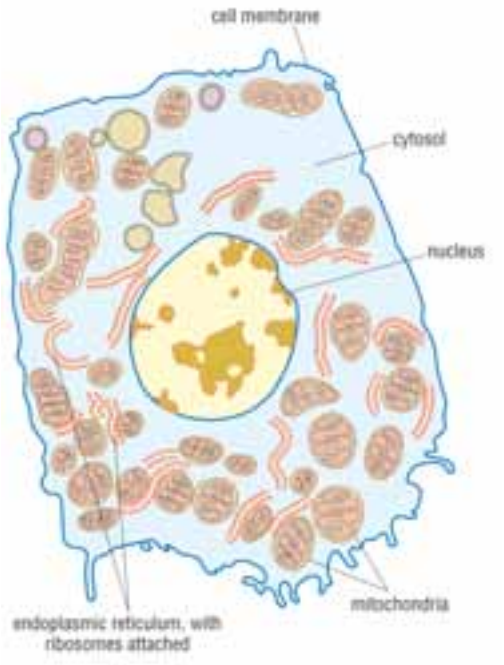

Figure 3.1 Drawing of a human cell with its internal structures. (Source: The Open University, 2008, *Understanding Cancers,* SK123, Figure 2.7a, p.30)

The largest structure in any cell is usually the **nucleus**, which contains most of the DNA in the cell. **DNA** (deoxyribonucleic acid) is a complex large chemical, which contains the genes of the individual. **Genes** are structures that determine what type of cells will develop, how they function, and how the cells in an organism are arranged, nourished, stimulated and protected in the body. Most human cells have one nucleus, but muscle cells have more than one and red blood cells have none at all. Other important structures in the cell create new molecules (e.g. proteins needed for cell growth) and others break down fuel molecules (e.g. glucose) absorbed from the surrounding environment. Cells would not be able to survive without generating energy from nutrients brought to them in the blood to fuel all the processes that go on inside the cell.

What is the difference between a normal cell and a cancer cell, in terms of cellular structures? The short answer is not much is different. Almost always the only important difference is that the nucleus is larger and may be somewhat irregular in cancer cells. The difference is not so much in their appearance, but in how cancer cells behave.

3.2 What is a cancer?

Cancers can develop in any part of the body, but they are more common in some organs than in others. For example, the top five organs in which fatal cancers developed worldwide in 2008 were:

- lungs (1.4 million deaths)
- stomach (740,000 deaths)
- liver (700,000 deaths)
- colon and rectum (610,000 deaths)
- breast (460,000 deaths).

Each of these cancers began when a single normal cell in the organ (e.g. a breast) began to divide uncontrollably, forming a solid mass of new cells (Figure 3.2). A lump of new cells growing in an inappropriate location is known as a **tumour** (the general public often calls it a 'growth'). The original mass of cells is called the **primary tumour** to distinguish it from any 'break-away' tumours that may form later, if cells from the primary tumour escape and spread to other parts of the body.

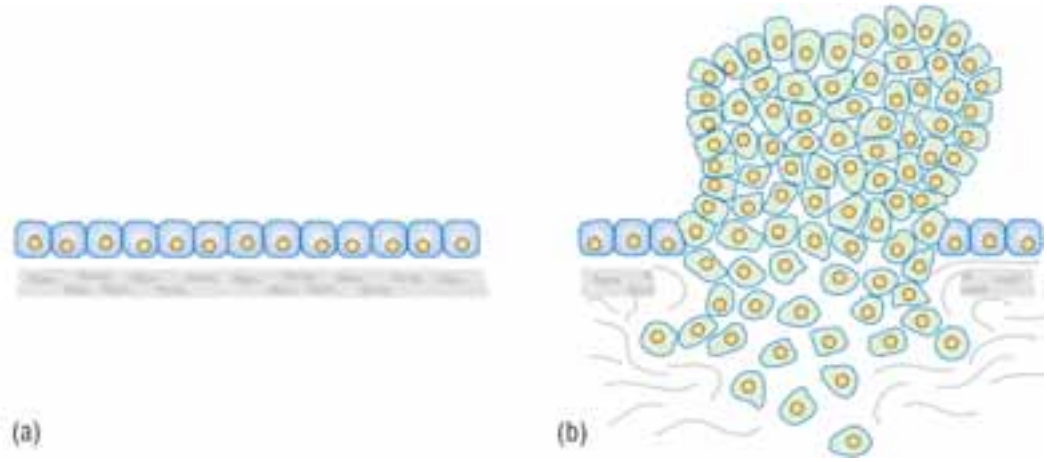

Figure 3.2 (a) Cells in the body are usually well organised into tissues and do not grow beyond their normal boundaries. (b) Cancer cells grow uncontrollably, forming a mass with undefined boundaries. (Source: The Open University, 2008, *Understanding Cancers,* SK123, Figure 2.1, p.22)

Tumours can be either 'benign' or 'malignant' and this has a crucial impact on the person's chances of survival. Most **benign tumours** are rarely life-threatening, though some may grow very large over a long time and eventually interfere with the functioning of a vital organ, such as the liver, heart or brain. A **malignant tumour** is the medical name for a *cancer.* Some cells in a malignant tumour break away from the original primary mass of cells and spread around the body, carried in the blood stream or lymphatic vessels. The malignant cells become lodged in distant locations (e.g. in fine capillaries in organs like the lungs or breast) and begin to generate new **secondary tumours.** The habit of spreading to other parts of the body is the defining characteristic of cancers, and this is what makes them life-threatening and difficult to treat.

At this point, you may be asking yourself why cancer cells grow in an uncontrolled fashion, if they contain the same types of molecules and cellular structures as normal cells? Although cancer cells are very similar to their 'normal' counterparts, they differ in the activity of a few genes. These genes allow cancer cells to divide and produce new cancer cells much more often than normal cells are able to divide. The cancer genes also change the behaviour of cancer cells and give them other characteristics that promote their survival and their ability to spread beyond the original primary tumour.

Table 3.1 summarises some of the important differences between normal and cancer cells.

Table 3.1 The basic properties of normal and cancer cells.

Normal cells	**Cancer cells**
Require energy to fuel chemical reactions inside the cells	Require more energy to fuel chemical reactions inside the cells
Divide and reproduce new cells only when appropriate signals are received	Divide and reproduce new cells continuously without needing the appropriate signals
Have specialised functions appropriate for their location (e.g. lung cells have special functions for their role in the lungs; breast cells have special functions for their role in the breast, etc.)	Lose part or all of their specialised functions (i.e. a cancer cell originating in the lungs no longer looks or behaves like a lung cell)
Age and die after a limited number of cell divisions (usually no more than eight cycles of cell division)	Survive an unlimited number of cell divisions (possibly hundreds of cycles of cell division)
Self-destruct and die when the appropriate signals are received (e.g. because the cell is ageing or developing abnormal characteristics)	May not self-destruct even when the appropriate signals are received, so abnormal cells survive and continue to divide
With some exceptions (e.g. blood cells) remain fixed in a location within tissues and organs	May escape from their original location and spread to other tissues and organs, where they can divide and reproduce new cancer cells

3.3 The human body and cancer

Cancer cells grow aggressively and invade other neighbouring tissues. A few cancer cells rapidly become many cells (Figure 3.2b) and some cells break away from the primary tumour and settle in distant places, where they form new **secondary tumours** (or *metastases*, pronounced 'mett-ass-tah-seez'). As a primary or secondary cancer gets larger, it releases chemical signals that cause new blood capillaries to grow into it.

■ Why do you think a cancer needs new blood vessels as it grows larger?

□ The cancer cells in the middle of the tumour need a supply of oxygen and nutrients to fuel their growth. The new blood vessels bring it to them and remove waste products such as carbon dioxide.

3.3.1 Problems in diagnosing cancers from their symptoms

The symptoms and signs of cancer are extremely diverse, depending on where in the body the tumours are growing. There are no characteristic signs and symptoms that are only due to cancers, because their effects resemble many other diseases. Some symptoms are local, affecting only the tissue or organ containing the original tumour; for example, a persistent cough may be a symptom of cancer in the lungs. Some cancers may have widespread effects all over the body; for example, cancer in the pancreas can alter the production of insulin and glucagon (Study Session 2), causing disruption to the patient's energy supply from glucose in the diet, affecting all body functions.

■ In the two examples given above (cancer in the lungs and cancer in the pancreas), what other diseases have the same symptoms?

□ A persistent cough could be due to tuberculosis; disruption to the body's energy supply from glucose in the diet could be due to diabetes mellitus.

There are many other examples of the difficulty in distinguishing between a cancer and another disease. For instance, cancer of the ovaries frequently leads to a lot of fluid collecting in the abdomen, causing swelling and pain which can be confused with intestinal obstruction (described in Study Session 8 later in this Module). Fluid and swelling in the abdomen presses up against the *diaphragm* (the muscular wall separating the lung cavity from the abdomen), restricting the ability of the person to breathe deeply. This causes the symptom of breathlessness, which can easily be confused with chronic obstructive pulmonary disease or bronchial asthma (described in Study Session 4).

3.4 Risk factors for cancers

This section will introduce you to the idea of **cancer risk factors** that can *increase* our chance of developing a cancer. Knowing what they are is helpful in educating the members of your community in how they can *decrease* their cancer risks by changing their behaviour. The factors that are linked with increases in cancer risk are listed in Box 3.1.

Box 3.1 Risk factors for cancer

- Age
- Cigarette smoking and chewing tobacco or *khat*
- Genetic factors
- Environmental risk factors, such as radiation and certain viruses
- Exposure to some industrial chemicals (e.g. insecticides)
- Lack of exercise
- Fatty diet leading to obesity
- Excessive alcohol consumption.

■ Which of the cancer risk factors in the above list are capable of being *reduced* by actions that an individual can take for themselves?

□ Individuals can reduce their cancer risks from all the potential causes in the above list *except* age, genetic factors and some environmental risk factors.

Old age is a cancer risk because as we get older our cells accumulate more damage from avoidable risks (e.g. smoking, alcohol) and unavoidable exposures in the environment, e.g. radiation from rocks, viruses that cause cancers, etc. Older cells have less ability to control their own growth, so they are more likely to become malignant and start to form a cancer. Genetic factors can also increase a person's cancer risk; some families seem to have more than the average number of cancers arising in family members, and this is thought to be due to the existence of certain cancer-promoting genes in their cells.

The good news is that the WHO estimates that over 30% of all cancers can be prevented, and in the next section we will explain how.

3.4.1 Cancer prevention through risk reduction strategies

You can teach your community members how to reduce their risk of developing cancer by avoiding certain behaviours and habits.

■ Look again at the list of cancer risk factors in the previous section. What advice can you give to help people in your community to reduce their cancer risks? (In the answers below, we have added in brackets which cancers can be reduced by each strategy.)

□ You could advise them to:

- Avoid cigarette smoking or chewing tobacco or *khat* (they increase the risk of cancers of the mouth, throat, lungs, stomach, colon and bladder)
- Avoid excessive alcohol usage (which is a risk factor for cancers of the mouth, oesophagus, stomach, breast and liver)
- Eat a healthy diet containing plenty of fruits, vegetables and other high-fibre foods from plant sources like whole grains, peas and beans (this helps in reducing cancer risks in the whole of the gastrointestinal system)
- Maintain a healthy weight (this reduces the risk of many cancers, including cancers of the ovaries and breast)
- Avoid exposure to industrial chemicals by wearing personal protective clothing (this reduces the risk of lung and skin cancers, among others)
- Avoid exposure to cancer-promoting viruses (described below).

3.4.2 Prevention of cancers caused by viruses

Infection with two viruses are strongly associated with the development of specific cancers: hepatitis B virus (HBV) causes liver cancer, and human papilloma virus (HPV) causes cancer of the cervix. Both these viruses can be transmitted by unprotected sexual intercourse. HBV infection can follow from exposure to the blood of an infected person, e.g. during healthcare. Immunization against HBV is a routine part of the Expanded Programme on Immunization (the EPI) in Ethiopia; three doses are given to all infants as part of the pentavalent vaccine (pentavalent means that five different vaccines are combined in one injection). Some high-income countries also offer immunization with a vaccine against HPV, but this is not currently available in Ethiopia.

The EPI in Ethiopia is described in detail in the *Immunization* Module in this curriculum.

■ What advice would you give to women about protecting themselves from cancer of the cervix caused by HPV infection acquired during sexual intercourse?

You learned about the ABC rules in the *Communicable Diseases* Module, Part 3, Study Session 25.

□ The best way to prevent cervical cancer due to HPV is to follow the **ABC rules for prevention of sexually transmitted infections (STIs)**:

- Abstinence (refraining from sexual intercourse)
- Be faithful (to one long-term partner)
- Condoms (correct and consistent use of condoms for all acts of sexual intercourse).

You should also teach your community that cancers that are detected early by regular self-examination are more easily treated, with a much better chance of success, than cancers where treatment begins only after a long delay.

Waiting before showing a health professional a lump found anywhere in the body could mean that it is too late to save the person's life! You should also encourage people to come for cancer screening and early detection. All types of cancer affecting men and women are found in Ethiopia, but from hospital data the most common cancers seem to be breast cancer and cancer of the cervix (cervical cancer) in women – which we describe next.

3.5 Breast cancer

The cause of most **breast cancers** is unknown. Genetic factors are involved in about 2% of cases, and women who are obese and/or eat a high fat diet, or drink a lot of alcohol are more at risk, but there is no clear cause in most cases. However, benign (harmless) lumps in the breast are very common, so you need to reassure women in your community that every change and every lump found in the breasts does not mean they have breast cancer. Only about one in every five women with a breast lump turns out to have cancer. The breasts are changing every month with the phases of the menstrual cycle, due to changes in the levels of the female reproductive hormones (oestrogen and progesterone), and sometimes these changes result in *temporary* lumps in the breast. Some women develop small painless lumps just before their menstrual period, which disappear after a few days. Sometimes a small tender cyst develops (a collection of fluid in the breast), which also disappears after a few days. If a lump is felt in the breast that remains for two weeks, it is wise to get it checked by a health professional.

3.5.1 Screening for breast cancer

Screening refers to any method of examining an apparently healthy person to see if they have the early signs of a particular disease, which would benefit from having early treatment. Screening for breast cancer is easily carried out by women themselves. You should advise women in your community to examine their breasts once every week, using the method of **breast self-examination** illustrated in Figure 3.3 and described in Box 3.2 (on the next page).

Advise women who find a breast lump to seek medical help – they should not to go to the traditional healers.

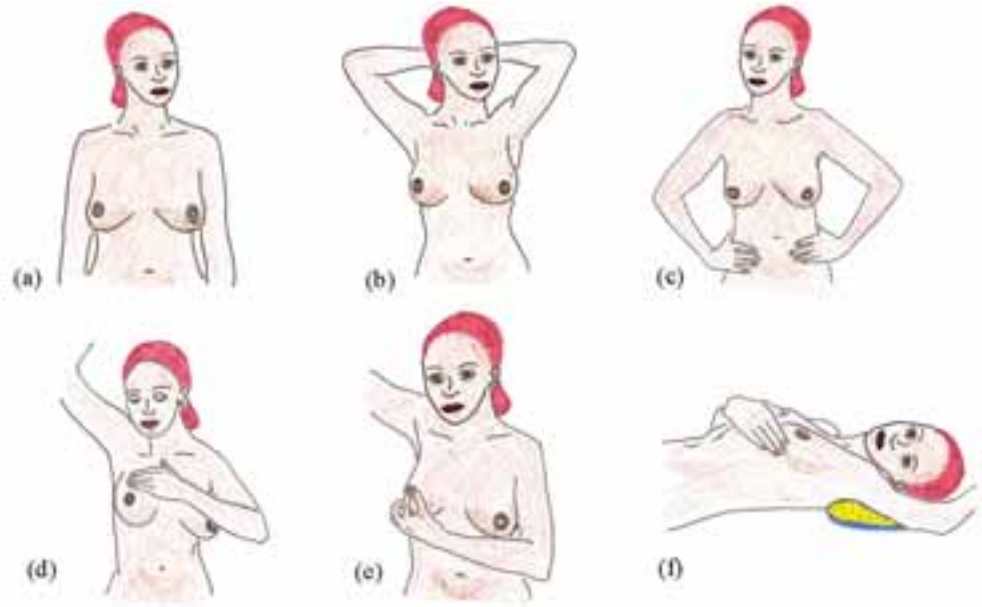

Figure 3.3 The steps of breast self-examination: steps (a) to (c) are done facing a mirror. Step (f) is done lying down. (Diagrams: Dr Radmila Mileusnic)

Box 3.2 Steps in breast self-examination

The following steps relate to the diagrams in Figure 3.3 and should be carried out in this order.

(a) View the breasts with arms down at your sides. One breast is normally a little larger than the other, but do they appear about the same size and shape? Is the outline of each breast rounded and smooth, or are there any creases or dimples?

(b) Look at your breasts for the same signs as in (a), but this time with your arms raised and your hands holding each other behind your head.

(c) Repeat the visual inspection with your hands on your hips.

(d) Raise your right hand above your head; with all four fingertips of your left hand, gently press the whole of your right breast, moving your fingers to the next area and using small circular movements. Feel for any lumps or thickened tissue. Repeat with the left breast and right hand.

(e) Hold your right nipple between the thumb and first finger of your left hand; gently roll the nipple, feeling for any lumps or tenderness. Repeat with the left breast.

(f) Lie down and stretch your left arm upwards and behind your head. Use small circular pressures with the finger tips of your right hand to examine the whole breast. Repeat with the right breast and left hand.

If a woman feels an unusual lump or any palpable mass in the breast, or sees a change in the appearance of the breast, she should go to the nearest health centre for further assessment and specialist treatment. The types of changes in the appearance or 'feel' of the breast that should alert a woman to seek medical help are shown in Figure 3.4.

Figure 3.4 Drawings of changes in the breast that may suggest possible cancer. (Diagrams: Morning2k via Wikimedia Commons)

There are also image screening methods for early detection of breast cancer in higher health institutions, using either low-dose X-rays (the technique is called *mammography*) or ultrasound imaging of the breast. In many high-income countries, all women over the age of 45 or 50 years are screened using these methods every two or three years. However, the technology is not available (or not accessible) in most low-income countries in Africa.

3.5.2 Breast cancer treatment

Breast cancer is usually treated surgically, either by removing just the cancerous tumour from the breast, or by removing the whole breast. The skin covering the breast is stitched back in place after the breast (or lump) has been removed, leaving a neat scar. Follow-up treatment may be recommended with either radiotherapy (a high-dose radiation beam is shone on the breast area), or chemotherapy with special anti-cancer drugs. This is to try to kill any cancer cells that have spread away from the original tumour in the breast, to stop them from developing into new secondary tumours elsewhere.

3.6 Cervical cancer

Cervical cancer refers to cancer cells growing in the tissues of the cervix – the muscular organ connecting the uterus and the vagina (Figure 3.5). Most cases of cervical cancer are caused by sexually transmitted infection with the human papilloma virus (HPV).

In low- and middle-income countries, cervical cancer is the most common female cancer and one of the leading causes of death amongst women. In Ethiopia, it is believed from hospital reports that cervical cancer is the most common of all cancers. It is usually a slow-growing cancer that may not produce symptoms in its early stages. If the cancer is advanced, it may produce symptoms including an offensive discharge and bleeding from the vagina, and pain during sexual intercourse. You should encourage any woman with these symptoms to seek urgent medical attention.

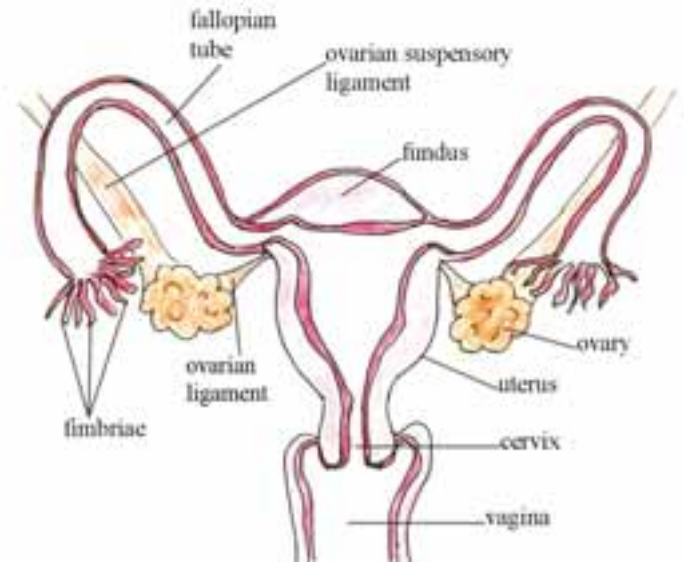

Figure 3.5 Female internal reproductive organs.

3.6.1 Cervical cancer screening

Early detection of cervical cancer can be done with a test called a **Pap smear test**, in which cells are gently scraped from the cervix with a blunt instrument, smeared onto a glass slide and looked at under a microscope. A special stain is applied to the cells (called the Pap stain after the doctor who invented it), which shows up the cancer cells if they are present (Figure 3.6).

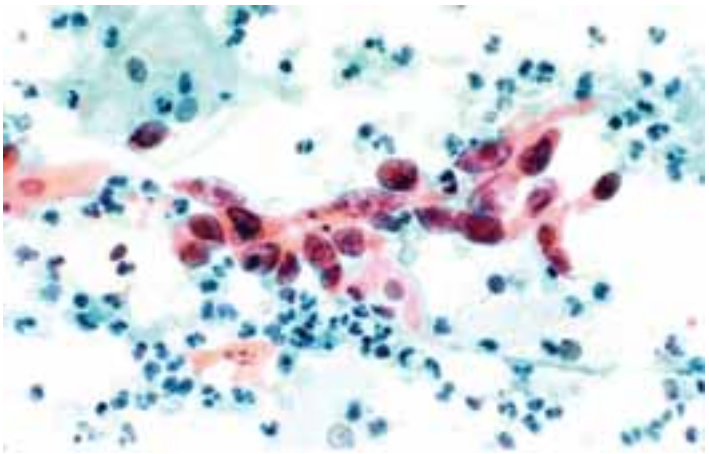

Figure 3.6 Pap smear of cells from the cervix magnified by a microscope to reveal cancer cells (stained pink) among the normal cervical cells (stained blue). (Photo in the public domain: National Cancer Institute, USA)

Women who are sexually active should ideally have a Pap smear test once every two or three years, but this is only available in higher-level health facilities in Ethiopia. Cervical cancer screening detects the cancer early. If effective treatment, such as surgical removal of the uterus, chemotherapy or radiation follows, it dramatically stops the progression of cervical cancer and can cure the disease completely. Advise your female clients to go to a specialised well-woman clinic if possible and have the screening test for cervical cancer.

3.7 Care for a person with advanced cancer

As you have seen in previous sections, cancer may be treatable if it is diagnosed early and depending on its type. However, some cancers are untreatable and others are diagnosed too late for treatment to be effective. If the original cancer spreads to other part of the body, the secondary tumours can damage the function of many different organs and make the patient very sick. As the cancers grow, they can interfere with processes that maintain life and the patient becomes **terminally ill** (i.e. expected to die within weeks).

The care given to a person who has advanced cancer (or any other chronic life-threatening condition) is referred to as **palliative care**. The aim of palliative care is to improve the quality of life of the sick individual and their family in the period before the death, and to help the family cope with the bereavement after the death. It involves prevention and relief of suffering, pain and other physical problems, and attention to psychosocial and spiritual issues. It focuses on supporting the patient to enjoy what remains of their life as fully as possible, and helps them and their family to manage symptoms such as pain and nausea. It also helps the relatives to cope with the overwhelming feelings they may be experiencing about losing their loved one.

The aim in palliative care is always to support the patient in their own home for as long as possible, and to involve others in the community who can give comfort to the patient and family members. In Ethiopia, an important contribution can be made by religious and spiritual leaders in the community. Don't forget that families who are caring for a dying person also need practical help and support, for example to lift a bedridden patient to change the bedding or make the person more comfortable (Figure 3.7).

Figure 3.7 A Health Extension Practitioner and a family member changing the position of a terminally ill person to make him more comfortable.

Please refer to the *Communicable Diseases* Module, Part 3, Study Session 30 for a detailed description of palliative care in relation to people dying from HIV/AIDS. However, all the aspects described are equally relevant to someone who is dying from cancer, heart disease or any other chronic condition – for example, chronic obstructive pulmonary disease or bronchial asthma, the subjects of the next study session.

Summary of Study Session 3

In Study Session 3, you have learned that:

1 Cancers are characterised by the rapid creation of abnormal cells which grow beyond their usual boundaries, and which can invade adjoining parts of the body and spread to other organs.

2 A tumour is a solid mass of new cells growing in an inappropriate location; they can be benign (harmless) or malignant (life-threatening cancers).

3 The human body is made of fluids and cells of many different types with specific functions; cancers can start in cells in any organ or tissue and spread to other parts of the body.

4 The symptoms and signs of cancers are easily confused with other chronic conditions, and depend on where in the body the cancer is growing; there is no characteristic defining symptom or sign of cancer.

5 Age, genetic factors, cigarette smoking, chewing *khat*, drinking excessive alcohol, high fat diets, obesity, exposure to chemicals or viruses, and lack of exercise are some of the risk factors for cancer.

6 About 30% of all cancers can be prevented by having a healthy lifestyle and avoiding tobacco, alcohol, fatty food, exposure to chemicals and unprotected sexual intercourse.

7 Cervical cancer and breast cancer are the most common cancers in Ethiopia, based on hospital reports.

8 There is no clear cause of breast cancer, but it can usually be treated if it is detected early enough. Teaching women about breast self-examination can save many lives through early detection and treatment.

9 Cervical cancer is mainly caused by infection with the human papilloma virus (HPV); it can be prevented by following the ABC rules (Abstinence, Be faithful, Condom use). Early detection by regular Pap smear tests followed by treatment can save many lives.

10 The palliative care given to someone who is terminally ill with advanced cancer includes management of symptoms such as pain and nausea, and physical, practical and spiritual support for the dying patient and their family members.

Self-Assessment Questions (SAQs) for Study Session 4

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 3.1 (tests Learning Outcomes 3.1 and 3.2)

Which of the following statements is *false*? In each case, explain what is incorrect.

A More people die from cancer in the world every year than from HIV/AIDS, tuberculosis and malaria combined.

B Benign tumours are not generally life-threatening.

C Malignant tumours are life-threatening because they spread and cause damage to organs and tissues all over the body.

D Cancer cells are normal cells growing in the wrong place.

E Cancer cells can multiply uncontrollably by repeated cell divisions.

F Cancer cells 'self-destruct' when they get too old or develop abnormal features.

SAQ 3.2 (tests Learning Outcomes 3.1 and 3.2)

Suppose you are invited to give a talk about cancers in a school in your village. You want to begin by describing what cancer cells are, using words that children will understand. What will you say?

SAQ 3.3 (tests Learning Outcome 3.2)

Which of the following is a symptom of cancer? Explain your answer.

(a) Fever
(b) Cough
(c) Missing menstrual periods
(d) All of the above
(e) None of the above

SAQ 3.4 (tests Learning Outcomes 3.1 and 3.3)

Mr Abera is a 65-year-old man, who used to be a farmer, but now he doesn't go out into the fields very often. He has smoked cigarettes for the last 25 years, he drinks alcohol almost every day, and he likes to eat a lot of fatty meat. His body mass index (BMI) is 33 (look back at Figure 2.7 in Study Session 2).

(a) What risk factors do you observe in Mr Abera's lifestyle that increase his chances of developing cancer?
(b) What advice will you give Mr Abera to decrease his risk factors?

SAQ 3.5 (tests Learning Outcomes 3.1 and 3.4)

What advice would you give to women who ask you about the best ways to reduce their chance of dying from breast cancer?

SAQ 3.6 (tests Learning Outcomes 3.1 and 3.5)

(a) How could you help to support the spiritual needs of a cancer patient who is terminally ill in your community?
(b) What other features of palliative care could help the patient and his or her family?

Study Session 4 Chronic Obstructive Pulmonary Disease (COPD) and Bronchial Asthma

Introduction

Chronic obstructive pulmonary disease (COPD) and bronchial asthma are very common **respiratory diseases** (i.e. affecting the respiratory system) all over the world, including in Ethiopia. Patients with COPD are usually in the older age groups and have a combination of two clinical conditions – *emphysema* and *chronic bronchitis*, which will be explained in this study session. Bronchial asthma is an allergic reaction to particles getting into the lungs from the environment. Although it can affect all ages, it is the most common chronic disease among children.

According to estimates by the WHO, about 235 million people have asthma worldwide, and 210 million people have COPD. Millions more have these or other undiagnosed chronic respiratory diseases. Asthma is not often fatal, but about three million people die of COPD every year and experts predict that COPD will become the third leading cause of death worldwide by the year 2030.

In this study session, you will learn about the respiratory system, what COPD and bronchial asthma mean, and how they affect patients' lives. We will teach you how to recognise the symptoms and signs in people in your community, and how to use screening questions for COPD to find out if a person has risk factors for developing this respiratory condition, or early signs of disease that they are not yet aware of. We will also discuss how COPD and bronchial asthma affects patient's lives and how to prevent these diseases, so you can make an important contribution to improving the health of your community.

Learning Outcomes for Study Session 4

When you have studied this session, you should be able to:

4.1 Define and use correctly all of the key words printed in **bold**. (SAQs 4.1 and 4.2)

4.2 Describe the main structures in the respiratory system and how they are affected by COPD and bronchial asthma. (SAQ 4.1)

4.3 Describe the major risk factors for COPD and bronchial asthma, and the screening questions you can use to detect early signs of COPD. (SAQs 4.1, 4.2, 4.3 and 4.4)

4.4 Describe the major symptoms and signs of COPD and bronchial asthma, and how they affect patients' lives. (SAQs 4.3 and 4.4)

4.5 Explain how you can educate people in your community to prevent or reduce the impact of COPD and bronchial asthma. (SAQs 4.2, 4.3 and 4.4)

4.1 The human respiratory system

Trachea is pronounced 'trak-ee-yah'; bronchi is pronounced 'bronk-ee' and bronchioles are 'bronk-ee-oles'.

Before we can teach you about respiratory diseases, you need to know more about the respiratory system and how it works. Look carefully at Figure 4.1. The air that you breathe in (inhale) passes down your windpipe (its medical name is *trachea*) into tubes in your lungs called *bronchi*, which branch into fine **bronchioles** that carry air into all parts of the lungs.

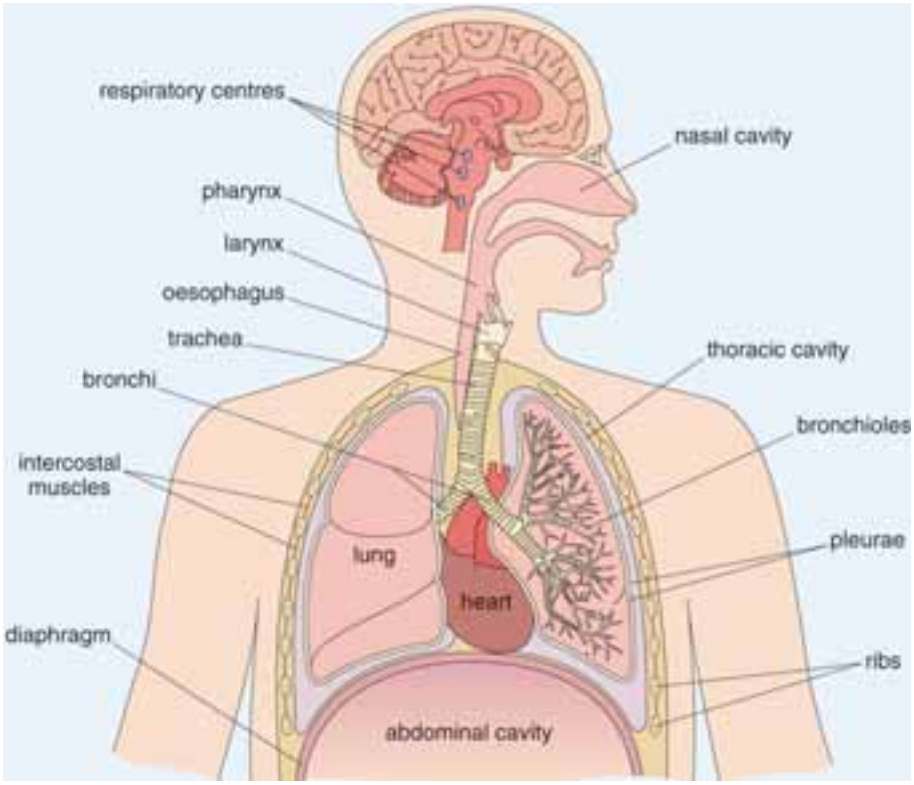

Figure 4.1 The human respiratory system (also known as the pulmonary system). (Source: The Open University, *Chronic Obstructive Pulmonary Disease*, SDK125, Case Study 5, Figure 3.3)

The bronchioles end in bunches of tiny round air sacs called *alveoli* ('al-vee-ole-eye', the singular is alveolus). The airways and alveoli are elastic (stretchy). When you breathe in, each air sac fills up with air like a small balloon, and when you breathe out, it gets smaller again as the air leaves.

Small blood vessels called pulmonary capillaries cover the walls of the alveoli (Figure 4.2). When air enters the air sacs, the oxygen in the air passes through the very thin walls of the alveoli into the blood in the capillaries. At the same time, carbon dioxide (a waste gas) moves from the capillaries into the alveoli and is breathed out (exhaled). This process is called **gas exchange**.

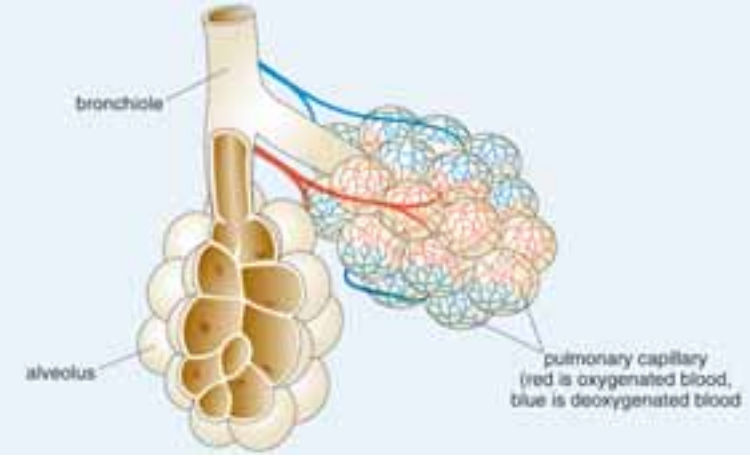

Figure 4.2 A cross-section of a bronchiole and clusters of alveoli (air sacs) showing the blood capillaries covering their surfaces. (Source: The Open University, *Chronic Obstructive Pulmonary Disease*, SDK125, Case Study 5, Figure 3.6)

With this information in your mind, we can move on to describe how the respiratory system is affected in COPD first and then in bronchial asthma.

4.2 Chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease (**COPD**) is a progressive respiratory disease that makes it hard to breathe. The long name of this condition tells you a lot about the problem if you know what each of the words means.

■ What does *chronic* mean when applied to a disease? You should know it already from earlier study sessions in this Module.

□ A **chronic disease** is one that begins slowly, gradually gets worse over time and lasts for a long time, usually for the rest of the person's life.

'Obstructive' means that the disease involves blockages (obstructions) somewhere in the body, and 'pulmonary' tells you that the disease affects the respiratory (or pulmonary) system.

4.2.1 The lungs in COPD

People with COPD have inflammation in their lungs that causes the production of large amounts of **mucus** – a clear slimy fluid secreted by cells lining the inside of the lungs. The mucus is a very good place for bacteria to grow, so lung infections are common in people with COPD. The mucus blocks the fine bronchioles and causes **wheezing** – squeaky breathing; you can often hear a quiet whistling or squeaking sound coming from the lungs when the person breathes in.

■ Can you think what effect it will have on a person whose lungs are obstructed with sticky mucus?

□ They won't be able to get as much air into their lungs when they breathe, so they feel short of breath; their lungs can't expand so easily, so they have a feeling of tightness in the chest. You might also have guessed correctly that people with COPD are always coughing, because of the irritation in their lungs and wanting to cough up the mucus.

4.2.2 Emphysema and chronic bronchitis

The symptoms we have just described are known as **chronic bronchitis** ('bronk-eye-tuss'). Because the airways are constantly irritated and inflamed, the lining of the bronchioles becomes thicker and the space in the middle of the tube becomes smaller (see the bottom left diagram in Figure 4.3). This further restricts the amount of air that can get into and out of the lungs.

People with COPD also develop a condition called **emphysema** ('em-fee-see-mah'). Persistent coughing stretches these delicate structures so much that over time they lose their elastic quality and become stiff. This means that they don't expand as easily to let air enter. Also, the walls between many of the alveoli are destroyed by the high pressure inside the air sacs when a cough fails to dislodge a mucus obstruction. This damage leads to fewer larger air sacs instead of many tiny ones (see the bottom right diagram in Figure 4.3). If this happens, the amount of gas exchange in the lungs is reduced.

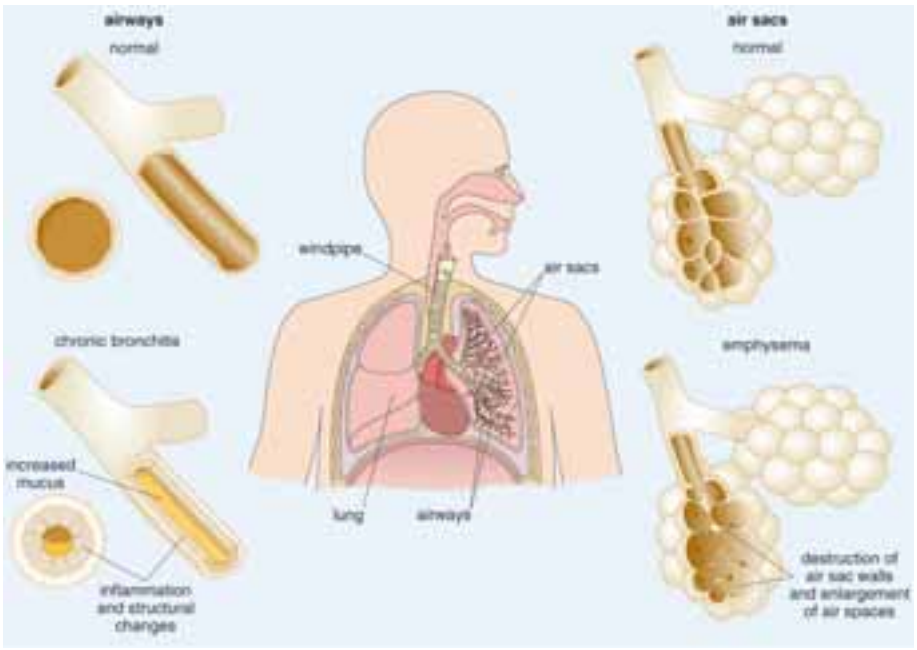

Figure 4.3 (Top) Normal airways and alveoli (air sacs). (Bottom left) Airways blocked with mucus and (bottom right) alveoli damaged by COPD. (Source: The Open University, *Chronic Obstructive Pulmonary Disease*, SDK125, Case Study 5, Figure 1.2)

4.2.3 Risk factors for COPD

Figure 4.4 Breathing smoke from indoor cooking fires, especially when dried animal dung is used as fuel, is a risk factor for COPD. (Photo: Basiro Davey)

Age is a risk factor for COPD: most people who have COPD were at least 40 years old when their symptoms began. However, the main risk factor is smoking tobacco. Most people who have COPD smoke or used to smoke cigarettes. People who have a family history of COPD (older relatives who developed it) are also more likely to develop the disease if they smoke. Long-term exposure to other lung irritants is another risk factor for COPD. These include:

- Second hand-smoke from someone who is smoking tobacco in the same house every day
- Industrial air pollution (smoke, chemical fumes and dust)
- Most important of all in low-income countries – indoor smoke from cooking fires (Figure 4.4).

4.2.4 Effects of COPD on the patient's life

As you already know, the symptoms of COPD include a persistent cough that produces large amounts of mucus (often called a 'smoker's cough'), shortness of breath, especially with physical activity, wheezing, chest tightness and frequent infections in the lungs (colds, pneumonia). As the disease gets worse over time, the flow of air into and out of the lungs becomes so poor that the person becomes seriously disabled by breathlessness. They may have swelling (oedema) in their ankles, feet or legs, a bluish colour on their lips due to a low blood oxygen level, and extreme shortness of breath even when sitting still. It becomes impossible to walk even a few metres.

COPD also affects the quality of life in other ways. Breathlessness stops people from doing normal physical and social activities, which further reduces their independence and contact with family, friends and neighbours. They become poor because they cannot work, and have to live with family members who may not be sympathetic to their condition. COPD can lead to a diminished role within society and the family, and the loss of intimacy in personal relationships. Many COPD sufferers eventually become housebound (unable to go out at all) and heavily dependent on family care.

Immediately refer a person with COPD causing severe breathlessness; they urgently need oxygen supplied through a mask.

A person with COPD may die from heart failure, because the heart becomes exhausted by the effort of trying to pump enough oxygen around the body. Urgent medical attention is required if they are having difficulty getting enough breath for talking, their lips and fingernails turn blue due to the low oxygen level in their blood, and their heart is beating very fast.

4.2.5 COPD screening at community level

Table 4.1 is a questionnaire to help you to assess whether a person you suspect may have COPD is at risk of developing the condition. You ask the questions and fill in whether the person gives a 'Yes' or 'No' answer.

Table 4.1 COPD screening questions.

Questions		Yes	No
1	Have you been coughing a lot and producing thick mucus (sputum) coughed up from your lungs?		
2	Have you had shortness of breath?		
3	Have you heard wheezing from your lungs when you breathe?		
4	Do you smoke cigarettes, or did you smoke cigarettes in the past? If not, do you live with someone who smokes cigarettes?		
5	Does anyone in your family have asthma and/or allergies?		
6	In your work, have you been exposed to dust or chemicals that you often breathed in?		
7	Have you often been exposed to smoke from cooking fires inside your house?		

Interpretation of the results of the COPD screening questionnaire is as follows:

- If the person answers 'yes' to at least two out of Questions 1, 2 and 3, refer him or her to the health centre for further evaluation. It is likely that they have COPD.
- If the person answers 'yes' to only one of Questions 1, 2 or 3, and also has one or more of the risk factors mentioned in Questions 4 to 7, then advise them about the need for regular screening for COPD and educate them on the prevention of COPD by reducing their exposure to the risk factors.

4.2.6 Prevention of COPD

The good news is that COPD is a preventable disease! Educate people in your community how they can protect themselves from developing it by not smoking (or stopping smoking) tobacco, which is dangerous to health not only in terms of COPD.

■ Smoking is a risk factor for what other conditions?

□ Cardiovascular diseases and some cancers (e.g. lung cancers) are caused by smoking.

Figure 4.5 A flue attached to an oven prevents smoke and fumes from polluting the air in a rural house.
(Photo: Alex Duncan)

Fitting cooking stoves with a flue (a pipe that takes smoke and fumes out of the house, Figure 4.5) is another way to protect the lungs from smoke damage. This is also important in preventing other conditions, including respiratory infections in children (the smoke irritates their delicate lungs and creates mucus for infectious agents to grow in), and cataracts in women whose eyes are exposed to cooking smoke for many hours a day (cataracts are described in detail in Study Session 5).

4.3 What is bronchial asthma?

Bronchial asthma is a common lung disease affecting millions of people worldwide. Like COPD, it is characterised by narrowing of the airways (bronchioles) in the lungs, but there are some major differences. First, bronchial asthma is an allergic reaction to certain particles in the air, known by the general term **allergens**, which usually come from other animals or plants. Examples of allergens include:

- Pollen from trees, crops and flowers
- House dust mites (microscopic crawling animals that live in house dust and feed on the flakes of skin that humans shed every day)
- Animal hairs (especially domestic animals like cats, dogs and horses)

The muscles in the walls of the bronchioles constrict (become narrow) if a person with asthma breathes in an allergen that he or she has become sensitive to. Most people are not sensitive to these common allergens, so people who develop bronchial asthma may have genetic factors that make their lungs react so strongly. The narrowing of the bronchioles can begin very suddenly and is called an **asthma attack**. The symptoms of an asthma attack are similar to COPD and include wheezing, coughing, chest tightness and shortness of breath. If the person uses an inhaler (a device that sprays special medicine into their lungs), the narrowing of the bronchioles can usually be reversed quite quickly, so they can breathe normally again.

- ■ Can you see one big difference between asthma and COPD?
- □ Asthma symptoms can be reversed by breathing in the correct medicine, but COPD symptoms cannot be reversed – the damage to the lungs is permanent.

A person with an asthma attack should go urgently to a health centre or hospital.

However, you should always advise people who are having an asthma attack to be taken urgently to a hospital or health centre if the symptoms do not quickly improve. Although it is unusual for people in high-income countries to die from an asthma attack, this is because most patients carry inhalers with them everywhere and can treat themselves if an attack begins. In countries like Ethiopia, where very few people with asthma have an inhaler, a severe attack can leave the person so short of breath that they die from lack of oxygen.

The factors that set off and worsen acute asthma symptoms are called 'inducing factors'. They include smoke, atmospheric pollution, some chemicals, and bacterial and viral infections, etc. It is also believed that emotional stress and worry are inducing factors for an asthma attack. Identifying and avoiding asthma-inducing factors are essential steps in preventing a person with asthma from developing an attack of symptoms.

The effects of asthma on people's lives has some common features with COPD, such as breathlessness restricting physical and social activities. People with asthma are often anxious about the sudden onset of an attack and they may try to avoid going to places where they may be exposed to an inducing factor or an allergen.

In the next study session, we turn to chronic conditions affecting vision and hearing.

Summary of Study Session 4

In Study Session 4, you have learned that:

1 COPD is an increasingly common progressive respiratory disease; it mainly affects people after the age of about 40 years.

2 COPD has two main components – chronic bronchitis and emphysema – which, over time, cause permanent irreversible damage to the lungs. The main symptoms are a persistent cough, excessive production of mucus in the lungs, shortness of breath, wheezing and chest tightness. COPD makes respiratory infections more likely.

3 Smoking tobacco is the main risk factor for COPD, as well as inhaling second-hand smoke, air pollution, chemical fumes and dust from the environment or workplace, and indoor smoke from cooking fires. Stopping (or not ever) smoking and avoiding air pollution is the primary way to prevent COPD.

4 Bronchial asthma is a common lung condition, in which narrowing of the airways can happen suddenly in response to inhaling an allergen, such as house dust mite, pollen or animal hairs; inducing factors that can make an attack worse are industrial pollution, respiratory infections, cigarette smoking and emotional stress.

5 The symptoms of asthma are similar to those of COPD, but they are reversible if the correct medicine is inhaled. Another difference is that asthma is much more common than COPD among younger people; it is the commonest chronic condition in children worldwide.

6 The effects of COPD and asthma on people's lives share some common features, such as breathlessness restricting physical and social activities. People with advanced COPD may be unable to work or live independent lives, or walk even a few steps without becoming dangerously short of oxygen. People with asthma are often anxious about the sudden onset of an attack and they may avoid going to places where they may be exposed to an inducing factor or an allergen.

Self-Assessment Questions (SAQs) for Study Session 4

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Supporting Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module

SAQ 4.1 (tests Learning Outcomes 4.1, 4.2 and 4.3)

Which of the following statements is *false*? In each case, explain what is incorrect.

A COPD is a progressive disease, which affects the cardiovascular system.

B Wheezing, breathlessness and a cough with production of large amounts of mucus in the lungs are the major symptoms of COPD.

C Air entering the body travels down the oesophagus into the lungs.

D In COPD, the air sacs lose elasticity and their walls can break down.

E Bronchial asthma is mainly a disease of elderly people.

F Exposure to pollen and animal hair can cause COPD.

SAQ 4.2 (tests Learning Outcomes 4.1, 4.3 and 4.5)

(a) What is the most common risk factor for COPD, and what other risk factors may contribute to this condition?

(b) What advice will you give your community members to combat this risk factor, and what other diseases could be prevented by doing so?

SAQ 4.3 (tests Learning Outcomes 4.3, 4.4 and 4.5)

Table 4.1 presented a questionnaire to help you to evaluate if someone has got COPD or has risk factors for COPD. Imagine that you asked Mr Sileshi all the questions in Table 4.1. He answered 'Yes' to Questions 4 and 6, but to all other questions he answered 'No'.

- What advice will you give Mr Sileshi and why?

SAQ 4.4 (tests Learning Outcomes 4.3, 4.4 and 4.5)

Read Case Study 4.1 and then answer the questions that follow it.

Case Study 4.1 Mihret becomes suddenly breathless

Mihret is a 25-year-old woman who comes to you complaining that when she was cooking in her house this morning, she suddenly felt very tight in her chest and had difficulty breathing. This is the first time this has happened. She went outside into the fresh air and her breathing returned to normal within about 15 minutes. You asked her if she or any family members smoke tobacco and she says 'No'. You asked if there was smoke in the house from the cooking fire and Mihret said 'Yes, the house is always smoky when I am cooking'.

(a) What condition do you suspect that Mihret has experienced? Explain your answer.
(b) What could have caused it?
(c) What advice do you give her?

Study Session 5 Cataracts, Eye and Ear Injuries

Introduction

The eye and ear are special organs of the human body that are designed to detect information about the world around us. Any impairment of function in these two organs is experienced as a big problem, particularly by people in rural communities. But this does not always mean that people with eye or ear problems are totally disabled and cannot contribute anything to help themselves or the community at large. Difficulties in seeing or hearing can seriously interfere with normal daily life, but you can help by organising some form of rehabilitation for affected people and their families. (Study Session 16 of this Module is on community-based rehabilitation).

In this study session you will learn about the basic anatomy of the eye, how the eye functions, what cataract means, and the common manifestations of cataract. You will also be learning how to deal with common types of eye and ear injuries, and how to provide emergency care for these problems.

Learning Outcomes for Study Session 5

When you have studied this session, you should be able to:

5.1 Define and use correctly all of the key words printed in **bold**. (SAQ 5.1)

5.2 Describe the main structures of the eye and their functions. (SAQ 5.1)

5.3 Describe the clinical manifestation of cataract. (SAQ 5.2)

5.4 Explain how cataracts can be treated, using language that an affected person in your community can understand. (SAQ 5.2)

5.5 Describe the main types of eye injuries and what first aid you would give in each case. (SAQ 5.3)

5.6 Describe how you would educate people in your community on the prevention of blindness. (SAQ 5.2)

5.7 Describe the effects of a foreign body in the ear and how to remove it. (SAQ 5.4)

5.1 Anatomy and function of the eye

You first need to study the structures of the human eye and their functions. Knowing this will help you understand about the different causes of blindness, such as cataract. As you read the following descriptions, see if you can identify the structures in Figure 5.1, which intentionally has no labels.

The eyeball is a small organ in size, only about 2.5 cm in diameter, but it serves a very important function, which is your sight. Vision is the primary means that you use to gather information from your surroundings. The eye is usually compared to a camera. Each eye gathers light and transforms it into signals to your brain, which interprets what you see as a picture or image. Both the eye and the camera have lenses to focus the incoming light so that the image formed will be clear and understandable.

Figure 5.1 The human eye, front view. (Adapted from: The Open University, 2008, *Visual Impairment: A Global View*, SDK125, Case Study 7, p.13)

5.1.1 Eyelids and eyelashes

The **eyelids** are muscular folds of skin above and below your eyes, which can open and close like a gate covering and revealing the eye. They protect the eye from foreign matter, such as dust, dirt and other debris that might damage the eyes. When you blink, the eyelids also help spread tears over the surface of the eye, keeping it moist and comfortable. **Eyelashes** are small hairs growing from the edges of the eyelids. They filter out dust and debris from the air close to the eye, preventing it from getting into the eyeball.

5.1.2 Sclera and conjunctiva

The **sclera** is a tough, leather-like, white tissue that extends all around the eye. Similar to an eggshell surrounding an egg and giving its shape, the sclera surrounds the eye and gives the eye its shape. The sclera is also attached to small muscles around the eye, which, in turn, move the eye left and right, up and down, and diagonally. When you look at yourself in the mirror the white part of your eye that you see is the front part of the sclera. Outside the sclera is a very thin transparent membrane, called the **conjunctiva**.

5.1.3 Cornea, iris and pupil

The **cornea** is a clear layer at the front of the eye, as you can see in Figure 5.2. You can also see that the cornea is located in front of the **iris**. The main purpose of the cornea is to help focus light as it enters the eye. The iris is the coloured part of your eye and is made of muscle. The iris controls the amount of light that enters the eye through the pupil. The central opening in the ring-shaped muscular tissue of the iris is called the **pupil**, and the amount of light that enters the eye, can be altered by the iris changing its shape.

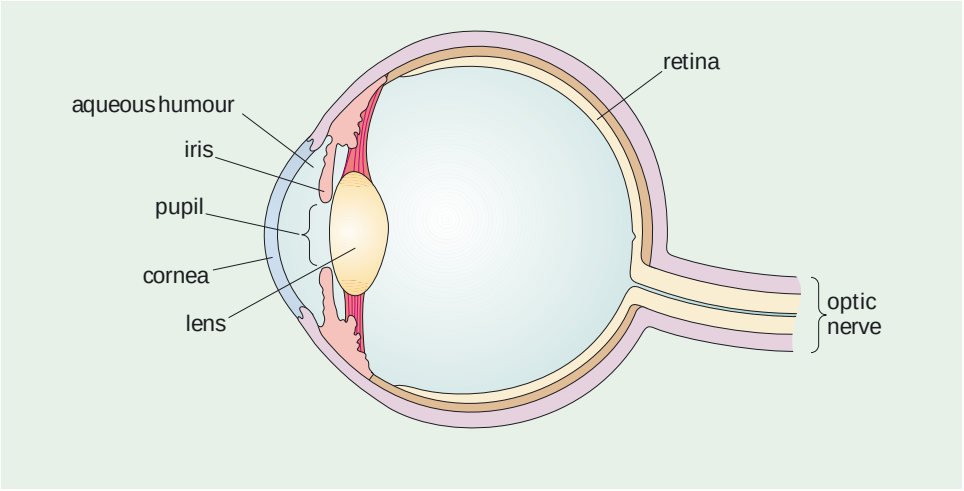

Figure 5.2 Cross section of the eye showing the different parts viewed from the side. (Adapted from: The Open University, 2008, *Visual Impairment: A Global View*, SDK125, Case Study 7, p.13)

5.1.4 Lens and aqueous humour

The **lens** of the eye is a clear flexible structure that is located just behind the iris and the pupil. The lens focuses the light as it passes through the eye onto the retina at the back of the eye. The aqueous humour (it means 'watery matter') is the fluid found just behind the cornea; its function is to nourish the lens.

5.1.5 Retina

The **retina** is a complex layer of tissue at the back of the eye, where the image from the light entering the eye is focused. When light hits the retina, it send signals to the brain along the optic nerve. The brain interprets these signals and turns them into information about what the eye is seeing. Damage to any of the structures of the eye due to physical injury or infection, or their gradual wearing out due to age, reduces the quality of vision.

Now try this exercise to test your knowledge of the structures of the eye.

- Look at Figure 5.3. Can you add the correct names to the structures labelled (a) to (e)?

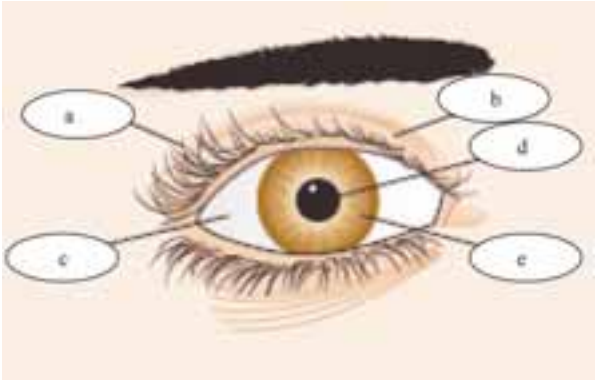

Figure 5.3 Can you name these structures? (The answers are in Section 5.2.1.)

Next we turn to a major cause of blindness all over the world that results from problems in one of the structures you just learned about.

5.2 Cataracts

Cataracts are changes in clarity (clouding) of the lens in the eye, which interferes with the passage of light into the eye. As the lens gets increasingly cloudy (opaque), less and less light can get through it.

- What effect will this have on the signals reaching the brain about what the eye is seeing?

- If less light can reach the retina at the back of the eye, through the cloudy lens, then the signals reaching the brain will be weaker and less focused. The cataract will gradually impair the quality of the person's vision and result finally in blindness, when light can no longer get through the lens.

In 2002 (European calendar) the World Health Organization estimated that there were 37 million people in the world who were totally blind (unable to see with both eyes), and 161 million people with some sort of visual impairment affecting their sight. Cataracts are the most common cause of blindness worldwide, contributing to 48% of the 37 million people who cannot see at all. Ethiopia is making strong efforts to tackle sight problems in our population (Figure 5.4).

Figure 5.4 Ethiopian poster for World Sight Day in 2010 (European calendar).

5.2.1 Recognition of cataracts

You should suspect cataracts are the problem when a person comes to you with complaints of visual changes, such as blurred vision, difficulty in seeing in bright light, inability to see distant objects or scenes, poor colour vision, and difficulty in reading. As cataracts continue to progress and the lens become more opaque, the person will say they feel like they are looking through cloudy glass. The area of the pupil appears white or cloudy when the cataract is found at a late stage.

Figure 5.3: The labels you should have added are (a) eyelashes; (b) eyelid; (c) sclera; (d) pupil; (e) iris.

Cataracts are usually progressive and painless, and not associated with any redness of the eye. When you look at a person with advanced cataract you can see the clouding or milky appearance of the lens, which is particularly obvious if you shine a light into the eye (Figure 5.5).

Figure 5.5 A cataract clouding the lens. (Photo: Dr Amir Bedri Kello)

Cataracts can sometimes develop in children, but usually the person is above the age of 40 years. If someone complains of these problems, you should suspect cataract and refer this person to the nearest hospital or health centre. The diagnosis that cataract is the cause of the visual problems will be confirmed by examination with a special instrument called a slit-lamp microscope (or simply 'eye microscope') to look into the eye.

You should tell the person with suspected cataracts that after the examination at the hospital or health centre, the doctor will discuss if a solution is possible for their sight problems. A simple surgical treatment could transform their vision from not seeing well to being able to see much better again. We will tell you about treatments for cataract later in this study session.

5.2.2 Classification and causes of cataract

Cataracts may be classified based on several factors, including the age of the person when the cataract was first detected, the cause of the cataract and whether it is an inborn (genetic) or acquired problem. Some of the causes include physical injury to the eye, long-term exposure to very bright sunlight, or to the fumes and smoke from household cooking fires, cigarette smoking, poor control of diabetes mellitus (the high sugar levels in the blood damages the eye), and so on. All of these factors reduce the clarity of the lens over time. The susceptibility to develop cataracts can also be transmitted in the genes from parent to child.

Refer to the *Immunization* Module, Study Session 3 and the *Communicable Diseases* Module, Study Session 4 for the doses of Vitamin A drops. More details of blindness due to nutritional deficiency are given in the *Nutrition* Module, Study Session 5.

You should also know that deficiency of vitamin A from the food we eat is an important cause of blindness. To prevent blindness from vitamin A deficiency, infants are given a supplement of vitamin A drops with measles vaccine, repeated every six months until the age of five years.

5.2.3 Prevention of cataracts

The purpose of classifying cataracts is to help you understand the different causes, so that you can educate your community about those causes which are preventable.

- What specific causes of cataract can you prevent or delay from causing visual impairment?

- Did you say poorly controlled diabetes mellitus, eye injury, or direct exposure to sunlight, smoke and fumes? You are right!

- How would you advise people to reduce their risk of developing cataracts?

- By getting treatment if they are diabetic, because effective blood-sugar control delays the progression of cataracts; by shading their eyes with dark glasses to protect them from the harmful rays from the sun; and by not smoking cigarettes, and ventilating their room if smoke from a cooking fire is collecting in the house.

Though there is no really effective way of preventing cataracts at present, interventions such as these can significantly alter the disease burden of cataracts by minimising exposure to factors that promote them to develop. A healthy lifestyle might also help, just as it helps prevent other non-communicable diseases: eat a balanced diet, get regular exercise and rest, and do not smoke or drink much alcohol.

5.2.4 Treatment of cataracts

The most important step in the treatment of cataracts is early detection of the problem. Once it is detected at the early stage, the initial treatment is to slow down the clouding of the lens by following the preventive measures described in the previous section. For late-stage cataract with blindness, the best intervention is surgical treatment to remove the cloudy lens (Figure 5.6).

Figure 5.6 Cataract surgery in a health centre in Ethiopia.
(Photos: Dr Amir Bedri Kello)

Taking out the lens improves the person's sight because light can get all the way to the back of the eye again. However, without a lens to focus the light, the restored vision is more blurred than before the cataracts developed. Cataract surgery may be available that includes replacing the cloudy lens with an artificial one, which restores good sight.

So, besides advocating and practicing the preventive measures, you have to facilitate transfer of people affected by cataracts to a hospital or health centre with an eye-care unit. You should tell the person you refer about the big transformation of life after the treatment of cataract blindness (Case Study 5.1), so that the person will decide on travelling for treatment. At times cataract operation campaigns may come to your village and you should take part in actively mobilising affected people in the community to come for treatment.

Case Study 5.1 Mr K had never seen his grandson

Mr K is 71 years old and has worked as a farmer all his life. His daughter recently gave birth to his first grandson, but he was very depressed when he realised that he cannot see the baby because he is blind from cataracts in both eyes. As a Health Extension Practitioner, you recognised several years ago that Mr K's sight problems were due to his cataracts, but he would not take your strong advice to go to the health centre for assessment and possible treatment. When you went to his house for a visit after his grandson was born, you again encouraged him to travel for cataract surgery. This time he decided to go for treatment. The surgery was very quick and it did not cause him pain. The outcome was successful and when he came back to the village he prepared a big feast to celebrate his ability to see his new grandson.

Does this story help you in referring other people for cataract treatment? We hope that it does, as you know it is a great blessing for anyone to reach the age of having grandchildren and great-grandchildren. But being unable to see them is sad. When this disability is corrected by cataract surgery it is like being reborn. So, such a success story is useful in encouraging people to go for cataract treatment.

5.3 Eye injuries

Eye injuries are very common in most communities, especially in children and people younger than 30 years. Injury to the eye is one of the causes of cataracts. Eye injuries are the leading cause of blindness in only one eye worldwide. When you study the types of injuries described below, you will understand why young people are more likely than older people to suffer a blinding injury to one eye.

5.3.1 Causes and types of eye injuries

There are several common causes of eye injury, which have different outcomes depending on the extent of the injury and degree of disability that follows. Some of the common causes are listed below.

Chemical injury (splash)

A splash in the eye by anything other than clean water can be dangerous. Some substances sting when they get into the eye accidentally (e.g. lemon juice, salty water), but are harmless. Others can cause serious damage (e.g. cleaning fluids, agricultural chemicals). Acids cause more damage to the delicate structures of the eye than most other chemicals.

Scratch by a foreign body

Any foreign body (e.g. a speck of dust or some dirt) that gets into contact with the eye accidentally causes a scratch to the cornea or sclera. This can be painful at the time it happens, and cause the eye to 'water' as a way of flushing the dirt out of the eye. If the scratch is not deep it will usually soon heal. However, a deep scratch can cause impaired vision if it leaves a scar on the cornea.

Penetration by sharp objects

Penetration of the cornea (or rarely the sclera) can happen due to sharp objects accidentally entering the eye and penetrating the eyeball. This causes intense pain, redness and excessive weeping of tears from the eye, and can lead to permanent sight problems. The objects causing the injury can be fragments of wood, metal or stones, and such accidents often happen at work (Figure 5.7).

Figure 5.7 A young man at risk of a penetrating eye injury. He is not wearing anything to protect his eyes while working.

Blunt (non-penetrating) injury

The eye can get injured by a blow, for example in a fight or a fall, without any penetration in the eye structure externally. The surface of the eye looks very red, due to bleeding from tiny blood capillaries in the sclera. The eye may swell and vision may be affected, but usually the swelling will go down and the blood will be absorbed into the body over several days or weeks.

Injury to the eyelids

You may come across someone who has got a cut to the eyelids following a blow or sharp injury. There may also be swelling without a cut over the eyelids.

Now it is time to tell you about first aid supportive care for such a problem, and all the other eye injuries described above.

5.3.2 Supportive care in the case of eye injury

If you are treating someone with a chemical splash injury, or dust in the eyes, simply rinse the eye with plenty of clean water. Foreign bodies which are not attached to the eye, or do not cause penetration to the eyeball, can simply be removed with the edge of a clean piece of cloth. Getting the chemicals, dirt or other foreign body out of the eye quickly protects it from further damage. If the foreign body is difficult to remove because it is attached to the eye, or if there is penetration or injury to the eyeball (Figure 5.8), cover the eye with clean cloth and transfer the person to the health centre or hospital.

Figure 5.8 The cornea has been partly torn away in this person's eye. Injuries are a common cause of sight loss. (Photo: Dr Fitsum Bekele Gulelat)

If you happen to see a person with injury to the eyelids, or swelling, you should stop the bleeding and help reduce the swelling by applying gentle pressure to the eye using a pad of clean cloth. Refer the person to the health centre or hospital.

5.4 Trachoma

Trachoma is described in detail in the *Communicable Diseases* Module, Part 4, Study Session 39.

We will briefly mention a very common cause of blindness in Ethiopia – bacterial infection with *Chlamydia trachomatis* leading to a condition called **trachoma**. The infection causes inflammation of the conjunctiva, the thin transparent membrane covering the eyeball and the inner surface of the eyelids. The upper eyelid is particularly affected and over time it becomes so swollen and scarred that the eyelashes turn inwards and scratch across the surface of the cornea every time the person blinks. The cornea is damaged by the scratching eyelashes and it gradually becomes opaque (unable to transmit light).

Corneal opacity is a major cause of sight loss. Over 80 million people suffer from trachoma worldwide, and in Ethiopia there are estimated to be more than 238,000 people who are blind because of it (Figure 5.9).

Figure 5.9 An Ethiopian woman with corneal opacity caused by chronic trachoma. (Photo: AMREF Ethiopia/ Atsebeha Asrat)

Mild trachoma is easily treated with tetracycline eye ointment (1%). Trachoma scarring can be reduced or prevented by simple eye surgery to turn the eyelashes outwards so they don't scratch the eye. Prevention of trachoma is through avoiding the infections from getting into the eyes. The bacteria are transmitted mainly by flies landing on the face and carrying the infected discharge from the eyes to another person, or the bacteria are transferred on dirty hands or cloths used to wipe the sore eyes. Regular washing of faces and hands, disposing of rubbish and other waste to keep flies away from houses, and penning animals away from homes at night, are all ways to reduce the risk of trachoma.

Next you will be studying about foreign bodies in the ear, which is a common problem in children.

5.5 Ear injuries due to foreign objects

As you learned in the *Communicable Diseases* Module (Study Session 35), children are prone to develop infections of the inner ear, which may have spread from the respiratory tract up the Eustachian tubes into the ears (Figure 5.10).

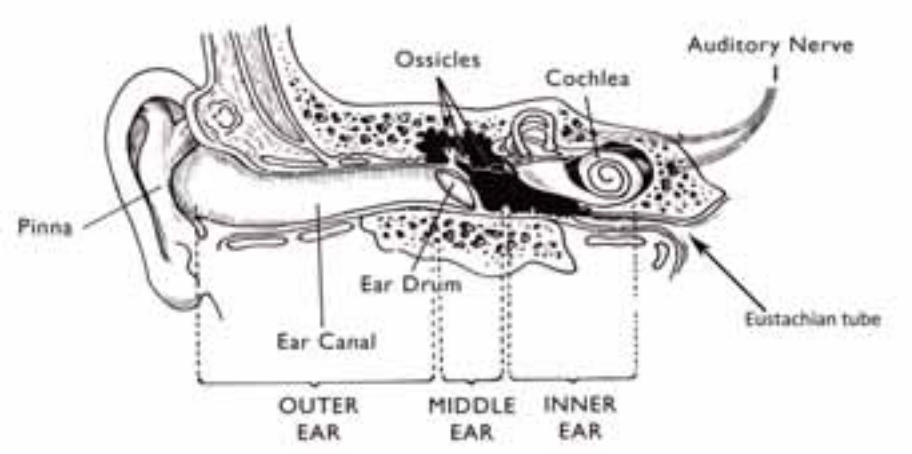

Figure 5.10 Anatomy of the ear and its connection with the respiratory tract via the Eustachian tubes on each side of the head. (Source: WHO, 2006, *Primary Ear and Hearing Care Training Resource: Trainer's Manual – Intermediate Level*, p.16)

Another very common ear problem in children is caused when they put foreign objects into the ear canal (on the left of Figure 5.10) when they are playing. They often put small objects such as beans, peas, rice, beads, fruit seeds or small stones into their ears. If these foreign bodies remain in the ear for a long time, they make it more likely that the child will develop an ear infection. This in turn may lead to a loss of hearing, if untreated. You should suspect the possibility of something foreign in a child's ear if the child complains of pain in the affected ear, a bad smell or discharge comes from the ear (Figure 5.11), or the parents or school teacher tell you that the child doesn't seem to hear them talking if they speak into that ear.

Figure 5.11 Pus discharge as a result of chronic ear infection (otitis media). (Photo: WHO, 2006, *Primary Ear and Hearing Care Training Resource*: *Student's Workbook – Intermediate Level*, p.53)

Simple removal of a foreign object from the ear helps to reduce the risk of deafness resulting from chronic (long-term) infection. Shine a torch into the child's ear and if the foreign object is visible, try to remove it by using a thin *blunt* instrument (Figure 5.12) – the end must not be sharp! If the ear drum is broken or scarred by infection, the child could suffer some permanent hearing loss in that ear. If you don't see a foreign object when you look into the ear with a torch, transfer the child to the nearest health facility for specialist help. If there is any discharge from the ear, the child will need medical treatment with antibiotics.

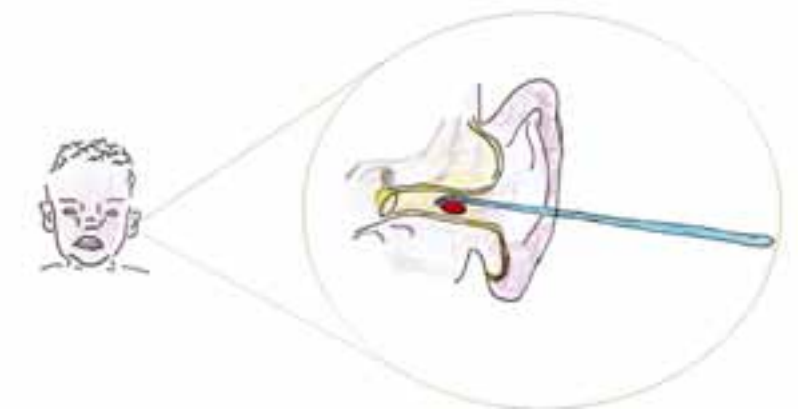

Figure 5.12 Foreign object being carefully removed from a child's ear by a thin blunt instrument. (Diagram: Dr Radmila Mileusnic)

Be careful not to push the instrument too far into the ear, or you may puncture the delicate ear drum!

In the next study session you will study another important but often neglected topic for your health promotion and disease prevention practice – oral health and the prevention of dental problems.

Summary of Study Session 5

In this study session, you have learned that:

1 The eye serves an important purpose of vision and its function is comparable to the function of a camera in taking a photo.

2 The main structures of the eyeball are the sclera, cornea, pupil, iris and lens, all of which have the important function of transmitting light onto the retina at the back of the eye where the image is formed.

3 Cataracts and eye injuries are important causes of blindness worldwide, where cataract alone contributes to 48% of all people who are totally blind.

4 The early symptoms of cataract are blurred vision, difficulty seeing in bright light and poor colour vision.

5 Cataract progression can be slowed by preventing eye injury, strict control of blood sugar, and avoiding exposure to smoke from cigarettes and indoor fires. Lack of vitamin A in the diet and measles infection are other causes of blindness.

6 Common causes of eye injury are scratches, chemical splashes, penetrating and blunt injuries, and cuts to the eyelids.

7 Damage to the cornea by the eyelashes turning inwards and scratching it is an important cause of blindness. It is due to a chronic eye infection called trachoma.

8 Children often insert small foreign objects into their ears, which can lead to problems of ear infection and deafness. Some of the common objects they play with are beans, peas, beads and fruit seeds.

9 Careful removal of foreign objects from the ears prevents ear infection, which is an important cause of deafness, especially in children.

Self-Assessment Questions (SAQs) for Study Session 5

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 5.1 (tests Learning Outcomes 5.1 and 5.2)

Which structures of the eye are serving the purpose of defending the eye, and which ones are for transmission of light into the eye?

SAQ 5.2 (tests Learning Outcomes 5.3, 5.4 and 5.6)

Read Case Study 5.2 and respond to the questions that follow.

Case Study 5.2 Mr Worku can't see well

Mr Worku, a 75-year-old man from your village, complains of having blurred vision and difficulty seeing in the bright sunlight whenever he goes to the market. He very frequently holds his hands above his eyes to shade them from the sun, and he finds it difficult to see who is approaching him when he meets people in the village.

(a) What is the most likely cause of the visual problems this man is having? What signs in the case study suggested your diagnosis?
(b) What advice will you give to Mr Worku about how his condition can be delayed from getting worse? What do you tell him about possible treatment in the future?

SAQ 5.3 (tests Learning Outcome 5.5)

Why do you think that children and young adults are more likely than older people to suffer an injury to *one* eye that results in long-term damage?

SAQ 5.4 (tests Learning Outcome 5.7)

Read Case Study 5.3 and respond to the questions that follow.

Case Study 5.3 A child has a bad-smelling ear discharge

A three-year-old child was brought to you with earache, pulling her external ear now and then, and you can see a whitish-yellow ear discharge. The parents also report that the child is not hearing well when they speak to her in a normal voice. They say they have to speak very loud so that the child hears what they say.

(a) What possible problem would you look for in this child?
(b) How would you treat her condition?

Study Session 6 Oral Health

Introduction

Oral diseases are a significant burden to all countries of the world, including Ethiopia. Oral diseases include tooth decay, leading to painful dental cavities and tooth loss, gum infections that cause teeth to decay and fall out, broken teeth, birth defects such as cleft lip and cleft palate, and cancers in the mouth (oral cancer). The World Health Organization (WHO) estimates that 60–90% of school children worldwide have dental cavities, and severe gum disease is found in 5–20% of middle-aged adults.

With the exception of birth defects (which have a genetic basis), all these oral conditions share common risk factors with the four leading chronic diseases – cardiovascular diseases, diabetes mellitus, cancers and chronic obstructive pulmonary disease (COPD) – they include unhealthy diet, tobacco use and excessive use of alcohol. Poor oral hygiene is also a risk factor for oral diseases.

In this study session you will learn the basic anatomical structure of the mouth and teeth, and about the common causes of oral diseases and how to promote oral health in your community through improved oral hygiene.

Learning Outcomes for Study Session 6

When you have studied this session, you should be able to:

6.1 Define and use correctly all of the key words printed in **bold.** (SAQs 6.1, 6.2 and 6.3)

6.2 Explain what oral health means and describe the structures in the oral cavity and their functions. (SAQs 6.1 and 6.4)

6.3 Describe the common oral diseases and their causes. (SAQs 6.2 and 6.3)

6.4 Explain how to decrease the burden of oral diseases in your community by promoting oral hygiene. (SAQs 6.2 and 6.4)

6.1 The oral cavity and oral health

We begin this study session by introducing you to the anatomy and functions of the mouth and its associated structures. This will enable you to understand the oral diseases and disorders described later. According to the WHO, **oral health** means being free from the following conditions: chronic mouth and facial pain, oral or throat cancer, oral sores, birth defects such as cleft lip and palate, gum disease, tooth decay, and tooth loss.

6.1.1 The oral cavity

Oral hygiene is the practice of keeping the **oral cavity** (lips, tongue, teeth, throat and surrounding structures, Figure 6.1) clean and healthy to prevent tooth decay and gum disease.

The oral cavity is the entrance to the digestive tract and the respiratory system (look back to Figure 2.2 in Study Session 2 and Figure 4.1 in Study Session 4). A healthy oral cavity has smooth, unbroken lips without any sores. The teeth are not broken or cracked; they are clean and without signs of decay. The tongue and gums are clean and pink, without any greyish coating,

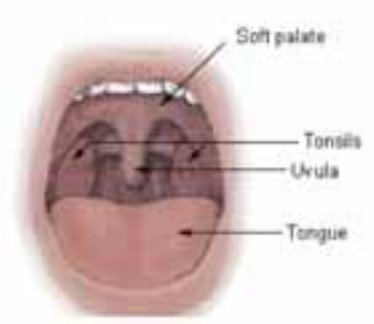

Figure 6.1 Diagram of the oral cavity; the lower teeth are hidden behind the lower lip. (Source: Author unknown, downloaded from Wikimedia Commons)

bleeding, sores or swelling. The **saliva** that keeps the mouth moist should be a clear fluid, not thick or coloured white or greenish, which is a sign of infection. The breath emerging from the mouth should be without any smell.

In addition to the teeth, the other structures that aid chewing of food are the lips, cheek muscles, tongue, the roof of the mouth (hard palate), the soft palate (see Figure 6.1) and the uvula. The **tonsils** are small organs in the throat, containing white blood cells, which help to prevent infection entering the body through the mouth.

6.1.2 Teeth

Humans normally produce two complete sets of teeth in our lifetime. The first set are called 'baby' teeth or 'milk' teeth and there are 20 of them. They usually begin to emerge from the gums at the age of four to six months, but occasionally much earlier. The second set, consisting of 32 permanent teeth, begin to replace the first teeth around the age of six years. If a permanent tooth is damaged or lost, the body cannot replace it. Teeth are the toughest structures in the body – much stronger than our bones. They are covered in tooth **enamel**, the hard white shiny substance which gives great strength to the tooth (Figure 6.2).

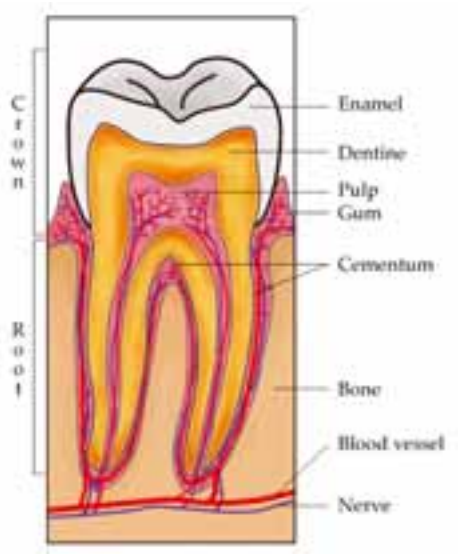

Figure 6.2 Internal structure of a human tooth (a molar in this example). (Source: Author unknown, downloaded from Wikimedia Commons)

- What do you think is the purpose of tooth enamel and what does it enable us to do?

- The enamel protects teeth from penetration by bacteria, so it prevents tooth decay. It also strengthens the teeth and stops them from wearing down, so we can bite off chunks of food and chew it to a soft mass throughout our lives.

There are various tooth shapes for different jobs. For example, when chewing, the upper teeth work together with the lower teeth of the same shape to bite, chew and tear food apart. According to their shape and function the adult teeth have got different names (Figure 6.3 and the bullet points below it).

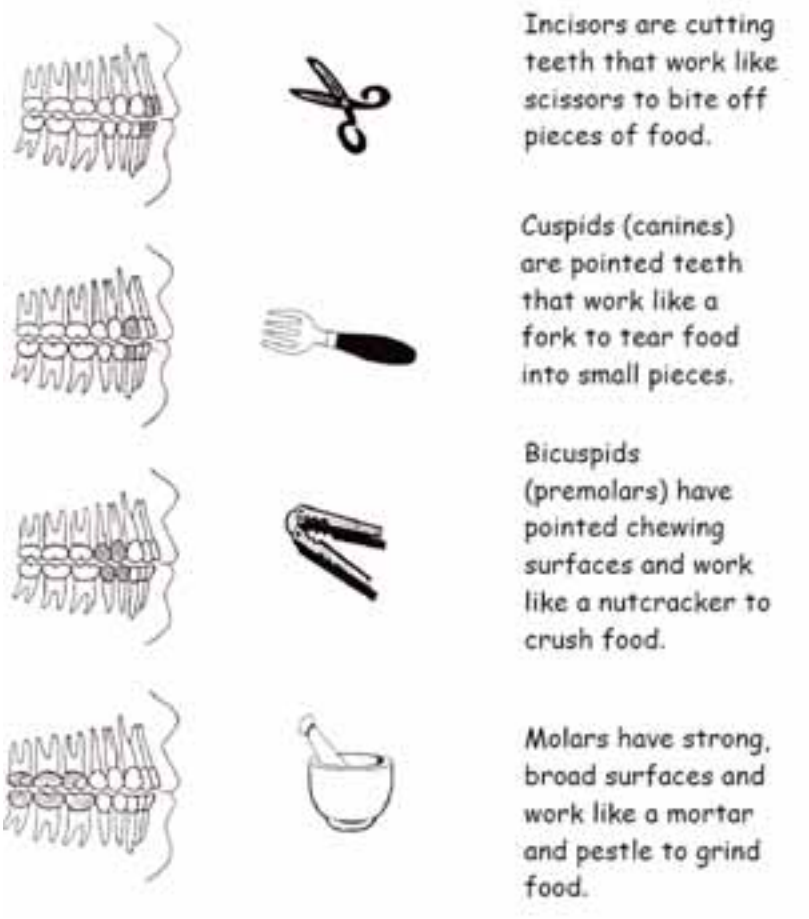

Figure 6.3 The position, shapes and functions of different types of teeth in the adult mouth. (Source: Ontario Association of Public Health Dentistry, 2001, *Oral Anatomy*, pp.2–5)

- Incisors: there are eight incisors in the front of the mouth (four on the top and four on the bottom). They have sharp, chisel-shaped crowns that cut food.
- Cuspids: (or canine teeth): there are four cuspids, one next to each incisor. They have a pointed edge to tear food.
- Bicuspids (or premolars): the four pairs of bicuspids are located next to the cuspids. They crush and tear food.
- Molars: there are twelve molars, in sets of three, at the back of the mouth. They have wide surfaces that help to grind food.

6.1.3 Salivary glands

Glands are organs of the body which produce natural substances such as hormones and breast milk, and fluids that keep the body in fluid balance. **Salivary glands** are organs that produce saliva and release it into the mouth, particularly when we are hungry and when we are chewing food. There are three pairs of salivary glands; their names and locations are shown in Figure 6.4. Their names tell you where they are located: parotid means 'beside the ear', sublingual means 'under the tongue', and submandibular means 'under the jaw'.

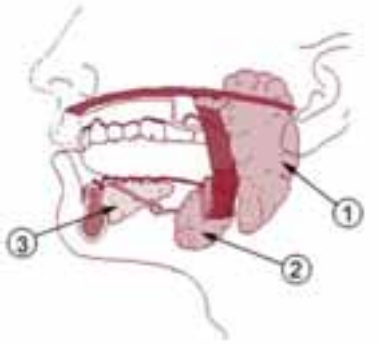

Figure 6.4 Salivary glands: (1) the parotid gland, (2) the sublingual gland and (3) the submandibular gland. (Source: Author unknown, downloaded from Wikimedia Commons)

Figure 6.5 A healthy tongue; the 'cracks' are normal and characteristic of each individual. (Photo: Author unknown, downloaded from Wikimedia Commons)

If the salivary glands don't function properly due to disease or an injury, the amount of saliva produced decreases and the mouth becomes dry. This is unpleasant for the affected person, it makes chewing and swallowing food more difficult, and it increases the risk of tooth decay and gum disease. There may also be a bad smell from a dry mouth, because saliva naturally keeps the mouth clean by washing away bacteria and small particles of food.

6.1.4 Tongue

The tongue is a muscular organ which is important in enabling us to taste different types of food, roll chewed food into a ball for easy swallowing, and communicate with others through speech. A healthy tongue is pink and clean, with hundreds of tiny 'taste buds' visible on its surface (Figure 6.5).

6.2 Common oral diseases and their causes

Neglecting dental and oral hygiene, eating a high-fat high-sugar diet, chewing *khat,* smoking or chewing tobacco, and excessive alcohol consumption are the main causes of mouth, tooth and gum diseases. In this section, we describe the most common oral diseases, how you can identify them and what actions you should take.

6.2.1 Bacterial, viral and fungal infections in the mouth

As a health worker, you will know that inspecting the tongue of a person helps you to quickly assess whether he or she is healthy or not. In someone who is unhealthy, the tongue is often coated with a whitish or yellowish deposit that has a fur-like appearance. This may be caused by bacteria, viruses or a fungal infection ('thrush') growing on the tongue, which may be due to inadequate oral hygiene. You should also be aware that up to 50% of people who are HIV-positive have fungal, bacterial or viral infections in the mouth, which often occur early in the course of HIV infection. If you are involved in palliative care for someone who is terminally ill (see Study Session 3), you will notice that mouth infections such as thrush are very common as the person approaches closer to death.

Opportunistic infections in people living with HIV/AIDS are described in the *Communicable Diseases* Module, Part 3, Study Session 21.

Mouth infections may be treated by good oral hygiene (see Section 6.2.2 below) and by salt water mouth washes. Dissolve a large spoonful of salt in a cup of water which has been boiled and then allowed to cool. The patient should take a mouthful of the salt solution and hold it in his or her mouth for at least two minutes, using their tongue to move the solution around all parts of the mouth. Spit out the solution and repeat one or two more times. This should be carried out two or three times per day until the mouth remains clean.

A patient with HIV/AIDS or a terminal illness, whose immune system is not working adequately, may need medical treatment for infections in the mouth and should be referred.

- Can you explain why infections in the mouth are common among people living with HIV/AIDS or in the later stages of a terminal illness?
- The reason is because the immune system, which normally defends the mouth from infection, is no longer functioning adequately.

6.2.2 Tooth decay

Bacteria constantly multiply in food particles in the mouth, particularly on the teeth and trapped between the teeth. When bacteria build up, they form a sticky, colourless substance called **plaque** (pronounced 'plaak'), which is the main cause of tooth decay and gum disease. Bacteria produce acids that destroy tooth enamel, enabling the bacteria to penetrate into the internal structure of the tooth (look back at Figure 6.2) and cause decay. When plaque is not removed by brushing, it hardens into **tartar** (or *calculus*), which is very difficult to remove. The growing layer of tartar pushes the gums away from the tooth and in time it may become loose and fall out.

Certain foods contribute to plaque formation. A diet high in sugar and starch will eventually result in tooth decay. Today, in most parts of Ethiopia, sugar appears to play a key role in the increasing rates of tooth decay. Sugar cane, soft drinks, biscuits, candy, other sweets and refined sugars are readily available in every corner of the country, and the use of sugar as a sweetener in tea and coffee is now universal in both urban and rural Ethiopia. This is having a negative impact on the dental health of the population.

Using tobacco also increases the risk of developing gum disease. Smoking and chewing tobacco and *khat* contribute to plaque and tartar build up, as well as causing oral cancer (see Section 6.2.4).

6.2.3 Fluorosis

Fluoride is a substance found in nature that strengthens teeth and helps prevent tooth decay. Most water systems naturally contain some fluoride, but the amounts must be 'just right' to promote oral health. Not getting enough fluoride in the diet or water supply increases the risk of tooth decay. Many western countries either add it to tap water or advise people to use toothpastes containing fluoride. Communities in the highlands of Ethiopia have water supplies low in fluoride, so they are prone to faster rates of tooth decay than elsewhere.

However, very high concentrations of fluoride are even more damaging to the teeth. Water sources in the Ethiopian Rift Valley have very high fluoride levels, causing **dental fluorosis** (yellowish discoloration of the teeth, (Figure 6.6a) in their populations. A high intake of fluoride during childhood, especially in the first six to seven years of life, leads to severe fluorisis later in life (Figure 6.6b). This is associated with cracking and 'pitting' (tiny holes in the surface) of the teeth, which create cavities for bacteria to grow and cause tooth decay. The teeth become very weak and can easily break.

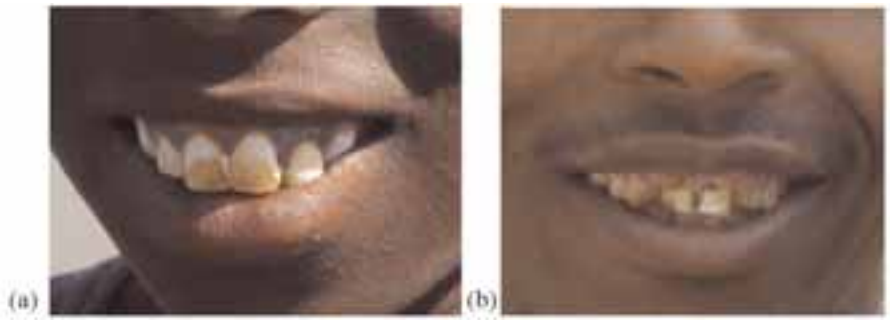

Figure 6.6 (a) Dental fluorosis in a boy aged about ten years, Ziway, Ethiopia. (b) Tooth decay and broken teeth in an adult with severe dental fluorosis, SNNPR, Ethiopia. (Photos: Basiro Davey)

6.2.4 Tooth abscesses, mouth ulcers and cold sores

Tooth **pulp** is the deepest part of the tooth structure, where nerves and blood vessels are found (look back at Figure 6.2). If it becomes diseased or injured and can't repair itself, the tooth dies and will soon fall out. The most common cause of pulp death is a cracked tooth or a deep cavity. Both of these problems can let bacteria enter the pulp and cause an infection inside the tooth. This infection can create a **tooth abscess**, which is a collection of pus trapped inside the root of the tooth, or in the tissue surrounding the root. Tooth abscesses are very painful and often produce swelling of the mouth in the affected area. The tooth may have to be removed to release the pus and allow the infected area to recover. The patient may also need antibiotic treatment.

Mouth ulcers are open sores in the mouth, where infection has penetrated the outer layer of tissue. The edge of an ulcer is often 'rolled' like a piece of *injera*. Salt water mouth washes may be enough to kill the infection in a mouth ulcer. Another common oral infection are **cold sores** – rapidly developing 'scabs' on the lips and around the edges of the mouth, caused by Herpes viruses (Figure 6.7).

Figure 6.7 A cold sore on the lip caused by Herpes viruses. (Photo: Public Health Image Library, image 1573)

6.2.5 Eroded or broken teeth

Cracked or broken teeth can be caused by personal habits such as biting pens or chewing hard items like *khat*, hard grains and nuts. Chewing *khat* wears down the teeth over many years. Elderly users of *khat* may have to grind the leaves and mix the green paste with water (Figure 6.8) because their teeth may have worn away completely after many years of chewing the tough leaves. Using your teeth as a heavy duty tool (e.g. for wire cutting or opening bottles) can damage the enamel and crack or break the tooth. This makes tooth decay more likely to occur.

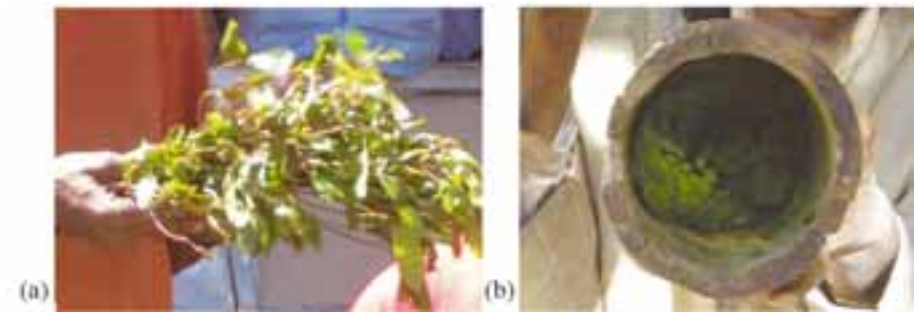

Figure 6.8 (a) *Khat* being sold in a market in Adama, Ethiopia; (b) *Khat* ground with water by an elderly man whose teeth have worn away.
(Photos: (a) Janet Haresnape; (b) Basiro Davey)

6.2.6 Oral cancer

In Study Session 3 of this Module you studied the different types of cancers, with particular focus on cancers of the breast and female cervix. **Oral cancer** in the mouth is a less common cause of disability and death, which is often neglected because the signs and symptoms are not recognised, or are thought to be due to infection in the mouth. The signs are white and red patches inside the mouth or lips (Figure 6.9), swelling, blisters and ulcers, difficulty in swallowing, ear pain, loose teeth, and bleeding from the mouth. These signs should alert you to refer the person urgently to a higher health facility for specialist evaluation.

Figure 6.9 Widespread cancer and fungal infection of the tongue. (Photo: Luca Pastore, Maria Luisa Fiorella, Raffaele Fiorella, Lorenzo Lo Muzio, downloaded from Wikimedia Commons.)

- In most countries, the incidence of oral cancers is between one and ten new cases arising every year per 100,000 population. In the Ethiopian population of approximately 80 million people, how many new cases of oral cancer would you expect in a single year?

- 80 million divided by 100,000 = 8,000. So if there is only one new case per 100,000 population in Ethiopia, you would expect 8,000 new cases of oral cancer to develop in a single year. There would be ten times this number (80,000 cases) if the incidence rate was 10 new cases per 100,000 population.

Two known causes of oral cancer are tobacco and alcohol. Eighty to 90% of oral cancers come from smoking cigarettes, cigars or pipes, chewing tobacco or *khat*. The longer a person has used tobacco, the higher is their risk of developing cancers, including oral cancer, as well as lung and other cancers. People who use a pipe for smoking tobacco are especially prone to cancer of the lip. When a person stops using tobacco, they greatly reduce the risk of developing oral cancer. Strong alcoholic drinks ('spirits' like whisky and brandy) are damaging to the delicate membranes in the mouth, and prolonged use over several years increases the risk of developing oral cancers.

6.2.7 Cleft lip and cleft palate

Finally, we should mention birth defects such as cleft lip and palate (Figure 6.10). These conditions occur in around one per 500 to 700 of all births, but the rate varies substantially between different ethnic groups and in different countries. The clefts can be repaired surgically, but many affected children in poor communities are left without surgery.

A cleft lip may result in the child being stigmatised and rejected as it grows up. A cleft palate can allow infection to get into the brain through the gap in the roof of the mouth; this rapidly leads to death unless urgent medical attention is received.

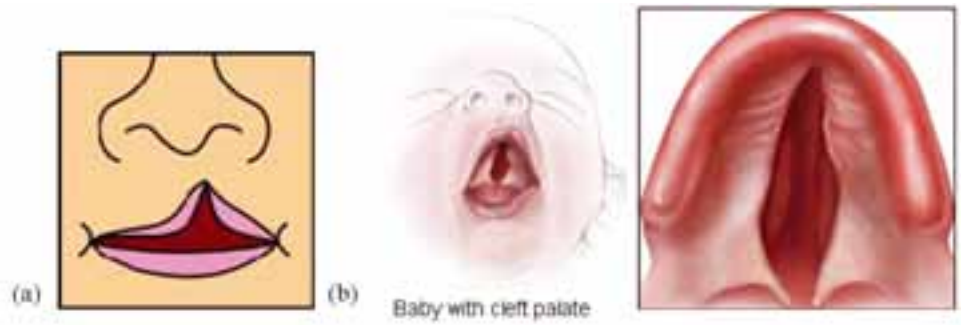

Figure 6.10 Diagrams of (a) cleft lip, and (b) a cleft palate. (Sources: (a) Felsir; (b) PD-USGOV, both downloaded from Wikimedia Commons)

6.3 How can the burden of oral diseases be reduced?

The burden of oral diseases and several other chronic non-communicable diseases can be reduced simultaneously by addressing common risk factors, such as tobacco use, harmful use of alcohol and an unhealthy diet. Therefore, the health education you should give to people in your community to promote oral health should be to:

- Reduce the intake of sugars and fats and eat a well-balanced diet, which is rich in fruits, vegetables, whole grains, peas and beans; raw vegetables and fruits also help to clean the teeth due to their high fibre content.
- Drink milk. It contains calcium to build strong teeth and bones.
- Eat fluoride-rich foods, such as fish, if they live in a low-fluoride area. Excess fluoride in water can be controlled by the authorities if water is treated to remove some of the fluoride; traditional low-cost methods include storing drinking water in clay pottery, which absorbs some of the fluoride.
- Don't smoke or chew tobacco and don't chew *khat*.
- Reduce alcohol consumption to small occasional amounts (if any).
- Promote oral hygiene.

Oral hygiene is the practice of keeping the mouth clean and healthy by brushing the teeth, gums and tongue every day, and cleaning between the teeth using thread-like material (flossing) to prevent tooth decay and gum disease. Advise your community members, especially children, to brush their teeth for a minimum of two minutes at least twice a day and ideally after each meal. If modern toothbrushes are unavailable or are too expensive, use indigenous tooth sticks made from *neem, woiyra* or other trees (Figure 6.11).

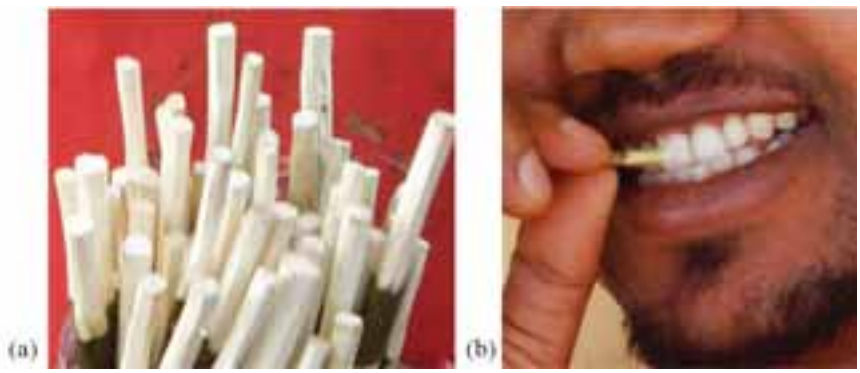

Figure 6.11 (a) Tooth sticks used in Ethiopia; (b) using a tooth stick to clean between the teeth. (Photos: (a) Basiro Davey, (b) Ali Wyllie)

In big towns, modern toothbrushes and toothpaste are available for cleaning the teeth, but they cost much more than traditional tooth sticks. You should advise your clients that if they buy a toothbrush, choose a soft bristled one and use fluoride toothpaste. Hold the toothbrush at a 45-degree angle at the gum line, brushing in a circular motion. This sweeps plaque from between the teeth.

People living with HIV/AIDS, diabetes or cancer should ask a dentist or doctor to check their oral cavity once or twice a year, because these conditions weaken the resistance of the body and infection in the mouth is very likely.

In the next two study sessions (the final sessions in Part 1 of this Module) you will learn about how to give life-supportive care to people with emergency conditions.

Summary of Study Session 6

In Study Session 6, you have learned that:

1 Oral health is being free from pain and disease in the oral cavity; oral hygiene is the practice of keeping the mouth clean by brushing and flossing.

2 The oral cavity is the entrance to the digestive and respiratory systems; it includes the teeth and other structures that aid chewing and speech, such as the lips, cheeks, tongue, hard and soft palate, and the salivary glands.

3 Humans produce two sets of teeth in their lifetimes. The teeth are the strongest structures in the body; their surface is protected by a layer of hard enamel. The shapes of the four different types of teeth enable them to perform different functions during eating.

4 Three pairs of salivary glands secrete saliva, which is a clear liquid produced to keep the mouth wet and clean, and to aid chewing and swallowing.

5 Sticky bacterial growth around the teeth is called plaque. It destroys the enamel by producing acids which allow decay to penetrate the teeth. If plaque is not removed, it hardens into tartar, which causes the gums to pull away from the teeth. Plaque, tartar and gum disease increase the risk of tooth loss.

6 Dental fluorosis is caused by long-term high intake of fluoride in the water supply beginning in childhood; severe fluorosis leads to cracking of the teeth and tooth decay.

7 Other common causes of oral diseases are tooth abscesses, mouth ulcers and cold sores, worn and eroded teeth, and oral cancers.

8 Babies may be born with a cleft lip or cleft palate, which should be repaired surgically.

9 Common causes of oral diseases are a high-sugar high-fat diet, use of tobacco, *khat* and alcohol, using the teeth as a tool, and poor oral hygiene.

10 Oral health can be promoted through eating a healthy diet, drinking milk to build strong teeth and bones, avoiding harmful substances like tobacco, *khat* and alcohol, good oral hygiene, and protecting the teeth from damage and decay.

11 Regular tooth brushing and cleaning between the teeth (flossing) should be taught to children and adults in your community.

Self -Assessment Questions (SAQs) for Study Session 6

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 6.1 (Learning Outcomes 6.1 and 6.2)

Which of the following statement is *false*? In each case, explain why it is incorrect.

A The structures of the oral cavity enable us to speak, chew and swallow.

B Humans normally produce two sets of 32 teeth.

C The mouth is the entrance to the digestive and respiratory systems.

D The palate is the floor of the oral cavity.

E Saliva helps to keep the mouth clean.

F Teeth are dead structures made from enamel and bone.

SAQ 6.2 (tests Learning Outcomes 6.1, 6.3 and 6.4)

(a) What is plaque and what conditions promote its formation on our teeth?
(b) What are the consequences of plaque forming on the teeth?
(c) What can be done to prevent it?

SAQ 6.3 (tests Learning Outcomes 6.1 and 6.3)

Habtamu was born and grew up in the Rift Valley in Ethiopia. He is now ten years old and his teeth are yellowish in colour. His friends say he has natural 'gold' teeth, but most of them also have yellow or brown patches on their teeth.

(a) Why are Habtamu's teeth yellow? What is this condition called?
(b) What problems could result from it in the future?

SAQ 6.4 (tests Learning Outcomes 6.1, 6.2 and 6.4)

Imagine that you are invited to talk about promoting oral health in a primary school in your village. After the lesson, you ask the students to make a poster with the most important messages about oral health. What messages would you expect to see on the poster made by the children?

Study Session 7 Injury-Related Emergencies and Supportive Care

Introduction

Emergency conditions are those that threaten a person's life, limbs or eyesight. These are common conditions in every community all over the world. They can result in disability and death if they are not properly and urgently treated. Learning about these emergencies enables you to improve the outcome of **life-supportive care**, i.e. care that prevents death and reduces the risk of long-term disability in an individual who has suffered a life-threatening emergency. Note also that effective life-supportive care also protects the person's family and his or her community from the socio-economic consequences of loss of life, limb or eyesight. These adverse outcomes reduce or destroy the productivity of the individual and affect their ability to care for their family and contribute to the community at large.

In this study session you will learn about common *injury-related emergencies*, how they occur, how to detect these conditions, and how to give basic life-supportive care to an injured person. You will also learn how to transfer a patient with these emergencies to a higher-level health facility for more complete specialist care. The emergencies to be covered in this session are acute injury and bleeding caused by violence, fractures, head and spinal injury, burns and multiple injuries.

Learning Outcomes for Study Session 7

When you have studied this session, you should be able to:

7.1 Define and use correctly all of the key words printed in **bold**. (SAQs 7.1, 7.2 and 7.4)

7.2 Describe how to stop external bleeding following an injury and how to assess a person for internal bleeding. (SAQs 7.1 and 7.4)

7.3 Identify different types of fractures and explain how to immobilise a fractured limb for transport to a health facility. (SAQs 7.1, 7.2 and 7.4)

7.4 Describe the signs and symptoms of head and spinal injuries, and how to immobilise a person with such an injury for transport to a health facility. (SAQs 7.1, 7.2 and 7.4)

7.5 List the common causes and degrees of burns injuries and describe the first aid you should give for a burn. (SAQs 7.1 and 7.3)

7.1 Acute injury and violence

Acute injury refers to any physical damage to the body that occurs suddenly as a result of force. There are many ways in which a person can be injured, either unintentionally (for example, in an accidental fall or being hit by a vehicle), or intentionally through violence, war or attempted suicide. Figure 7.1 (on the next page) shows the distribution of deaths as a result of different types of injury worldwide.

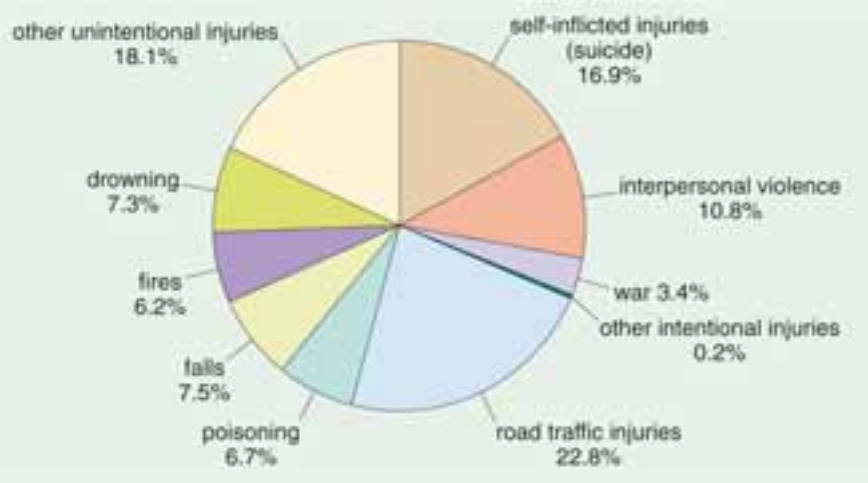

Figure 7.1 Percentage of deaths worldwide due to intentional and accidental (unintentional) injuries among people aged 15–45 years. (Diagram: The Open University, *Trauma, Repair and Recovery*, SDK125, Case Study 6, Figure 1.3)

■ What are the top four causes of injury-related deaths shown in Figure 7.1?

□ They are: road traffic injuries (22.8%), other unintentional injuries (18.1%, i.e. not due to drowning, fires, falls or poisoning), suicide (16.9%), and interpersonal violence (10.8%).

Violence includes rape and is the intentional and unlawful use of force between two individuals, or a group of people, leading to physical or mental harm. It is a major public health problem worldwide – each year more than two million people die as a result of injuries caused by violence. Many millions survive their injuries, but remain permanently disabled. Many other health problems result from violent assaults, including mental disorders (see Part 2 of this Module), sexually transmitted infections (STIs), unwanted pregnancies and behavioural problems.

7.2 Bleeding

Violence caused by blows, sharp objects, bullets or sticks, and other causes of acute injury like falling or road traffic accidents, usually results in **bleeding** – the loss of blood from the arteries, veins and capillaries in the cardiovascular system. (Look back at Figure 1.4 in Study Session 1 of this Module to remind yourself about these blood vessels.) Based on the source of bleeding, it can be classified into:

- arterial blood (bright red, foamy and spurting in pulses)
- venous blood (darker in colour and flowing swiftly from the wound)
- capillary bleeding (red, oozing slowly from the wound at a steady rate).

Life-threatening bleeding is called **haemorrhage**, but you should be aware that it could be due to external or internal bleeding. **External bleeding** is visible and obvious, whereas **internal bleeding** is hidden inside the body (abdomen, chest or a limb) and is more difficult to detect. We will describe the signs of each of them in turn, and how to give life-supportive care to a person who is bleeding.

7.2.1 External bleeding

External bleeding usually occurs following a deep cut, piercing with a sharp object or a superficial bullet wound. The most serious bleeding comes rapidly spurting from an artery. This can be life-threatening if the wound is too deep and the spurt is under too much pressure to control. Minor bleeding usually stops by itself within ten minutes when a blood clot develops which blocks the bleeding vessel or wound. You should suspect life-threatening external bleeding if:

- You see blood spurting from a wound
- Bleeding fails to stop after all measures to stop bleeding have been attempted (see Box 7.1)
- The person shows signs of excessive blood loss resulting in low circulating blood volume (shock).

Box 7.1 First aid supportive care for external bleeding

- Apply direct PRESSURE to the wound, after removing any clothing or foreign body from the wound.
- Help the person to lie down and ELEVATE the injured part above the level of the heart.
- Apply a BANDAGE to the wound; it should be just tight enough to stop the bleeding, but not so tight that it obstructs the circulation.
- Start intravenous (IV) fluid therapy with Normal Saline solution or Ringer Lactate solution if the person shows signs of shock. Transfer the patient to the nearest hospital or health centre immediately after you have begun the infusion.

You learned how to set up a pre-referral IV fluid infusion in Study Session 22 of the *Antenatal Care* Module and in your practical skills training sessions.

■ What are the signs of shock following severe blood loss? (You learned about shock in the *Antenatal Care* and *Labour and Delivery Care* Modules in relation to pre- and post-partum haemorrhage.)

□ A person who is in shock displays weakness, confusion or an altered state of consciousness, and has a fast pulse rate (over 100 beats per minute), and low blood pressure: the diastolic pressure (the bottom number) is below 60 mmHg.

7.2.2 Internal bleeding

This type of bleeding occurs when there is a rupture of arteries or veins inside the body, for example in the abdomen. It may be caused by a kick or violent blow, a fall or another type of accident. You should remember that even though the affected person does not show any sign of bleeding externally, there may be significant damage to the internal organs, usually to the liver, spleen or thigh bone (see Section 7.3.1 below), resulting in a large amount of hidden internal bleeding. The signs that should make you suspect internal bleeding are given in Box 7.2 (on the next page).

Box 7.2 Signs indicating internal bleeding

Be alert for the following signs:

- Pain at the site of impact, reported by the patient
- Tenderness (feeling of pain by the affected person upon palpation)
- Rigid abdominal muscles (guarding an internal injury)
- Bleeding from other sites, e.g. from the nose or ears
- Signs of shock.

Measure the injured person's blood pressure and pulse rate. If you suspect they have internal bleeding, lie the person down on their back. Raise their legs in an attempt to improve their blood pressure by allowing some blood from the legs to drain back towards the heart. Get someone to hold the person's legs up for you, or use pillows to support them (Figure 7.2). Then secure an intravenous (IV) cannula in a vein in the person's hand or arm and begin fluid infusion with a litre of Normal Saline or Ringer's Lactate solution. Then transfer them urgently to the nearest health facility.

Figure 7.2 Raise the person's legs to increase their blood pressure if you suspect internal bleeding.

Do not allow an injured person to eat or drink anything before their emergency transfer to a health centre or hospital!

Do not allow the person to eat or drink anything before or during the journey to a health centre or hospital. Their condition may require surgical treatment to stop the internal bleeding, and food or fluids inside the stomach can be vomited into the lungs during surgery.

7.3 Fractures

Another common consequence of accidents or violence is fracture of a bone. A **fracture** is where there is a break in a bone caused by a force applied to the body. The degree of damage depends on the magnitude of force applied and the strength of the bone. Fractures can happen as a result of minimal force if the bone is weak due to underlying disease (e.g. osteoporosis, or bone cancer). If you have not come across **osteoporosis** before, it means softening of the bones due to reduction in the concentration of calcium in the bone. This condition is more common in older persons and people who are not moving around because of other illnesses or disability.

■ Can you give an example from your daily life experience in a rural area of some causes of a bone fracture? Which group in a population is most likely to suffer such an injury and why?

□ You may have thought of a fall from a horse, tree or motorbike, a heavy blow from a stick or a bullet passing through a bone. Children and young men are the most likely members of a population to take the type of risks that lead to fractures (Figure 7.3).

Figure 7.3 Children and young men are more likely to take risks that lead to fractures and other injuries.

7.3.1 Types of fractures

Fractures can be classified according to the following criteria:

- **Closed** or **open fractures**, depending on the presence or absence of skin perforation. In an open fracture, part of the broken bone pushes out through the person's muscles and skin at the site of the fracture; in a closed fracture, the broken end of the bone is not exposed to view.
- **Simple** or **complicated fractures**, depending on presence (complicated) or absence (simple) of damage to soft tissues (nerves, arteries, muscles) around the site of the fracture.

■ Are the fractures in Figure 7.4 simple or complicated, open or closed?

Figure 7.4 (a) X-ray picture showing a fracture of the thigh bone (femur); (b) Diagram of a fracture of the upper arm bone (humerus). (Photo (a) Courtesy of Philip Parkinson, Leeds Teaching Hospital, NHS Trust, UK; (b) The Open University, *Trauma, Recovery and Repair*, SDK125, Case Study 6, Figure 4.11)

□ Both fractures are complicated by the displacement of the bone into the soft tissue in the thigh or upper arm. In (a) the broken ends of the bone remain inside the soft tissue, so it is a closed fracture. In (b) the broken end of the bone has penetrated right through the soft tissue and is visible outside the surface of the arm – this is an open fracture.

7.3.2 Symptoms and signs of fractures

A person who has fractured a bone will have great pain, tenderness and abnormal movement at the site of the fracture, loss of function of the affected limb, deformity (bending), swelling and bruising. They can also have external or internal bleeding, resulting in low blood pressure and fast pulse rate. If you encounter a person who has been involved in an accident or injury with any of the above symptoms and signs, you should consider the possibility of fracture.

7.3.3 Supportive care for a bone fracture

IV fluids to replace lost blood

You have learnt that it is very important to give IV fluid to someone who has shock and low blood volume due to blood loss from an injury or other causes. The amount of blood lost in fractures depends on the type of bone affected and the severity of the fracture. The larger the size of bone fractured you should expect more blood to be lost. The amount of internal bleeding following a fracture is estimated as:

- About 1.5 l (litres) of blood is lost following fracture of a single thigh bone
- About 1.0 l is lost following fracture of bones of the lower leg (calf).

You should also be aware that fracture of a relatively small bone may result in a much larger amount of bleeding if there is associated injury to a major blood vessel. Therefore, you should always check for signs of shock after a fracture and begin IV fluid infusion if the person's blood pressure falls and the pulse rises. Also give the person two paracetamol tablets with a small cup of water to relieve the pain of the fracture.

Immobilising a fractured limb

The other important component of basic supportive care for a person with a fracture in a large bone (e.g. in the arm or leg) is to immobilise the injured limb before transporting the person to a health centre or hospital.

■ Why do you think immobilising the limb is important?

□ It prevents further damage to the limb, which can happen if it moves and the sharp ends of the fractured bone push out through the skin.

Figure 7.5 A health worker applying a split to a fractured leg bone.

A fractured limb is immobilised by keeping it straight, using a rigid material called a **splint**, which you can make from anything like very strong cardboard, a plank of wood, or similar material. The splint should be as long as the whole arm or leg (not just the broken part) to stop movement in the joint above and below the fractured site. It is usually fixed *behind* the affected limb by wrapping soft cloths around the limb and the splint to bind them together (see Figure 7.5). This process is called **splinting**. Splinting prevents further damage, which may result in loss of the limb or disability at a later period.

Once you have applied the splint and fixed it securely, the next step is to make sure that the person reaches a hospital or health centre in a splinted state in order not to aggravate the injury further. By doing this you ensure that the patient is treated in a more specialised and complete way, which helps reduce the risk of death or disability from fracture.

7.4 Head and spinal injury

Head, neck and spinal injuries account for about 50% of the deaths immediately following injury globally. Injury to the brain or the **spinal cord** (the part of the nervous system that extends from the brain down inside the vertebral column or backbone) can affect the person's ability to breathe and lead to permanent paralysis.

7.4.1 Causes, signs and symptoms of head and spinal injuries

Head injuries usually occur from blows to the brain. Injuries to the head may include fracture of the bones of the face or the skull, swelling of the brain due to inflammation and fluid collecting inside the skull after a blow to the head, or cuts to the scalp and other soft tissues around the skull. Spinal injury is when the backbone and the nerve tissue inside the spine are injured.

Certain causes of injury should alert you to possible head and spinal damage. These include a fall from any height (e.g. from a horse, motorbike, bicycle, or building), a penetrating injury to the head from a gun or knife, a heavy blow to the head, or a traffic accident (Figure 7.6). When you are called to see a person after any of these events, you should suspect the possibility of head or spinal injuries. These accidents are also common to fracture injuries. The symptoms and signs of head injury or spinal injury are given in Box 7.3.

Figure 7.6 Accidents involving a *bajaj* (in Amharic, a three-wheeled taxi) often occur in heavy traffic. (Photo: Basiro Davey)

Box 7.3 Signs of head or spinal injury

You may find these signs either separately or in combination:

- Unconsciousness or reduced level of consciousness
- Confusion in the patient's speech or behaviour
- Visible cuts or bruises to the scalp
- Blood or fluid coming out through the nose or ears
- Unexplained headache or disturbance to sight
- Difficulty breathing
- Extreme pain or pressure in the neck, head or back
- Tingling or loss of sensation in the hands, fingers, feet or toes
- Partial or complete loss of control over any part of the body, including urination and defaecation (passing stool)
- Difficulty with balance and walking.

7.4.2 Emergency care for someone with a head or spinal injury

When you suspect an individual has a head or spinal injury, the first thing to make sure is whether the person's airway is clear, so he or she is able to breathe. Then check for signs of blood loss and shock as described earlier. It is very important to keep the person at rest, not moving, and in the position you found him or her. When you approach the injured person, approach from the foot end, to reduce the risk of moving their head or neck and causing further damage.

After giving basic life-supportive care (described in the final section of Study Session 8), the next step is to prepare the injured person for transportation to a health facility. This primarily involves protecting and stabilising the spinal cord in the neck, so that it cannot move and cause more serious damage, which may lead to death or permanent disability. Apply sandbags or pillows on each side and at the back of the neck to immobilise the person's head and neck (Figure 7.7 on the next page).

Figure 7.7 Supporting and immobilising an injury to the neck or spinal cord. (Diagram: Dr Radmila Mileusnic)

7.5 Burns injuries

Burns are such a common accident that you are sure to have seen someone suffering from a burn in your village. A **burn** is a severe form of injury which causes significant soft tissue damage, as well as changes affecting blood volume (fluid balance). By fluid balance it is meant that people with a major burn will develop shock as a result of evaporation of body fluids from the burn surface; this reduces their blood volume even though they are not bleeding. While most burns are minor and do not require hospitalisation, extensive burns are a life-threatening emergency. You should also know that the very young and the very old do not tolerate burns well or respond so well to treatment (Figure 7.8).

Figure 7.8 A tragic situation when a farmer's house catches fire and a child is burned.

7.5.1 Common causes of burns

What are the common causes of burns in your village? Do they include the situations listed in Box 7.4, which are common all over the world?

Box 7.4 Common causes of burns

- Fire and flame
- Boiling fluid (scald injury)
- Acid (chemical burn)
- Electrical burn from faulty electrical equipment.

All these causes of burns result in destruction of the skin and varying layers of the soft tissue underneath. In burns injuries, the depth of the burn depends upon the temperature of the heat source and how long the body was in contact with it. The most common sites of a burn are the hands, arms, legs and feet.

Other important burns-related conditions that you should know about are burns involving the chest, face and inhalation (breathing in) of a large amount of smoke and heat. These conditions require urgent special attention at a health facility due to the risk that they will interfere with breathing. You should suspect a respiratory tract burn when the person inhales a large amount of smoke and heat as a result of being trapped in a closed space during a fire.

7.5.2 Classification of burns

Most burns injuries are minor and do not require hospitalisation. Factors that affect the severity of a burn include the age of the person, the presence of burns to the face or respiratory tract (lungs), and of course, the depth of the burn. Burns can be classified into first degree (superficial), second degree (intermediate), or third degree (full-thickness) depending on the depth of injury to the skin and underlying structures.

First degree burns

In a **first degree burn** the injury is restricted to the most superficial layer of the skin. Nerve endings in this layer become exposed and the burn surface is painful. Blister formation is common. This kind of burn heals spontaneously within ten days if protected from infection by gentle washing regularly and sometimes covering with a clean sheet of gauze or cloth.

Second degree burns

In a **second degree burn** the skin is injured to a deeper layer than the first degree burn. Because of the extent of the damage, the burnt surface appears to you whitish (bloodless) and is *painless* as compared to the first degree burn. This is because the nerve endings that transmit the feeling of pain to the brain have been destroyed. Healing takes longer (three to four weeks) and occurs by scar formation.

Third degree burns

In a full-thickness or **third degree burn**, the whole layer of the skin and subcutaneous tissue is destroyed and the muscles, tendons or the bone underneath the skin may be visible. Healing occurs very slowly. Severe scarring is unavoidable. If third degree burns cover a large area of the body, death usually results from dehydration as fluids evaporate through the burnt skin, and infection enters through the burn.

7.5.3 Emergency care for people with serious burns

If first aid has not already been given, flush the burn thoroughly with clean cold water. This helps to prevent further damage. You should also remove all burned clothing from the body of the person. If the burn area is limited, immerse the site in cold water for about 30 minutes. This again helps reduce pain, swelling (oedema) caused by tissue fluid flooding into the damaged area, and inflammation.

The other important aspect of immediate care in a major burn is prevention of heat loss from the body, especially in children, if a large area of the body has been burnt, or there are third degree burns. **Hypothermia** is defined as excessive cooling of a person or reduction of body temperature which, if not prevented, may result in the body systems stopping their normal function. To prevent hypothermia from happening you should apply clean wraps around the burnt area or the whole patient.

■ Why should you immerse or flush a burnt part of the body with cold water?

□ This is because of three main reasons:

- It reduces further tissue damage
- It reduces swelling/oedema and inflammation
- It also helps to reduce pain.

After giving immediate first aid, urgently refer a person with a severe burn to a higher health facility for specialist care and treatment.

What you have studied so far is only the *first aid* treatment for a severe burn. Once you have done this, refer individuals with severe burns to a hospital or health centre for specialist care. This must be done as soon as possible. The first six hours following a burns injury are critical for recovery.

7.6 Multiple injuries, emergency transport and referral

In the previous sections of this study session, we have described how to treat bleeding, fractures, head and spinal injuries and burns when they occur *separately*. However, in many accidents or after a violent attack, the patient is often suffering the combined effects of **multiple injuries** – several injuries at the same time. Knowing that multiple injuries are likely to happen in the same individual helps you to remember that you must not concentrate only on *one* type of injury – you must focus on *all* the multiple effects and your first priority is to address whatever is most threatening to their life. Delivery of basic life-supportive care is taught at the end of Study Session 8, after you have learned about emergency conditions that are *not* due to injuries.

Remember that most health emergencies will require rapid referral to a health centre or hospital. As a Health Extension Practitioner, you have an important responsibility in your community to prepare an **emergency transport plan**, which identifies individuals with vehicles (car, truck, gharry, etc.) who can get injured people to a health facility as quickly as possible. As in all referrals for whatever cause, you must write a clear **referral note**, describing the patient's name, address, age, etc., the circumstances in which the injury or other emergency occurred, your assessment of their condition and any actions you have taken.

Summary of Study Session 7

In Study Session 7, you have learned that:

1 Injury due to accidents and violence is a common cause of emergency conditions which threaten life, limb and eyesight; it is a common problem globally and at national level.

2 The effect of an injury is not limited to immediate life-threatening emergency conditions; it can persist way beyond the immediate injury period in the form of profound economic, mental health and behavioural problems.

3 Violent assaults such as rape can lead to sexually transmitted infections (STIs) and unwanted pregnancies.

4 Injury often results in life-threatening internal or external bleeding. Try to stop external bleeding with pressure and bandages. Start pre-referral IV fluid therapy in cases of shock.

5 Fractures (open or closed), head and spinal injuries must be attended to urgently in order to prevent loss of limbs, paralysis and permanent disability. Immobilisation of the injured part during transport to a health facility is essential life-supportive care.

6 Flame, hot fluid, chemicals and electricity are the common causes of first, second or third degree burns, depending on the depth of skin and soft tissue affected. Flushing a burn with cold water is an important element of first aid care in order to minimise the extent of damage and reduce pain.

7 Remember to develop an emergency transport plan to get an injured person to a health centre or hospital quickly. Write a clear referral note with all the patient's details, your assessment of the injury and any actions you have taken.

Self-Assessment Questions (SAQs) for Study Session 7

Now that you have completed this session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 7.1 (tests Learning Outcomes 7.1, 7.2, 7.3, 7.4 and 7.5)

Which of the following statements is *false*? In each case, say what is incorrect.

A If a wound is bleeding externally, you apply pressure to it, elevate the bleeding part and bandage it tightly enough to stop the bleeding.

B A person who has internal bleeding will have a slow pulse and rapidly rising blood pressure.

C Pain in the abdomen and rigid abdominal muscles are signs of a possible internal injury.

D Bleeding from the nose, ears or scalp and confusion in the patient's speech or behaviour are signs of possible head injury.

E Swelling and internal bleeding are signs of an open fracture.

F A person with a first degree burn is at risk of dying from dehydration and infection.

SAQ 7.2 (tests Learning Outcomes 7.1, 7.3 and 7.4)

(a) How would you immobilise (i) a fractured limb and (ii) a neck or spinal injury?

(b) What is the purpose of immobilisation and what outcomes could it prevent?

SAQ 7.3 (tests Learning Outcome 7.5)

What are the steps of emergency first aid care for a severe burn?

SAQ 7.4 (tests Learning Outcomes 7.1, 7.2, 7.3 and 7.4)

Read Case Study 7.1 about Mr. Samuel and respond to the question that follows it.

Figure 7.9 Falling from a horse can cause serious injuries. (Photo: Basiro Davey)

Case Study 7.1 Mr. Samuel has a horse-riding accident

Mr Samuel is a 54-year-old farmer who was heading home from his farm (Figure 7.9). He was riding fast when his horse stumbled and fell into a ditch, throwing Mr Samuel against a rock on the ground. He was found by some villagers, who called you to see him. When you reach the place, you see that he is lying on the ground and he seems unable to get up. You can't see any blood on his clothes.

- What possible injuries could Mr Samuel have suffered?

Study Session 8 Gastrointestinal Emergencies, Choking and Basic Life Support Techniques

Introduction

Non-injury emergencies are life-threatening conditions such as appendicitis and intestinal obstruction, poisoning and choking. They are certain to occur in your community and require your urgent help in supporting the life of affected people before they are transferred to a higher health facility for specialised treatment. In this study session you will learn about the most common non-injury emergencies, and how to detect those which, if unattended, might result in death. You will also learn how to prepare patients with these conditions for referral.

This study session ends with a section on basic life support techniques, which applies to patients with non-injury emergencies and also to conditions such as airway obstruction, bleeding, or multiple injuries, as described previously in Study Session 7.

Learning Outcomes for Study Session 8

When you have studied this session, you should be able to:

8.1 Define and use correctly all of the key words printed in **bold**. (SAQs 8.1, 8.2, 8.3, 8.4 and 8.5)

8.2 Describe the signs and symptoms of appendicitis and intestinal obstruction, and explain how to give life-supportive care for these emergency conditions. (SAQs 8.1 and 8.2)

8.3 List the routes of entry of poison into the body, describe the signs and symptoms of poisoning, and explain how to give life-supportive care to someone who is poisoned. (SAQs 8.3 and 8.4)

8.4 Describe the signs and symptoms of choking and explain how to give life-supportive care to someone who is choking. (SAQ 8.5)

8.5 Outline how to give emergency life-supportive care, using the ABCDE-T approach. (SAQs 8.2, 8.3, 8.4 and 8.5)

8.1 Gastrointestinal emergencies

Gastrointestinal emergencies are acute abdominal conditions characterised by pain in the abdomen, which began in the last seven days (not longer ago) and which is severe enough to affect the daily life and activities of the individual. A condition is described as **acute** if it begins suddenly and gets worse over a short period of time. An **acute emergency** is one that rapidly becomes life-threatening.

If abdominal pain has lasted for more than seven days it is called *chronic* abdominal pain and the affected person should be referred as soon as possible.

- Can you suggest a possible cause of chronic abdominal pain? (Think back to Study Session 3.)

- It may be due to a cancer somewhere in the abdomen, e.g. in the stomach, intestines, liver, spleen, pancreas or reproductive organs.

The two most common causes of gastrointestinal emergencies are appendicitis and intestinal obstruction, described below. Note that they have overlapping symptoms and signs, making their distinction difficult. In addition, the symptoms are not always typical in very old or very young people and this uncertainty often causes delay in diagnosis. Delay in starting treatment contributes to the more severe effects of these conditions in older or younger age groups, and their bodies have more limited ability to repair afterwards.

8.1.1 Appendicitis

Appendicitis is an acute condition which occurs as a result of inflammation of the appendix. The **appendix** is a small tube, closed at one end, which is found at the junction between the small and the large intestine (Figure 8.1). It has no known function in digestion. The appendix can become inflamed when pieces of food get trapped in it and infection develops in the rotting food.

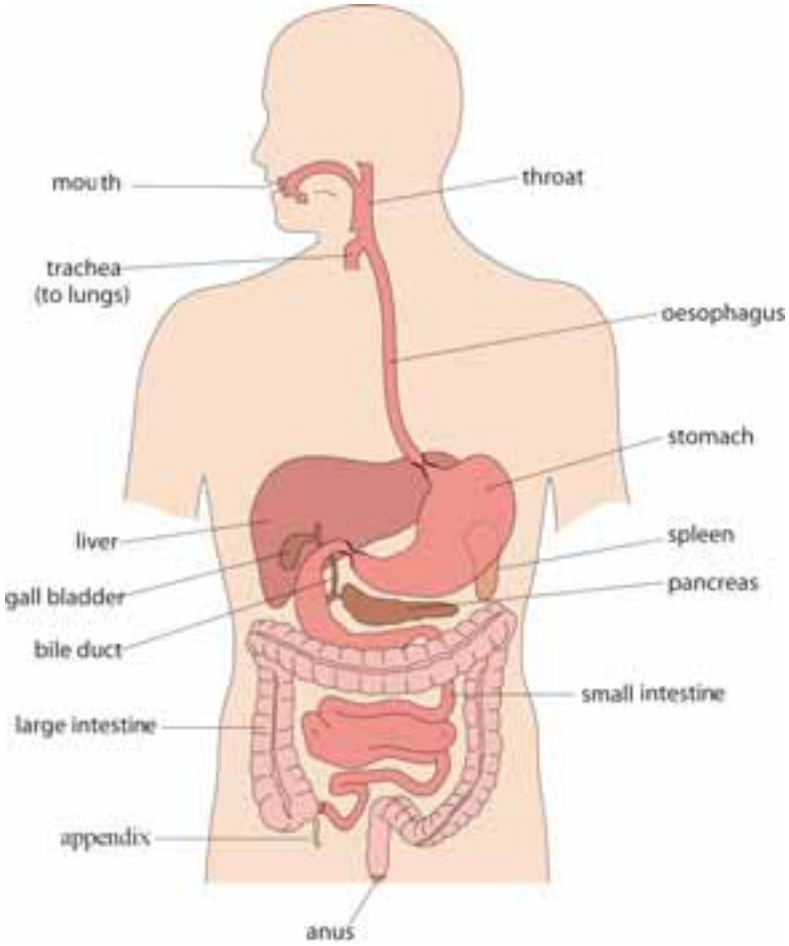

Figure 8.1 The **digestive tract** or **gastrointestinal system** is the tube-like passage from the mouth, through the stomach and intestines to the anus, together with the organs that connect with it (e.g. the liver, spleen and pancreas). (Source: The Open University, 2006, *Living with Diabetes*, Figure 2.1)

Acute appendicitis commonly affects adolescents and young adults, but it can occur at any age. The typical symptoms and signs that make you suspect someone has acute appendicitis include:

- Pain around the navel (belly button) which later shifts to the lower abdomen, particularly on the right side. Notice in Figure 8.1 that the appendix is on the lower right side of the abdomen.
- Fever (body temperature above 37.5ºC)
- Nausea and vomiting
- Tenderness and rigidity of the abdominal muscles guarding the affected internal organs.

If you see a person with the above symptoms which have only recently begun, refer them to a health centre or hospital for assessment. You can give two paracetamol tablets with a small cup of water to help to relieve the pain, but tell the person not to eat or drink anything else until they have been seen by a doctor. If they have acute appendicitis, the appendix will have to be removed surgically by an operation to the abdomen. Reassure the patient that this type of surgery is straightforward and they will soon recover afterwards.

■ Can you remember why eating or drinking is not advised for a patient who is being referred for possible surgery?

□ You learned in Study Session 7 that the reason the stomach should be empty before surgery is to avoid the patient vomiting food or drink and obstructing their lungs when they are unconscious due to the anaesthetic.

If the affected person comes to you several days after the onset of appendicitis, the infection may have spread outside the appendix into the rest of the abdomen. Widespread infection in the abdomen is called *abdominal sepsis* and it can lead to **septic shock**, which is manifested by low and falling blood pressure, fast pulse, rapid respiration, fever and extreme abdominal pain. Without urgent surgery to remove the inflamed appendix and antibiotic treatment for the infection, a person with septic shock will soon die. If you have been trained to do so, insert an intravenous (IV) cannula into a blood vessel in the person's arm and begin fluid therapy with a litre of Normal Saline or Ringer's Lactate solution. Make sure the fluid infusion continues during the journey to a health centre or hospital.

Refer a person with acute abdominal pain urgently! If they develop septic shock, death will soon follow.

8.1.2 Intestinal obstruction

Intestinal obstruction means a blockage somewhere in the gastrointestinal system (look back at Figure 8.1) and is another important cause of acute abdominal pain. It can be caused by either mechanical or non-mechanical obstructions. A mechanical obstruction means that something is physically blocking the digestive tract, preventing the flow of food through the intestine. In the case of non-mechanical obstruction, the digestive tract is not directly blocked, but food does not move forwards because of some problem in the muscular action of the intestine itself, which normally pushes the food along. Without special tests, it is difficult to diagnose whether a blockage is mechanical or non-mechanical. In both cases, the patient will require immediate referral to a higher health facility.

If you suspect an intestinal obstruction, refer the patient immediately.

The signs and symptoms of intestinal obstruction are:

- Abdominal pain, which may be throughout the abdomen
- Nausea and vomiting
- Constipation (absence of gas and faeces)
- Abdominal distension (swollen abdomen)
- Tenderness and rigidity of the abdominal muscles guarding the internal organs
- Shock (in advanced cases).

The pre-referral actions described above for acute appendicitis also apply to a patient with suspected intestinal obstruction.

8.2 Poisoning

A **poison** (also called a **toxin)** is a naturally occurring or manufactured substance which, if taken into the body in sufficient quantity, causes temporary or permanent damage. The common poisons that people may have in their homes include medical drugs, alcohol, household cleaning chemicals, kerosene and pesticides. You may be surprised when we say to you that medical drugs are 'poisons', but remember that medicines must be taken in the prescribed dosages and only by the person who has been prescribed that drug. All medical drugs are toxic if the dose is exceeded, or if they are taken by the wrong person – for example, the adult dose of a drug could seriously harm a child. In the Amharic language, this is expressed in the saying that 'even honey is sour if too much is taken'.

■ Can you think of some naturally occurring poisons?

□ You may have thought of poisonous plants, the bite or sting of poisonous animals (e.g. snakes, scorpions), and the toxins released by certain bacteria when they get into the body.

Figure 8.2 Protective clothing including a special mask must be worn to prevent inhalation (breathing in) or skin exposure to poisonous chemicals when spraying insecticides. (Photo: Dr Daddi Jima)

There are four different ways that a poison can get into the body. It can be:

- Ingested by swallowing, e.g. medicines, household chemicals, etc.
- Inhaled in the breath, e.g. when spraying houses or water collections with chemicals to kill insects or other vectors of communicable diseases (Figure 8.2); or inhaled carbon monoxide gas, which is an invisible poison found in the fumes formed by burning charcoal
- Injected, e.g. when bitten by a snake or injected by a needle
- Absorbed when the poison comes into contact with the skin and passes through it into the body, e.g. when a person is splashed with a chemical that kills insects (insecticide) or weed killer.

You should also know that the effects of poisoning are more serious when the person poisoned is very young, very old, or in poor health. This makes early diagnosis especially important in these groups.

8.2.1 Signs and symptoms of poisoning

The symptoms of **poisoning** partly depend on the route of entry into the body. Common symptoms include nausea, vomiting, abdominal pain, difficulty in breathing, headaches, changes in heart rate pattern (fast, slow or irregular), watering of the eyes, confusion, and impaired consciousness. If the exposure has been to the skin, the person may also complain of swelling, rashes, redness and itching of the skin.

You should suspect poisoning if there are empty containers for medicines or chemicals near the poisoned person, or there is a strange smell present (for example, of bleach or kerosene). So, in considering poisoning, you should look around where the person became ill and ask questions to gather possible clues. Take the containers with you to show the doctor when you transport the patient to the nearest health facility. Knowing what has been swallowed will help the medical staff to know what action to take to neutralise the poison.

8.2.2 Suicide by poisoning

Drinking *berekina* (bleach, Figure 8.3) or kerosene is a common method of trying to commit **suicide**, i.e. the person intended to purposefully kill themselves. If you suspect suicide by poisoning, deal with the immediate emergency as you would for any other poisoning event. If the person survives, they will need additional support when they return to the community to resolve the cause of the mental distress that pushed them to attempt suicide. Refer to Study Session 10 of this Module for a detailed discussion of the signs that may give you early warning that someone is thinking of trying to kill themselves. Part 2 of this Module describes a wide range of mental health problems and how to deal with them at community level.

Figure 8.3 A person in severe mental distress may try to commit suicide by drinking a poison such as bleach or kerosene.

8.2.3 First aid for a person with poisoning

If you find a person who has been poisoned accidentally or intentionally, apply basic life-supportive care using the ABCDE-T approach (described in Section 8.4.1 of this study session). If the poison has been absorbed through the skin, remove any contaminated clothing and wash the body with water and soap. If a chemical has been swallowed which has caused burning of the lips and throat, you can give the person frequent sips of cold water or milk, which may neutralise the poison a little bit. Then refer the person to the hospital or health centre urgently.

Go with a person who has been poisoned – they could stop breathing on the way to the health facility and you may be able to save their life on the journey.

8.3 Choking

Choking is defined as an obstruction of the upper part of the windpipe (trachea) resulting in an acute life-threatening emergency (Figure 8.4). A person whose airway is obstructed will quickly become unconscious and die due to **suffocation** (lack of oxygen), unless the obstruction is quickly removed. Look back at Figure 4.1 in Study Session 4 of this Module to remind yourself of the location of the trachea in the respiratory system.

Figure 8.4 Food obstructing the airway is the commonest cause of choking.

An obstruction of the airway may be partial or complete, and choking may occur in the conscious or unconscious person. The common causes of choking that you may be faced with are:

- Blockage of the airway by the tongue falling back into the throat of an unconscious person who is lying on their back (see Figure 8.4(a) later in this study session)
- Inhalation (breathing in) of a piece of food, such as a lump of meat, a chicken or fish bone, a bean or a nut; children may also inhale small objects during play
- Injury to the airway, for example after a blow to the front of the neck.

8.3.1 Signs of choking

You can distinguish between complete or partial obstruction of the airway by noting the following features:

In **partial obstruction**, the person may:

- have difficulty breathing, but may be able to call for help
- have a persistent cough (the body's attempt at removing the obstruction)
- produce snoring and/or wheezing sounds.

In **complete obstruction**, the person may:

- be unable to speak, breathe or cry out
- be gripping his/her throat
- be agitated and distressed
- have a blue/dark tinge on the lips due to low oxygen levels
- rapidly lose consciousness.

8.3.2 How to help someone who is choking

In your village you may have seen someone choking before – perhaps a child or an adult. Were you able to help them? This is what you should do:

- If the person is breathing, encourage him/her to continue breathing and coughing.
- Slap the person vigorously on the upper back with your palms, while bending the person forwards. Do this several times (see Figure 8.5a).
- If back slapping does not remove the obstruction, try giving **abdominal thrusts** (see Figure 8.5b and Box 8.1).

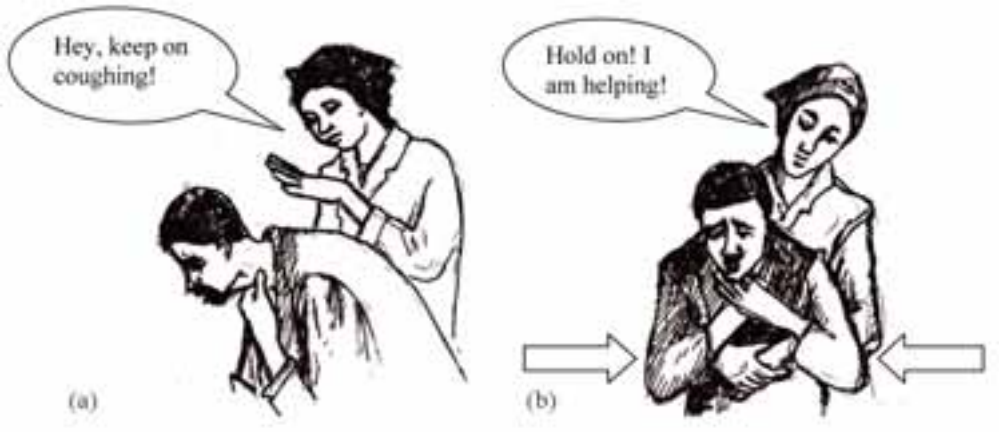

Figure 8.5 Techniques to help someone who is choking: (a) back slapping, (b) abdominal thrust to force the obstruction up and out of the airway.

Box 8.1 Abdominal thrust technique to remove an airway obstruction

1 Position yourself behind the person and put both of your arms around the upper part of the abdomen. Make sure that he/she is bending forwards.

2 Make a fist with one hand over the person's upper abdomen (between the bellybutton and the breastbone), then grasp the wrist of the fisted hand with the other hand (Figure 8.5b).

3 Pull both your hands sharply inwards and upwards. Do this up to five times. This helps you to increase the pressure in the blocked airway in order to dislodge the obstruction.

4 Usually, this will have removed the obstruction: however, if not, repeat the back slapping and abdominal thrust procedures two to three times more.

5 If the person becomes unconscious, lay them on their back, open their mouth and try to remove any obstruction with your fingers or forceps if you have them. Begin 'rescue breathing' as described in Section 8.4.1.

Figure 8.6 This poster is displayed in many Health Posts in Ethiopia to teach parents how to help a child who is choking. (Photo: Basiro Davey)

■ A child is choking and comes to you coughing and screaming. Which technique would you use first and why?

□ You should first try backslaps and encourage coughing (Figure 8.6). This is the first step for someone who is choking but who can breath, speak and cough. In this case, the child's coughing and screaming indicates that the blockage is partial because they can still breathe.

8.4 Basic life support techniques

In Study Session 7 you considered the effects of a single injury and how you might respond to each injury type. In this study session, you have learned how to deal with some common non-injury emergencies. In this final section, you will learn about **basic life support techniques**, which you must apply to a person who is unconscious or has stopped breathing for whatever reason – whether due to an injury, internal bleeding, septic shock, airway obstruction or some other cause. These techniques are also important in someone who is suffering from the combined effects of *multiple injuries*, e.g. after being hit by a car or falling off a horse, a person may have internal bleeding, a head injury and fractured bones.

Before giving care for each of the emergency conditions you suspect may be occurring, you must know how to *prioritise* your actions when giving basic life-supportive care. What should you do first, second and third? It is vital that you first address whatever condition is most threatening to their life. This section shows you how to do this.

8.4.1 The ABCDE-T approach

The simple way of remembering what to do first, second and third to save the life of a person with an emergency condition is to use a system known by the letters **ABCDE-T** (Box 8.2).

Box 8.2 The ABCDE-T of basic life support

You should perform these actions in the following sequence:

- A is *airway* care
- B is *breathing*
- C is *circulation* of the blood
- D is *disability* and brain and spinal cord *damage*
- E is *exposure* and *examination* of the person's body
- T is *transfer* to the nearest health facility.

'A' stands for airway care

Your first action is to keep the airway open. As you already know, the commonest cause of blockage of the airway is food or another foreign body lodged in the windpipe. Airway obstruction can also occur when a person is unconsciousness after a blow to the head or neck, or because they have lost a lot of blood from an injury.

The obstruction after a head injury may also be due to a broken tooth, blood clots or the person's tongue falling back into the throat and blocking the airway. This is particularly likely to happen if they are lying flat on their back.

Figure 8.7(a) illustrates how the airway gets blocked easily by the tongue falling back into the throat. In Figure 8.7(b) and (c), note how the action of lifting the chin also lifts the tongue and opens the airways, allowing the person to breathe. Remember that when you lift the chin, you must not move the neck! You may aggravate a possible neck or spinal injury in the process.

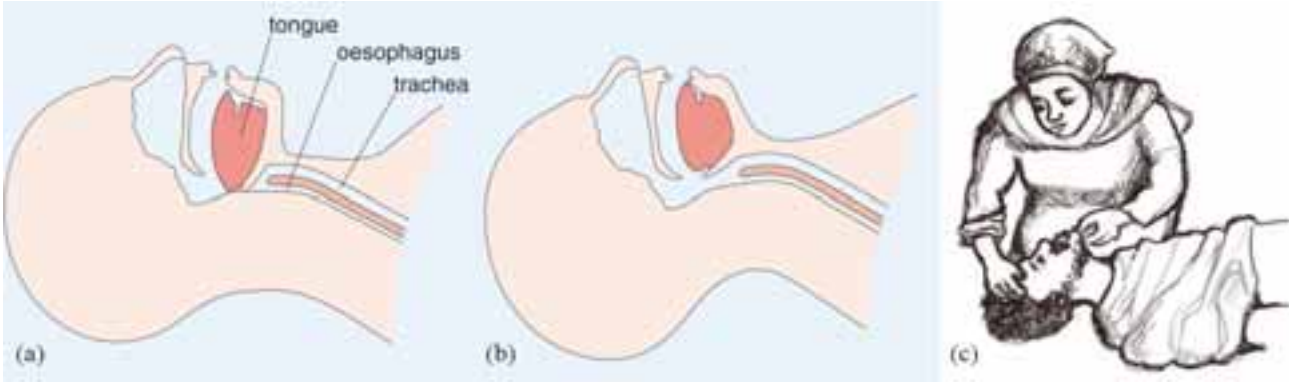

Figure 8.7 Diagram of a person's airway: (a) blocked by the tongue, and (b) cleared by tilting the head and lifting the chin. (c) A health worker lifting the chin to open the airway of an unconscious man. (Diagrams (a) and (b) from The Open University, *Trauma, Repair and Recovery*, SDK125, Case Study 6, Figure 2.1)

'B' stands for breathing

Once you are sure that the airway is open, the next step is to check whether the person is breathing or not. Listen for sounds of breathing and feel for breath on your cheek when you bend close to the person's mouth. Also look for chest movements (rising and falling) as breath moves in and out. If the person is breathing steadily, you can put him or her in the **recovery position** (see Figure 8.8). Notice the position of the injured person's legs and arms, which stabilise him on his side with his airway open. Lying the person on their side is to prevent choking if they vomit and to keep the tongue from falling back into the throat and blocking it.

Figure 8.8 An injured person being put in the recovery position. (Diagram: Dr Radmila Mileusnic)

If the person is not breathing at all, begin **rescue breathing**, i.e. breathing for the person, also known as 'mouth-to-mouth resuscitation'. The steps of rescue breathing are shown in Box 8.3.

Box 8.3 Steps in rescue breathing for an adult patient

1 Make sure that the airway is open

2 Pinch the nose shut to prevent air from escaping and tilt the person's chin upwards to open their mouth

3 Fill your own lungs with air and steadily blow into the person's mouth until the chest rises. This should take about two seconds.

4 Feel for the person's pulse to make sure their heart is beating, but don't waste time measuring the pulse rate.

5 Repeat the rescue breaths about every five seconds. Do this for about one minute, giving about 12 rescue breaths in that time

6 Feel for a pulse between every rescue breath. Continue rescue breathing as long as a pulse is present but the person is not spontaneously breathing on their own.

If the patient is a child:

7 Follow the steps above, but you need to give smaller, faster rescue breaths. Give one rescue breath about every *three* seconds. Do this for about one minute, giving about 20 rescue breaths in that time. Then continue with step 6.

'C' stands for circulation

Once you are sure that the person is breathing, then check for any site that is bleeding. Count the person's pulse and measure the blood pressure. If there is any bleeding give first aid to stop the bleeding (look back at Box 7.1 in the previous study session). If the person has got any signs of shock, start pre-referral intravenous (IV) fluid therapy, if you have been trained to do so.

■ If a person has a haemorrhage or septic shock, what do you expect to find when you take the pulse and blood pressure?

□ The pulse will be rapid (possibly over 100 beats per minute), but weak and fluttering. The blood pressure will be low and falling; the diastolic pressure may be below 60 mmHg.

'D' stands for disability and brain and spinal cord damage

Next you assess the person for any possible head or spinal injuries, as described in the previous study session (Section 7.4).

■ Do you remember the signs of head or spinal injuries?

□ The person may have difficulty breathing, pain in the neck, head or back, blood or fluid coming from the nose, ears or cuts on the scalp, tingling or loss of sensation in the hands, fingers, feet or toes, confusion, loss of control of urination and defaecation, difficulty with balance and walking, or partial or complete paralysis.

'E' stands for exposure

Expose the person to your full attention; this means open their clothes and if possible remove their clothing. You must do this very carefully, avoiding moving the limbs, head or neck if you suspect a limb fracture, head or spinal injury. Look at the whole person to be certain that you have not missed any injury. Examine the abdomen for swelling, tenderness or 'guarding' the internal organs with rigid muscles, which may indicate internal injury, acute appendicitis or intestinal obstruction.

'T' stands for transfer

When you have stabilised the patient by treating any immediately life-threatening conditions, transfer your patient to the nearest health facility as quickly as possible. Remember to take all the precautions to reduce trauma and support life during the journey, as described in this and the previous study session.

- What else should you remember to do?

- Write a clear referral note giving the patient's name, address, age, the circumstances that led up to the emergency, your assessment of their condition, and any actions you have taken. Sign and date the referral note and print your name and contact details so the higher level health facility can communicate with you about the patient.

This concludes Part 1 of this Module. In Part 2, we turn to the important subject of mental health problems in rural communities.

Summary of Study Session 8

In Study Session 8, you have learned that:

1 Non-injury emergencies, such as appendicitis, intestinal obstruction, poisoning or choking, are potentially life-threatening conditions that require urgent attention and life-supportive care.

2 The effects of non-injury emergencies are more severe in young children and old people. This is due to delayed recognition of their condition because their symptoms may not be typical, and the body's more limited ability to reduce the effects of these conditions in extreme age groups.

3 Appendicitis means inflammation and infection of the appendix. The signs and symptoms are similar to intestinal obstruction: i.e. abdominal pain, tenderness and guarding of the internal organs by rigid abdominal muscles, fever, nausea, and vomiting. In advanced cases, septic shock may occur.

4 Poison can enter the body through the mouth, lungs or skin, or it may be injected; poisoning may be accidental or intentionally self-inflicted (suicide) and the poison (toxin) may be naturally occurring, a manufactured chemical or an overdose of medicine.

5 Common symptoms of poisoning include nausea, vomiting, abdominal pain, difficulty in breathing, headaches, fast, slow or irregular heart rate, watering of the eyes, confusion, and impaired consciousness. If poison was absorbed through the skin, there may be swelling, rashes, redness and itching.

6 First aid for a person who is choking is to encourage coughing, back slapping and applying repeated abdominal thrusts. If the person becomes unconscious, attempt to remove the obstruction if you can see it in their throat and begin rescue breathing.

7 Basic life support techniques can be used for both injury and non-injury emergency life-threatening conditions.

8 A simple way to remember the priorities of basic life-supportive care is to use the ABCDE-T approach, addressing in this order: their Airways, Breathing, Circulation, Disability, Exposure (to check for anything you may have missed), and Transfer to a higher health facility.

Self-Assessment Questions (SAQs) for Study Session 8

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 8.1 (tests Learning Outcomes 8.1 and 8.2)

(a) In which group of patients is it most difficult to recognise the signs and symptoms of appendicitis and intestinal obstruction?

(b) Which signs and symptoms are common to both conditions?

(c) Are there any signs that may make you more likely to suspect appendicitis or more likely to suspect intestinal obstruction?

SAQ 8.2 (tests Learning Outcomes 8.1, 8.2 and 8.5)

What life-supportive care do you give to a person with a gastrointestinal emergency?

SAQ 8.3 (tests Learning Outcomes 8.1, 8.3 and 8.5)

Which of the following statements is *false*? In each case, explain what is incorrect.

A If you suspect that a person has swallowed poison, apply abdominal thrusts to help them to cough out the poison.

B If you suspect that a person has absorbed poison through their skin, remove any contaminated clothing and wash the body with soap and water before referring them.

C Swallowing bleach or kerosene is a common method of trying to commit suicide in rural communities in Ethiopia.

D Tying a cloth over the nose and mouth is good protection from inhaling droplets of insecticide while spraying houses to kill mosquitoes.

E Burning charcoal in an enclosed room is dangerous because the fumes are poisonous and inhaling them can cause loss of consciousness.

SAQ 8.4 (tests Learning Outcomes 8.1, 8.3 and 8.5)

Mrs Chaltu is found unconscious after complaining to her neighbours that she is feeling miserable.

(a) What do you suspect has happened? What would you look for in her surroundings and why?

(b) Outline how you would perform basic life-supportive care for her.

SAQ 8.5 (tests Learning Outcomes 8.1, 8.4 and 8.5)

Read Case Study 8.1 and then answer the question that follows it.

Case Study 8.1 An emergency at a wedding feast

Mr. Shewangizaw is celebrating his daughter's wedding. He was in good health and happily moving around the wedding tent, talking and encouraging guests to enjoy the food and drink prepared for the wedding feast. However, shortly after sitting down to eat himself, he began coughing and appeared to be having difficulty breathing, holding his neck with both hands and coughing forcefully and persistently.

- What is the correct sequence of actions that you should perform to help this man?

Notes on the Self-Assessment Questions (SAQs) for *Non-Communicable Diseases, Emergency Care and Mental Health*, Part 1

Study Session 1

SAQ 1.1

A is true. Blood accounts for approximately 7–9% of total body weight in an adult human.

B is *false*. An adult has 5–6 litres of blood circulating around the body (not 10–15 litres).

C is true. The primary function of the blood is to transport oxygen nutrients, and as a means to remove waste products from the tissues.

D is true. Red blood cells contain a protein called haemoglobin**,** which is red in colour and contains a lot of iron.

E is *false*. Haemoglobin picks up oxygen as it passes through the *lungs* (not the heart).

SAQ 1.2

If there was a hole in the wall that separates the two ventricles of the heart, the oxygenated blood returning from the lungs via the pulmonary circulation would mix with the deoxygenated blood returning from the rest of the body. When the left ventricle contracts to pump blood back to the body, it would contain a mixture of oxygenated and deoxygenated blood. In a baby born with such a hole in its heart (as sometimes happens), the body tissues and organs receive less oxygen than in a person with an undamaged heart; the baby will be more tired and breathless than a normal person.

SAQ 1.3

The pulse is most easily felt in veins on the inside of the wrist and in the neck. The normal range of the pulse is 60–80 beats per minute in a resting adult, and the normal range of blood pressure is between 90/60 mmHg and below 140/90 mmHg.

SAQ 1.4

(a) The first thing to check is Mr Tilahun's pulse rate and blood pressure to see if they are raised. If he has stopped taking medication for hypertension, it is likely that his blood pressure is too high.

(b) Heart failure is the most likely cause of his symptoms. He has had hypertension for several years, which can lead to the heart being unable to pump blood around the body efficiently. He is not getting enough oxygen or nutrients to his tissues, so he feels breathless, tired and weak.

(c) You should refer him to the nearest health centre or hospital urgently. He could have a heart attack at any time. He must begin taking medication to lower his blood pressure again soon. You should also pay attention to Mr Tilahun's mental health – his illness may be making him depressed.

SAQ 1.5

She should teach people in the community that they can reduce their risk of cardiovascular diseases by:

- Eating a healthy diet, with plenty of fruits and vegetables, and low salt and fat intake
- Drinking very little alcohol
- Not smoking cigarettes
- Taking exercise every day
- Avoiding stress wherever possible
- Taking their medication regularly if their blood pressure is already raised.

Study Session 2

SAQ 2.1

A is *false*. Blood glucose can also fall too low in a person with diabetes; the condition is characterised by lack of *regulation* of blood glucose.

B is true. Diabetes is becoming more common in developing countries like Ethiopia.

C is true. Excess glucose is stored in the liver until it is needed.

D is *false*. Glucagon (not insulin) stimulates the liver to release stored glucose when the body needs more fuel.

E is *false*. Exercise *is* recommended for people with diabetes as part of a healthy lifestyle and maintenance of a normal weight for their height; also, the blood glucose levels of a diabetic person are often too high, as well as sometimes too low.

SAQ 2.2

The completed version of Table 2.2 appears below.

Table 2.2 Internal organs and their functions

A	**B**
Pancreas	Produces many substances including hormones like insulin and glucagon
Liver	Stores glucose in the form of glycogen and slowly releases glucose from its glycogen stores
Digestive tract	Breaks down foods into smaller nutrients which can be absorbed into the blood
Skeletal muscles	Used for movement, e.g. in the arms and legs

SAQ 2.3

Mr Tajebe probably has Type 2 diabetes. One reason for reaching this conclusion is that his diabetes only began when he was already 63 years old, and Type 1 diabetes usually starts in children or young adults. Another reason is that his condition is currently being controlled by diet alone; Type 1 diabetes requires daily insulin for its control.

SAQ 2.4

The typical symptoms of diabetes are: feeling thirsty all the time and drinking of a lot of fluids, passing large amounts of urine, weight loss, and a feeling of tiredness. The best sign of diabetes is to test the urine for the presence of sugar, using a dipstick for this purpose.

SAQ 2.5

A is true. Type 1 diabetes might be caused by a virus infection.

B is true. A family history of diabetes increases the risk of developing diabetes.

C is *false*. Eating rice is *not* a risk factor for diabetes; in fact, eating a slowly broken-down carbohydrate like rice is a good choice for someone with diabetes, because the glucose levels in the body rise only slowly as rice is digested.

D is *false*. Glycogen (not glucagon) is the form in which excess glucose is stored in the body; glucagon is a hormone produced by the pancreas.

SAQ 2.6

Mrs Aster's BMI is 29. Her weight is at the top end of the 'overweight' range; if she gains any more weight she will be categorised as obese. Her weight puts her at increased risk of developing diabetes.

SAQ 2.7

Your poster might say something like:

- Don't let yourself become overweight!
- Eat a healthy balanced diet with plenty of fruits and vegetables.
- Limit your intake of sugary or fatty foods.
- Exercise every day.

Study Session 3

SAQ 3.1

A is true. More people die from cancer worldwide every year than from HIV/AIDS, tuberculosis and malaria combined.

B is true. Benign tumours are not generally life-threatening.

C is true. Malignant tumours are life-threatening because they spread and cause damage to organs and tissues all over the body.

D is *false.* Cancer cells are growing in the wrong place, but they are not normal cells – there are many differences (e.g. see the answer to E below).

E is true. Cancer cells can multiply uncontrollably by repeated cell divisions.

F is *false.* Cancer cells survive for many cell divisions because they do not 'self-destruct'; normal cells do self-destruct when they get too old or develop abnormal features.

SAQ 3.2

We don't know exactly what words you would use, but you might say that normal cells increase their numbers by dividing into two cells, and then these two cells each divide again, so there are four cells, and so on. Usually normal cells can only do this a few times before they become too old and stop dividing. Cancer cells, on the other hand, can go on increasing in number by dividing into two cells, then four cells, and so on, without any control.

SAQ 3.3

(d) is the correct answer. Cancers don't have characteristic symptoms that indicate a cancer diagnosis. The symptoms depend on where the cancer is growing in the body and can easily be confused with the symptoms of other chronic diseases or conditions like misses menstrual periods.

SAQ 3.4

(a) Mr Abera has a lot of cancer risk factors: very little exercise, smoking cigarettes, fatty diet, high alcohol consumption and he is obese (BMI = 33).

(b) You should advise Mr Abera to stop smoking, reduce his alcohol consumption, stop eating fatty foods and switch to eating more vegetables, fruits, peas, beans and whole grains, take more exercise, and lose weight.

SAQ 3.5

There is no clear cause of breast cancer that women can avoid, but it is associated with obesity and excessive drinking of alcohol, so you should advise women to avoid alcohol and becoming overweight. Early detection and treatment of breast cancer reduces the chance that women will die from the disease. The best method of early detection is regular breast self-examination to check for lumps or other abnormalities and seeking treatment if anything suspicious is found. If the facilities exist in your locality, then screening women aged over 45 years by mammography every two or three years can detect breast cancers very early.

SAQ 3.6

(a) A good example of supporting the spiritual needs of a terminally ill patient would be to organise a meeting with family members and religious leaders or spiritual advisers at the patient's home. It can be very comforting and uplifting to join in a religious service or blessing according to the beliefs of the family and the ill person.

(b) Other aspects of palliative care involve managing the patient's symptoms (e.g. pain, nausea), helping to make him or her comfortable, assisting the family with practical matters, listening to their worries, and helping the sick person and family members to come to terms with the inevitable death and the grief that follows.

Study Session 4

SAQ 4.1

A is *false*. COPD is a disease which affects the respiratory system (not the cardiovascular system).

B is true. Wheezing, breathlessness and a cough with production of large amounts of mucus in the lungs are the major symptoms of COPD.

C is *false.* Air entering the body travels down the *trachea* (not the oesophagus) into the lungs. The oesophagus carries food and drinks from the mouth into the stomach. If you got this wrong, look back at Figure 2.2 in Study Session 2.

D is true. In COPD, the air sacs lose elasticity and their walls can break down – this condition is called emphysema.

E is *false.* Bronchial asthma can affect all ages, but it is much more common than COPD in young adults and it is very common in children. It is COPD that mainly affects older adults and elderly people.

F is *false.* Asthma (not COPD) can be caused by exposure to pollen and animal hair – but only in people who are sensitive to these allergens.

SAQ 4.2

(a) The most common risk factor for COPD is cigarette smoking; other risk factors could include second-hand tobacco smoke, air pollution, chemical fumes and dust from the environment and workplace, and indoor smoke from cooking fires – particularly if dried animal dung is used.

(b) You should always teach people in your community that smoking tobacco is dangerous to health and may cause serious illnesses, including COPD, cardiovascular diseases and lung cancer. It is also an inducing factor for bronchial asthma.

SAQ 4.3

Your advice to Mr Sileshi is that he should stop smoking and make sure he wears a mask to protect his lungs from exposure to dust or chemicals during his work. Tell him that both these factors increase his risk of developing COPD, which is a permanent disabling disease that cannot be reversed. Advise him to go at once for screening for COPD if he develops any of the characteristic symptoms: cough with production of mucus, breathlessness, wheezing and tightness in the chest.

SAQ 4.4

(a) You suspect that Mihret has experienced an attack of bronchial asthma. Your reasons are that she is too young to be developing COPD and she does not smoke tobacco or live with anyone who smokes. Also, the attack of tightness in her chest and breathlessness began suddenly and went away after about 15 minutes. COPD symptoms begin gradually over many years and they don't get better.

(b) You noticed that her breathlessness stopped when she went outside into the fresh air, so the most likely cause of her asthma attack is the smoke from cooking inside the house, which she was breathing in.

(c) The advice you should give her is to try to avoid breathing in smoke; for example she could cook outdoors, or fit a flue to her stove or a chimney over her cooking fire to take the smoke out of the house.

Study Session 5

SAQ 5.1

The eyelids and eyelashes protect the eye from foreign materials getting into it. The sclera, cornea, pupil, iris and the lens serve the purpose of light transmission onto the retina at the back of the eye.

SAQ 5.2

(a) Mr Worku is an elderly man who is having problems seeing in bright sunlight; his vision is blurred and he has increasing difficulty in seeing the world around him clearly. These are typical early symptoms of cataract

(b) You should advise him to do everything he can to delay the cataracts from getting worse, such as wearing dark eye glasses to protect his eyes from sunlight, avoiding exposure to smoke, eating a balanced diet, and effective blood-sugar control if the man has got diabetes. Explain to him that if his cataracts progress to the stage where his sight has almost gone, he can get surgical treatment to remove the cloudy lenses and restore his sight – at least to some extent. Tell him that the operation is quick, simple and painless.

SAQ 5.3

Injuries to *one* eye usually result from chemical splashes, accidental scratches, penetration by sharp objects, or non-penetrating blows. This type of injury is most likely to happen during jobs such as welding or stone work, or during fights or play with sharp objects such as sticks or stones. These types of activities are more likely to involve children and young adults than older people.

SAQ 5.4

(a) The symptoms described by this child's parents should make you suspect the child has a foreign body in her ear. At three years old she is too young to be able to tell you if she has put something into her ear.

(b) Shine a torch into her ear to look for the possibility of a foreign body in there. If you can see the object, try very carefully to remove it with a thin blunt tool. Then refer the child to a health facility. The whitish-yellowish discharge from her ear tells you that it is infected and she needs medical treatment with antibiotics.

Study Session 6

SAQ 6.1

A is true. The structures of the oral cavity enable us to speak, chew and swallow.

B is *false.* Humans do normally produce two sets, but only the second (permanent) set has 32 teeth. The first set (milk or baby teeth) has only 20 teeth.

C is true. The mouth is the entrance to the digestive and respiratory systems.

D is *false.* The palate is the *roof* of the oral cavity (not the floor).

E is true. Saliva helps to keep the mouth clean.

F is *false.* Teeth are *living* structures with dentine, pulp and blood vessels inside them; only the upper surface of a tooth is covered with hard dead enamel.

SAQ 6.2

(a) Plaque is a sticky bacterial growth around the teeth. The conditions that promote its formation are high-sugar high-fat diets and poor oral hygiene.

(b) Plaque destroys the tooth enamel by producing acids which allow decay to penetrate the teeth. If plaque is not removed, it hardens into tartar, which causes the gums to pull away from the teeth. Plaque, tartar and gum disease increase the risk of tooth loss through decay.

(c) Reducing the amount of sugars and fats in the diet, and increasing the amount of fruits and vegetables, helps to reduce the development of plaque. Regular brushing and flossing of the teeth also removes plaque and promotes oral health.

SAQ 6.3

(a) Habtamu probably has yellow teeth because he has been drinking water containing a high concentration of fluorides all his life. His friends also have yellow teeth. This condition is called fluorosis.

(b) Fluorosis leads to weakening of the teeth, which are likely to develop 'pits' (holes) and cracks where decay can get in. Habtamu will probably suffer from a lot of tooth decay, and broken or lost teeth.

SAQ 6.4

The messages you would expect to see on the school poster should include:

- Brush your teeth for two minutes at least twice a day, especially after meals.
- Use traditional tooth sticks or a soft bristle toothbrush and toothpaste.
- Avoid sugary foods and drinks.
- Eat a healthy diet rich in fruits and vegetables.
- Drink milk. It contains calcium to build strong teeth and bones.
- When you grow up, don't smoke or chew tobacco, or chew *khat*, or drink alcohol.

Study Session 7

SAQ 7.1

A is true. If a wound is bleeding externally, you apply pressure to it, elevate the bleeding part and bandage it tightly enough to stop the bleeding.

B is *false.* A person who has internal bleeding will have a *rapid* pulse and *falling* blood pressure.

C is true. Pain in the abdomen and rigid abdominal muscles are signs of a possible internal injury.

D is true. Bleeding from the nose, ears or scalp and confusion in the patient's speech or behaviour are signs of possible head injury.

E is *false.* An open fracture means the broken bone is sticking out through the skin at the fracture site. There is also likely to be swelling and internal bleeding, but this also occurs in closed fractures.

F is *false.* A person with a *third* degree burn is at risk of dying from dehydration and infection if the burned area is extensive. First degree burns are superficial and heal within a few days.

SAQ 7.2

(a) Fracture immobilisation is done by keeping the injured limb straight using a rigid material called a splint, which is bandaged to the broken limb to keep it still. The splint should be long enough to immobilise the whole of the limb above and below the fracture. Immobilisation of spinal injuries is done by applying sand-bags or pillows on each side and at the back of the neck to stop the head and neck from moving during transportation to a health facility.

(b) The purpose of immobilising a fracture or spinal injury is to prevent further injury or damage to the patient, which could occur if the broken parts are moved during transport to a health facility. In the case of a fracture, further damage to the broken limb could lead to loss of the limb or difficulty in using the limb. In the case of spinal injury, further damage could cause death or permanent disability, e.g. paralysis.

SAQ 7.3

The first thing you should do is to cool the burn by flushing it with cold water and if possible immerse the burned part in cold water. Gently remove any clothing that is touching the burned area. Cover the wound with a sterile dressing or (if one is not available) a very clean cloth. If the burn is extensive or deep, transport the person to a health centre or hospital for specialist care.

SAQ 7.4

Mr Samuel seems unable to get up so he may have fractured a limb, or suffered head and spinal injuries; he may also have internal bleeding. In other words, he could have multiple injuries which happened all at the same time when he fell from the horse and hit the rock.

Study Session 8

SAQ 8.1

(a) Gastrointestinal emergencies are more difficult to recognise in very old and very young people.

(b) The signs and symptoms that are common to both appendicitis and intestinal obstruction are abdominal pain, guarding the internal organs with rigid abdominal muscles, nausea and vomiting, and fever.

(c) A person suffering with acute appendicitis is more likely to experience lower abdominal pain, particularly on their right side. An intestinal obstruction usually produces widespread abdominal pain, the abdomen may be swollen and the person may have difficulty in passing faeces or gas.

SAQ 8.2

Life-supportive care for patients with gastrointestinal emergencies depends on the severity of the symptoms. If the symptoms began very recently, give two paracetamol tablets with a small cup of water to relieve the pain. If the symptoms are advanced and there are signs of shock, begin IV fluid administration. In both cases, refer the patient to the nearest hospital or health centre, instructing them to take nothing by mouth before they have been seen by a doctor, because surgical intervention is likely to be required.

SAQ 8.3

A is *false.* Abdominal thrusts are applied to help someone who is choking to cough the obstruction out of their airway. This technique is useless to help someone who has swallowed poison, which will be absorbed into their body through the digestive tract.

B is true. If you suspect that a person has absorbed poison through their skin, remove any contaminated clothing and wash the body with soap and water before referring them.

C is true. Swallowing bleach or kerosene is a common method of trying to commit suicide in rural communities in Ethiopia.

D is *false.* Tying a cloth over the nose and mouth is *not* adequate protection for someone who is spraying houses to kill mosquitoes. Insecticide sprayers should wear proper protective clothing, including a special mask.

E is true. Burning charcoal in an enclosed room is dangerous because the fumes are poisonous and inhaling them can cause loss of consciousness.

SAQ 8.4

(a) You suspect that Mrs Chaltu has tried to kill herself by drinking a poisonous chemical. Look for any empty containers in her surroundings to see if you can identify what she has swallowed. Take the containers with you to show the doctor when you transport Mrs Chaltu to the nearest health facility.

(b) She is unconscious so you should apply the basic life support techniques outlined in the ABCDE-T approach, first making sure that her airway is open by placing her in the recovery position (Figure 8.2), and checking her breathing, pulse and blood pressure. If she is not breathing, begin rescue breathing for her. Once she is breathing, if there are signs of burning on her lips, mouth and throat (e.g. from swallowing bleach or kerosene), give her sips of cold water or milk. Check for any signs of disability and examine her body in case there is anything you have missed. Go with her on the transfer to the health centre or hospital.

SAQ 8.5

Mr Shewangizaw is choking, probably caused by a blockage of food in his airway. He should be encouraged to cough to remove the obstruction. If this does not work, you should support the effort by slapping his upper back. If the back slapping does not work, use the abdominal thrust technique. If he becomes unconscious, lay him down and see if you can remove the obstruction from his throat with your fingers or forceps. Begin rescue breathing to keep him alive while he is taken to a hospital or health centre.