Federal Democratic Republic of Ethiopia
Ministry of Health

Communicable Diseases

Part 4 Other Diseases of Public Health Importance and Surveillance

Blended Learning Module for the Health Extension Programme

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Carter Center, 2006, *Implementing the SAFE Strategy for Trachoma Control: A Toolbox of Interventions for Promoting Facial Cleanliness and Environmental Improvement*, by Paul Emerson and Laura Frost, with Robin Bailey and David Mabey, accessed from http://www.cartercenter.org/documents/2302.pdf

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Contents

Study Session 32 General Features of Faeco-Orally Transmitted Diseases

Introduction

In Parts 1 to 3 of this Module, you have learned the general principles of how communicable diseases are transmitted, the specific features of the bacterial and viral vaccine-preventable diseases, and about malaria, leprosy, tuberculosis (TB) and HIV/AIDS. In Part 4, you will learn about other diseases of major public health importance in Ethiopia, beginning with **faeco-orally transmitted diseases**, i.e. diseases in which the infectious agents are found in faeces (stool) and enter the body through the mouth (oral route). The mode of transmission may be in contaminated food water, on the hands, or on objects such as bowls, spoons and cups. For simplicity, we will sometimes refer to these diseases as **faeco-oral diseases**.

In this study session, you will learn about the general features of faeco-oral diseases: the main types commonly found in Ethiopia, their general symptoms and signs, how to treat mild cases and when to refer patients with severe conditions for specialised treatment, or laboratory tests to confirm the diagnosis. You will also learn about the importance of giving effective health education to your community on ways to prevent and control faeco-oral diseases. This general understanding forms the basis for the more detailed discussion of specific faeco-oral diseases in Study Sessions 33 and 34.

Learning Outcomes for Study Session 32

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

32.1 Define and use correctly all of the key words printed in **bold**. (SAQs 32.1, 32.3 and 32.4)

32.2 Name the common types of faeco-orally transmitted diseases in Ethiopia, the infectious agents that cause them, and the main routes of transmission. (SAQs 32.1, 32.2 and 32.4)

32.3 Describe the characteristic symptoms and signs of faeco-oral diseases, and explain why diarrhoea can be life-threatening. (SAQ 32.3)

32.4 Describe how you would treat mild cases of faeco-oral disease, and when you would refer severe cases for laboratory investigation and/or specialised treatment. (SAQ 32.3)

32.5 Suggest effective ways to prevent and control faeco-oral diseases at the community level. (SAQs 32.2 and 32.4)

32.1 Classification of faeco-oral diseases and their infectious agents

Faeco-oral diseases can be caused by a wide range of infectious agents, including bacteria, viruses, **protozoa** (single-celled parasites) and **helminths** (parasitic worms). All human parasites, whether they are single-celled or many-celled, live inside the human body: some are harmless, but others cause disease. In this study session, we are concerned with infectious agents which are transmitted via the faeco-oral route.

■ Can you think of a viral disease that you learned about in Part 1 of this Module which is transmitted faeco-orally?

□ Poliomyelitis (polio) is a viral faeco-orally transmitted disease that was described in detail in Study Session 4.

You already know about polio, which has become rare in Ethiopia thanks to the immunization programme, so we will not discuss it again here. Table 32.1 lists the common faeco-oral diseases and where they are described in detail later in this Module. You may already know about some of them from your own experience in your community.

Table 32.1 Common faeco-orally transmitted diseases in Ethiopia and their causal infectious agents.

Faeco-oral disease	Infectious agent	Study Session
Bacteria:		
• Cholera	*Vibrio cholerae*	33
• Shigellosis (bacillary dysentery)	*Shigella* species	33
• Typhoid fever	*Salmonella typhii*	33
Viruses:		
• Viral diarrhoeal diseases	Rotavirus (most cases)	33
Protozoa:		
• Amoebiasis (amoebic dysentery)	*Entamoeba hystolica*	34
• Giardiasis	*Giardia intestinalis*	34
Helminths:		
• Ascariasis	*Ascaris lumbricoides*	34
• Hookworm	*Necator americanus* or *Ankylostoma duodenalis*	34
• Taeniasis (tapeworm)	*Taenia saginata* (most cases)	38

Amoebiasis is pronounced 'am-mee-bya-sis'; giardiasis is 'jee-arr-dya-sis'; ascariasis is 'ass-kar-rya-sis'; and taeniasis is 'tee-nya-sis'.

32.2 Direct and indirect faeco-oral transmission

Figure 32.1 Contaminated hands can easily transmit infectious agents directly to the mouth. (Photo: Basiro Davey)

As we mentioned in the Introduction to this study session, faeco-oral transmission means 'from faeces to mouth'. But the route can either be **direct transmission** from contaminated hands touching the mouth and transferring the infectious agents directly; or **indirect transmission** through consumption of food or water, or using utensils, contaminated with the infectious agents.

■ How could a person's hands become contaminated with faeces?

□ You may have thought of several ways, including:

- Using the toilet and not washing the hands afterwards
- Cleaning a child's bottom after defaecation
- Shaking hands with someone whose hand is already contaminated (Figure 32.1)
- When flies rest on the hand after they have crawled on faeces
- Accidentally touching faeces in the soil where people or animals have defaecated in the open fields.

Faeces can also contaminate food or water, indirectly transmitting the infectious agents when a person eats the food, or drinks the water, or some gets into the mouth during washing. Diseases transmitted indirectly by food or water are called **foodborne diseases** and **waterborne diseases** respectively (see Box 2.2 in Study Session 2).

■ Can you suggest some ways that food could become contaminated with faeces?

□ You may have thought of several ways, including:

- Contaminated hands touching food during preparation or eating
- Using contaminated water to prepare food (e.g. washing fruit)
- Using contaminated utensils (knife, spoon, bowl, etc.) to prepare or eat food
- Feeding a baby with contaminated milk, or using a contaminated bottle
- Flies resting on food after crawling over faeces
- Serving inadequately cooked fruit and vegetables grown in soil contaminated with faeces.

■ How could water become contaminated with faeces?

□ You may have thought of several ways, including:

- Sources of water (streams, wells, etc.) can be contaminated with faeces washed out of the soil by heavy rain if people defaecate in open fields, or in poorly constructed latrines
- Hands or utensils for eating or drinking may be washed in contaminated water
- Contaminated containers may be used to fetch or store water.

The correct construction of latrines is taught in the *Hygiene and Environmental Health* Module.

The examples given above illustrate faeco-oral transmission via the **six Fs**: food, fingers, flies, fluids, faeces and fomites. Figure 32.2 illustrates the different ways that faeco-oral transmission can occur.

Fomites ('foh-mytz') is the term given to non-living things (e.g. bowls, water containers, soil) that can transmit infection indirectly.

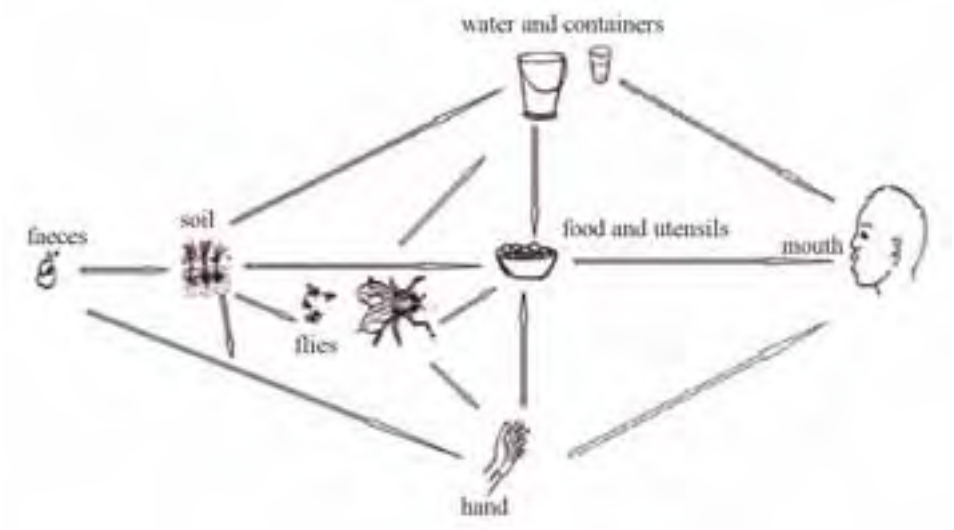

Figure 32.2 Different ways that faeco-oral transmission of infectious agents can occur. (Source: adapted from AMREF, 2007, *Communicable Diseases Distance Education Program*, Unit 11)

32.3 Symptoms and signs of faeco-oral diseases

Most – but not all – faeco-oral diseases have diarrhoea as their main symptom, and for this reason these conditions are also known as **diarrhoeal diseases**. Other common symptoms are vomiting, abdominal pain, and sweating or shivering. A high-grade fever is a sign of some faeco-oral diseases, i.e. a temperature of 38.5°C or above, measured with a thermometer. Of the diseases listed in Table 32.1 earlier, all *except* typhoid fever, ascariasis and taeniasis are characterised by diarrhoea. As it is such a common symptom of so many faeco-oral diseases, we will focus on diarrhoea in more detail.

32.3.1 Diarrhoea

Diarrhoea is the passage of loose faeces (liquid stool) three or more times a day, or more than is normal for the individual. If the diarrhoea continues for less than 14 days, it is referred to as **acute diarrhoea**; if it lasts for more than 14 days it is said to be **chronic** or **persistent diarrhoea**. Diarrhoea is also distinguished into **acute watery diarrhoea** (sometimes abbreviated to AWD), which typically occurs in cases of cholera, and **bloody diarrhoea** (also known as **dysentery**), which typically occurs in cases of shigellosis and amoebiasis.

Severe or some dehydration in a child is life-threatening. Refer the child urgently to the nearest health centre or hospital, telling the carer to feed sips of fluid to the child on the way.

Diarrhoea results in **dehydration** – the rapid loss of body fluids and important salts required for proper control of body functions, particularly in the brain, nerves and muscles. Children are highly susceptible to dehydration if they have diarrhoea, even after only one day; they can quickly die if the fluid loss is continuous and cannot be replaced by drinking fluids. A sign of some degree of dehydration in a child with diarrhoea is if it seems restless and irritable (easily upset), and drinks eagerly if offered fluids. If the dehydration is severe, the child may be too lethargic to drink, the eyes often appear sunken, and if you pinch the skin on the child's abdomen it may take two seconds or more for the pinched skin to go back to the normal position.

32.3.2 How common are diarrhoeal diseases?

Diarrhoeal diseases are the second largest cause of death globally among children aged under five years – only pneumonia and other acute respiratory infections (ARIs, the subject of Study Session 35) account for more child deaths worldwide. The World Health Organization (WHO) estimates that 1.5 million children in this age group die from diarrhoeal diseases every year, almost half of them in Africa. The most vulnerable children are the youngest ones, particularly before their second birthday. In Ethiopia, 23% of deaths in children aged under five years is due to diarrhoeal diseases – around 73,000 such deaths every year. Diarrhoeal diseases kill more children than malaria, HIV/AIDS and measles *combined*.

- Why do you think children are especially likely to be infected with the organisms that cause diarrhoeal diseases?

- There are many reasons, but you may have suggested that children are less likely than adults to wash their hands after defaecating, and more likely to put their fingers or dirty objects into their mouths, and also more likely to play in soil where they may come into contact with faeces.

32.4 Diagnosis and treatment of faeco-oral diseases

32.4.1 Diagnosis

To be certain that the cause of a faeco-oral disease has been correctly diagnosed, identified the infectious agent can only be done using laboratory techniques. However, identification of the infectious agent is not needed for the correct treatment of most cases of children with mild episodes of watery diarrhoea, which is evident in the majority of the faeco-oral diseases you will come across in your work.

The diagnosis of diarrhoeal diseases in children is further discussed in the Module on the *Integrated Management of Newborn and Childhood Illness (IMNCI)*.

For adults, laboratory examination is required to diagnose faeco-oral diseases accurately. At Health Post level, you should base your diagnosis on the specific symptoms and signs, for example, whether there is diarrhoea and (if yes) is it watery or bloody, and does it have a foul smell? Is the patient vomiting or complaining of abdominal pain? Does the patient have a fever? If your diagnosis is ascariasis, you can treat the adult patient as described in Study Session 34. But if you suspect other types of faeco-oral diseases (e.g. cholera, typhoid fever), refer the patient to the nearest higher level health facility, sending a referral note stating that further diagnosis is needed before specific treatment can begin. How to make or suspect a diagnosis of specific faeco-oral diseases will be discussed in Study Sessions 33 and 34, when we talk in more detail about types that you may encounter in your community.

32.4.2 Treatment

The treatment of any faeco-oral disease depends on whether the patient has diarrhoea or not. Patients without diarrhoea are treated depending on the type of infectious agent responsible, and you will learn more about the specific treatments for each condition in Study Sessions 33 and 34.

For patients with diarrhoea, especially children, the core measure in the treatment is rapid and adequate **rehydration** – fluid replacement – usually by drinking fluids. In the most severe cases the fluid has to be given intravenously (directly into a vein). Rehydration is the most important component of treatment for diarrhoea and it should be started as soon as possible and continued for as long as necessary. The best fluid to use to avoid the dangers of dehydration is a solution of **oral rehydration salts** (**ORS**) – a packet containing sugar and salts in the correct amounts, which the caregiver dissolves in clean drinking water. The sugar and salts are absorbed into the child's body, replacing what it has lost in the diarrhoea; the salts also help water to be absorbed across the inflamed lining of the gut, where it has been damaged by the action of infectious agents. WHO *Guidelines on the Treatment of Diarrhoea* now also emphasise the importance of giving zinc supplements to young children with diarrhoea, in addition to ORS.

For children with diarrhoea, the measures that you need to undertake during treatment are briefly summarised in Box 32.1 (on the next page). However, the WHO estimates that less than 40% of children with a diarrhoeal disease receive the correct treatment.

Figure 32.3 (a) The most important part of the treatment for diarrhoea is rehydration with ORS. (b) Breastfeed infants as often as the child wants. (c) Additional nourishing meals help to regain the child's strength. (Source: WHO, 2007, *Diarrhoea Treatment Guidelines for Clinic-Based Health Care Workers*)

Box 32.1 Summary of the main measures to treat a child with diarrhoea

In order to treat a child with diarrhoea effectively, you have to learn the detailed descriptions of each of these measures, which are discussed in the *IMNCI* Module, Study Session 5.

- First, you have to assess the degree of dehydration and classify the child as having 'no', 'some' or 'severe' dehydration, depending on specific symptoms and signs.
- Select and apply the appropriate treatment for the degree of dehydration.
- Check for other general danger signs indicating other major health problems, such as malaria, malnutrition or pneumonia, and treat them; e.g. if the child has malaria, give appropriate antimalarial drugs (refer back to Study Session 8 of this Module).
- Counsel the mother on how to give ORS at home (Figure 32.3a); if she does not have ORS, the child should be encouraged to drink as much clean fluids as possible.
- If the child is breastfed, the mother should go on breastfeeding during diarrhoea episodes (Figure 32.3b); weaned children need additional nourishing meals to help them recover their strength (Figure 32.3c).

For adults with diarrhoea, assess whether the patient can take fluids orally, and if they cannot, refer them immediately to the nearest higher level health facility. If the patient is able to take fluids orally, give ORS and tell them to drink 200–400 ml after each loose stool. You should also advise the patient to take other fluids in addition to ORS and to continue eating. For most cases of diarrhoea in adults, additional treatment (other than rehydration) is generally required – mainly giving an antibiotic or other medication appropriate for the specific infectious agent. However, laboratory examination of stool samples is required before making the diagnosis, which can't be carried out at Health Post level. Therefore, give ORS to adults with diarrhoea and refer them. Advise the patient that early treatment is important because the disease could worsen rapidly.

32.5 Prevention and control of faeco-oral diseases

Effective prevention and control measures can interrupt faeco-oral transmission of infectious agents by targeting the different routes of transmission mentioned earlier and summarised in Figure 32.2. As you remember, the sources and modes of transmission to be targeted are: hands, food, water, utensils, soil and flies contaminated with faeces. Most of the prevention and control measures are relatively simple and easy to apply. You have an important role in educating your community by explaining what simple steps can be taken to reduce the risk of faeco-oral diseases. So, in addition to the effective treatment of cases, you need to help families put into effect the measures outlined below.

32.5.1 Prevention of faeco-oral transmission

Give clear health education messages in ways that motivate people in your community to undertake the prevention and control measures described below. Each measure has been given a distinguishing letter, so you can relate it to the questions that follow the descriptions.

Ways to prevent faecal contamination of hands

A Wash hands with soap and clean water:
- A1 After defaecation, or cleaning the bottom of a child, or changing an infant's nappy (diaper).
- A2 After working with soil, or after children have been playing on soil, where there has been open defaecation by people or animals.
- A3 Before preparing food or eating.

B Cut fingernails and avoid putting fingers into the mouth.

Ways to prevent contamination from unsafe food

C Prepare and eat food safely:
- C1 Observe thorough hand hygiene before and during any contact with food
- C2 Ensure that all utensils are completely clean; allow them to 'air dry' after washing (don't wipe with a cloth)
- C3 Wash raw vegetables and fruits thoroughly in clean water
- C4 Cook other food items thoroughly, particularly meat and fish
- C5 Eat cooked food while it is hot and reheat food thoroughly if it has cooled
- C6 Cover food so it cannot be exposed to flies.

D Promote exclusive breastfeeding of infants under six months old:
- D1 If babies or young children are fed animal milk or formula, the bottle and teat, or cup and spoon, should be thoroughly washed with clean water and soap before every feed
- D2 Animal milk should be boiled and cooled before drinking
- D3 Formula milk should be mixed with boiled cooled water.

E Control flies:
- E1 Cover food to prevent contamination by flies
- E2 Dispose of faeces and other wastes safely, so flies cannot land on sewage.

Ways to prevent contamination from unsafe water

F Protect water sources from contamination with faeces:
- F1 Use a properly constructed latrine and safe disposal of faeces
- F2 Avoid open defaecation in the fields (Figure 32.4)
- F3 Avoid direct contact of hands with drinking water
- F4 Install protected water sources, such as covered wells with pumps

G Boil water before drinking, or using in preparation of food or fluids

H Use clean drinking cups and clean covered containers for storing water.

Figure 32.4 Sign celebrating the achievement of Fura in the Southern Nations, Nationalities and Peoples Region (SNNPR) of Ethiopia as the first 'open-defaecation free' village in the region. All households have a latrine. (Photo: accessed from http://www.susana.org/docs_ccbk/susana_download/2-297-open-defecation-free-environment-ethiopia-en.pdf)

■ Which of the measures described above will help to prevent the transmission of infectious agents by flies? Use the letters assigned to each measure to indicate your answers.

□ Measures C6, E1, E2, F1 and F2 will all reduce the risk of faeco-oral diseases transmitted by flies.

■ Which of the measures described above are most important when preparing milk for feeding to young children?

□ Measures A1, A2, A3, B, C1, C2, D1, D2, D3, G and H.

32.5.2 Other ways to reduce the risks of faeco-oral diseases

Feeding young children before, during and after illness is described in detail in the *Nutrition* Module.

In addition to interrupting the direct and indirect transmission of infectious agents, the risk of faeco-oral diseases can be reduced by other ways of protecting and promoting general health, particularly of children. Malnutrition increases the susceptibility of children to develop severe symptoms if they are exposed to infection. Therefore, exclusive breastfeeding until the age of six months and good nutrition after weaning can help to protect children from infection and increase their resistance to the most severe symptoms if they become ill. Eating additional nourishing meals also aids recovery after illness.

Immunization is described in Study Sessions 3 and 4 of this Module, and in the *Immunization* Module

Immunization against all the vaccine-preventable diseases also promotes the general health of children and helps to protect them from faeco-oral diseases (Figure 32.5). A child who is suffering from a condition such as measles or pneumonia is also more vulnerable to develop a faeco-oral disease, because their immune system is overloaded by infection. Giving vitamin A supplements with the measles vaccine at the age of nine months, and every six months thereafter until the age of five years, also helps to promote health and increase resistance to infection. So, ensuring that parents and other caregivers know about and follow all these good practices can help to reduce the risks to children from faeco-oral diseases. A vaccine to protect children against rotavirus infection – the main cause of viral diarrhoeal disease – is expected to be added to the routine Expanded Programme on Immunization (EPI) in the near future.

Figure 32.5 Immunization and vitamin A supplements help to protect children from infection. This baby is receiving oral polio vaccine. (Photo: Dr Kalid Asrat)

In the next two study sessions, we will discuss specific types of faeco-oral diseases caused by bacteria and viruses (Study Session 33) and protozoa (Study Session 34); helminths that cause faeco-oral diseases are described in Study Sessions 34 and 38.

Summary of Study Session 32

In Study Session 32, you have learned that:

1 Faeco-oral diseases are caused by infectious agents whose route of exit from the body is in the faeces, and whose route of entry to new hosts is via the mouth.

2 Faeco-oral diseases can be caused by bacteria, viruses, protozoa and helminths.

3 Transmission of the infectious agents that cause faeco-oral diseases can be by the direct route, when hands contaminated with faeces make contact with the mouth. Indirect transmission is via contaminated food, water, soil, utensils or flies.

4 The common symptoms and signs of most faeco-oral diseases can include diarrhoea, vomiting, abdominal pain and fever or shivering.

5 Diarrhoea in different faeco-oral diseases may be acute or persistent (chronic), watery or bloody.

6 Young children are particularly vulnerable to dehydration (loss of body fluids and salts) due to diarrhoeal diseases. Diarrhoea is the second most important cause of death among children aged under five years.

7 The key to the treatment of diarrhoeal diseases is rehydration with oral rehydration salts (ORS), which should be given to the patient until all diarrhoea has ceased. Zinc supplements for affected children are also recommended by the WHO.

8 Prevention and control measures include handwashing with soap and clean water; safe preparation and serving of food; thorough cleaning of all cooking, drinking and eating utensils, and containers for drinking and storing water; safe disposal of faeces and other wastes, use of latrines, and protection of water sources from contamination (e.g. by avoiding open defaecation in fields); and control of flies.

9 Other protective measures include exclusive breastfeeding for all infants until the age of six months, feeding children adequate nourishing food to prevent malnutrition and immunization against vaccine-preventable diseases.

Self-Assessment Questions (SAQs) for Study Session 32

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering the questions below. 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 32.1 (tests Learning Outcomes 32.1 and 32.2)

Which type of infectious agent is the cause of each of the following faeco-oral diseases?

A Poliomyelitis

B Shigellosis

C Giardiasis

D Ascariasis

E Cholera

F Taeniasis

G Amoebiasis

SAQ 32.2 (tests Learning Outcomes 32.2 and 32.5)

Suppose that in the community you are working in, most people defaecate in the open fields.

(a) How will this increase the transmission of faeco-oral diseases?
(b) What prevention measures would you encourage this community to apply to reduce the risks?

SAQ 32.3 (tests Learning Outcomes 32.1, 32.3 and 32.4)

A mother brings a two-year-old boy to your Health Post and tells you that he has been passing loose watery stools several times a day for the last ten days. She has not seen any blood in the stools. The child appears lethargic, his eyes are sunken, he is not interested in drinking and when you pinch the skin of his abdomen it takes more than two seconds for the skin to return to the normal position.

(a) How should this child's condition be classified?
(b) What actions should you take?
(c) What will you explain to the mother about her child's condition?

SAQ 32.4 (tests Learning Outcomes 32.1, 32.2 and 32.5)

A village proudly installs a protected pump to improve the safety of its water source. What other measures could they take to reduce the indirect transmission of faeco-oral diseases via contaminated water?

Study Session 33 Bacterial and Viral Faeco-Oral Diseases

Introduction

In the previous study session you learnt about the general features of faeco-oral diseases. With that introduction in mind, we will now discuss the common faeco-oral diseases caused by bacteria and viruses. In Study Session 34, you will learn about faeco-oral diseases caused by protozoa and intestinal worms. The conditions covered in this study session are divided into two groups: bacterial and viral faeco-oral diseases characterised by diarrhoea, and those characterised by high fever.

We begin with three **diarrhoeal diseases**: cholera, shigellosis and rotavirus infections. In each case, you will learn about their specific infectious agents, occurrence, modes of transmission, symptoms and signs. Then we remind you of the common features of the diagnosis and treatment, prevention and control of diarrhoeal diseases, which you already studied in general terms in Study Session 32. Finally, we describe the **febrile illness**, typhoid fever, which is also transmitted by the faeco-oral route. The focus of discussion in this study session will be on aspects that will be especially important to you in your daily work as a Health Extension Practitioner.

Learning Outcomes for Study Session 33

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

33.1 Define and use correctly all of the key words printed in **bold**. (SAQs 33.1, 33.2 and 33.4)

33.2 Describe the most common types of bacterial and viral faeco-oral diseases, their causative infectious agents and their occurrence in the population. (SAQs 33.1 and 33.3)

33.3 Describe the main modes of transmission of each of the bacterial and viral faeco-oral diseases, and the age groups that are most susceptible to them. (SAQs 33.3 and 33.4)

33.4 Explain how you would diagnose and treat cases of bacterial and viral faeco-oral diseases, and when and why you would refer them to a higher-level health facility. (SAQs 33.2 and 33.4)

33.5 Describe how you would apply prevention and control measures against bacterial and viral faeco-oral diseases, and what actions you would take to prevent epidemics of cholera or shigellosis. (SAQs 33.2 and 33.4)

33.1 Cholera

We begin by discussing cholera – its infectious agent, occurrence, symptoms and signs. Knowing about the nature of cholera will help you to diagnose, treat, prevent and control this disease, as described in Sections 33.5 and 33.6, together with measures against all the other bacterial and viral diarrhoeal diseases.

33.1.1 Infectious agents and occurrence of cholera

What comes to your mind when hear the word **cholera**? It is an acute diarrhoeal disease that affects the intestines and can kill vulnerable patients within a few hours if they are not treated quickly. The WHO estimates that there are 3 to 5 million cases of cholera every year around the world, and between 100,000 to 120,000 deaths. It can affect people in all age-groups. Cholera is caused by the bacteria named *Vibrio cholerae* (Figure 33.1), which occur naturally in the environment in shallow water around coasts, particularly where rivers flow into the sea. However, people infected by cholera bacteria can rapidly spread the organisms anywhere in a country, particularly where faeces leak into waste water collections.

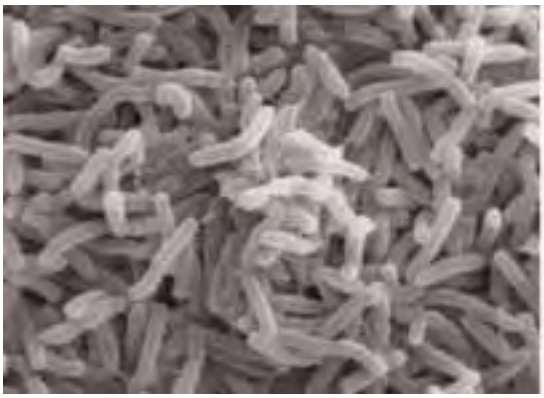

Figure 33.1 *Vibrio cholerae* bacteria magnified thousands of times. (Photo: Wikimedia Commons)

33.1.2 Cholera epidemics

Cholera can spread very easily from person to person, because even a few bacteria are enough to cause the disease if the person is already vulnerable, e.g. due to malnutrition or other infections. Although about 75% of people infected with the bacteria do not develop any symptoms, they can still pass on the infection in their faeces for up to two weeks, so epidemics can develop very quickly.

- Do you remember the definition of an epidemic? (Think back to Study Session 1 in Part 1 of this Module.)

- An **epidemic** is defined as a sudden rise in the number of cases of a condition, which go on increasing for weeks or months before being brought under control; sometimes the numbers affected in an epidemic can continue rising for years (e.g. HIV/AIDS).

There have been epidemics of cholera in Ethiopia; in 1970, several thousand deaths occurred in the eastern, central and southern regions of the country. Conditions leading to epidemics include the consumption of unsafe water, poor hygiene, poor sanitation and crowded living conditions. Cholera often follows after natural disasters involving flooding, and when large numbers of refugees live in camps (Figure 33.2). Consideration of these factors is important for the prevention and control of epidemics of cholera. In Section 35.2 of this study session, we mention the actions that should be taken to prevent a single case from leading to an epidemic. The details of epidemic investigations and management more generally are the subject of Study Session 42.

Figure 33.2 Cholera can spread quickly and cause epidemics in refugee camps, like this one in the Democratic Republic of the Congo.
(Photo: Ahu2, Wikimedia Commons)

33.1.3 Symptoms and signs of cholera

Knowledge of the typical symptoms and signs of cholera will help you to suspect cases and undertake further epidemic investigation measures. Cholera usually manifests after an **incubation period** of one to five days (i.e. the time between the bacteria entering the person's body and the first symptoms appearing), but it can begin within a few hours after the infection. In about 80% of cases, the disease presents with relatively mild symptoms, but about 20% develop acute watery diarrhoea with severe sudden onset. The stools are painless and voluminous, with the appearance of water in which rice has been boiled (*rice-water stools* are a characteristic sign of cholera). The patient also experiences nausea, vomiting (Figure 33.3), fever and rapid progression to experiencing extreme weakness and shock. In such cases, death may occur within hours after the start of the illness.

Figure 33.3 Profuse vomiting and rice-water stools are characteristic symptoms of cholera.

Shock in cholera results from rapid dehydration and loss of essential salts in the voluminous diarrhoea and vomit. You learned about shock as a result of haemorrhage during and after childbirth in the Modules on *Labour and Delivery Care* and *Postnatal Care*. The signs are the same in shock due to severe dehydration caused by cholera.

■ What are the typical signs of shock in an adult patient?

□ The typical signs of shock are systolic blood pressure dropping below 90 mmHg and/or diastolic blood pressure dropping below 60 mmHg, with a rapid pulse rate above 100 beats per minute. A person in shock will often appear confused and may lose consciousness. You must act quickly to save their life.

If you see a person with the characteristic symptoms and signs of cholera, you must manage the patient immediately and begin effective control measures in the community (as described below in Sections 33.4 and 33.5). The risk of a cholera epidemic developing from a single case is high, so you must also undertake epidemic investigation and management procedures, which will be described for all epidemic conditions in Study Session 42.

■ Suppose you were called to see an adult with acute watery diarrhoea and profuse vomiting of two days' duration. What other evidence would suggest a diagnosis of cholera in this person?

□ In addition to the rapid onset and progression of the illness, the following symptoms and signs would support the diagnosis of cholera:

- Painless diarrhoea and rice-water appearance of his stool
- Fever
- Extreme weakness
- Shock (low blood pressure and rapid pulse rate)
- Similar cases in the household or nearby.

33.2 Shigellosis (or bacillary dysentery)

The word **dysentery** refers to diarrhoea containing blood and mucus. There are two main types of dysentery, caused by different infectious agents. The one that we are going to describe here is **bacillary dysentery**, or shigellosis. The other type is amoebic dysentery, which is discussed in Study Session 34. However, in this section we will mention some of the main differences between the two types of dysentery, to help you diagnose them correctly.

33.2.1 Infectious agents and occurrence of shigellosis

The infectious agents causing **shigellosis** are different species of *Shigella* bacteria. Although these bacteria may cause mild cases of acute watery diarrhoea, dysentery is the real threat in shigellosis. The bacteria infect and destroy cells lining the patient's large intestine (colon), causing ulcers and bleeding, which results in the characteristic appearance of blood and mucus in the stool.

As you may recall from Study Session 1 of this Module, dysentery is common in Ethiopia, ranking among the top ten causes of outpatient visits (refer to Table 1.1). Although *Shigella* infection can occur at any age, it is rare in infants less than six months of age and most common in children aged two to three years. This age-distribution is unlike amoebic dysentery, which is rare in children less than five years of age. Two-thirds of the cases of shigellosis and most of the deaths are in children below ten years, and (like all diarrhoeal diseases) the effects are most severe in malnourished children.

Shigella bacteria can be easily transmitted from person to person and rapidly cause epidemics, particularly under conditions of overcrowding, where personal hygiene is poor, such as in prisons, institutions for children, and refugee camps. Small doses of the infectious agent – as few as ten organisms – are enough to transmit the infection, which means it can be transmitted easily to close contacts. Another reason for the rapid spread is that after recovery, infected individuals can transmit the bacteria in their faeces for up to four weeks after the illness. By contrast, epidemics of amoebic dysentery rarely occur. Therefore, if an epidemic of dysentery occurs in your community, you should suspect the most likely cause is bacillary dysentery due to *Shigella* bacteria.

33.2.2 Symptoms and signs of shigellosis

Symptoms of shigellosis usually appear after an incubation period of one to three days. The diarrhoea may be watery and of a large volume initially, but then changing into frequent, small-volume episodes of bloody and mucoid (mucus-containing) diarrhoea. The onset of the disease is sudden, with fever, abdominal pains, straining during defaecation and an irresistible urge to defaecate, but only small quantities of blood and mucus come out, without any formed solid stools. The person may complain of abdominal cramps and pain in the rectum, and is often too ill to leave their bed. Dehydration can progress quickly and may lead to shock and death if not rapidly treated.

33.3 Rotavirus infection and other viral diarrhoeal diseases

In this section, we will briefly mention the viruses that cause diarrhoeal diseases. The most prevalent infectious agents in this category are the **rotaviruses**. The WHO estimates that about 40% of all cases of severe infant diarrhoea worldwide, and at least 500,000 deaths in childhood from diarrhoeal diseases, are due to rotavirus infections – making these viruses the single biggest cause of diarrhoeal deaths. Most cases occur between the ages of three months and two years. Other viruses responsible for diarrhoeal diseases include the noroviruses.

The main manifestations of viral diarrhoeal diseases include acute, very watery diarrhoea, nausea and projectile vomiting, often (but not always) with fever and abdominal pain. Vomiting is called 'projectile' when the person cannot control the rapid emergence of vomit, which is projected forwards from the mouth with great force. Dehydration can occur rapidly in children and is the most common cause of death.

Individuals at highest risk from viral diarrhoeal diseases are malnourished children, weanlings and bottle-fed infants. To help prevent rotavirus infections, encourage exclusive breastfeeding under the age of six months; if the mother cannot breastfeed, or after weaning, encourage feeding with a very clean cup and spoon instead of a bottle. If bottles have to be used, show the parents how to wash the bottles and teats frequently and very thoroughly with clean warm water and soap.

33.4 Modes of transmission of diarrhoeal diseases

All three types of diarrhoeal diseases discussed so far are transmitted directly or indirectly by faeco-oral routes, as already described in detail in Study Session 32.

- Briefly distinguish between direct and indirect modes of faeco-oral transmission of infectious agents.
- Direct transmission occurs through contact between hands contaminated with faeces and the person's mouth; indirect modes of transmission are through ingestion of contaminated food or water, contact with infected soil, utensils, etc., and transmission by flies that have crawled on faeces (Figure 33.4).

Figure 33.4 Flies are a major source of indirect transmission of diarrhoeal diseases. (Photo: CDC Image Library, image 5452)

The main modes of transmission for cholera, shigellosis and viral diarrhoeal diseases are summarised in Table 33.1 and Figure 33.5.

Table 33.1 Main modes of transmission for bacterial and viral diarrhoeal diseases.

Diarrhoeal disease	**Main modes of transmission**
Cholera	Contaminated water or food (summarised in Figure 33.5)
Shigellosis (bacillary dysentery)	Person-to-person contact, e.g. while caring for a sick person, or via contaminated water or food
Viral diarrhoeal diseases	Contaminated water or food, particularly when feeding infants with milk or other nutritious fluids in a contaminated bottle

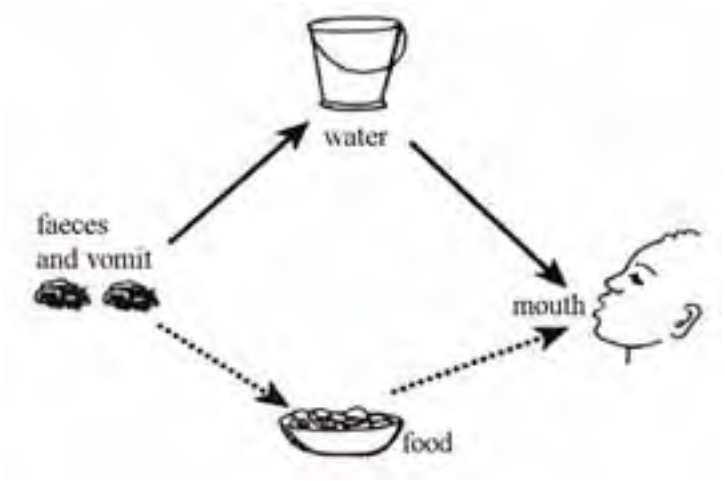

Figure 33.5 The main modes of transmission for most diarrhoeal diseases are by ingestion of contaminated food and water. (Source: adapted from AMREF, 2007, *Communicable Diseases Distance Education Programme*, Unit 11)

33.5 Diagnosis, treatment and control of bacterial and viral diarrhoeal diseases

You have already learned the general features of the diagnosis and treatment of diarrhoeal diseases in Study Session 32, so the discussion below will remind you of the main points in your role as a Health Extension Practitioner.

33.5.1 Diagnosis of diarrhoeal diseases

Accurate diagnosis of a specific type of diarrhoeal disease is only possible with laboratory identification of the infectious agents, mainly from stool samples. This can be essential in determining the type of treatment if antibiotics are required, and can also help to target prevention and control measures most effectively. However, **laboratory diagnosis** of the infectious agent takes time and is not needed for the treatment of most cases of acute watery diarrhoea among children. You can begin treating most children immediately on the basis of your **clinical diagnosis**, i.e. your knowledge of the characteristic symptoms and signs of acute watery diarrhoea described earlier in this study session, without the need for identifying the specific infectious agent.

Laboratory diagnosis *is* required for:

- children with dysentery (which could be bacillary or amoebic)
- all adults with severe diarrhoea, however caused.

Even in cases where laboratory diagnosis is required, you should not wait for the results of the investigation before starting rehydration as described below (Section 34.4.2) and referring the patient to the nearest health centre or hospital. Explain to the adult patient or caregiver (if the patient is a child) that referral is needed for further diagnosis, because treatment varies depending on the specific cause of the disease. Ensure that the patient seeks treatment urgently, as the disease could worsen rapidly and lead to serious outcomes.

Although you can't be sure of the diagnosis yourself, if you suspect dysentery or cholera, ask whether anyone else in the patient's household, or their neighbours, have a similar illness. This helps you to identify and report suspected cases, which is essential to prevent an epidemic from spreading.

33.5.2 Treatment of bacterial and viral diarrhoeal diseases

As you already know, for all patients with diarrhoea (watery or bloody), the core measure in treatment of all cases is rapid and adequate **rehydration** – fluid replacement. This is usually achieved by the patient drinking plenty of fluids, but in the most severe cases the fluid has to be given intravenously (directly into a vein). Rehydration should be started as soon as possible and continued for as long as the diarrhoea persists. The best fluid to prevent or treat dehydration is a solution of **oral rehydration salts** (**ORS**) – a simple mixture of sugar and salts in the correct proportions mixed with boiled and cooled water (Figure 33.6).

Figure 33.6 A man with cholera is helped to drink oral rehydration salts. (Photo: CDC Image Library, image 5301)

In addition to rehydration, other interventions might also be necessary depending on the type of disease and the age of the patient. For children with diarrhoea, the measures that you should undertake during treatment were summarised in Box 32.1 in the previous study session. However, before you can treat a child with diarrhoea correctly, you first need to learn how to assess and classify the danger signs and the level of dehydration; this is taught in detail in the Module on the *Integrated Management of Newborn and Childhood Illness* (IMNCI) in this curriculum.

A patient in shock due to severe diarrhoeal disease will die without adequate and rapid rehydration.

For adults with severe diarrhoea, assess if the patient is able to take fluids orally. If they are too weak or nauseous to take fluids orally, or they are showing signs of shock, refer them immediately to the nearest health centre or hospital. Advise the patient or caregiver that immediate treatment is necessary to save the patient's life.

If the patient is able to take fluids orally, give ORS and tell them to drink 200–400 ml of ORS after each loose stool. Advise the patient to drink other fluids as much as possible and to continue eating. Adults with severe diarrhoea due to bacteria may also need an antibiotic treatment appropriate for the specific disease, after first determining the type of bacteria from laboratory examination of a stool sample. This is one reason why adults with severe diarrhoea are given ORS and referred to a higher health facility.

33.6 Prevention and control of bacterial and viral diarrhoeal diseases

Prevention and control measures for all diarrhoeal diseases, whatever the infectious organism, aim at interrupting faeco-oral transmission from contaminated hands, water, food and other sources. Look back at Study Session 32 to remind yourself of the key points to emphasise when you educate people in your community on how to protect themselves and their children from developing diarrhoeal diseases. Figure 33.7 illustrates some important strategies that everyone should know.

Figure 33.7 Poster showing actions to reduce the transmission of diarrhoeal diseases: (top right) build a latrine with a water container for handwashing; (bottom left) give an affected child ORS to drink and take him to a health facility; (bottom right) bury faeces in a safe place. (Photo: Ali Wyllie)

33.6.1 Controlling epidemics of diarrhoeal diseases

What else should you do if there is an outbreak of a diarrhoeal disease, which threatens to spread in the community?

- Which bacterial or viral diarrhoeal diseases are most often associated with epidemics? Do you remember two reasons why?

- Cholera and shigellosis (bacillary dysentery) can rapidly spread and cause an epidemic. The two main reasons are that very small numbers of bacteria (fewer than ten) can result in the illness if they get into a susceptible person, and people who have recovered from the illness can go on shedding the bacteria in their faeces for weeks afterwards.

Suspected cases of cholera or shigellosis (bacillary dysentery) should be immediately reported to the *woreda* Health Office.

Whenever you suspect there may be a single case of cholera or shigellosis in your community, you must take swift action to investigate and report it, and apply measures to control the source of infection before it can spread. Epidemic investigation techniques will be discussed in detail in Study Session 42, so here we will briefly summarise the main points.

■ Why do you think it is important to report suspected cases of cholera or shigellosis to the *woreda* (District) Health Office?

□ You cannot prevent an epidemic from developing on your own. Reporting suspected cases enables the *woreda* Health Office and other higher bodies to start epidemic investigation and laboratory diagnosis as soon as possible, and collaborate with you in taking action to control the outbreak before it spreads.

You should try to identify everyone who has been in close contact with the **source patient** (i.e. the first case in your community) by asking the patient, the family and neighbours about what the patient has been doing recently and who he or she has seen. It is particularly important to locate everyone who has been eating the same food or drinking water from the same place as the patient. Give these individuals advice to seek early treatment if the illness starts and to report it immediately.

33.6.2 Epidemic control measures for cholera

In addition to the points described above, you should take action to prevent the spread of cholera bacteria in water, food or on the hands of people who have been caring for patients.

- Ensure that everyone in contact with the patient knows that they must be especially careful to wash their hands very thoroughly with soap and water after touching the patient, as well as at all the usual times (after defaecation, before preparing food or eating, etc.)
- Make sure that faeces or vomit from the patient cannot contaminate sources of drinking water, for example, when washing the patient's soiled clothes, bedding or drinking cups. Do not wash any articles that may be carrying cholera bacteria in streams, pools or water containers that people use to collect drinking water (Figure 33.8). Infected water is one of the main transmission modes for cholera bacteria. In a cholera epidemic, everyone in the community must use protected water sources for drinking, and either boil the water or disinfect it by adding chlorine.
- Disinfection of clothes contaminated with faeces and vomit, and articles used by patients, is essential; they should be boiled or scrubbed with a disinfectant solution such as chlorine bleach.
- Interruption of foodborne transmission includes cooking food thoroughly before eating, preventing contamination of food by flies and avoiding eating raw vegetables and fruits.

Figure 33.8 Clothes from someone with cholera should not be washed in water that people use for bathing or drinking. (Photo: Basiro Davey)

33.6.3 Epidemic control measures for shigellosis

Shigella bacteria are particularly likely to be passed directly from one person to another, for example when shaking hands, so people who are caring for a patient with bacillary dysentery are at high risk of infection. Educate carers that a very small number of organisms can cause infection and that strict hygiene precautions are needed when handling the faeces of patients. In addition, patients and carers should understand that anyone with a *Shigella* infection should not prepare food for others to eat, or care for a young child or a sick person, until a month after recovery. This is because the bacteria continue to be shed from the person in their faeces for several weeks, and can easily be transmitted to vulnerable contacts.

■ What measures would be most important in preventing transmission of shigellosis?

□ The measures to be given priority include:

- frequent and very thorough handwashing with soap and water (Figure 33.9)
- avoiding direct contact with faeces if possible, and disposing of faeces safely
- disinfection of clothing and articles contaminated with faeces.

Figure 33.9 Handwashing with soap and water is the single most important measure to control a shigellosis epidemic. (Photo: Basiro Davey)

33.6 Typhoid fever

In the final section of this study session, we turn to **typhoid fever** – a bacterial faeco-oral disease caused by *Salmonella typhi* bacteria, which is classified as a *febrile illness* (not a diarrhoeal disease). The incubation period is usually one to two weeks. Although typhoid fever can cause diarrhoea in children, it is rare in children of less than five years of age. In adults, diarrhoea may be present in the early stage of the illness, but this quickly turns to constipation. The main distinguishing feature is a very high fever (39°C to 40°C), with headache, lethargy, loss of appetite, and sometimes rose-coloured spots on the chest. If you are trained to palpate the abdomen, you may be able to feel an enlarged liver and spleen.

Typhoid fever is a major health problem in poor communities and is **endemic** (always present at a relatively constant rate) in Ethiopia. The WHO estimates that there are about 17 million cases worldwide every year. Transmission of typhoid fever can occur by the direct faeco-oral route, but it is mainly transmitted indirectly through contaminated water and food.

■ What other febrile diseases have you learned about so far in this Module, i.e. with high fever as one of their main manifestations?

□ Malaria and meningococcal meningitis are febrile diseases. (In Study Session 36, you will learn about two more: louse-borne relapsing fever and typhus.)

You can suspect a case of typhoid fever based on your clinical diagnosis, but because the symptoms of typhoid fever are similar to that of malaria, you should first use the malaria rapid diagnostic test (RDT) if you are in an area where malaria is endemic (Figure 33.8). Even after ruling out malaria, you can't be sure of the diagnosis of typhoid fever, because meningitis and relapsing fever can also present with similar symptoms and signs. Therefore, if you suspect typhoid fever, refer the patient to the nearest higher level health facility for laboratory diagnosis and specialist treatment.

As with other faeco-oral diseases, your role in the prevention and control of typhoid fever is giving health education to your community on measures that aim to interrupt faeco-oral transmission. In the next study session, we will focus on faeco-oral diseases caused by single-celled parasites and helminths (worms).

Figure 33.8 Malaria Rapid Diagnostic Test (RDT) kit. The technique for conducting the test was described in Study Session 8 of this Module. (Photo: Ali Wyllie)

Summary of Study Session 33

In Study Session 33, you have learned that:

1 Common faeco-orally transmitted diseases caused by bacteria and viruses include cholera, shigellosis (bacillary dysentery), viral diarrhoeal diseases (rotavirus infection is the most prevalent), and typhoid fever.

2 Cholera is a bacterial disease, which manifests with painless, acute watery diarrhoea that resembles rice-water, and profuse vomiting.

3 Shigellosis or bacillary dysentery is an acute diarrhoeal disease characterised by blood and mucus in the stool, with urgency and straining during defaecation.

4 Viral diarrhoeal diseases are the commonest type of diarrhoeal disease, particularly in children. Their manifestation is mainly acute watery diarrhoea.

5 The transmission of cholera bacteria and rotaviruses is mainly via contaminated water and food, whereas shigellosis is mainly spread via person-to-person contact.

6 Cholera and shigellosis are prone to epidemics, because small numbers of bacteria can cause the illness, and bacteria continue to be shed for some time after the patient recovers.

7 Epidemic control measures include swift case reporting, identification of contacts of the source patient, frequent thorough handwashing with soap and water, safe disposal of faeces, and disinfection or boiling of clothes, bedding and utensils used by the patient.

8 You can treat most cases of children with acute water diarrhoea at Health Post level, without the need for laboratory diagnosis of the causative infectious agent. However, adults with severe diarrhoea and children with dysentery should be referred urgently after starting rehydration with oral rehydration salts (ORS).

9 Typhoid fever is a febrile illness, characterised by high continuous fever, with constipation (rather than diarrhoea) in most adult patients. The disease is spread faeco-orally via infected water and contaminated food. If you suspect typhoid fever, you should refer the patient quickly.

Self-Assessment Questions (SAQs) for Study Session 33

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering the questions below. One question also tests some of the Learning Outcomes of Study Session 32. 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 33.1 (tests Learning Outcomes 33.1, 31.2, 31.3 and 33.4)

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

A Typhoid fever is transmitted mainly indirectly by contaminated food or water.
B The characteristic manifestations of cholera include bloody diarrhoea.
C Shigellosis is transmitted mainly by direct person-to-person contact.
D Diarrhoeal diseases can lead to severe dehydration and shock.
E Viruses are the commonest cause of diarrhoea in children.
F Typhoid fever is a common cause of diarrhoea in adults.

SAQ 33.2 (tests Learning Outcomes 31.1, 33.4 and 33.5)

If you see an adult patient with bloody diarrhoea, what actions should you take:

(a) To treat the patient?
(b) To prevent the disease from spreading?

SAQ 33.3 (tests Learning Outcomes 33.2, 33.3 and 33.4)

Complete the missing details from Table 33.3 below.

Table 33.3 Incubation periods and most affected age-groups for common bacterial and viral faeco-oral diseases.

Disease	Incubation period	Age group for most cases
Cholera		
Shigellosis		
Rotavirus infection		
Typhoid fever		

SAQ 33.4 (tests Learning Outcomes 32.3, 32.4, 33.1, 33.3, 33.4 and 33.5)

(a) Rotaviruses are endemic in all developing countries and the major cause of diarrhoeal diseases in young children. What does endemic mean?
(b) How are bacterial and viral diarrhoeal diseases transmitted?
(c) A nine-month-old baby has had three episodes of watery diarrhoea in the last three days. The mother says the child is still partly breastfed, and is eating and drinking normally. It does not appear to be dehydrated. What actions should you take and what should you advise the mother?

Study Session 34 Intestinal Protozoa, Ascariasis and Hookworm

Introduction

In the previous study session, you learned about the most common faeco-oral diseases caused by bacteria or viruses. In this study session, we will describe the main **intestinal parasitoses** (pronounced 'para-sit-oh-seez'), i.e. diseases caused by parasites living in the intestines. You will learn about the **intestinal protozoa** (single-celled organisms) causing *amoebiasis* and *giardiasis*, and the **intestinal helminths** known as *ascaris worms* and *hookworms*. There are other, much larger, intestinal parasites in addition to those described here, such as the tapeworms, which you will learn about in Study Session 38.

It is important for you to know about these diseases so that you can treat or refer cases and apply prevention and control measures in your community. The prevention and control measures for these conditions are the same as you have already learned in earlier study sessions in relation to other faeco-oral diseases. However, you will notice that there are significant differences in the symptoms and treatment of the parasitic diseases described here.

Learning Outcomes for Study Session 34

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

34.1 Define and use correctly all of the key words printed in **bold**. (SAQs 34.1, 34.2 and 34.3)

34.2 Identify the common causative agents, occurrence and modes of transmission of the common faeco-oral diseases caused by intestinal protozoa and roundworms. (SAQs 34.2, 34.3 and 34.4)

34.3 Explain how you would diagnose and treat cases of amoebiasis, giardiasis, ascariasis and hookworm infection, based on their symptoms and signs, and when and why you would refer them to a higher-level health facility. (SAQs 34.1, 34.2, 34.3 and 34.4)

34.4 Describe how you would apply prevention and control measures against these common intestinal parasitoses. (SAQs 34.2 and 34.5)

34.1 Intestinal protozoal diseases

The two commonest types of faeco-oral diseases caused by intestinal protozoa are *ameobiasis* (or *amoebic dysentery*) and *giardiasis*. Both conditions are also classified as diarrhoeal diseases based on the characteristic symptom of diarrhoea. The prevention and control measures against both diseases are the same as for other faeco-oral diseases described previously (refer back to Study Session 32, Section 32.6). Our focus here will be on the unique features that enable you to suspect cases of these diseases, and refer patients after starting rehydration with oral rehydration salts (ORS).

34.1.1 Amoebiasis

Amoebiasis is a disease resulting from infection of the large intestine (colon) by a protozoan parasite called *Entamoeba histolytica*.

The distribution of this single-celled parasite is very widespread – the WHO estimates that around 500 million people around the world are infected with these amoebae (Figure 34.1). It is endemic in Ethiopia, and research studies have shown a prevalence of amoeba infection ranging from 4% to 19% in the Ethiopian population.

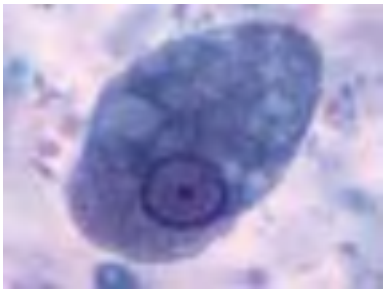

Figure 34.1 *Entamoeba hystolica* magnified over 1,000 times and stained blue to reveal its large nucleus. (Photo: CDC Image Library, image 607)

The plural amoebae is pronounced 'amm-ee-bee'.

However, most people with amoebae in their intestines show no symptoms, but they can pass on the amoebae to others and are an important reservoir of infection. Individuals who develop amoebiasis, experience bloody diarrhoea (so the disease is also known as *ameobic dysentery*), fever and abdominal cramps, sometimes alternating with periods of constipation. Unlike in cases of bacillary dysentery, the blood and mucus is mixed with solid stool and patients are not usually bedridden. Very rarely, amoebiasis can lead to serious complications, including abscesses in the liver, lungs or brain.

Another difference between dysentery caused by ameobae and dysentery caused by *Shigella* bacteria is that amoebiasis mainly affects young adults; it rarely occurs below the age of five years. By contrast, dysentery in children under ten years is mainly due to *Shigella* species. Also, amoebiasis does not usually produce epidemics, so an epidemic of dysentery is most probably due to cases of shigellosis.

Some amoebae in an infected person's intestines transform and become encased in a round protective membrane called a **cyst**. The cysts pass out of the body in the faeces. They are highly resistant to damage and can be transmitted by direct and indirect faeco-oral routes, mainly via contaminated food or water. They hatch out in the new person and the protozoa rapidly increase in number by cell division.

For accurate diagnosis, laboratory identification of the cysts in the patient's stool is necessary to differentiate it from shigellosis. Therefore, you should start any patient with dysentery on rehydration with ORS and refer them to the nearest higher level health facility for further investigation and specialist treatment. Advise the patient or caregiver that further investigation is needed for diagnosis and that early treatment is important because the disease could lead to serious outcomes.

Figure 34.2 Diagrams of *Giardia intestinalis* parasites: (left) the free-swimming adult form found in the intestines; (right) cyst found in the faeces of an infected person. (Source: CDC Public Health Image Library, image 3394)

34.1.2 Giardiasis

Giardiasis is a faeco-oral disease which results from infection of the small intestine by protozoa called *Giardia intestinalis*, also known as *Giardia duodenalis.* (Note: the same protozoa are called *Giardia lamblia* in older textbooks.) Studies have shown the prevalence of *Giardia* infection in Ethiopia ranges from 2.0% to 11.4% of the population. Like the parasitic amoebae described in the previous section, *Giardia* form resistant cysts in the person's intestines (Figure 34.2) that pass out in the faeces. The cysts can be

easily transmitted in water contaminated by faeces, from person-to-person through hand-to-mouth transmission and in food. They hatch out in the new person and the protozoa rapidly increase in number by cell division.

The commonest clinical manifestation of giardiasis is foul-smelling, pale, greasy diarrhoea, without blood or mucus (mucoid). The diarrhoea can be acute and resolve by itself within a few days, or it may be persistent (lasting for more than 14 days). Other symptoms of giardiasis include nausea, vomiting, abdominal cramps and abdominal distension (swelling).

You should suspect giardiasis in children if the diarrhoea is persistent, but not bloody or mucoid. For children with mild non-bloody or non-mucoid diarrhoea, the management does not require identification of the infectious agent; cases are managed with oral rehydration as already described for simple acute watery diarrhoea (refer back to Section 32.4.2). If a child has persistent or severe diarrhoea, and giardiasis is one of the causes you suspect, treatment is carried out at a higher-level health facility on a case-by-case basis, taking into account the presence of other symptoms and/or malnutrition. Therefore, you should start ORS treatment and refer the child.

Details of the specific management of children with persistent or severe diarrhoea are taught in the Module on the *Integrated Management of Newborn and Childhood Illness*.

In adults, you should suspect a diagnosis of giardiasis in cases with acute or persistent, non-bloody or non-mucoid diarrhoea. However, as other diseases could also have similar manifestations, confirmation of the diagnosis is needed through detection of the parasite in laboratory examination of stool samples. Therefore, start all adult patients on rehydration with ORS and refer them for further diagnosis and treatment.

- Amoebiasis and giardiasis both present with diarrhoea. What is the difference in the type of diarrhoea resulting from the two diseases?

- The main difference in the type of diarrhoea is that in amoebiasis it is bloody or mucoid (contains mucus), whereas in giardiasis it is pale, greasy and foul smelling.

34.2 Intestinal roundworms

In this section, you will learn about diseases caused by roundworms living in the intestines. **Helminths** is the collective name given to parasitic worms. They have complicated lifecycles, and some helminths require transmission between humans and other host animals before they mature. There are three main groups of helminths: the roundworms, the tapeworms and the flatworms (or flukes). Here we focus on **intestinal roundworms** (helminths that are round in cross-section), which live in the person's intestines and exit from the body in the faeces. The two commonest intestinal roundworms in Ethiopia cause the diseases known as *ascariasis* and *hookworm* infection. Neither of these conditions is characterised by diarrhoea, so they are not classified as diarrhoeal diseases.

34.2.1 Ascariasis

Like other faeco-oral diseases, you need to know the main features of ascariasis: its infectious agent, occurrence, modes of transmission, symptoms and signs, diagnosis and treatment. Prevention and control measures are similar to those for other faeco-oral diseases, described in earlier study sessions. However, ascariasis requires specific drug treatment based on its symptoms and signs.

Figure 34.3 A female adult ascaris worm (*Ascaris lumbricoides)*, with measuring scale. (Photo: CDC's Parasites and Health page, at http://www.dpd.cdc.gov/dpdx/HTML/Ascariasis.htm)

Ascariasis results from infection of the small intestine with a helminth parasite called *Ascaris lumbricoides*. It is the largest of the intestinal roundworms; mature worms can measure 15–35 cm in length (Figure 34.3). It is the commonest of all the faeco-oral diseases caused by parasitic helminths. It mainly affects children, particularly between three to eight years of age. In Ethiopia, around 37% of the population is estimated to be infected with *Ascaris lumbricoides*.

The complicated lifecycle of ascaris worms is shown in Figure 34.4 and is essential for their full development into egg-laying adults. In the descriptions that follow, the numbers relate to the numbers on each stage shown in Figure 34.4. Adult *Ascaris lumbricoides* worms in the intestines (1) lay eggs which pass out with the faeces (2). The eggs are transmitted faeco-orally by ingestion of contaminated food, water, etc. (stages 2 to 4). The eggs hatch and develop into larvae (immature stage) in the intestines (5). The larvae are carried in the bloodstream to the lungs, where they develop further (6). They migrate upwards from the lungs into the throat (7), where they are swallowed – returning once again to the person's intestines. Male and female worms mate and the females lay eggs in the intestines (1), which pass out in the faeces (2), and are ingested by new hosts – beginning the lifecycle all over again.

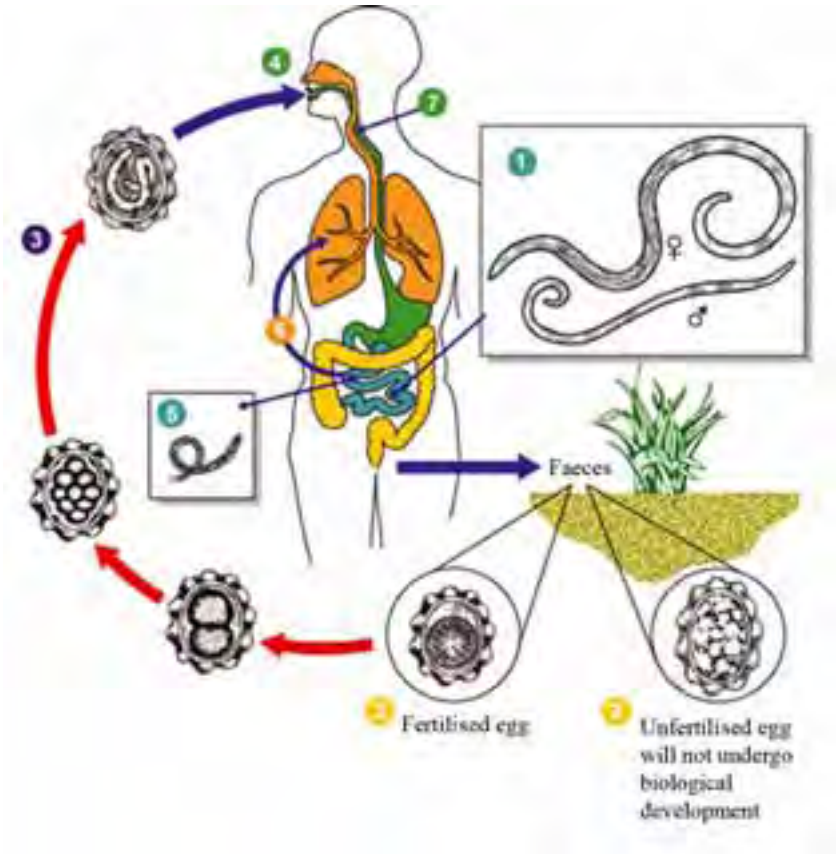

Figure 34.4 The life cycle of ascaris worms. (Source: adapted from: CDC's Parasites and Health page, at http://www.dpd.cdc.gov/dpdx/HTML/Ascariasis.htm)

Cases of ascariasis manifest with abdominal discomfort, and live worms may be seen in the stools, vomit or occasionally emerging from the nose. You can make a clinical diagnosis of ascariasis if the patient or the caregiver of a child tells you that long worms have passed with the stool or vomit, or if you are able to see the worms yourself. Eggs in the faeces are too small to see with your eyes, and although they can be identified by laboratory diagnosis of stool samples, there is no need to send samples for investigation or refer the patient

– unless there are obvious signs of anaemia (see Box 34.1 in the discussion of hookworm infection later in this study session). You can treat mild cases yourself, and you should also give *all* children aged between two to five years routine treatment to kill intestinal worms, as described next.

Treatment for ascariasis and routine deworming

If you diagnose ascariasis, the treatment schedule is as given in Table 34.1. There are two drugs (albendazole and mebendazole), both available in either liquid or tablet form. However, even if there are no signs of worm infection, **routine deworming** is recommended for all children aged 24 months or older who have not been treated in the previous six months. Give every child that you see in this category the appropriate dose of albendazole or mebendazole *every six months* to treat intestinal worms. Chewable deworming tablets that taste good are available. For children who find swallowing a tablet difficult, you can crush it between two spoons and mix it with a little water to help them to take the dose. This regimen kills hookworms as well as ascaris worms.

Do not give either albendazole or mebendazole to pregnant women who are in their first 14 weeks of pregnancy.

Table 34.1 Deworming schedule for ascariasis or hookworm, depending on the age of the child.

Drug	**Age 0 to 2 years**	**Age 2 to 5 years**
Albendazole (400 mg tablet)	None	1 tablet (400 mg)
Medendazole (100 mg or 500 mg tablets)	None	1 × 500 mg tablet (or 5 × 100 mg tablets)
Mebendazole oral suspension (Figure 34.5)	2.5 teaspoons (250 mg)	None

Figure 34.5 Bottles of oral mebendazole suspension in a Health Post store. (Photo: Basiro Davey)

34.2.2 Hookworm infection

Hookworm infection is transmitted via contact with faeces, but it is not actually a faeco-oral disease, because the infection does not enter through the mouth, as you will see below in our discussion of its transmission process. However, it is appropriate to discuss hookworm infection with other faeco-oral diseases because the infectious agents exit from the body in the faeces, the routine deworming regimen is the same as for ascariasis (Table 34.1 above), and prevention and control includes the measures already described for other faeco-oral diseases (see Study Sessions 32 and 33).

Hookworms live in the small intestine and suck blood from blood vessels in the intestinal walls. The main infectious agents are called *Necator americanus* and *Ancylostoma duodenale.* Hookworm infection is endemic in Ethiopia, especially in areas where people walk barefooted and sanitary conditions allow faeces to contaminate the soil. In Ethiopia the prevalence of hookworm infection is estimated to be around 16% of the population.

During the transmission process (Figure 34.6), immature parasites (larvae) in the soil enter the body by penetrating the skin, usually through bare feet. The larvae then migrate to the small intestine, after passing through different body systems. In the small intestine, the adult worms mate and the females lay eggs which are excreted with the faeces. The eggs develop in the soil into larvae, which can then be transmitted to new individuals through the skin.

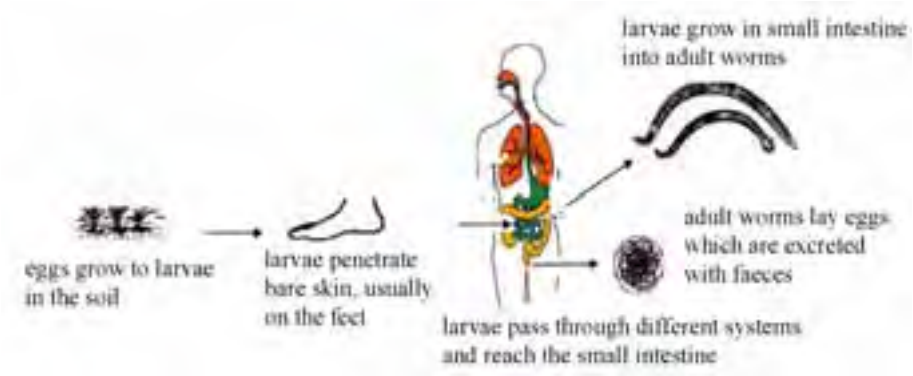

Figure 34.6 The transmission cycle of hookworms. (Source: adapted from CDC's Parasites and Health page, at http://www.dpd.cdc.gov/dpdx/HTML/Hookworm.htm)

- What preventive measure should you advise people in your community to apply to protect themselves from hookworms?

- In addition to all the measures involving personal hygiene after defaecation, before food preparation and when eating etc., you should specifically educate your community to interrupt the transmission of hookworms by:
  - Wearing shoes to prevent the parasites from entering through skin while walking barefooted.
  - Using latrines, disposing of faeces safely and stopping open defaecation in fields, to prevent contamination of soil with the parasites.

Diagnosis and treatment of hookworm infections

Cases of chronic hookworm infection manifest with abdominal pain and the symptoms and signs of anaemia (see Box 34.1), due to blood loss caused by the blood-sucking worms. It is very important that you treat worm infestations routinely in children aged from two to five years, because persistent hookworm infections (like ascariasis) causes a significant loss of **micronutrients** (minerals and vitamins) from the body. Infected individuals may develop anaemia, which can be life-threatening. Anaemic children fail to grow properly and their school performance will be negatively affected.

Box 34.1 Anaemia: a common sign of ascariasis or hookworm infection

Anaemia refers to a deficiency of haemoglobin in the blood. **Haemoglobin** is the red, iron-rich protein that gives red blood cells their colour and enables them to pick up oxygen and transport it around the body. Symptoms and signs of anaemia include becoming easily tired; pallor (paleness) inside the eyelids, gums, nails and palms of the hands (Figure 34.7); shortness of breath; and a fast pulse rate, which an anaemic person may notice as their heart beating fast even when they are quietly resting. Therefore, routine deworming of children aged between two to five years, every six months, according to the dosages given in Table 34.1 earlier, is essential to kill hookworms as well as ascaris worms.

Figure 34.7 Paleness inside the eyelids and gums are signs of anaemia.

In the next study session, we turn to the largest single cause of mortality among children under the age of five years: acute respiratory tract infections.

Summary of Study Session 34

In Study Session 34, you have learned that:

1 Parasitic infection of the intestines could be due to protozoa or helminths.

2 Common types of intestinal protozoal infections in Ethiopia include ameobiasis and giardiasis.

3 Ameobiasis presents with dysentery (stools containing blood and mucus). Amoebic dysentery is rare in children, in contrast to shigellosis (bacillary dysentery) which mainly affects young children. Suspected cases of amoebiasis should be started on rehydration with ORS and then referred for laboratory diagnosis and treatment.

4 Giardiasis presents with pale, greasy and foul-smelling diarrhoea. For children with mild cases, treat as for acute watery diarrhoea, by rehydrating with ORS. For persistent or severe cases in children, and all adults with suspected giardiasis, start rehydration and then refer them for laboratory diagnosis and treatment.

5 Common diseases caused by intestinal helminths in Ethiopia include ascariasis and hookworm infection.

6 Ascariasis is the commonest intestinal helminth infection in children. Cases present with abdominal discomfort and you may see the passage of live worms with the faeces or vomit. Treat cases with albendazole or mebendazole according to the schedule in Table 34.1.

7 Hookworm infection is a common cause of anaemia in areas where walking barefooted is common and sanitary conditions are poor. Refer suspect cases for laboratory confirmation and educate the community on shoe wearing, use of latrines and proper disposal of faeces.

8 All children aged between two to five years should be routinely dewormed every six months, using the dosages in Table 34.1, to kill ascaris and hookworms.

Self-Assessment Questions (SAQs) for Study Session 34

Now that you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering the questions below. Some questions also test some Learning Outcomes of Study Sessions 32 or 33. 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 34.1 (test Learning Outcomes 33.1, 33.4, 34.1 and 34.3)

Suppose a 30-year-old man came to you complaining of diarrhoea. You asked about the type of diarrhoea and the patient described it to you. Which diseases do you suspect, if he describes the diarrhoea as:

(a) Bloody with mucus?
(b) Watery?
(c) Pale and greasy?

How should you manage the patient in each of the above cases?

SAQ 34.2 (test Learning Outcomes 34.1, 34.2, 34.3 and 34.4)

A mother brought her five-year-old child complaining of long round worms coming out with the child's stool.

(a) What is your diagnosis and how should you manage the child's condition?
(b) What measures do you undertake at community level to decrease such infections?

SAQ 34.3 (test Learning Outcomes 34.1, 34.2 and 34.3)

Abebe is a farmer who came to you with symptoms of anaemia.

(a) What possible causes of anaemia do you consider?
(b) What evidence would suggest hookworm infection?
(c) How do you manage Abebe's illness?

SAQ 34.4 (tests Learning Outcomes 33.3, 33.4, 34.2 and 34.3)

List the main differences between amoebiasis and shigellosis in terms of their occurrence, symptoms and signs.

SAQ 34.5 (tests Learning Outcome 34.4)

How are the prevention and control measures for ascariasis and hookworm infection:

(a) the same?
(b) different?

Study Session 35 Acute Respiratory Tract Infections

Introduction

In this study session, you will learn about acute respiratory tract infections (ARIs). The **respiratory tract** (or 'airways') includes all the parts of the body that enable us to breathe. ARIs are infections of the respiratory tract by either bacteria or viruses, and the term 'acute' indicates that the illness is of short duration (less than two weeks). ARIs are the leading cause of illness and death among young children everywhere in the developing world (Figure 35.1). Ethiopian children suffer four to eight episodes of ARI on average every year, with the highest occurrence in urban areas in overcrowded living conditions. In rural Ethiopia, 20% of the deaths of children aged under five years and more than 30% of the infant deaths under one year are due to ARIs. A better knowledge of ARIs will enable you to detect children with an ARI more quickly and give appropriate treatment, or refer them if the disease is severe.

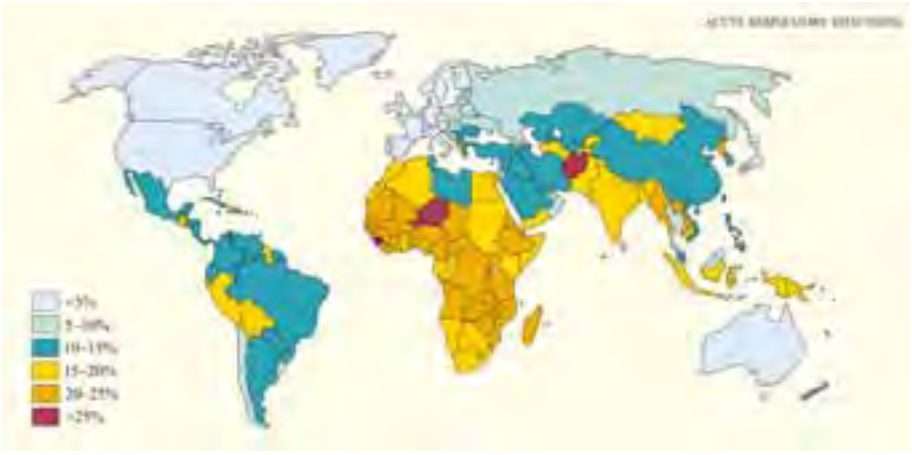

Figure 35.1 Estimates of the percentage of deaths in children aged under five years from ARIs in the year 2000. (Source: The Open University, *Pathogens and People* (S320 Book 1), Figure 1.13, p.32, based on data from Williams, B.G. *et al.* (2002), *The Lancet Infectious Diseases*, 2)

Learning Outcomes for Study Session 35

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

35.1 Define and use correctly all of the key words printed in **bold**. (SAQs 35.1, 35.2, 35.3 and 35.5)

35.2 Identify the common causative agents, modes of transmission and risk factors for the common acute respiratory tract infections (ARIs): acute otitis media, pharyngitis and pneumonia. (SAQs 35.1, 35.2 and 35.5)

35.3 Describe the clinical presentations and complications of ARIs, and the danger signs of severe pneumonia, and explain how these conditions should be managed. (SAQs 35.2, 35.3 and 35.4)

35.4 Explain the most effective ways to prevent and control ARIs, including through community education. (SAQs 35.2 and 35.5)

35.1 What are acute respiratory tract infections?

Acute respiratory tract infections (**ARIs**) are bacterial or viral infections of the respiratory tract leading to breathing difficulties, fever and other complications, including infections in the ear and the membranes surrounding the brain. ARIs are classified according to whether they affect the upper or lower respiratory tracts (Figure 35.2). The **upper respiratory tract** consists of the airways from the nostrils to the vocal cords in the larynx (voice box), and includes the pharynx (back of the throat) and part of the internal structure of the ear (the middle ear). The **lower respiratory tract** refers to the continuation of the airways below the larynx and the branching airways throughout the lungs.

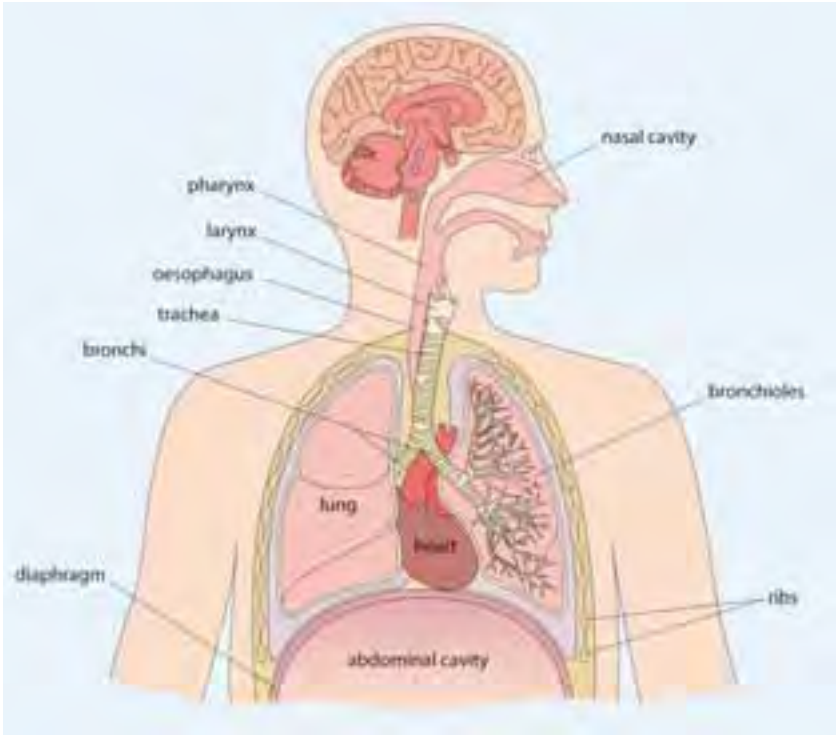

Figure 35.2 Anatomy of the upper and lower respiratory tract.
(Source: The Open University, 2008, *Chronic Obstructive Pulmonary Disease* (SDK125 Case Study 5), Figure 3.3, p.36)

Rhinitis is pronounced 'riy-niy-tiss'; otitis is pronounced 'oh-tiy-tiss'; pharyngitis is pronounced 'fah-rin-jiy-tiss'.

Upper respiratory tract infections (**URIs**) are the most common of all communicable diseases. They are transmitted from one person to another by airborne droplets spread through coughing or sneezing. URIs include mild self-limiting infections such as the common cold (rhinitis), and more severe acute infections in the ear (acute otitis media), or in the pharynx (pharyngitis). **Lower respiratory tract infections** (**LRIs**) are the leading cause of pneumonia, which will be described in Section 35.4 of this study session. First, we discuss acute otitis media and then pharyngitis, both of which can cause severe complications in children.

35.2 Acute otitis media

Acute otitis media (**AOM**) is a severe infection of the middle ear (Figure 35.3), lasting less than two weeks. It is very common in babies and young children, but is rarely seen in adults. Studying this section will help you to prescribe the necessary treatments to a child with AOM, and know when to make a referral of more complicated or persistent cases for further investigation and specialist treatment at a higher level health facility.

It may surprise you to learn that infection inside the ear is classified as a URI. The explanation can be found in Figure 35.3. In each ear, the middle and inner ear are connected to the upper respiratory tract by a tube called the *Eustachian tube*, which leads to the pharynx. You can sometimes hear a soft 'pop' in your ears when you swallow as the pressure wave created by swallowing travels up the Eustachian tubes. Upper respiratory tract infection in the pharynx and tonsils can reach the middle ear if the infectious agents spread upwards along the Eustachian tubes.

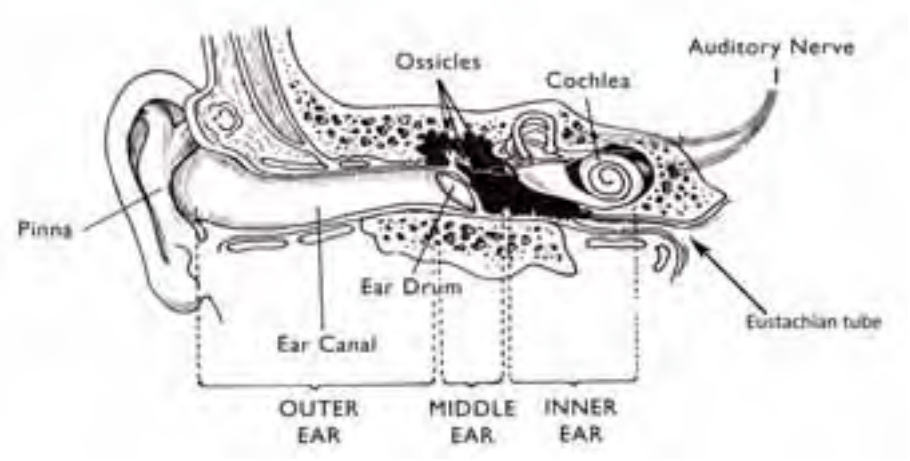

Figure 35.3 Anatomy of the ear and its connection with the upper airways. (Source: WHO, 2006, *Primary Ear and Hearing Care Training Resource: Trainer's Manual – Intermediate Level*, p.16)

35.2.1 How does acute otitis media affect hearing?

In normal situations, the middle ear is filled with air, which transmits sounds from the outside world to tiny bones (called the *ossicles*, see Figure 35.3), causing them to vibrate. The vibration generates signals which the auditory nerve transmits to the brain. This process enables us to hear the sounds. If infection reaches the middle ear, the lining becomes red and inflamed, and it leaks sticky tissue fluid (mucus) into the ear. As the infection builds up, white blood cells crowd into the area to fight the infectious agents and the middle ear becomes filled by **pus** – a thick whitish-yellowish fluid, formed by mucus packed with living and dead bacterial cells and debris from damaged tissue in the ear.

- What effect do you think pus in the middle ear will have on normal hearing, and why?

- It is likely to impair hearing, because the thick, sticky pus stops the ossicles from vibrating properly, so sounds are not transmitted to the brain in the normal way.

35.2.2 Causes, transmission and risk factors for acute otitis media

Immunization against bacterial infections caused by *Haemophilus influenzae* type b is included in the routine EPI schedule for all children in Ethiopia; immunization against *Streptococcus pneumoniae* infection will become available soon.

The two predominant bacteria that cause otitis media include *Streptococcus pneumoniae* and *Haemophilus influenzae* type b, both of which can be prevented by immunization. It can also be caused by a viral vaccine-preventable disease, which you learned about in Study Session 4 of this Module.

■ Can you recall which vaccine-preventable disease is transmitted by airborne droplets and may lead to acute otitis media (AOM) as one of its complications?

□ Measles is associated with several complications in young children, including AOM and pneumonia.

AOM is transmitted by airborne spread of the causative infectious agents in droplets, sprayed into the air when a sick person coughs or sneezes. The infection in the new host usually begins with a common cold, sore throat or measles.The presence of certain risk factors makes babies and young children more vulnerable to developing AOM (see Box 35.1).

Box 35.1 Risk factors for acute otitis media

- Age: most cases are below five years of age
- Family history of otitis media
- Winter season
- Living in overcrowded conditions where other children have coughs or runny noses
- Indoor air pollution from cooking fires (Figure 35.4) and/or tobacco smoke
- Bottle-feeding a baby (breastfeeding offers some protection from URIs)
- Poor nutrition, particularly when the child is not exclusively breastfed
- HIV-infection in the child.

Figure 35.4 Smoke from indoor cooking fires escapes from these traditional Ethiopian round houses (*tukul*); indoor smoke pollution increases the risk of pneumonia and AOM. (Photo: Basiro Davey)

35.2.3 Clinical manifestations, diagnosis and complications of acute otitis media

The symptoms and signs of AOM are highly variable, especially in infants and young children. As a health worker in the community, you should check the following symptoms in children with upper respiratory tract infections:

- Ear pain, often manifested by irritability (the child is easily upset) and occasionally holding or tugging at the ear
- A change in sleeping or eating habits
- Symptoms associated with upper respiratory tract infection, such as a runny nose and sneezing typical of the common cold
- Hearing loss, which may manifest as changes in speech patterns; however, this often goes undetected if hearing loss is mild or in one ear only, especially in younger children.

You can diagnose AOM by careful history-taking and physical examination. Ask the child's caregiver about any history of the above symptoms of AOM. Examine the ear thoroughly for redness or pus discharging from the ear canal (Figure 35.5).

Acute otitis media may progress to produce other complications. These include **chronic otitis media**, manifested by pus discharging from the ear for more than two weeks, which can lead to permanent deafness.

■ What is the complication called if the bacteria that cause otitis media infect the membranes surrounding the brain? How serious is this complication?

□ You learned in Study Session 3 in Part 1 of this Module that **bacterial meningitis** is a potentially life-threatening infection of the brain, which can also spread and cause an epidemic.

Figure 35.5 Pus discharge as a result of chronic otitis media. (Photo: WHO, 2006, *Primary Ear and Hearing Care Training Resource*: *Student's Workbook – Intermediate Level*, p.53)

35.2.4 Treatment of acute otitis media

As a Health Extension Practitioner you need to know how to treat acute otitis media. Treat the child as an outpatient in the Health Post or at home. Give oral *co-trimoxazole* or *amoxicillin* for five days. The dose of these antibiotics in tablets or syrup preparations depends on the age or weight of the child, as given in Table 35.1. These dosages also apply to the treatment of pneumonia, which will be discussed in Section 35.4 of this study session.

Table 35.1 Antibiotic drug dosages for the treatment of acute otitis media and pneumonia.

Age (weight)	**Co-trimoxazole (give twice per day for five days)**			**Amoxicillin (give three times per day for five days)**
	Adult tablet (80 mg trimethoprim + 400 mg sulphamethoxazole)	Paediatric tablet (20 mg trimethoprim + 100 mg sulphamethoxazole)	Syrup (80 mg trimethoprim + 400 mg sulphamethoxazole /5 ml)	Syrup (125 mg/5 ml)
2–12 months (4–10 kg)	½ tablet	2 tablets	5 ml (1 teaspoon)	5 ml (1 teaspoon)
12 months to 5 years (10–19 kg)	1 tablet	3 tablets	7.5 ml (1.5 teaspoons)	10 ml (2 teaspoons)

The assessment and treatment of ear infections in children is described in more detail in the module on *Integrated Management of Newborn and Childhood Illness (IMNCI)*.

If the child has ear pain or high fever (equal to or above 39°C or 102.2°F), which is causing distress, give 5 ml of *paracetamol* syrup up to three times per day.

If there is pus draining from the child's ear, show the mother or another caregiver how to dry the ear by wicking (cleaning the ear using a twist of very clean cotton). Advise her to wick the ear three times daily, until there is no more pus (Figure 35.6). Tell the mother not to place anything in the ear between wicking treatments. Do not allow the child to go swimming or get water in the ear. If the pus continues to discharge from the ear after five days, refer the child to a health centre for further assessment and treatment.

Figure 35.6 Wicking pus from the ear of a child with acute otitis media.
(Diagram: Dr Radmila Mileusnic)

Strategies for the prevention and control of acute otitis media, pharyngitis (the subject of the next section) and pneumonia (described in Section 35.4) are the same, and will be described at the end of this study session.

35.3 Pharyngitis

Pharyngitis refers to infection and **inflammation** (becoming hot, swollen and red) of the structures in the pharynx. In most cases, the tonsils are affected and become inflamed and ulcerated (tonsillitis). In this section, we will describe the clinical manifestations, complications and treatment of pharyngitis. A better understanding of these points will help you to identify a child with pharyngitis and know that you should refer them to a higher level health facility. Pharyngitis can be caused by viruses or bacteria, but the most important causes are bacteria of the type known as Group A *Streptococci*. Infection with Group A *Streptococci* is common among Ethiopian children. It can lead to severe complications, including heart disease.

Figure 35.7 Sore throat and swollen tonsils due to pharyngitis. (Photo: CDC/PHIL, Strep Throat Picture 1, Hardin Library for the Health Sciences, University of Iowa, accessed from http://www.lib.uiowa.edu/hardin/md/cdc/strepthroat.html)

35.3.1 Clinical manifestations and complications of pharyngitis

Pharingitis generally begins with the sudden onset of fever (temperature above 37.5°C, measured with a thermometer in the armpit), and a sore throat, with redness and swelling of the tonsils at the back of the throat (Figure 35.7). Other symptoms include headache, cough, runny nose and pain during swallowing.

Infection of the pharynx by Group A *Streptococci* has many complications, which include otitis media and throat abscesses (swelling containing pus). In a minority of severe cases, a form of heart disease – called **rheumatic heart disease** – can develop as a result of the body's attempt to fight the infection. The immune system recognises Group A *Streptococci* as 'foreign' and produces antibodies that attack the bacteria. **Antibodies** are specialised proteins made by specific white blood cells as part of the body's defence against infection. However, in rare cases, the antibodies produced to fight

Group A *Streptococci* can attack the heart muscle of the infected child. As a result, these children can develop rheumatic heart disease later in life.

35.3.2 Referral of children with pharyngitis for treatment

Educate mothers and other caregivers about the symptoms of acute otitis media and pharyngitis, and advise them to bring their child to you, or go to a health centre, if they suspect either of these conditions. Early diagnosis and correct treatment greatly improve the outcomes and reduce the risk of complications. Pharyngitis due to Group A *Streptococci* should be treated by doctors using a drug called *Benzathine penicillin*. This drug is given in the form of an injection, which is not authorised for use at Health Post level.

If you identify children with pharyngitis, you should refer them to the nearest health centre or hospital for specialised assessment and treatment.

35.4 Pneumonia

A better understanding of pneumonia will help you to save many lives through early diagnosis and treatment or referral of cases, especially among children, and educating your community on effective prevention and control measures.

35.4.1 What is pneumonia and what causes it?

Pneumonia is a lower respiratory tract infection that mainly affects the lungs. The lungs are made up of small sacs called *alveoli*, which are filled with air when a healthy person breathes in. When an individual has pneumonia, the alveoli are filled with pus and fluid, which makes breathing painful and limits the amount of oxygen they can take into the body. Pneumonia is caused by a number of infectious agents, mainly by certain bacteria and viruses (Box 35.2). In children or adults whose immunity is weak, other organisms such as fungi can cause a rare form of pneumonia, which may be responsible for at least one quarter of all pneumonia deaths in HIV-infected infants.

Box 35.2 Major bacterial or viral causes of pneumonia

Bacterial causes (the major causes of death from pneumonia)

- *Streptococcus pneumoniae* – the most common cause of bacterial pneumonia.
- *Haemophilus influenzae* type b (Hib) – the second most common cause of bacterial pneumonia.

Viral causes

- Respiratory syncytial virus – the most common viral cause of pneumonia.

Pneumonia is the number one cause of death among children in Ethiopia and worldwide: globally, it causes an estimated 1.6 million child deaths every year. It is also among the top five causes of illness and death in adults in Ethiopia. The Ethiopian Demographic and Health Survey (DHS, 2005) estimated that 13% of children had pneumonia during the survey year, and infants (children up to one year old) were more likely to have pneumonia than older children under the age of five.

Viral infections often come on gradually and may worsen over time. The common symptoms include cough, fever, chills, headaches, loss of appetite and wheezing.

■ Which of the bacterial causes of pneumonia can be prevented by immunization?

Details of vaccines in the Expanded Programme on Immunization (EPI) in Ethiopia are given in the *Immunization* Module.

□ You learned in Study Session 3 (in Part 1 of this Module) that vaccines exist to protect children from bacterial pneumonia caused by *Haemophilus influenzae* type b (Hib) or *Streptococcus pneumoniae*. The Hib vaccine is already routinely given to infants in Ethiopia, and the pneumococcal vaccine will be added to the routine EPI schedule in the near future.

As we mentioned earlier, immunization against measles also helps to protect children from complications, which include pneumonia and AOM.

35.4.2 Pneumonia transmission and risk factors

The infectious agents causing pneumonia may reach the person's lungs through different routes. The most common modes of transmission are:

- Airborne droplets spread when the sick person coughs or sneezes, and inhaled into the lungs (breathed in) by a susceptible person;
- Direct oral contact with someone who has pneumonia (e.g. through kissing).
- During or shortly after birth, babies are also at higher risk of developing pneumonia from coming into contact with infectious agents in the birth canal, or from contaminated articles used during the delivery.

These modes of transmission help to explain why certain risk factors increase the probability that children or adults will develop pneumonia. Box 35.3 summarises the common risk factors, some of which also increase the patient's susceptibility to fatal complications if pneumonia occurs.

Box 35.3 Common risk factors for pneumonia

- Under-nutrition/malnutrition, which weakens the immune system and reduces resistance to infection
- Inadequate breastfeeding or formula feeding of infants under six months old, which predisposes them to malnutrition and infection
- Lack of immunization against vaccine-preventable diseases that affect the respiratory system
- Infection with HIV and/or tuberculosis
- Living in overcrowded homes, where airborne infection is easily transmitted
- Exposure to indoor air pollution, especially smoke from cooking fires burning vegetable and animal waste (e.g. dried cow dung), which irritates the lungs and makes it easier for bacteria and viruses to gain a hold.

35.4.3 Diagnosis and classification of pneumonia

Children with pneumonia may have a range of clinical presentations, depending on their age and the cause of the pneumonia. Children who have bacterial pneumonia usually become severely ill and show the following symptoms:

- Fast or difficult breathing (see Table 35.2)
- Cough
- Fever and chills
- Loss of appetite
- Wheezing.

Adults with pneumonia also have fever, cough, and fast or difficult breathing.

Table 35.2 Estimating 'fast breathing' in children in different age groups.

If the child is aged:	The child has fast breathing if you count:
2 months to 12 months old	50 breaths or more per minute
12 months to 5 years old	40 breaths or more per minute

In severe cases of pneumonia, children under five-years-old may struggle to breathe and usually show **chest in-drawing**, which you can observe as drawing inwards or retracting of the lower chest (red arrows in Figure 35.8) during *inhalation* (taking air into the lungs).

Figure 35.8 Chest in-drawing during inspiration: the lower chest wall moves in sharply as the child breathes in. (Diagram: Dr Radmila Mileusnic)

Pneumonia in children and adults is classified into non-severe and **severe pneumonia** based on the features of the condition summarised in Box 35.4. This classification is very important because it determines what treatment is given to the patient (as you will see in Section 35.4.4).

Box 35.4 Severe signs of pneumonia in children and adults

Children

- Age less than 2 months
- Presence of general danger signs (unable to drink or eat, lethargic or unconscious)
- Chest in-drawing
- **Stridor** (a harsh noise made during inhalation)
- Respiratory rate exceeding the limits in Table 35.2.

Adults

- Age 65 years or older
- Respiratory rate equal to or greater than 30 breaths per minute
- Presence of confusion.

A child with fast breathing, chest in-drawing or stridor should be immediately referred to hospital.

If a child with pneumonia has fast breathing (Table 35.2), but no general danger signs, or chest in-drawing, or stridor, classify him/her as having *non-severe* pneumonia. Adults with pneumonia who do not have the severe signs given in Box 35.4, are also classified as having *non-severe* pneumonia.

Infants less than two months old with pneumonia may have serious complications such as meningitis and may die soon. Refer them urgently!

35.4.4 Treatment of pneumonia

Severe pneumonia in children and adults is diagnosed if they exhibit the signs summarised in Box 35.4. You should refer all patients with severe pneumonia immediately to the nearest health centre or hospital, where appropriate drugs can be prescribed by doctors or health officers.

For adults with non-severe pneumonia, give amoxicillin tablets, 500 mg three times a day for seven days. Details of the treatment of severe and non-severe pneumonia in children are given in a separate Module on the *Integrated Management of Newborn and Childhood Illness* (IMNCI). Here we remind you of the oral antibiotics you can give children with non-severe pneumonia without any other danger signs. The course of treatment is for five days with either co-trimoxazole (the preferred antibiotic drug), or if co-trimoxazole is not available, give amoxicillin. The doses of co-trimoxazole or amoxicillin depend on the age or weight of the child, and were summarised earlier in Table 35.1. Look back at it now, and then answer the following question.

■ Suppose you saw a three-year-old girl with non-severe pneumonia. What dose of co-trimoxazole syrup would you give this child, and for how many days?

If any of your non-severe patients do not improve with the drug treatments you give them, or if their condition gets worse, immediately refer them to the nearest health centre or hospital.

□ She is between 12 months and five years, so you should give her 7.5ml (one and a half teaspoons) of co-trimoxazole syrup (containing 80 mg trimethoprim + 400 mg sulphamethoxazole), twice a day for five days (look back at Table 35.1).

Co-trimoxazole for HIV-positive children should be prescribed by doctors as prophylaxis against opportunistic infections with bacteria, viruses and fungi that cause pneumonia. Part 3 of this Module includes a detailed discussion of the prevention and treatment of pneumonia in people living with HIV infection.

■ If a one-month-old child comes to you with symptoms of fever and a respiration rate of 70 breaths per minute, what should you do?

□ The child is less than two months old and may have pneumonia, so it is at high risk of serious complications (e.g. meningitis and death). Therefore, refer the baby immediately to the nearest hospital or health centre.

35.5 Prevention and control of acute respiratory tract infections

Finally, we turn to the methods of prevention and control of acute respiratory tract infections (ARIs). You need to know about them so you can teach members of your community how they can protect their children and vulnerable adults from acute otitis media, pharyngitis and pneumonia.

■ Do you remember the difference between prevention and control?

□ **Prevention measures**, such as immunization, are applied *before* the occurrence of a communicable disease to reduce the risk that it will develop. **Control measures**, such as the treatment or isolation of cases, are applied *after* the occurrence of the disease, with the aim of reducing the transmission of the infectious agents to new susceptible people.

Prevention measures for ARIs include:

- Feeding children with adequate amounts of varied and nutritious food to keep their immune system strong.
- Breastfeeding infants exclusively (no other food or drinks, not even water) for the first six months (Figure 35.9); breastmilk has excellent nutritional value and it contains the mother's antibodies which help to protect the infant from infection.
- Avoiding irritation of the respiratory tract by indoor air pollution, such as smoke from cooking fires; avoid the use of dried cow dung as fuel for indoor fires.
- Immunization of all children with the routine Expanded Programme on Immunization (EPI) vaccines in Ethiopia (Box 35.5).

Figure 35.9 Exclusive breastfeeding helps to protect babies from communicable disease, including pneumonia. (Photo: UNICEF Ethiopia)

Box 35.5 EPI vaccines that protect against acute respiratory tract infections

Immunize all children with:

- *Haemophilus influenzae* type b (Hib) vaccine at 6, 10 and 14 weeks; Hib is one of the five vaccines in the pentavalent vaccine used in Ethiopia.
- Measles vaccine at nine months of age.
- *Pneumococcal* vaccine, when it becomes available in the EPI, to protect them against *Streptococcus pneumoniae* bacteria.

The dosages, schedules and vaccination routes for Hib, measles and pneumococcal vaccines are taught in the *Immunization* Module.

You can help to control the spread of respiratory bacteria by educating parents to avoid contact as much as possible between their children and patients who have ARIs. You should also teach people with ARIs to cough or sneeze away from others, hold a cloth to the nose and mouth to catch the airborne droplets when coughing or sneezing, and disinfect or burn the cloths afterwards. Immunization also increases control, by reducing the reservoir of infection in the community and increasing the level of *herd immunity* (described in Study Session 1 in Part 1 of this Module).

Summary of Study Session 35

In Study Session 35, you have learned that:

1 Acute respiratory tract infections (ARIs) may affect the upper or lower respiratory tracts and are major public health problems in Ethiopia.

2 Malnutrition, under-nutrition, lack of exclusive breastfeeding, lack of immunization, indoor air pollution and HIV infection are the major risk factors for ARIs.

3 Acute otitis media is a common upper respiratory tract infection in young children, which is manifested by fever, ear pain, pus discharging from the ear and irritability. Children with symptoms of acute otitis media should be identified as soon as possible and treated by 'wicking' the pus from the ear, and giving antibiotics to prevent complications such as deafness, meningitis and pneumonia.

4 Pharyngitis is another common upper respiratory tract infection, which is manifested by fever, sore throat and swollen inflamed tonsils. Children with symptoms of pharyngitis should be referred to a higher level health facility for assessment and treatment.

5 Pneumonia is the major killer of children in Ethiopia and is among the top five causes of illness and death among adults.

6 Severe pneumonia in children is manifested by the presence of danger signs, which include fast breathing, fever, chest in-drawing and stridor. Children with severe pneumonia are at high risk of death, and should immediately be referred to a higher level health facility to save their lives.

7 Co-trimoxazole or amoxicillin are the antibiotics authorised at Health Post level to treat acute otitis media and non-severe pneumonia. Dosages are based on the patient's age and weight.

8 Prevention and control of acute respiratory tract infections include adequate nutrition, exclusive breastfeeding for infants under six months of age, immunization, protection from indoor smoke pollution, keeping children away from patients with pneumonia, teaching people to cough and sneeze away from other people, and co-trimoxazole prophylaxis for adults and children with HIV infection.

Self-Assessment Questions (SAQs) for Study Session 35

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 Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 35.1 (tests Learning Outcomes 35.1 and 35.2)

Imagine that you see a 67-year-old man at a rural village with cough, fever and fast breathing. What is your diagnosis and what action should you take?

SAQ 35.2 (tests Learning Outcomes 35.1, 35.2, 35.3 and 35.4)

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

A A 40-day-old infant who has fast breathing can be treated at home.
B Acute otitis media and pneumonia can be caused by the same bacteria.
C Rheumatic heart disease is the result of the heart becoming infected with bacteria.
D Bacterial pneumonia in children is usually more severe than viral pneumonia.
E Pharyngitis can be prevented by immunization.

SAQ 35.3 (tests Learning Outcomes 35.1 and 35.3)

State at least three clinical signs that you might expect to find in a four-year-old child with severe pneumonia.

SAQ 35.4 (tests Learning Outcome 35.3)

Which one of the following is the preferred drug for treating acute otitis media or non-severe pneumonia in children at Health Post level?

(a) Arthemeter-lumefantrine
(b) Paracetamol
(c) Co-trimoxazole
(d) Quinine
(e) Amoxicillin

SAQ 35.5 (tests Learning Outcomes 35.1, 35.2 and 35.4)

Complete Table 35.4 by placing a cross in the appropriate boxes to indicate whether each of the actions in the first column is a prevention or a control measure against ARIs – or both.

Table 35.4 Prevention and control measures against ARIs.

Action	Is it prevention?	Is it control?
Early diagnosis and treatment		
Adequate nutrition		
Immunization against respiratory tract infections		
Reduction of indoor smoke pollution		
Coughing or sneezing into a cloth, or turning away from other people		

Study Session 36 Louse-Borne Diseases: Relapsing Fever and Typhus

Introduction

You already learned about the most widespread vector-borne disease in Ethiopia – malaria, transmitted by mosquitoes (Study Sessions 5–12 in Part 1 of this Module). Two other vector-borne diseases of public health importance in Ethiopia are the subject of this study session. They are caused by different bacteria, but are transmitted by the same vector – the human body louse (plural, lice). The diseases are louse-borne *relapsing fever* and louse-borne *typhus*, which are classified as **febrile illnesses** because the symptoms always include high fever. In this study session, you will learn about the causes, modes of transmission, symptoms and methods of prevention of these diseases. This will help you to identify patients and quickly refer them to the nearest health centre or hospital for specialist treatment. You are also expected to report any cases of these louse-borne diseases to the District Health Office, so that coordinated action can be taken to prevent an epidemic from spreading in your community.

Learning Outcomes for Study Session 36

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

36.1 Define and use correctly all of the key words printed in **bold**. (SAQs 36.1 and 36.3)

36.2 Describe the vector and the modes of transmission of relapsing fever and typhus, and the conditions in which epidemics are most likely to occur. (SAQs 36.1 and 36.3)

36.3 Describe the symptoms of relapsing fever and typhus, and the actions you should take if you identify a suspected case. (SAQs 36.3 and 36.4)

36.4 Explain how you would apply effective methods to prevent and control relapsing fever and typhus. (SAQs 36.2, 36.3 and 36.4)

36.1 The human body louse

Before we discuss relapsing fever and typhus, it is first helpful to describe the vector of both these diseases. The human body louse (species name, *Pediculus humanus humanus*) is commonly found in the clothes, bedding and on the bodies of people living in overcrowded and insanitary conditions, where there is poor personal hygiene. When body lice are found, for example in clothes, the articles are said to be **louse-infested**. (Note the term is *infested*, not infected.)

■ Can you suggest examples of places where louse infestation is more likely to occur because of overcrowding and lack of sanitation?

□ You may have suggested refugee camps (Figure 36.1), badly maintained prisons or army camps during times of war.

Figure 36.1 Overcrowding and poor sanitation create perfect breeding sites for body lice.

Male and female lice mate and the female lays eggs (known as nits), which she attaches to body hairs or fibres in clothing and bedclothes where people sleep (Figure 36.2). The eggs hatch into small immature lice (called nymphs), which bite their human hosts to suck blood, nourishing their growth and development into adult lice (Figure 36.3). They have a lifespan of only a few weeks, and feed at frequent intervals. The bites cause an allergic reaction in the person's skin, which becomes inflamed and itches, causing the person to scratch the area. Lice are transmitted from person to person during close contact and when sharing bedding in which eggs have been laid. They can survive for only a few days off the human host.

Figure 36.3 An adult female body louse, *Pediculus humanus humanus*. (Photo: CDC Image Library, image 9202)

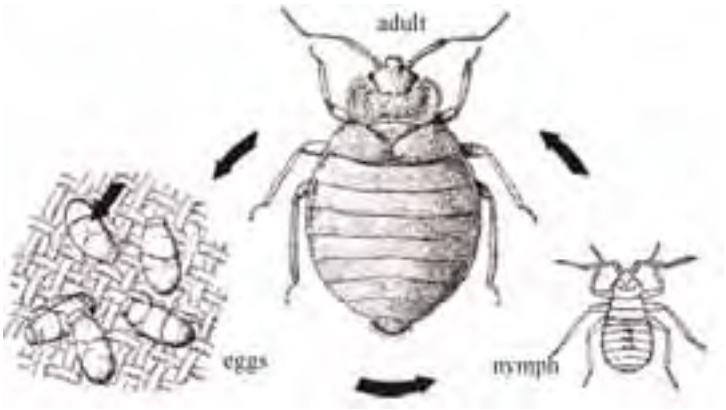

Figure 36.2 Life cycle of the human body louse, *Pediculus humanus humanus*. (Source: WHO, 1997, *Vector Control*: *Methods for use by Individuals and Communities).*

Although human body lice can transmit relapsing fever and typhus, the modes of transmission are somewhat different in these two diseases, as you will see in the following sections.

36.2 Louse-borne relapsing fever

Louse-borne relapsing fever (RF) is caused by spiral-shaped bacteria called *Borrelia recurrentis.* RF is common in Ethiopia, Sudan and Rwanda. It is one of the **epidemic-prone diseases** that can cause small, or large-scale epidemics anywhere in Ethiopia, with an estimated 10,000 cases annually. RF is more common in the highlands, where it occurs mainly in the rainy seasons, but in south west Ethiopia it occurs in dry and rainy seasons equally. Epidemics of RF are often associated with epidemics of typhus, since both are transmitted by the body louse in similar conditions of overcrowding and lack of hygiene.

36.2.1 Mode of transmission of relapsing fever

The bacteria that cause RF infect body lice when they take a blood meal from an infected person (Figure 36.4). The bacteria multiply in the gut of the louse, but the infection is *not* transmitted to new hosts when the louse bites a healthy person. Instead, humans acquire the infection when they scratch their bites and accidentally crush a louse, releasing its infected body fluids onto their skin. The bacteria enter through breaks in the skin, typically caused by scratching the itchy louse bites. After entering into the skin, the bacteria multiply in the person's blood and they can also be found in the liver, lymph glands, spleen and brain.

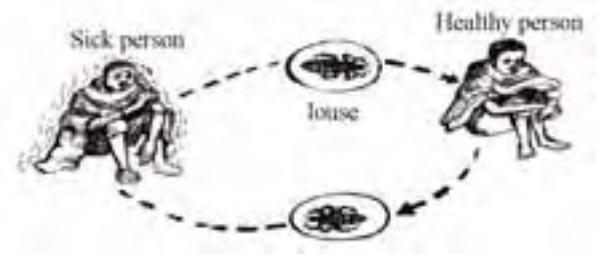

Figure 36.4 Body lice carry the bacteria that cause relapsing fever from an infected person to a healthy person.

36.2.2 Symptoms of relapsing fever

The incubation period between the infection and the start of symptoms is typically five to ten days. The common clinical manifestations of RF include the sudden onset of episodes of high fever, up to 40°C, with periods of shivering and chills, accompanied by headache, joint pain, dry cough and sometimes bleeding through the nose. About one third of patients develop tiny red or purple spots on the skin. The symptoms continue for three to nine days, while the immune system of the patient makes antibodies that attach to the bacteria and clear them from the blood, and the patient appears to recover. However, not all of the bacteria are destroyed. The numbers of bacteria gradually increase, and four to seven days after recovering from the first episode of fever, the patient 'relapses', i.e. the symptoms begin all over again. Almost all the organs are involved and there will be pain in the abdomen and an enlarged liver and spleen, in addition to the other symptoms. Without treatment with special antibiotics, 30% to 70% of cases can die from complications such as pneumonia and infection in the brain, leading to **coma** (a state of deep unconsciousness) and death.

■ What other disease that you have already learned about has similar episodes of fever, headache and chills, with periods of recovery and then relapse?

□ Malaria has similar symptoms to relapsing fever.

36.2.3 Actions if you suspect relapsing fever

The similarity between the clinical manifestations of malaria and RF mean that you should first consider whether a diagnosis of malaria can be ruled out. If your community is in a malaria-endemic area, perform a malaria rapid diagnostic test (RDT) on the patient's blood, as described in Study Session 7 of this Module. If there is no malaria in your area, or the RDT is negative, you should immediately refer a patient suspected of having RF to the nearest health centre or hospital.

Immediately refer all patients with suspected relapsing fever.

The good news is that RF can be easily and successfully treated with special antibiotics, but these can only be prescribed by a doctor. You are not expected to prescribe drugs for relapsing fever. The symptoms usually begin to improve within 24 hours of starting the treatment. Make sure that the patient and the family know that RF can be life-threatening without treatment, but that it can be cured with the right medicine.

Lice carrying the bacteria that cause RF are very easily transmitted between close contacts of the infected person. Therefore, you should also do **active case finding** – searching actively for other cases of RF by asking about anyone with the characteristic symptoms in the patient's family or village to detect if there could be an epidemic spreading. Precautions should be taken by you and by health workers in the hospital or health centre, to avoid close contact with a patient with relapsing fever, to prevent acquiring the infection.

36.3 Louse-borne typhus

You learned about typhoid fever in Study Session 33.

Typhus should not be confused with *typhoid fever*. Although there are some similarities between these two febrile illnesses, they are caused by different bacteria and typhoid is transmitted mainly in infected food, not by body lice. **Louse-borne typhus** (also known as *epidemic typhus*, 'jail fever' or *tessibo beshita* in Amharic) is similar in many ways to relapsing fever. Like RF, it is a bacterial infection transmitted by the human body louse, but the causative bacteria are different. They are extremely small bacteria called *Rickettsia prowazekii* (named after two doctors who died of typhus when they were researching into the disease). These bacteria quickly have to get inside the cells of their human host in order to survive and multiply – unlike the bacteria that cause RF, which circulate in the blood and don't live inside the host's body cells.

Louse-borne typhus has caused major epidemics over many centuries, resulting in millions of deaths during war, famine and mass displacement. The WHO estimates that globally in recent years around 1,400 people die from typhus every year. Like RF, outbreaks occur in situations of overcrowding in unhygienic conditions where body lice can easily breed and spread. Outbreaks of the disease have occurred in Ethiopia from time to time. Typhus is more common in the highlands, in places such as Gondar, Shewa, Bale, Arsi, Gojam and Tigray.

36.3.1 Mode of transmission of louse-borne typhus

There is one difference in how the *Rickettsia* bacteria that cause typhus, and the *Borrelia* bacteria that cause RF, are transmitted by body lice to new human hosts. The *Rickettsia* bacteria acquired during a blood meal from an infected person multiply in the gut of the louse and pass out of its body in the louse's faeces, which are deposited on the person's skin. These bacteria can survive for several days in the faeces. The louse bites are itchy and when the person scratches them, the louse faeces are rubbed into breaks in the skin. This is how the typhus bacteria are transmitted to healthy people when an infected louse gets into their clothes or bedding. They quickly enter the new host's body cells and begin to multiply.

36.3.2 Symptoms of louse-borne typhus

The clinical manifestations of louse-borne typhus are similar to other common febrile illnesses in Ethiopia, including relapsing fever. After an incubation period of about one to two weeks the symptoms begin suddenly, with severe headache and fever rising rapidly to 38.8°C to 40.0°C. But unlike RF, the high temperature in typhus is sustained throughout the illness and the symptoms do not spontaneously improve and then relapse. A prominent cough is very common, occurring in 70% of patients. They also experience very severe muscle pain, sensitivity to light, lethargy and falling blood pressure. If untreated, the most severe cases end in coma and death.

36.3.3 Actions if you suspect louse-borne typhus

If you suspect a case of typhus, your actions should be exactly the same as already described for suspected cases of RF.

■ What should you do?

□ Test for malaria if you are in a malaria endemic area. Refer patients suspected of having typhus to the nearest health centre or hospital, where they will be treated by doctors with special antibiotics. You are not expected to prescribe these drugs. Typhus is an epidemic-prone disease, so search actively for other people locally with a similar illness and report all suspected cases to the District Health Office.

In addition to the above actions, you should also educate your community about how to prevent these louse-borne diseases. This is the subject of the final section of this study session.

36.4 Prevention of louse-borne relapsing fever and typhus

Let us now focus on the common prevention aspects of relapsing fever and typhus. As we said earlier, these diseases are associated with overcrowding and insanitary conditions – in other words, they are associated with poverty. They are best prevented by addressing the underlying socioeconomic circumstances that promote louse infestation: overcrowding, poverty, homelessness and population displacement. However, you should also educate people in your community to take the following preventive actions:

- Maintain good hygienic practices, such as washing the body, clothes and bedding regularly, and drying clothes and bedding in direct sunlight, which damages the lice and their eggs to some extent
- Change clothes and bedding at frequent intervals to reduce the number of body lice
- Treat louse-infested clothes and bedding with chemicals to kill the lice and their eggs (this is called **delousing**). In infested situations like those in refugee camps, clothes and bedding should be deloused by trained personnel with appropriate insecticides, such as 0.5% permethrin dust or DDT. You are not expected to apply these chemicals. Treating clothing with liquid permethrin can provide long-term protection against louse infestation.

Note that close contact with patients should be avoided and delousing of the patient's clothes and bedding should be done immediately, to prevent transmission of infected body lice from the patient to healthy people – including the health workers who are caring for them.

If there is an outbreak of relapsing fever or typhus, the spread of infection can be controlled by active case finding and effective treatment of infected persons and their close contacts with the correct antibiotics. These drugs have to be prescribed and monitored by doctors – you are not expected to give any drugs to patients with RF or typhus. Early treatment controls the spread of infection by reducing the reservoir of bacteria in the local population.

In the next study session, we complete the discussion of vector-borne diseases by describing four that are of significant public health importance in Ethiopia.

Summary of Study Session 36

In Study Session 36, you have learned that:

1 Louse-borne relapsing fever (RF) and typhus are major epidemic-prone diseases in Ethiopia. They are vector-borne febrile illnesses caused by bacteria and transmitted by the human body louse.

2 RF and typhus are diseases of poverty and overcrowding, which are most likely to occur in refugee camps, prisons and other places where large numbers of people live in crowded conditions, with poor sanitation and lack of personal hygiene, which promote infestation with body lice.

3 RF and typhus have similar symptoms, including high fever, headache, and joint and muscle pain. Patients with typhus often also have a persistent cough. The symptoms of RF typically occur in cycles of a few days, resolving spontaneously for a few days before the patient relapses with another episode of symptoms. Typhus symptoms tend to be sustained over time.

4 Patients with RF or typhus should be referred immediately for antibiotic treatment in higher health institutions; both diseases are life-threatening if not treated, but respond well to the correct antibiotics.

5 When you suspect a case of RF or typhus, you should conduct active case finding in the community to locate any similar cases; you can control the spread of an epidemic by referring all patients for early treatment, reporting cases to the District Health Office and seeking help to apply prevention measures.

6 Regular washing of clothes, bedding and bodies, delousing using chemicals such as permethrin and DDT, and treatment with antibiotics are the major prevention and control methods during epidemics of RF or typhus.

Self-Assessment Questions (SAQs) for Study Session 36

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 Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 36.1 (tests Learning Outcomes 36.1 and 36.2)

(a) What are the similarities in how relapsing fever (RF) and typhus are transmitted from person to person?

(b) Can you describe one difference?

SAQ 36.2 (tests Learning Outcome 36.4)

During your visit to a rural area, you observe that many people in a particular village wear dirty clothes and do not change their clothes for several weeks. What educational messages do you give the families in that village and what is your health education aiming to prevent?

SAQ 36.3 (tests Learning Outcomes 36.1, 36.2, 36.3 and 36.4)

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

A It is possible to distinguish between relapsing fever and typhus at Health Post level by identifying differences in their symptoms.
B Relapsing fever and typhus occur only in the rainy seasons in Ethiopia.
C Treatment with the correct antibiotics is sufficient to control epidemics caused by relapsing fever or typhus.
D The correct antibiotics can effectively treat relapsing fever and typhus if the patient is referred immediately.
E Health workers should protect themselves from developing relapsing fever or typhus by avoiding close contact with patients with these diseases.

SAQ 36.4 (tests Learning Outcomes 36.3 and 36.4)

Estifanos is a 30-year-old farmer who came to your Health Post with fever, severe headache and extreme muscle pain. He tells you that there are many similar illnesses in his village.

(a) What are the possible diagnoses for Estifanos?
(b) What action do you take?

Study Session 37 Other Vector-Borne Diseases of Public Health Importance

Introduction

Three important vector-borne diseases have been discussed previously in this Module: malaria in Study Sessions 5–12 and relapsing fever and typhus in Study Session 36. In this study session, you will learn the causes, modes of transmission, clinical manifestations, prevention and control of four other vector-borne diseases of public health importance in Ethiopia: schistosomiasis, leishmaniasis, onchocerciasis and lymphatic filariasis. A better understanding of these diseases will help you to identify patients and refer them quickly to a health centre or hospital for specialist treatment.

You will also learn about the health education messages that you need to communicate to members of your community, so they can reduce their exposure to the vectors of these diseases and apply appropriate prevention measures. As you will see in this study session, prevention of all of these diseases includes controlling the vectors with chemicals and/or environmental management, using personal protective clothing or bed nets to reduce exposure to the vectors, and rapid case detection and referral for treatment. Early treatment prevents serious complications and can save lives, and it also reduces the reservoir of infectious agents in the human population.

Learning Outcomes for Study Session 37

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

37.1 Define and use correctly all of the key words printed in **bold**. (SAQs 37.1 to 37.5)

37.2 Identify the vectors and modes of transmission of schistosomiasis, leishmaniasis, onchocerciasis and lymphatic filariasis. (SAQs 37.1, 37.2 and 37.3)

37.3 Describe the distribution and impact of schistosomiasis, leishmaniasis, onchocerciasis and lymphatic filariasis in Ethiopia. (SAQs 37.1, 37.3, 37.4 and 37.5)

37.4 Describe the symptoms of schistosomiasis, leishmaniasis, onchocerciasis and lymphatic filariasis, and how you would diagnose and refer cases to a higher level health facility. (SAQs 37.3 and 37.4)

37.5 Describe how you would apply prevention and control measures against schistosomiasis, leishmaniasis, onchocerciasis and lymphatic filariasis. (SAQs 37.1, 37.3 and 37.5)

37.1 Schistosomiasis

Schistosomiasis is a chronic communicable disease caused by parasitic flatworms (also known as trematodes, or blood flukes), which affect the blood vessels in the intestines or in the urinary tract of infected people. In some places, the disease is known by its alternative name – bilharzia. Two species of *Schistosoma* parasites are common in Ethiopia: *Schistosoma mansoni* (Figure 37.1 on the next page), which causes disease mainly in the intestines, and *Schistosoma haematobium*, which causes disease mainly in the bladder and sometimes also in other parts of the urinary tract such as the kidneys.

Schistosomiasis is pronounced 'shy-stoh-soh-my-assis'. It is described as chronic because the symptoms develop gradually, become progressively more serious, and last for a long time unless treatment is given.

Figure 37.1 A mating pair of *Schistosoma mansoni* flatworms, magnified and viewed through a microscope; the thin female worm is curled partly inside and below the much larger male worm. Adult worms measure 12 to 20 mm in length. (Photo: CDC Image Library, image number 11194, Dr Shirley Maddison)

The WHO estimates that more than 207 million people worldwide are infected with *Schistosoma* parasites – and 85% of them are in Africa. Approximately 200,000 people die every year in Africa as a result of the complications caused by these parasites. Rural communities living near water bodies such as rivers, lakes and dams may be highly affected by the disease, because the worms have a complex lifecycle in which they spend part of their development living in freshwater snails. You will learn more about their lifecycle later in this section. First, as a Health Extension Practitioner, you need to know where the disease is common in Ethiopia.

37.1.1 Where is schistosomiasis common in Ethiopia?

Schistosoma mansoni is widespread in several parts of Ethiopia, usually at an altitude of between 1,200 to 2,000 metres above sea level. Some of the common places include Ziway (Figure 37.2), Hawassa, Bishoftu, Wonji, Haromaya, Jimma, Bahir Dar and some places in Gojam, Dessie and Tigray. In many of these locations, more than 60% of schoolchildren are infected with *Schistosoma mansoni*. A high burden of the disease in children has severe adverse effects on their growth and performance at school.

Figure 37.2 Lake Ziway, Ethiopia. Washing, swimming or standing in infected water exposes people to the risk of infection with *Schistosoma* parasites. Children are especially vulnerable. (Photo: Basiro Davey)

Schistosoma haematobium is limited to some lowland areas, including the swampy land and floodplains of the Awash and Wabe Shebele valleys and along the Ethiopian–Sudan border.

37.1.2 Mode of transmission of schistosomiasis

Let us now focus on the mode of transmission of schistosomiasis. The major reservoirs of *Schistosoma* parasites are infected humans (the primary hosts) and freshwater snails (the intermediate hosts).

- What do you understand about the term *reservoir* in the context of communicable diseases? (Think back to Study Session 1 of this Module.)

- A **reservoir** is any location where infectious agents live *before* they infect new human hosts, and which is important for the survival of the disease-causing organism. Reservoirs can be living (e.g. infected humans or other animals, such as dogs, cows, insects or snails), or non-living things in the environment (e.g. water, food).

Figure 37.3 shows how *Schistosoma* parasites are transmitted from infected people to new human hosts, via the intermediate hosts – freshwater snails. Figure 37.4 shows the lifecycle of the parasites in more detail, highlighting the immature forms that can be found in the water.

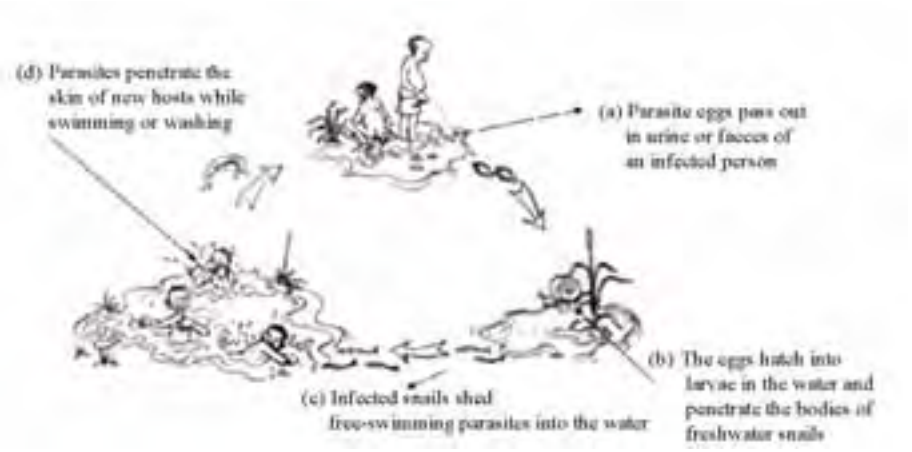

Figure 37.3 How schistosomiasis is transmitted from infected humans to new human hosts, via freshwater snails. (Source: Adapted from http://www.who.int/schistosomiasis/epidemiology/en/)

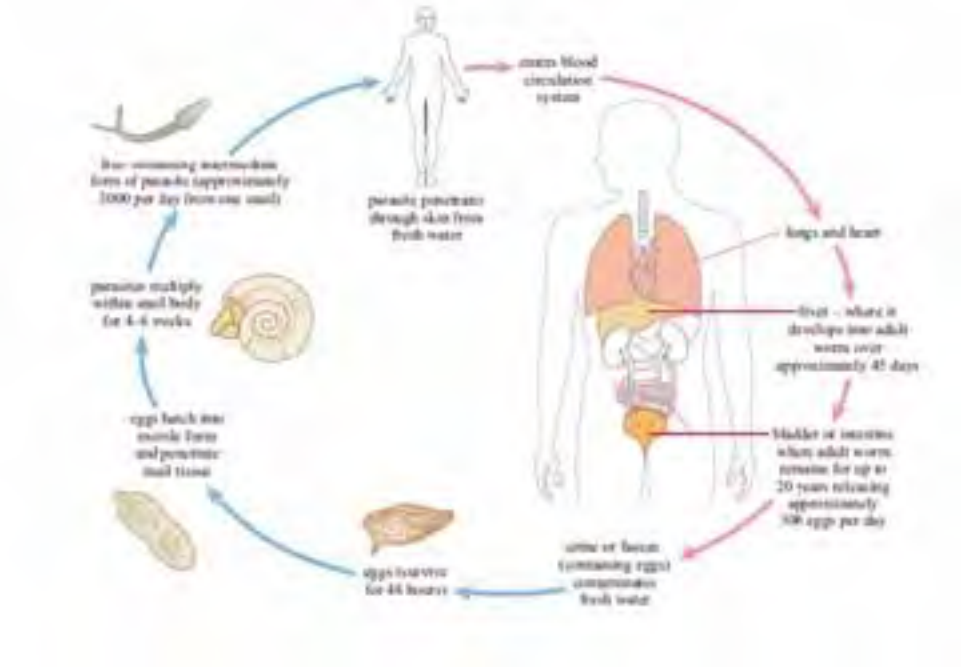

Figure 37.4 Lifecycle of *Schistosoma* parasites as they pass through human hosts and freshwater snails. (Source: The Open University, *Environment: Journeys Through a Changing World,* U116, Block 3, Figure 1.13)

The immature form of the parasite penetrates the skin of a new host when he or she is swimming, washing or standing in infected water. They pass to the liver, where they mature into adult worms. Male and female adult worms mate (look back at Figure 37.1) and deposit their eggs in the blood vessels of either the intestine (*Schistosoma mansoni*) or bladder (*Schistosoma haematobium*). The eggs pass out into the water in either the faeces or urine, to continue the infection cycle.

37.1.3 Clinical manifestations and diagnosis of schistosomiasis

The infected person's immune system reacts against the parasites' eggs in their blood vessels, which are recognised as 'foreign bodies'. The immune reaction causes an acute inflammation around the eggs, which can lead to chronic symptoms (see Box 37.1). Note that the clinical manifestations of schistosomiasis are mainly related to the immune response against the eggs in the intestine or bladder – the symptoms are not due to the worms themselves. The adults can survive in the person's body for up to 20 years, releasing around 300 eggs every day.

Box 37.1 Clinical manifestations of schistosomiasis

- Dermatitis (itching) where a parasite has penetrated the person's skin. This so-called 'swimmer's itch' occurs most often with *Schistosoma mansoni*, manifesting two or three days after invasion as an itchy rash on the affected areas of the skin.
- The main symptoms of *Schistosoma mansoni* infection of the intestines are abdominal pain and bloody diarrhoea. A blood test usually reveals signs of anaemia and the abdomen may be swollen due to enlargement of the liver. If the infection remains untreated it can lead to permanent liver damage in advanced cases.
- The main symptoms of *Schistosoma haematobium* infection of the bladder are pain during urination, frequent need to urinate, and blood in the urine. If the infection remains untreated it can lead to chronic bladder diseases, including cancer, and permanent kidney damage. It may also lead to infertility in men, and pain during sexual intercourse and vaginal bleeding in women.

The clinical manifestations (described above) should lead you to suspect cases of schistosomiasis. Asking children if they have seen any blood in their urine is an important way of detecting whether *Schistosoma haematobium* is common in the area. The diagnosis of schistosomiasis is confirmed in a laboratory by direct observation of the parasite eggs in samples of faeces or urine examined under the microscope (Figure 37.5).

Figure 37.5 An egg from a *Schistosoma* parasite, magnified and viewed under a microscope, confirms the diagnosis of schistosomiasis. (Photo: CDC Image Library, image number 4841)

37.1.4 Prevention and control of schistosomiasis

Several prevention and control strategies should be integrated to reduce the burden of schistosomiasis. You have an important role as a Health Extension Practitioner to teach community members in affected areas how to apply the major prevention and control measures, which can be described in five general categories:

You will meet these prevention and control categories again when we discuss the other vector-borne diseases later in this study session.

- **Integrated vector control (IVC) measures**, aimed at reducing the number of vectors; in areas affected by schistosomiasis, these measures involve using the chemical 'Endod' to kill the snails, and environmental management to destroy snail habitats by improving irrigation and farming practices; this could involve removing vegetation and draining and filling swampy areas or shallow pools wherever possible.
- **Parasite control measures**, aimed at reducing the number of parasites, e.g. treating water for washing with chlorine or iodine to kill the eggs and immature *Schistosoma* organisms.
- **Personal protection** against exposure to the parasites, e.g. farmers, fishermen and others who have to stand in infected water should wear rubber boots to protect their skin from penetration by the swimming forms of the *Schistosoma* parasites.
- **Rapid case detection and referral** to the nearest health centre for effective treatment; the drug used to treat schistosomiasis is called praziquantel, which is administered orally at a dosage of 40–60 mg per kg of body weight, given in two or three doses over a single day. You are not expected to prescribe praziquantel, which must be given at the health centre.
- **Education in the community** about the causes and modes of transmission of schistosomiasis.

■ What actions would you educate community members to take to protect themselves and their children from schistosomiasis?

□ In particular, you should encourage people to build and use latrines and avoid urinating or defaecating in water, in order to reduce contamination by *Schistosoma* eggs. Also they should wear protective clothing when standing in infected water, and seek early diagnosis and treatment for any suspected cases.

37.2 Leishmaniasis

Leishmaniasis is pronounced 'lye-sh-man-eye-assis'. Visceral is pronounced 'viss-urr-al' and cutaneous is pronounced 'kute-ay-nee-ous'.

Leishmaniasis is a chronic parasitic disease, which exists in two forms: *visceral leishmaniasis* (also known as kala-azar), which affects the internal organs such as the liver and spleen, and *cutaneous leishmaniasis*, which affects the skin. The infectious agents are protozoa (single-celled organisms, Figure 37.6). There are four major species of *Leishmania* protozoa in Ethiopia:

- *Leishmania donovani*, which causes visceral leishmaniasis
- *Leishmania aethiopica, Leishmania major* and *Leishmania tropica*, all of which cause cutaneous leishmaniasis.

Figure 37.6 *Leishmania* protozoa, stained blue and magnified by viewing under a microscope. (Photo: CDC Image Library, image 11068)

Around 12 million people in 88 countries around the world are currently thought to be infected with *Leishmania* parasites and the WHO estimates that one to two million new cases occur each year. The vectors (and intermediate hosts) for these parasites are sandflies. The lifecycle will be described later in this section.

37.2.1 Where is leishmaniasis common in Ethiopia?

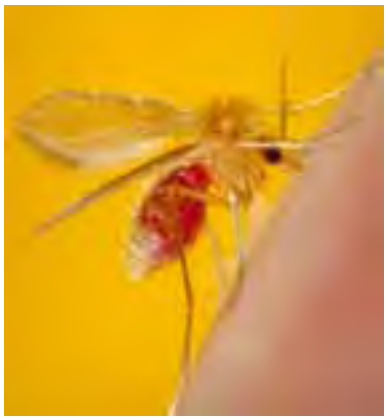

Figure 37.7 A female phlebotomine sandfly taking a blood meal from a person's arm. Note the human blood in its transparent abdomen. (Photo: CDC Image Library, image 10276/James Gathany)

During your work in the community, you should know the common places where leishmaniasis is present. Visceral leishmaniasis affecting the internal abdominal organs such as the liver and spleen is widely distributed in the lowlands of Ethiopia. Important endemic locations include Konso *woredas* (Lake Abaya and Segen Valleys), the Lower Omo plains, the Metama and Humera plains and Adiss Zemen. Cutaneous leishmaniasis occurs in Meta-Abo, Sebeta, Kutaber in Wello, and in some places in South West Ethiopia such as Jimma Zone.

37.2.2 Mode of transmission of leishmaniasis

Leishmaniasis is transmitted through the bite of female phlebotomine sandflies (Figure 37.7), which bite humans and some animals, and take blood meals to feed the development of their eggs. Phlebotomine means 'blood-sucking' and is pronounced 'fleb-otto-meen'. There are about 30 species of sandflies that can transmit *Leishmania* parasites to humans found throughout the tropical and temperate regions of the world. The females lay their eggs in many locations, including the burrows of rodents, old tree bark, cracks in buildings and rubbish heaps – anywhere that is warm and humid enough for their eggs to develop into flies.

When sandflies take blood meals from an infected person, they also become infected with the protozoa that cause leishmaniasis. The protozoa develop inside the sandfly and are passed on when the sandfly takes a blood meal from a healthy person. The *Leishmania* protozoa multiply inside the white blood cells of the healthy person and cause disease (Figure 37.8).

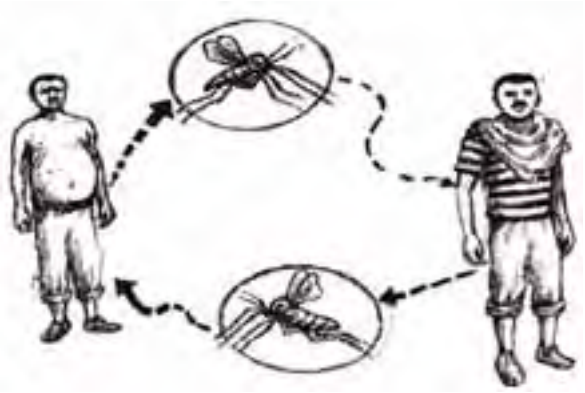

Figure 37.8 Transmission of *Leishmania* parasites from a sick person to a healthy person by a sandfly. The enlarged abdomen of the sick person on the left indicates visceral leishmaniasis affecting the internal organs.

37.2.3 Clinical manifestation and diagnosis of leishmaniasis

The clinical presentation of the two forms of leishmaniasis are very different. **Cutaneous leishmaniasis** normally produces skin ulcers on the exposed parts of the body such as the face, arms and legs (Figure 37.9). The disease can produce a large number of ulcers – sometimes up to 200 – which may result in physical disability (e.g. in using the hands). The visible ulcers are a source of social stigma, which can leave the patient suffering mental distress and rejection in their community.

Figure 37.9 Ulceration due to cutaneous leishmaniasis (a) on the face, (b) on the hand. (Photos: (a) WHO TDR Image Library, image 03061531/Crump; (b) CDC Image Library, image 352)

Visceral leishmaniasis (also known as *kala azar*, which means black fever in Hindu) is a life-threatening disease characterised by irregular episodes of fever, rapid and extensive weight loss, huge swelling of the spleen and liver (Figure 37.10 on the next page), and anaemia. If left untreated, up to 100% of patients die within two years of infection. For this reason, visceral leishmaniasis is said to have a high **case-fatality rate**.

If you suspect a case of visceral leismaniasis, the patient should be immediately referred to a higher health facility.

Figure 37.10 A child with severe weight loss and an enlarged abdomen with a huge liver and spleen due to visceral leishmanisis. (Photo: WHO at http://www.who.int/leishmaniasis/visceral_leishmaniasis/en/index.html)

You can identify patients with leishmaniasis by the clinical manifestations of the disease. For confirmation of the diagnosis, laboratory investigations should be done in health centres or hospitals, where the protozoan parasites can be detected in blood smears viewed with a microscope (look back at Figure 37.6).

37.2.4 Prevention and control of leishmaniasis

Several prevention and control measures are available for leishmaniasis. The general principles will already be familiar to you from the earlier discussion of schistosomiasis.

- **Integrated vector control (IVC) measures**, aimed at reducing the numbers of sandflies by indoor residual spraying of the inside and outside walls of houses, doorways, animal houses, and possible breeding sites of the sandflies (Figure 37.11); use of insecticide treated bed nets (ITNs) for sleeping under at night; and environmental management to reduce the breeding sites of sandflies.
- **Rapid case detection and referral** to the nearest health centre or hospital prevents the transmission of the parasite to others. Cases of leishmaniasis will be treated using intravenous or intramuscular drugs such as pentostam or amphotericin B. You cannot prescribe these drugs, which must be given under medical supervision.
- **Investigate and control epidemics in epidemic-prone areas**: early identification and management of epidemics of leishmaniasis helps to control the disease from spreading to the wider population.
- **Education in the community** about the causes and modes of transmission of leishmaniasis.

Figure 37.11 Spraying breeding sites of sandflies with insecticides.

- What actions would you educate community members to take to protect themselves and their children from leishmaniasis?

□ You would encourage them to use ITNs at night and not to sleep unprotected out of doors, so as to avoid sandfly bites; they should welcome spraying teams to treat their houses with insecticide, and eliminate rubbish heaps and other locations where sandflies like to lay their eggs. They should seek early diagnosis and treatment of any suspected cases.

37.3 Onchocerciasis

Onchocerciasis is a parasitic vector-borne disease caused by a worm that affects the skin, lymph nodes and the eyes of infected people. It is also called *river blindness*. The WHO estimates that worldwide there are about 500,000 people who are blind due to onchocerciasis. The disease is caused by a tiny worm called *Onchocerca volvulus* (Figure 37.12), which is transmitted from person to person in the bite of blackflies.

Onchocerciasis is pronounced 'onk-oh-serk-eye-assis'.

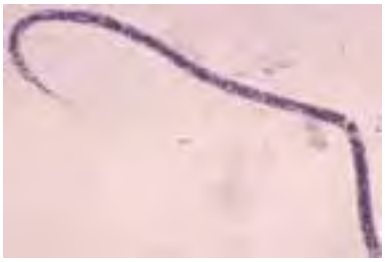

Figure 37.12 An *Onchocerca volvulus* worm, stained blue and magnified by viewing with a microscope. (Photo: CDC Image Library, image 1147)

37.3.1 Where is onchocerciasis common in Ethiopia?

Onchocerciasis is found in the western part of Ethiopia, where there are many rapidly flowing rivers and streams, with vegetation along the banks that provide good habitats for the blackflies that transmit the parasite. The most affected areas include Keffa, Illubabor, Gambella and Wollega. Cases of onchocerciasis have been also reported from Pawe, Humera and Metema.

37.3.2 Mode of transmission of onchocerciasis

The parasites that cause onchocerciasis are transmitted from human to human through the bites of blackflies, which belong to *Simulum* species (Figure 37.13). Blackflies breed in fast-flowing rivers and streams, with good vegetation nearby. Unlike mosquitoes and sandflies, they bite during the day when people are active in the area.

Figure 37.13 A blackfly feeding on the skin of a human host. (Photo: WHO at www.who.int/onchocerciasis)

- What type of water does the blackfly need to breed? How does this differ from the water required by the mosquito vectors of malaria?

□ Blackflies need fast-running water to breed, unlike *Anopheles* mosquitoes, which breed in shallow stagnant water collections.

The adult worms mate in the infected person, and the eggs hatch into microscopic worms called microfilaria, which burrow through the body tissues. The person's immune system attacks the microfilaria, causing inflammation and damage in the surrounding tissues. Sight defects and eventually blindness develops when the microfilaria are embedded in the

person's eye. When a female blackfly bites an infected person during a blood meal, the microfilaria are transferred from the person to the fly (Figure 37.14a). Over the course of one to three weeks, the microfilaria develop inside the blackfly to form infective larvae (Figure 37.14b). These are then passed on to other people when the blackfly takes another blood meal (Figure 37.14c). The microfilaria migrate to the skin, lymph nodes and eyes of the infected person, causing inflammation and tissue damage.

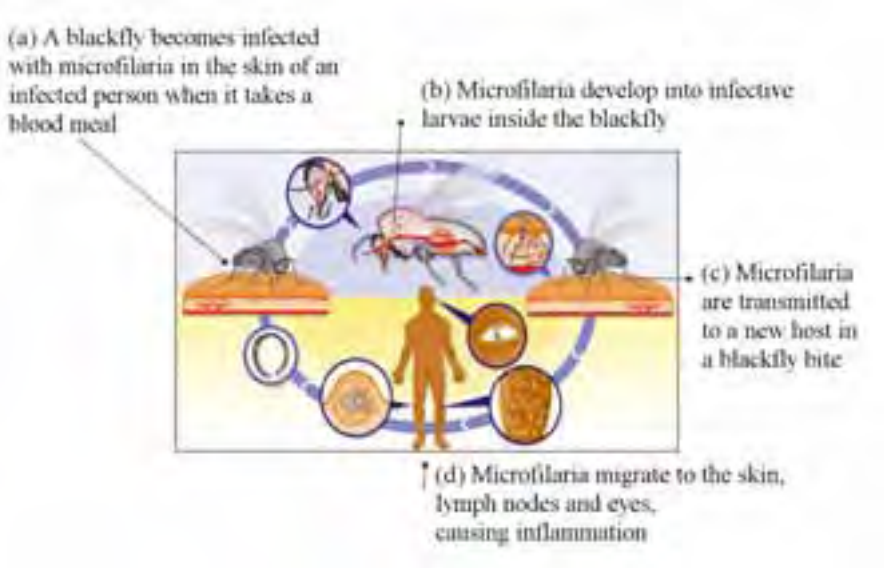

Figure 37.14 Transmission of *Onchocerca volvulus* from person to person by blackflies. (Source: www.who.int/onchocerciasis)

In the human host, the larvae migrate into the skin, and nodules (swellings) form around them. They slowly mature into adult worms, which can live for 15 years in the human body. After mating, the female worm releases around 1,000 microfilaria a day into the surrounding tissue. Microfilaria live for one to two years, moving around the body. When they die, they cause an inflammatory response which leads to the clinical manifestations and complications such as blindness.

37.3.3 Clinical manifestations and diagnosis of onchocerciasis

The clinical manifestations of onchocerciasis are the result of inflammation against the dead microfilaria. The most common clinical manifestations include skin rashes, lesions, intense itching, loss of the colour of the skin, and nodule formation (Figure 37.15a). Microfilaria also migrate to the eye, and causes scarring of the cornea (the covering of the eyeball), which leads to sight defects and ultimately blindness (Figure 37.15b).

The itching and disfiguring nodules and blindness are sources of great distress to patients, who may be stigmatised and rejected by their communities.

Figure 37.15(a) Nodules on the legs and loss of pigmentation in the skin of a man with cutaneous onchocerciasis. (b) Blindness due to onchocerciasis. (Photos: (a) WHO at www.who.int/onchocerciasis; (b) WHO/TDR image 9703913/ Crump)

Diagnosis of onchocerciasis is made by clinical examination. If you suspect that a patient may be infected, you should make a referral for laboratory confirmation and treatment. Microscopic investigation of a skin snip (taking samples from the skin) can identify the microfilaria and confirm the diagnosis.

37.3.4 Prevention and control of onchocerciasis

The WHO believes that onchocerciasis can be eliminated through the application of effective prevention and control methods, which are summarised below:

- **Integrated vector control measures** to reduce the population of blackflies, through application of insecticides in vegetation where vectors breed, and environmental management to reduce vegetation around fast-flowing rivers where people live.
- **Personal protective clothing** to avoid the bite of blackflies by covering exposed skin with clothing and wearing headgear in endemic areas.
- **Community-directed mass drug administration (MDA) with ivermectin**, i.e. mass drug treatment of everyone in communities where the diseases is endemic with the drug ivermectin, which kills the microfilaria, every 6 to 12 months (Figure 37.16). This is the most successful intervention at community level. Community members fully participate in the programme and the drugs are delivered by trained village drug distributors, supervised by Health Extension Workers and Practitioners like you. Community-directed MDA is being implemented in endemic areas of Ethiopia such as Pawe, Jimma, Illubabor and Keffa.

Figure 37.16 Mass drug administration with ivermectin successfully prevents onchocerciasis in affected communities. (Photo: WHO TDR Image Library, image 9703979/Crump)

- **Rapid case detection and referral**, particularly for complicated cases involving sight loss
- **Education in the community** about the causes, mode of transmission and prevention measures against onchocerciasis (Figure 37.17). Encouraging acceptance of the mass drug administration programme is an important health education message that you can deliver in affected communities.

Figure 37.17 Women at a health education session on how to protect themselves and their children from onchocerciasis. (Photo: WHO/Crump/image 97031009)

37.4 Lymphatic filariasis

In this final section, you will learn about the definition, mode of transmission, clinical manifestations, and methods of prevention and control of **lymphatic filariasis**. It is also known as *elephantiasis* because of its effects on the legs of infected people. Lymphatic filariasis is a parasitic disease caused by a worm that invades the **lymphatic system** – the network of vessels that exists throughout the body, connecting the lymph nodes, spleen and other organs, and where white blood cells are primarily found (Figure 37.18).

Figure 37.18 The human lymphatic system. (Diagram: The Open University, *SXR376 Preparatory Reading,* Figure 1.2)

The WHO estimates that over 120 million people worldwide are currently infected with the worm (species name *Wuchereria bancrofti*, Figure 37.19) which is responsible for 90% of all cases.

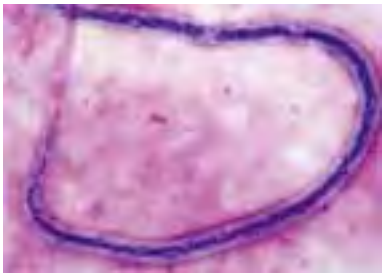

Figure 37.19 A *Wuchereria bancrofti* worm, stained blue and magnified by a microscope. (Photo: CDC Image Library, image 3009)

37.4.1 Where is lymphatic filariasis common in Ethiopia?

Like onchocerciasis, lymphatic filariasis is common in western Ethiopia, such as Illubabor, Keffa, Jimma, Wollega, Gambella and Pawe. Though the disease is not fatal, it is responsible for considerable disability and distress, causing social stigma among men, women and children. You will learn more about the social consequences of lymphatic filariasis and a non-infectious cause of swelling in the legs (podoconiosis) in Study Session 39.

37.4.2 Mode of transmission of lymphatic filariasis

The parasites that cause lymphatic filariasis are transmitted from human to human through the bites of *Culex* and *Anopheles* mosquitoes. The female mosquitoes take the microscopic forms of the parasitic worm (microfilaria) from an infected person during a blood meal (Figure 37.20a). The microfilaria develop into larvae, and when the mosquito feeds on another person, the larvae enter the skin punctured by the mosquito bite (Figure 37.20b). The larvae travel via the lymphatic vessels, where they develop into adult worms all over the body (Figure 37.20c). After mating, the females lay millions of eggs which develop into microfilaria, completing the lifecycle.

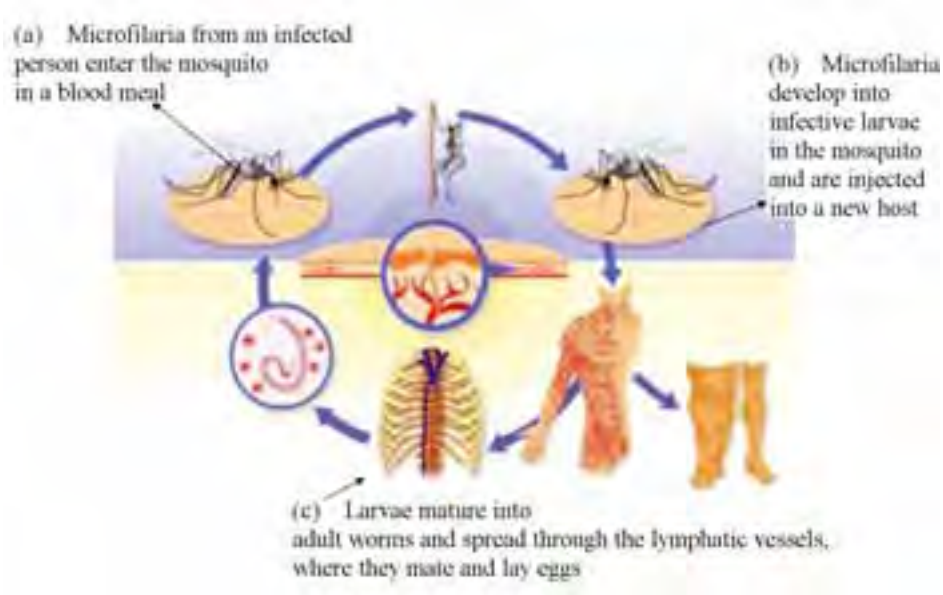

Figure 37.20 Life cycle of lymphatic filariasis. (Source: WHO at http://www.who.int/lymphatic_filariasis/en/)

37.4.3 Clinical manifestations of lymphatic filariasis

The clinical manifestations of the disease are as a result of the inflammation and damage to the lymphatic vessels caused by the person's own immune response trying to reject the worms, and when vessels become blocked by clusters of worms. The overall effect is to disrupt the lymphatic system, which normally collects tissue fluids draining from the body's cells and returns the fluid to the blood stream. If the lymphatic drainage is blocked, the lower limbs and sometimes also the genitals become hugely swollen with fluid – a condition called *lymphoedema* (pronounced 'limf-ee-deem-ah'). Most infections do not produce symptoms, but in people where the lymphatic drainage is badly damaged the common symptoms include *hydrocele* (swelling of the scrotum, pronounced 'hy-droh-seel'), swelling of the legs and feet, and thickening of the skin into folds (Figure 37.21). Infection of the swollen skin folds by bacteria is a frequent cause of very painful attacks. Patients suffer from episodes of fever and around 40% develop kidney damage.

Figure 37.21 Lymphatic filariasis causing swelling and tissue damage in (a) a leg; (b) the scrotum; (c) a breast. (Photos: WHO TDR Image Library, images (a) 94022625, (b) 9502756, (c) 9502760/Andy Crump)

Suspected cases of lymphatic filariasis should be referred to the health centre.

37.4.4 Diagnosis of lymphatic filariasis

You can suspect lymphatic filariasis from the clinical manifestations, but the diagnosis can only be confirmed by laboratory tests to reveal the microfilaria in blood smears viewed with a microscope. Adult worms blocking the lymphatic vessels or nodes are difficult to reach. Therefore, if you live in an endemic area and you suspect a case of lymphatic filariasis, you should refer the patient to the nearest health centre for further testing and treatment.

37.4.5 Prevention and control of lymphatic filariasis

Lymphatic filariasis is one of the few communicable diseases that the WHO believes could be **eradicated** (totally removed from all populations in the world, never to return) with the currently available prevention and control measures. These are:

- **Integrated vector control (IVC) measures** to reduce the mosquito population, including indoor residual spraying, use of insecticide treated bed nets (ITNs), and environmental management such as drainage and filling of breeding sites for the mosquitoes.

- **Community-directed mass drug administration** (**MDA**). The WHO recommends a two-drug regimen of albendazole and diethylcarbamazine (or ivermectin in areas where onchocerciasis is also endemic), which is administered to the entire at-risk population once every year for four to six years. These drugs are prescribed by staff at health centres.
- **Personal protective clothing** to reduce exposure of skin to mosquito bites, and use of ITNs.
- **Rapid case detection and referral** to prevent cases from spreading.
- **Education in the community** about the causes and modes of transmission of lymphatic filariasis, and ways to protect themselves from mosquito bites. Encouraging acceptance of the mass drug administration programme is an important health education message that you can deliver if your community is affected. You also have a key role in educating patients about how to prevent and alleviate disabilities and pain due to lymphatic filariasis, as described in the final part of this study session.

37.4.6 Prevention and alleviation of disability due to lymphatic filariasis

Patients with lymphoedema and thickened skin folds (for example, as in Figure 37.21) can be empowered to manage their symptoms and reduce their discomfort and pain through simple, but rigorous, hygiene techniques. You should educate them to wash the affected parts carefully every day, especially between the folds of thickened skin, and gently dry the area with a clean cloth. They should elevate (raise) swollen legs as much as possible whatever they are doing during the day and raise the foot of the bed or sleeping mat at night (Figure 37.22). Advise the patient to exercise the limbs any time and anywhere, as often as possible, to help the fluid to exit from their swollen limbs.

The methods described here are also used to reduce the swelling due to podoconiosis (non-infectious elephantiasis, Study Session 39).

Figure 37.22 Washing the affected limbs and elevating them while working or sleeping helps to alleviate the pain and swelling due to lymphatic filariasis. (Diagrams: WHO, 2003, *Community Home-Based Prevention of Disability due to Lymphatic Filariasis*)

In the next study session, you will learn about two more diseases of public health importance in Ethiopia – rabies and taeniasis (tapeworm disease) – which are spread to humans by warm-blooded animals (dogs and cattle).

Summary of Study Session 37

In Study Session 37, you have learned that:

1 Schistosomiasis is caused by parasitic flatworms transmitted from freshwater snails to humans. It is common in communities living near rivers, lakes and streams, where infected people shed *Schistosoma* eggs when they urinate or defaecate into the water.

2 *Schistosoma mansoni* affects blood vessels in the intestines and causes abdominal pain, bloody diarrhoea and anaemia. *Schistosoma haematobium* affects blood vessels in the bladder and causes pain during urination and bloody urine.

3 Leishmaniasis is caused by protozoan parasites transmitted to humans through the bite of sandflies, which breed in warm humid, places such as rubbish collections and rodent burrows.

4 *Leishmania donovani* causes the life-threatening condition called visceral leishmaniasis (or *kala azar*), manifested by fever, weight loss and swelling of the liver and spleen. Three other *Leishmania* species cause cutaneous leishmaniasis, which manifests as ulcers in exposed areas of skin.

5 Onchocerciasis is caused by a nematode worm (*Onchocerca volvulus*) transmitted in the bite of blackflies, which breed near fast-flowing rivers with good vegetation. The microscopic microfilaria cause skin nodules and can migrate to the eye, causing blindness.

6 Lymphatic filariasis (or elephantiasis) is caused by a nematode worm (*Wuchereria bancrofti*) transmitted to humans in the bite of female mosquitoes. The worms block the lymphatic system, causing swelling of the limbs and sometimes the genitals, resulting in severe pain, disability and bacterial infection of thickened skin folds.

7 Integrated vector control measures such as indoor residual spraying, use of insecticide treated bed nets (ITNs), chemical treatment of water, use of personal protective clothing and environmental management to destroy vector breeding sites are key interventions to prevent these vector-borne diseases.

8 Mass drug administration of the entire at-risk population at regular intervals for several years is the recommended strategy to prevent onchocerciasis and lymphatic filariasis in endemic communities.

9 Educating the community on the modes of transmission of vector-borne diseases, effective prevention strategies, and early diagnosis and referral of patients are important activities for Health Extension Practitioners and Workers in affected areas.

Self-Assessment Questions (SAQs) for Study Session 37

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 Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 37.1 (tests Learning Outcomes 37.1, 37.2 and 37.5)

How many communicable diseases can you name that can be prevented by integrated vector control methods? (Think about all the vector-borne diseases you have learned about in this Module – not just in this study session!)

SAQ 37.2 (tests Learning Outcomes 37.1 and 37.2)

Complete Table 37.1 by writing the common name of the vector in the second column beside the disease that it transmits.

Table 37.1 Four common vector-borne diseases and their vectors.

Vector-borne disease	Vector
Schistosomiasis	
Leishmaniasis	
Onchocerciasis	
Lymphatic filariasis	

SAQ 37.3 (tests Learning Outcomes 37.1, 37.2, 37.3, 37.4 and 37.5)

Imagine that you have been assigned to Humera and you see a 25-year-old man who has signs of severe weight loss, fever and a hugely enlarged abdomen.

(a) What is your diagnosis?
(b) What should you do for this patient?
(c) What should you educate his family about the mode of transmission and how to protect themselves from this disease?

SAQ 37.4 (tests Learning Outcomes 37.1, 37.3 and 37.4)

(a) How could you tell the difference between the skin lesions of onchocerciasis and cutaneous leishmaniasis?
(b) In addition to the physical consequences of the skin lesions, what impact can both these diseases have on the lives of affected people?

SAQ 37.5 (tests Learning Outcomes 37.1, 37.3 and 37.5)

(a) Which regions of Ethiopia are most affected by schistosomiasis?
(b) Why are children in affected communities particularly at risk of schistosomiasis, and what impact does the disease have on their lives, in addition to the pain and discomfort it causes?

Study Session 38 Common Zoonotic Diseases in Ethiopia: Rabies and Taeniasis

Introduction

In the last two study sessions in this Module, you learned about vector-borne diseases in which the infectious agent is transmitted to new human hosts by body lice, flying insects or snails. In this study session, we turn to two communicable diseases found in Ethiopia in which a non-human warm-blooded animal transmits the infectious agent to humans. These diseases are rabies transmitted to humans by dogs, and taeniasis (or tapeworm disease) transmitted by cows. Diseases in which a warm-blooded animal transmits the infectious agents to humans are known as **zoonotic diseases** (or zoonoses).

Taeniasis is pronounced 'teen-eye-assis'. Zoonotic is pronounced 'zoo-nott-ik'.

Zoonotic diseases are difficult to control because the non-human animal acts as a reservoir of infection that can be passed on to humans. Dogs and cows are domestic species, living in large numbers in human settlements (Figure 38.1), where it is very easy for the infection to be transmitted to people. In this study session, you will learn about the causes, modes of transmission, clinical manifestations, and the prevention and control measures against these two zoonotic diseases – rabies and taeniasis.

Figure 38.1 Cows are a reservoir of infection by intestinal tapeworms, which can be passed on to humans. (Photo: Basiro Davey)

Learning Outcomes for Study Session 38

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

38.1 Define and use correctly all of the key words printed in **bold**. (SAQs 38.1, 38.2 and 38.3)

38.2 Describe the mode of transmission of rabies and taeniasis to humans by their animal hosts. (SAQs 38.1, 38.2 and 38.3)

38.3 Describe the symptoms and diagnosis of rabies and taeniasis and state how you would treat or refer cases to a higher level health facility. (SAQs 38.1, 38.2 and 38.3)

38.4 Describe how you would apply prevention and control measures against rabies and taeniasis. (SAQs 38.2 and 38.3)

38.1 Rabies

Rabies is a severe life-threatening viral disease, transmitted to humans in saliva in the bite of infected animals, particularly those in the dog family (canines). Foxes, wolves, hyenas, bats, raccoons and skunks are also a reservoir of rabies virus, but in most countries they rarely transmit the disease. Bats are the main cause of rabies transmission in the USA and Canada.

Figure 38.2 A bite from a dog infected with rabies virus is the source of 99% of human deaths from rabies. (Photo: CDC Image Library, image 8319)

The infectious agent of rabies is a virus in the *rhabdovirus* family, which attacks the nervous system. If an infected person is not treated very quickly, death is almost inevitable (i.e. rabies has a very high **case-fatality rate**). The WHO estimates that around 55,000 people die from rabies every year, and 24,000 of them are in Africa; 99% of these deaths are the result of a bite from a dog (Figure 38.2).

38.1.1 The transmission of rabies in Ethiopia

Rabies is one of the most severe communicable diseases in Ethiopia, with many cases of the disease diagnosed in many parts of the country. For example, a study in Addis Ababa showed that about 73% of street dogs are infected with rabies virus and more than 2,000 people annually received treatment for rabies after a dog bite. Children are particularly vulnerable to being bitten by dogs, and about 40% of all cases are children under 15 years.

The rabies virus exists in the saliva of the infected animal (as well as in its nervous system) and is transmitted to a person through a bite. Transmission can also be if an infected animal licks a fresh break in the person's skin or mucus membranes, e.g. in the mouth (see Table 38.1 later, for different exposure categories). The virus travels in the nerves to the brain, where it causes inflammation. Person-to-person transmission is theoretically possible if someone with advanced rabies bites another human, but this is not known to have occurred.

38.1.2 Clinical manifestations and diagnosis of rabies

Figure 38.3 A rabid dog biting a man; the rabies virus from the dog's saliva travels along the nerves to the person's brain.

From the site of the bite, the virus goes to the central nervous system (Figure 38.3) and causes the clinical manifestations which, if untreated, eventually lead to death. Rabies has the highest case-fatality rate of any communicable disease. After an incubation period usually lasting one to three months, but sometimes even up to one year after the bite, the patient develops symptoms that are similar to many other illnesses – fever, headache and general weakness. The speed of progression is faster if the original site of infection was in an area of the body that is close to the spinal cord or brain, e.g. a bite on the face or hands. As the disease gets worse, the patient experiences anxiety, confusion, difficulty sleeping, hallucination (seeing things that aren't there), spreading paralysis (inability to move the muscles), difficulty swallowing and convulsions (uncontrollable shaking). A characteristic sign of late-stage rabies in some patients is hydrophobia (fear of water), which manifests in the patient reacting in terror if a bowl of water is brought near. This form of the disease (known as 'furious' rabies) prevents the patient from drinking and speeds the arrival of death within a few days. Other patients become increasingly paralysed and lose consciousness before death.

Diagnosis is made on the basis of these clinical signs. There are no tests to confirm rabies with absolute certainty while the patient is still alive. Viruses can be detected by laboratory investigation of the patient's brain after death, but this test is not usually carried out in countries with few resources.

38.1.3 First aid and post-exposure prophylaxis for rabies

Wound care and anti-rabies treatment after a dog bite can reduce the occurrence of rabies in a bitten person by up to 90%. This is what you should do if someone is bitten by a dog in your *kebele*.

First aid

Immediately after a dog bite, you should thoroughly clean and flush the wound with soap and water, detergent, or a substance that kills viruses such as 70% alcohol, tincture of aqueous solution of iodine, or povidone iodine. Continue flushing the wound for at least 15 minutes. The wound should not be sutured (stitched) unless this is essential to stop heavy bleeding. If stitches are required, the wound should not be sutured until after post-exposure prophylaxis has occurred.

Post-exposure prophylaxis for rabies

If a person is bitten by a dog in countries where rabies is endemic, there is no way of being certain that the animal is free from rabies. The bitten person should be given post-exposure prophylaxis (details of the regimen are described below) as soon as possible after the bite. Every year, around 15 million people receive this treatment worldwide, preventing an estimated 327,000 human deaths from rabies.

■ What do you understand by the term 'post-exposure prophylaxis' and where have you met this term in an earlier part of this Module?

□ **Post-exposure prophylaxis** (or PEP) means giving preventive therapy very soon after a *possible* exposure to a life-threatening infectious agent; it is given without waiting for a test to see if the exposure has actually transmitted the infection, because delay could mean that the infection spreads through the person's body. PEP is given after possible exposure to HIV, for example when a healthcare worker is splashed with blood or is pricked with a needle after injecting a patient with HIV/AIDS.

Post-exposure prophylaxis for HIV is described in Study Session 26 in Part 3 of this Module.

The WHO has published the guidelines in Table 38.1 for PEP following different levels of contact with a suspected rabid animal. Details of the vaccines and rabies immunoglobulin mentioned in the table will be described below.

Table 38.1 Guidelines for post-exposure prophylaxis against rabies based on the level of contact.

Contact category	Action
Category I: touching or feeding the animal, licks on intact skin (i.e. no exposure)	None
Category II: nibbling of uncovered skin, minor scratches or abrasions without bleeding	Immediate vaccination and local treatment of the wound
Category III: single or multiple bites or scratches that break the skin; contamination of mucus membranes with saliva from licks	Immediate vaccination and administration of rabies immunoglobulin; local treatment of the wound

After flushing the wound as directed, immediately refer people with Category II or Category III exposure to the nearest health facility for urgent post-exposure prophylaxis.

Rabies vaccines

Two types of vaccines exist to protect people from rabies after a Category II or III exposure. The older type is made from nerve tissue infected with rabies virus and is given intramuscularly (IM). The newer type of vaccine is made from virus-infected cells grown (cultured) in the laboratory and is safer and more effective. The WHO recommends that the rabies cell-culture vaccine (rabies CCV) should be used in preference to the nerve tissue vaccine wherever possible. Rabies CCV can be given either by intramuscular injection, or intradermally (ID) into the upper arm (Figure 38.4). The intradermal route has been shown to be as safe and effective as the traditional intramuscular route, and is cheaper because it requires less vaccine.

Figure 38.4 Intradermal injection of rabies cell-culture vaccine into the upper arm. (Photo: WHO, 1996, *Recommendations on Rabies Post-Exposure Treatment and the Correct Technique of Intradermal Immunization against Rabies*)

Modern cell-culture vaccines should be given in four or five doses: the dosage for each injection depends on the vaccine type and the route of administration (intramuscular dosages are 0.5 ml or 1.0 ml, whereas the intradermal dosage is only 0.1 ml). If you are referring someone to a health centre for rabies post-exposure prophylaxis, you should tell the patient and their family that it is *essential* to return at fixed intervals for repeat vaccinations in order to prevent rabies if they have been infected by the bite.

The intramuscular regimen is given at days 0, 3, 7, 14 and 28 after the exposure. The intradermal regimen is given at days 0, 3, 7, 28 and 90 after exposure. There is also a rabies vaccine which is administered at days 0, 7 and 28 days (IM), and rabies duck embryo vaccine, which is administered at day 0, 7 and 21 days (IM or ID). For both these vaccines, a booster dose is given after two to three years.

Rabies immunoglobulin

Specific protection in humans with Category III exposure (see Table 38.1) is provided by injecting a human or equine (horse) immunoglobulin at the site of the bite, as soon as possible after exposure to neutralise the virus. The term 'immunoglobulin' refers to a preparation of antibodies made either in humans or in horses who have been vaccinated against rabies. Antibodies from their blood which attack the rabies viruses are harvested and stabilised in an injectable liquid. As much as possible of the dose of rabies immunoglobulin is given into, or as near as possible to, the site of the bite. If there is any remaining in the syringe, it is injected at a different site to elicit active immunity. Human rabies immunoglobulin is given in a single dose of 20 international units (IU) per kilogram (kg) of the person's body weight. Horse rabies immunoglobulin is cheaper, but less effective and more likely to produce adverse allergic reactions; it is given in a single dose of 40 IU/kg.

38.1.4 Prevention of rabies

Since very few people survive after they develop symptoms of rabies, prevention is the best alternative. The main prevention measures against rabies are aimed at controlling the animals that transmit the virus, educating the community on how to protect themselves from dog bites, and what action to take if they are bitten. Your roles as a Health Extension Practitioner are to contribute to a comprehensive rabies control programme by carrying out the following activities:

- Educate the owners of dogs and the public on the importance of restricting the activity of their dogs.
- People should be educated that they must be careful handling or approaching strange-acting dogs and other canines. Warn parents that their children are particularly at risk.
- If a registration and immunization programme is available in your locality, register and immunize with anti-rabies vaccine any dog that owners want to keep.
- All unwanted dogs should be killed to reduce the population of animals living wild; maintain active searching for rabid dogs and take measures to ensure that they are killed.
- Detain and clinically observe for 10 days any healthy-appearing dog known to have bitten a person, if the owner wants to keep the animal. Unwanted dogs and dogs developing suspicious signs of rabies should be destroyed immediately.
- Give first aid for any dog bite and immediately refer the patient to the nearby health centre for post-exposure prophylaxis.

38.2 Taeniasis (tapeworm infestation)

In this section, you will learn about the definition, mode of transmission, clinical manifestations, and methods of prevention of taeniasis (tapeworm infestation). **Taeniasis** is a parasitic zoonotic disease caused by the adult stage of large tapeworms that live in the intestines of human hosts. The most common causative agent in Ethiopia is the beef tapeworm, *Taenia saginata*, which has the cow as its intermediate host. The other tapeworm that can cause taeniasis (*Taenia solium)* has pigs as its intermediate host, but they are not so common in Ethiopia. Taeniasis due to beef tapeworm is highly prevalent in Ethiopia due to the widespread habit of eating raw beef (*kitfo* in Amharic, Figure 38.5) and poor sanitary conditions. Defaecation in open fields in grazing lands, disposal of raw human sewage in rivers and its use as a fertiliser, facilitate the spread of taeniasis. The highest cases of taeniasis are found in the towns of Northern and Eastern Ethiopia.

Figure 38.5 The tradition of eating raw beef in Ethiopia exposes people to the risk of taeniasis through eating tapeworm eggs embedded in the meat. (Photo: Basiro Davey)

Other tapeworm diseases also exist in certain communities, e.g. people in fishing communities may be exposed to fish tapeworms (*Diphyllobothrium* species). Hydatid disease is also found in some parts of Ethiopia, caused by *Ecchinococcus* tapeworms transmitted mainly by dogs, which also infect people, cattle, sheep and horses. However, in this study session, we are focusing exclusively on the most prevalent form of tapeworm infestation in Ethiopia – taeniasis transmitted to humans by cows.

38.2.1 Mode of transmission of taeniasis

Adult beef tapeworms of the species *Taenia saginata* can grow very large – they can reach a length of five metres within a few months of infecting a person, but some have been recorded at up to 25 metres! The tapeworm attaches to the inside of the intestine by four strong suckers in its tiny head (Figure 38.6a). The long flat body of the tapeworm is formed from between 1,000 to 2,000 sections called *proglottids* (Figure 38.6b). The proglottids near the end of the tapeworm mature and become capable of surviving for a time after detaching from the main body of the worm. When a mature proglottid breaks away from the adult worm, it can contain up to 100,000 eggs. Approximately six mature proglottids are passed in the person's stool every day – shedding up to 600,000 eggs into the environment daily!

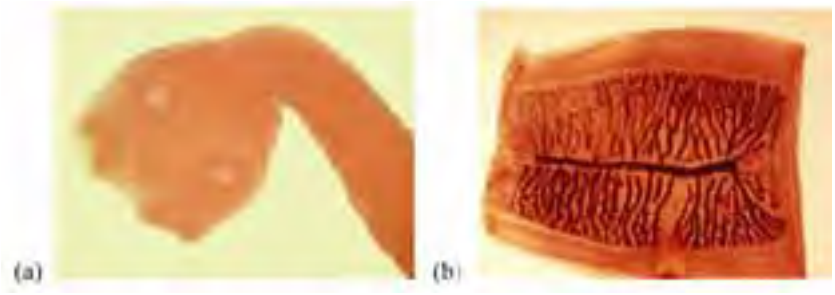

Figure 38.6 The beef tapeworm, *Taenia saginata* (a) The magnified scolex (head) of the tapeworm, showing the four suckers where it attaches to the wall of the intestine; it is only 1–2 mm in diameter. (b) A proglottid shed in the faeces. (Photos: CDC Parasite Image Library, at http://www.dpd.cdc.gov/dpdx/HTML/ImageLibrary/Taeniasis_il.htm)

Proglottids of *Taenia saginata* passed in the faeces of an infected person onto grazing land, or used as fertiliser, are eaten by cows grazing on the same fields. The eggs hatch into larvae inside the cow's intestine, and burrow out through the intestinal wall into the muscles, where they become trapped inside a wall of tissue that forms around them. This stage of the tapeworm's lifecycle is called a *cysticercus*. Transmission to new human hosts occurs when the person eats raw or undercooked beef containing a cysticercus. The digestive enzymes in the person's stomach and intestines digest the wall around the tiny immature tapeworm in the cysticercus, releasing it into the intestine, where it attaches to the intestinal wall by the four suckers shown in Figure 38.6(a). The tapeworm matures in the person's intestine and begins to release proglottids, continuing the lifecycle.

Cysticercus (singular) is pronounced 'siss-tee-surr-cuss'. The plural is cysticerci ('siss-tee-surr-kye').

38.2.2 Clinical manifestations, diagnosis and treatment of taeniasis

Generally, people live with relatively few symptoms even with a large tapeworm inside them. They may experience discomfort around the anus when proglottids are discharged, and diagnosis is made on the basis of seeing the flat white proglottids wriggling in the stools. Mild abdominal pain or

discomfort, nausea, change in appetite, weakness, and weight loss can also occur with *Taenia saginata* infection.

Traditionally, people with tapeworm in Ethiopia self-treat with extracts of *kosso* – the Amharic name for a slender flowering tree (species name *Hagenia abissinica*, Figure 38.7), or *enkoko* – the scarlet fruits of the climbing shrub (*Embelia schimperi*), both of which have proven taenicidal properties. Medical treatment is to give a single dose of praziquantel (one 10 mg tablet for every kilogram of the patient's body weight), which is highly effective at killing tapeworms. You are not expected to prescribe praziquantel, which is given at a health centre.

Taenicidal refers to any treatment that kills tapeworms; it is pronounced 'teen-ih-side-ull'.

Figure 38.7 The flowers of *Hagenia abissinica* (or *kosso*) are a traditional treatment for tapeworms in Ethiopia. (Photo: Pam Furniss)

■ Which other communicable disease have you learned about in this Module, which is treated with praziquantel?

□ Schistosomiasis is also treated with praziquantel, but at a much higher dosage (40 to 60 mg/kg, given in two or three doses during a single day – see Study Session 37, Section 37.1.4).

38.2.3 Prevention and control of taeniasis

The most important role for you as a Health Extension Practitioner in the prevention of taeniasis in your community is to educate community members about the mode of transmission of tapeworms from humans to cows and back to humans.

■ What health education messages should you give to people in your community to help prevent taeniasis?

□ You should educate them to:

- avoid open defaecation in the fields, and instead they should use a latrine
- avoid fertilisation of grazing lands by untreated human faeces
- wash hands thoroughly with soap and water after defaecation
- cook meat thoroughly and do not eat raw beef.

You also have a role in food hygiene inspection and community sanitation. Refrigeration or salting for long periods, or freezing at –10°C for at least nine days, also kills cysticerci in beef. You should also oversee the proper disposal of human faeces in your *kebele*.

Your role in education and inspection to improve food hygiene, sanitation and waste disposal are covered in the Module on *Hygiene and Environmental Health*.

Summary of Study Session 38

In Study Session 38, you have learned that:

1 Rabies is the most fatal of all communicable diseases; it is almost never cured once the patient shows symptoms.

2 The virus that causes rabies is transmitted in the bite of infected canines; 99% of cases in Africa are due to dog bites.

3 Immediate first aid for the wound and urgent referral for post-exposure prophylaxis with rabies vaccine and rabies immunoglobulin reduces the transmission of rabies after a dog bite and saves thousands of lives.

4 Prevention of rabies is mainly through elimination of unwanted dogs, vaccination where this can be afforded, and education of the population about avoiding dog bites and seeking immediate treatment if they are bitten.

5 Taeniasis due to beef tapeworm is a common disease in Ethiopia due to the culture of eating raw beef. Infected cows have tapeworms embedded in cysts in their muscles, which can be killed by thorough cooking.

6 Infected humans pass up to 600,000 eggs in their faeces every day. Open defaecation in fields and using raw human sewage as fertiliser contaminates grazing land, where cows eat the eggs attached to the grass. This perpetuates the lifecycle.

7 Environmental and food hygiene, proper sanitation, and cooking of beef thoroughly are the major prevention measures against taeniasis.

Self-Assessment Questions (SAQs) for Study Session 38

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 Support Meeting. You can check your answers with the Notes on the Self-Assessment Questions at the end of this Module.

SAQ 38.1 (tests Learning Outcomes 38.1, 38.2 and 38.3)

Mr. Kebede is bitten on the face by a dog which has shown abnormal behaviour in the last three days. The skin is clearly broken and the wound is bleeding a little bit.

(a) What category of exposure is this event?

(b) If Mr. Kebede comes quickly to your Health Post, which of the following actions should you do for him? In each case, explain why the action is correct or incorrect.

A Give him an antibiotic and send him home

B Suture his wound

C Thoroughly clean his wound with soap and water and send him to the nearby health centre for post-exposure prophylaxis

D Admit him to the Health Post and give him intravenous fluids.

SAQ 38.2 (tests Learning Outcomes 38.1, 38.2, 38.3 and 38.4)

Kemal is a three-year-old boy who has had close contact with his pet dog. In the last two days, the dog has showed abnormal behaviour and now it has run away. You examine Kemal carefully all over his body. You find that he has not been bitten and he does not have any scratches or breaks in his skin.

(a) What is Kemal's category of exposure?
(b) What do you advise Kemal's family?

SAQ 38.3 (testing Learning Outcomes 38.1, 38.2, 38.3 and 38.4)

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

A Most people who show symptoms of rabies will be cured if they are referred for medical treatment.

B Taeniasis causes discomfort in people who have a tapeworm in their intestines, but the disease is almost never fatal.

C Eating well-cooked beef may not protect people from taeniasis.

D Abdominal pain and the appearance of flat white worms in faeces are signs of taeniasis.

E Open defaecation in grazing lands is a risk factor for taeniasis.

Study Session 39 Diseases of Poor Hygiene and Environmental Health: Trachoma, Scabies and Podoconiosis

Introduction

This study session focuses on three significant health problems in Ethiopia, which are common in communities where there is poor hygiene and sanitation, and where people find it difficult to keep their environment clean. You have already learned a lot in this Module about diarrhoeal diseases and other infections in which poor hygiene is a major contributory cause. In this study session, we contrast three other conditions where the local environment makes an important contribution:

- *Trachoma,* a potentially blinding eye disease caused by bacteria, but flies are a strong environmental factor in its transmission
- *Scabies*, a persistent irritating rash caused by tiny crawling mites that burrow into the skin
- *Podoconiosis,* a form of elephantiasis (swollen limbs with thickened skin) that is not caused by an infection at all – but by irritating particles of red clay soil causing a damaging reaction in the skin.

A common feature of these diseases is the lack of clean water for washing, and lack of education about their causes and how to prevent them. As you will see, washing the body and clothes regularly and disposing of rubbish safely is the key to prevention and control. In this study session, you will learn about the causes, modes of transmission, treatment and prevention of trachoma, scabies and podoconiosis. A better understanding of these diseases will help you to diagnose, treat or refer patients, and educate your community on prevention measures.

Learning Outcomes for Study Session 39

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

39.1 Define and use correctly all of the key words printed in **bold**. (SAQs 39.1 and 39.2)

39.2 Describe the causes of scabies, trachoma and podoconiosis and the environmental factors that contribute to their prevalence. (SAQs 39.1, 39.2 and 39.3)

39.3 Describe the symptoms, diagnosis, treatment and referral criteria for scabies, trachoma and podoconiosis. (SAQs 39.1 and 39.2)

39.4 Describe the prevention and control measures at community level against scabies, trachoma and podoconiosis. (SAQs 39.1, 39.2, 39.3 and 39.4)

39.1 Trachoma – the ‘quiet blindness’

Trachoma is an infectious eye disease that can eventually cause blindness if left untreated. Infection of the eyes with the bacteria *Chlamydia trachomatis* usually occurs in childhood, but infected people generally do not develop severe sight problems until adulthood.

It is therefore essential that you are able to identify the early signs of the disease and treat patients appropriately in order to avoid severe complications developing later in life.

First, we will describe the infectious agents that cause trachoma, their modes of transmission and the clinical manifestations of the disease. This knowledge will enable you to identify people with symptoms, grade the signs according to a classification of severity, and decide whether you should treat patients yourself or refer them to a health centre or hospital. Then you will learn how to give health education about trachoma and its prevention in your community.

39.1.1 What causes trachoma?

Look closely at the diagram of the eye in Figure 39.1. Identify the areas labelled as the conjunctiva and the cornea. In the initial stages of trachoma, the bacteria *Chlamydia trachomatis* primarily infect the **conjunctiva** (pronounced 'kon-junk-tie-vah'). This is a thin clear membrane that covers the inner surface of the eyelid and the white part of the eyeball. First it becomes itchy and inflamed (red, swollen and painful); later it becomes scarred and the eyelashes turn inwards.

The **cornea** is the thick transparent tissue over the front part of the eye, covering the white, black and coloured areas. The damage to the cornea is not due to the bacteria, but by persistent scratching from the eyelashes, which have turned inwards due to scarring in the conjunctiva.

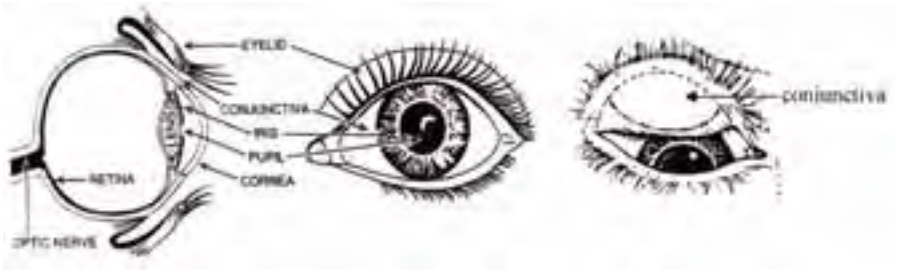

Figure 39.1 Anatomical structure of the eye. The conjunctiva lining the inside of the eyelids is the area most visibly affected by trachoma in the early stages. (Source: WHO, 1993, *Primary Healthcare Level Management of Trachoma*)

39.1.2 Modes of transmission of trachoma

Routine newborn care is described in the Modules on *Postnatal Care* and *Integrated Management of Newborn and Childhood Illness* (IMNCI).

The bacteria that cause trachoma are transmitted mainly by contact with the discharge (pus) coming from an infected person's eyes. Note that direct transmission from one person's eyes to the eyes of another person is unusual, but direct mother-to-newborn transmission can occur during birth if the mother has *Chlamydia* bacteria in her birth canal. These bacteria can live in the genitals of males and females, causing a sexually transmitted infection, which can get into the eyes of the baby as it is born. This is why tetracycline eye ointment (1%) is applied to the eyes of all babies as part of routine newborn care.

However, the most common routes by which *Chlamydia* bacteria get into the eyes and cause trachoma are through:

- Flies landing on the face of an infected person and then carrying the infected discharge to another person's face (Figure 39.2a).
- An infected person touching his/her eyes and then touching another person on the face or directly on their eyes (Figure 39.2b).

- Clothing used to wipe infected eyes (Figure 39.2c), and then contaminating the eyes of another person, for example if it is used as a towel.

Figure 39.2 Transmission of trachoma by (a) flies, (b) eye contact with contaminated hands, (c) eye contact with contaminated clothing. (Source: WHO, 1993, *Primary Healthcare Level Management of Trachoma*)

■ Based on your study of earlier parts of this Module, the infectious agents of which other diseases may be transmitted by house flies?

□ The infectious agents causing diarrhoeal diseases, such as dysentery and acute watery diarrhoea, can be transmitted by flies (Study Sessions 32 and 33).

39.1.3 How common is trachoma in Ethiopia?

Trachoma is a very common disease in developing countries, including Ethiopia – particularly in dry rural areas. About 80 million people in the world suffer from trachoma, of whom about eight million have become visually impaired. There are currently more than 238,000 people with blindness due to trachoma in Ethiopia. Trachoma is very common among children in certain parts of the country; for example, more than 50% of Ethiopian schoolchildren have had trachoma infections at some time. Without proper treatment, many of them will suffer severe eye problems in later life.

39.1.4 Clinical manifestations of trachoma and disease progression

As a Health Extension Practitioner you should examine affected children and adults to identify the severity of the trachoma. Use your clean hands and a pen to turn the eyelids upwards, so you can see the conjunctiva, as illustrated in Figure 39.3.

Figure 39.3 Examination of the conjunctiva inside the upper eyelid for signs of trachoma. (Source: WHO, 1993, *Primary Healthcare Level Management of Trachoma*)

Wash your hands thoroughly with soap and water before and after each eye examination!

The clinical manifestations of trachoma have been classified by the World Health Organization (WHO) into five *grades* indicating how far the disease has progressed. The first grade is the earliest manifestation of the infection, and the fifth grade is permanent eye damage causing sight loss and leading eventually to blindness. It is important for you to know the signs that indicate these grades, because the actions you take when you see a person with suspected trachoma depends on correct grading. The names and code letters of the five grades are given in Box 39.1; they are each described in detail below the box.

Box 39.1 The five grades of trachoma progression

First grade = Trachomatous follicles (TF)

Second grade = Trachomatous inflammation (TI) or (TF+TI)

Third grade = Trachomatous scarring (TS)

Fourth grade = Trachomatous trichiasis (TT)

Fifth grade = Corneal opacity (CO)

Trachomatous follicles (TF)

The first and earliest trachoma grade is characterised by the presence of five or more **trachomatous follicles** in the conjunctiva inside the upper eyelid. They are round, slightly raised, whitish areas of at least 0.5 mm in size (Figure 39.4). Trachomatous follicles should not be confused with trachoma scars, which are flat (see Figure 39.5 below), or the normal eyelash follicles on the edge of the eyelids. Other signs that you may notice are redness and swelling of the conjunctiva as a result of inflammation caused by the bacterial infection.

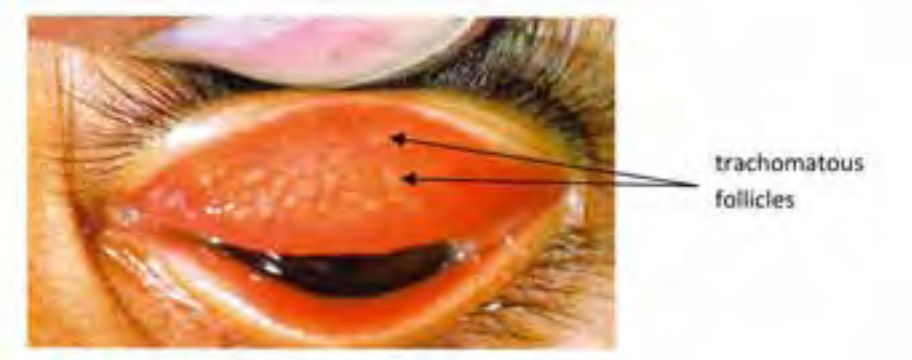

Figure 39.4 Trachomatous follicles in the upper conjunctiva of a child with early signs of trachoma. (Photo: WHO at http://www.who.int/blindness/causes/priority/en/index2.html)

Trachomatous inflammation (TF+TI)

The second grade is when profound inflammation occurs in more than half of the upper conjuctiva, which is red, thick and swollen, and has many trachomatous follicles (Figure 39.5). In severe cases, the blood vessels of the eyelids may not be visible due to the swelling of the conjunctiva.

Figure 39.5 Trachomatous inflammation with trachomatous follicles. (Photo: WHO, sources as in Figure 39.4)

Trachomatous scarring (TS)

In time, the inflammation resolves and the follicles are replaced by *scars* on the conjunctiva, which appear as small glistening lines or stars, and later may become flat, thick, white bands (Figure 39.6). This is the characteristic third grade of trachoma progression.

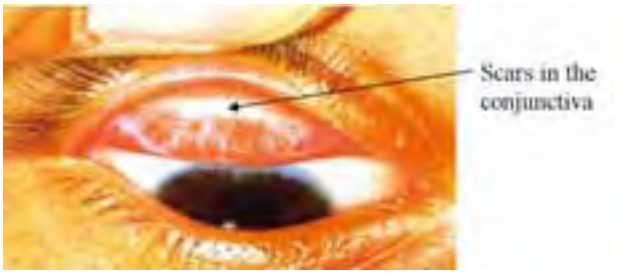

Figure 39.6 The white bands and lines are scars in the conjunctiva of the inner eyelid. (Photo: WHO, source as in Figure 39.4)

Trachomatous trichiasis (TT)

The scars gradually cause the eyelashes to turn inwards, and at least one eyelash rubs on the cornea. This sign is called *trichiasis* (pronounced 'trik-eye-assis') and is the fourth grade of trachoma severity. You can see in Figure 39.7 that many of the eyelashes are turned inwards and rub the cornea when the person blinks. This is painful and distressing for the person and it gradually damages the cornea.

Figure 39.7 Eyelashes rubbing the cornea. (Photo: WHO, source as in Figure 39.4)

Corneal opacity (CO)

A healthy cornea appears black where it covers the lens at the front of the eye. In the fifth and most severe grade of trachoma, the cornea becomes white and opaque (not transparent) as in Figure 39.8. This is known as **corneal opacity**.

Figure 39.8 Corneal opacity due to chronic trachoma. (Photo: WHO, source as in Figure 39.4)

- What effect will corneal opacity have on the person's sight?

  - Light cannot pass easily through the opaque cornea, so the person's sight will be severely impaired and total blindness may result.

- How can you tell the difference between trachomatous follicles and trachomatous scars in the conjunctiva?

  - Follicles are raised and round and at least 0.5 mm in diameter. Scars are lines or bands and are flat.

39.1.5 Prevention and control of trachoma

There are four major components for the prevention and control of trachoma at community level, which are represented by the letters **SAFE** (see Box 39.2 and the details below the box).

Box 39.2 SAFE strategy for the prevention and control of trachoma

S = Surgical treatment for trichiasis to stop eyelashes rubbing the cornea

A = Antibiotic treatment of active cases of trachoma by tetracycline ointment 1% applied to the eyes

F = Faces and hands washed regularly to prevent infection spreading

E = Environmental sanitation and safe water supply.

Surgical treatment

A simple surgical procedure can save a patient from becoming blind. Surgery can be carried out at the health centre by trained nurses and may simply involve turning out the eyelashes that are scarring the cornea. Your role is to reassure and refer patients with Grades 3 to 5 (i.e. trachomatous scarring, trachomatous trichiasis, or corneal opacity) for immediate surgery. Explain that the operation is very simple, quick and safe, and it will greatly reduce the discomfort in their eyes and prevent further damage from occurring.

Antibiotic treatment

You are expected to treat grade 1 and grade 2 **active trachoma** (i.e. people with trachomatous follicles and trachomatous inflammation in at least one eye) in the community. You should show parents how to administer tetracycline 1% ointment onto the conjunctiva inside the eyelids twice every day for six weeks (Figure 39.9a and b). If you identify two or more family members with trachoma, treat the whole family.

Figure 39.9 (a) Positioning a child to apply tetracycline eye ointment. (b) Placing the ointment inside the lower eyelid. (Diagrams: Dr Radmila Mileusnic)

If you are informed by the District Health Office that trachoma is a major concern, you may be advised to treat all the children in your community as a preventive measure. If this is the case, treat all children with tetracycline eye ointment for five consecutive days in a month, and repeat the same procedure for six consecutive months. Alternatively, a doctor may prescribe the oral antibiotic azithromycine (20 mg/kg bodyweight) as a single dose in place of tetracycline to treat the whole community.

Face washing

Educate all families, particularly mothers of children (Figure 39.10), by going house to house to teach them the importance of regular washing of face and hands, ideally using soap. Go to schools to teach children there in a large group that washing regularly prevents the transmission of trachoma from person to person. Everyone should learn the habit of washing their hands with soap and water in the early morning before they touch their eyes, before and after eating or preparing food, and after using the latrine.

Figure 39.10 Women teaching children how to wash their hands and faces in Wonji, Ethiopia. (Photo: WHO TDR Image Library, image 9400962/Martel)

Environmental sanitation

Detailed procedures of personal hygiene and sanitation are given in the Module on *Hygiene and Environmental Health*.

Educate every family to dispose of their household rubbish in a pit dug away from their home (Figure 39.11). Garbage and other dirty materials can be buried using spades or other locally made tools. The waste materials should be covered with soil or burnt inside the pit. Educate adults and children to keep their surrounding environment clean and free from rubbish and animal dung, to avoid encouraging the breeding of flies. Animals should be penned away from the house at night. Encourage everyone to use latrines and a safe water supply to prevent disease transmission by flies and dirty hands. Latrines should be properly covered after use.

Figure 39.11 Waste disposal in a pit away from the house. (Source: WHO, 1993, *Primary Healthcare Level Management of Trachoma*)

Now read Case Study 39.1 and then answer the question that follows it.

Case Study 39.1 Mrs Halima asks about her child's eye problems

Mrs Halima lives in a remote rural village in Wollo. Her ten-year-old son has had eye discharges for the last three years, which seem to be getting worse. During the last year, his eyes frequently weep tears and look swollen and red, and the boy complains that his eyes are sore. Mrs Halima has taken him to several traditional healers, but his eye problems have not been cured. She tells you she believes that her child's eye problems are related to supernatural powers and no treatment can help him.

- ■ What do you advise Mrs Halima and what action do you take for the child?
- □ Explain to the mother that her son's eye problems are a disease called trachoma, caused by bacteria. Tell her it can be cured using medicine in the eyes or a very simple operation to stop the child's eyelashes turning inwards and rubbing his eyes. Examine the boy's eyes and decide what grade of trachoma the disease has reached. If the grade is TF or TF+TI, treat him with tetracycline eye ointment 1%, and show the mother how to do it twice a day for the next six weeks. Follow up his progress regularly every week. If the boy needs surgery, inform the mother and refer him to the health centre immediately.

39.2 Scabies

Scabies is not a serious condition, but it is very common in poor communities and it may severely impair the quality of life of affected children.

39.2.1 What causes scabies and how is it transmitted?

Scabies (*ekek* in Amharic) is a parasite infestation of the skin caused by microscopic mites, *Sarcoptes scabiei* (Figure 39.11). These tiny animals are spread principally by direct skin-to-skin contact (e.g. during close physical contact between children and parents, or during sexual intercourse), and to a lesser extent through contact with infested clothes and bedding.

Male and female mites mate on the surface of the person's skin. The female burrows into the skin, depositing eggs in the tunnel behind her. After the eggs are hatched, larvae migrate to the skin surface and eventually change into the adult form. An adult mite can live up to about a month on a person, but they survive only two to three days once away from the human body. Individuals who become infested with scabies mites for the first time usually develop symptoms after four to six weeks, but they can still spread the mites during this time. If someone is cured of scabies, but acquires the mites again later, the symptoms appear much more quickly, within days.

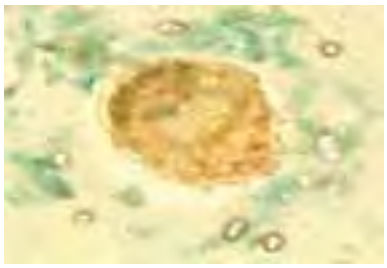

Figure 39.12 *Sarcoptes scabiei*, stained and viewed through a microscope. (Photo: CDC at http://www.cdc.gov/parasites/scabies/)

39.2.2 How common is scabies in Ethiopia?

Scabies mites are found worldwide, in all communities and climates. There are thought to be about 300 million cases of scabies in the world each year. In Ethiopia, as elsewhere, scabies is common where there is poverty, poor water supply, poor sanitation and overcrowding.

39.2.3 Clinical manifestations of scabies

The first clinical manifestation of scabies is severe itching of the skin, particularly at night. The characteristic raised red pimples on the skin that develop later are due to an allergic response to the mites. You may also be able to see the threadlike burrows in the skin made by egg-laying female mites. In infants, the palms, soles, face and scalp are most often affected (Figure 39.13a). In older children and adults the rash is most often found in the spaces between fingers and toes, wrist (Figure 39.13b), armpits, ankles, navel, 'belt line', groin, buttocks, genitals in men and breasts in women.

Figure 39.13 Scabies sores on (a) the soles of a baby's feet, (b) an adult's wrist. (Photos: DermNet, Dartmouth Medical School, USA, at http://hardinmd.lib.uiowa.edu/dermnet/scabies.html)

39.2.4 Treatment and prevention of scabies

A chemical called benzyl benzoate lotion (BBL, 25% solution) is used for the treatment of scabies. In adults, the lotion should be applied to the whole body, including the neck, face and ears – but taking care not to get it into the eyes, nose or mouth. Use a cotton swab to squeeze the lotion under the ends of the fingernails and toenails, where mites can hide. Tell the person not to wash! Repeat the treatment the following day and advise the patient not to wash for another 24 hours.

Children should also be treated with BBL, but the advice is to apply the lotion every day for three days; on each day leave the lotion on the child's body for 13 hours, then wash it off.

Other people who have been in close contact with a child or adult with scabies should also be treated with BBL to avoid re-infection, and all clothes and bedding should be thoroughly washed with hot water and dried in sunlight (Figure 39.14).

Figure 39.14 Sunlight helps to kill infectious agents in washed clothes and bedding dried in fresh air. (Photo: Basiro Davey)

Education on prevention of scabies should focus on explaining the transmission of the itchy mites and good personal hygiene, such as bathing and washing clothes frequently. The main control measures are early diagnosis and treatment of patients and contacts.

- How do you tell the difference between the skin manifestations of scabies and onchocerciasis? (Think back to Study Session 37.)

- Severe itching of the skin is the common characteristic of both scabies and onchocerciasis. However, onchocerciasis has additional symptoms such as loss of skin colour and nodule formation, whereas scabies rashes are raised red pimples and flaky skin. Scabies occurs mainly in conditions of poverty and overcrowding where the mites can easily breed; whereas onchocerciasis is common in south-west Ethiopia in communities living near the fast-flowing water required by the insect vector (blackflies).

39.3 Podoconiosis

Podoconiosis is pronounced 'poh-doh-koh-nee-oh-sis'.

Podoconiosis is a type of **elephantiasis** (swelling of the limbs) that is common in highland Ethiopia (*woina dega* or *dega*) in areas of red clay soil, usually at high altitudes. There is a great deal of misunderstanding about the disease in affected communities. Some people think it is caused by treading on a snake or frog, others that it is a curse or form of punishment. In reality, **podoconiosis** (Figure 39.15) is a reaction in the body to very small soil particles that have passed through the skin of the feet. The swelling begins in the feet and progresses up the legs, and both feet are usually affected.

Figure 39.15 Podoconiosis is swelling and deformity of the feet and ankles caused by reactions in the body to particles of red clay soil getting into the skin. (Photos: Gail Davey)

Unlike other types of elephantiasis, podoconiosis is *not* caused by any bacteria, viruses or parasites. It cannot be transmitted between people, so close contact with someone who has podoconiosis is totally safe. You may wonder why you are learning about it in a Module on *Communicable Diseases;* there are two reasons. First, severe podoconiosis looks a lot like lymphatic filariasis, which you learned about in Study Session 37. It is important to know the difference between these diseases because there are differences in their treatment. Second, how you teach patients to reduce the disability due to podoconiosis is exactly the same as the methods you have already learned about for lymphatic filariasis.

39.3.1 Distinguishing podoconiosis from lymphatic filariasis

The outward appearance of legs and feet affected by podoconiosis and lymphatic filariasis is very similar – you can't tell the difference just by looking. But there are some questions you can ask the patient that can help you to decide which diagnosis is most likely to be correct.

Where does the patient live?

If the patient lives more than about 1,200 metres above sea level, then the leg swelling is likely to be due to podoconiosis. This is because the mosquitoes that transmit lymphatic filariasis cannot survive above this altitude – it is too cold at night. If the patient has always lived in *dega* or *woina dega* areas, or does not live in zones where lymphatic filariasis is known to be prevalent, then you should diagnose the leg swelling as podoconiosis.

Where did the disease start and what body parts are affected?

If it started in the feet and both feet/legs are affected, then the diagnosis is likely to be podoconiosis. If the swelling began in the groin and spread downwards, if only one leg is affected (look back at Figure 37.21a), and/or the lymph nodes in the groin are enlarged – then the disease is likely to be lymphatic filariasis.

■ Can you suggest why it is important to distinguish between podoconiosis and lymphatic filariasis? (Think back to Study Session 37.)

Malaria can be transmitted by mosquitoes in communities up to 2,000 metres above sea level. See Study Session 5 in Part 1 of this Module.

□ Podoconiosis is not infectious (it is caused by soil particles), so patients don't need drug treatment because there is no infectious agent to kill; there is no vector so their houses don't need to be sprayed to kill mosquitoes (unless, of course, malaria is endemic in the area). Treating podoconiosis with the drugs used to treat lymphatic filariasis would be a waste of precious resources and would not cure the disease.

39.3.2 How does podoconiosis affect people?

There is a major similarity in the experiences of people with podoconiosis and lymphatic filariasis, as we already mentioned in Study Session 37. They often face severe stigma and rejection by their communities. They may be forced out of school, or even rejected by their church, mosque or *idir*. Other people may be reluctant to eat with them or associate with them in other ways. Marriage for people in affected families may be restricted to people from other affected families. Many of these social problems arise because people mistakenly fear that podoconiosis is infectious, and that they may catch it from patients.

People with swollen legs due to lymphatic filariasis face the same problems as people with podoconiosis.

In addition to this social stigma, people with podoconiosis often find it difficult to do physical work because their legs are heavy and uncomfortable. They often become very poor as a consequence of being unable to farm or take produce to market. Whole communities are also poorer because people with podoconiosis cannot work on their farms. As a country, the WHO estimates that Ethiopia loses US$200 million each year because of the work that people with podoconiosis are unable to do.

39.3.3 Treatment of podoconiosis.

Most people do not know that leg swelling from podoconiosis can be treated – but it can! Using simple foot hygiene, ointment, elastic bandages, socks and shoes, brings improvement to more than nine out of ten patients. They can manage their own foot care if you show them what to do. The basic steps of treatment will be familiar from Study Session 37, but are summarised again briefly here:

1 Foot hygiene. First soak the feet for 20 minutes in a basin of cold water into which half a capful (about 10 drops) of *berekina* (bleach) have been added.

2 Then wash the feet carefully using soap and clean cold water (Figure 39.16a). Dry between the toes with a clean cotton cloth.

3 Rub a small amount of ointment or oil into the skin after drying.

4 For patients with softer swelling of the legs, elastic bandages are useful. Show the patient how to apply the bandage from the toe to the knee, with the leg raised (Figure 39.16b).

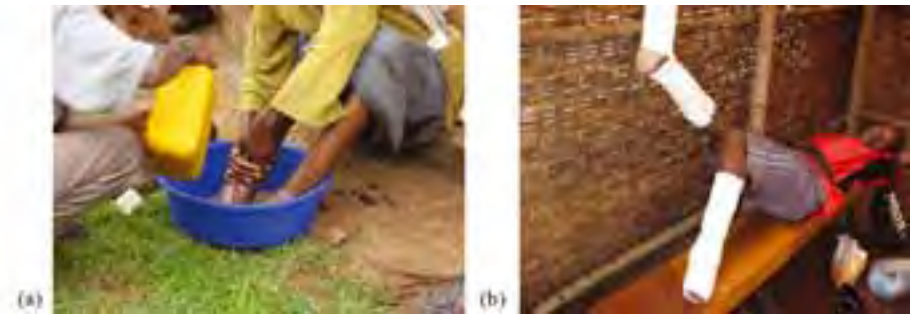

Figure 39.16 (a) Foot hygiene and (b) elastic bandages and raising the legs can greatly improve the symptoms of podoconiosis. (Photos: Gail Davey)

5 Encourage the patient to perform exercises to improve their circulation, such as toe points, ankle circles and calf raises, two or three times per day.

6 Raise the affected legs whenever possible by raising the foot end of the bed, or resting the foot on a stool when sitting.

7 Clean socks and closed shoes are vital in preventing further exposure to the soil. If local houses have floors made of earth (Figure 39.17), the floor should be covered with mats.

■ What do you now know about podoconiosis that may also help to break down the stigma that many patients face?

□ It is not infectious. Podoconiosis can be treated using simple hygiene measures. It can be prevented through regular use of shoes.

Experience in Southern Ethiopia has shown that more than 90% of patients with podoconiosis can be successfully treated without need of referral for care within the government health system. Communities can handle most of the problems that podoconiosis patients have without need for formal healthcare. Seeing young men and women fully treated (Figure 39.18) has a positive impact on the communities that knew them previously as patients.

Figure 39.18 These young women have been successfully treated for podoconiosis. Now they have found work as hairdressers. (Photo: Gail Davey)

Figure 39.17 Houses with earth floors should be covered with mats to prevent soil particles penetrating bare feet. (Photo: Janet Haresnape)

39.3.4 Podoconiosis-plus: problems that need urgent referral

Some podoconiosis patients will develop symptoms that need urgent referral for further care at a health centre or hospital. Here are some of the warning signs:

- *Red hot leg.* Sometimes, people with podoconiosis develop bacterial *superinfection* ('added infection' by bacteria that usually live on the skin) in the swollen leg. They report aching pain and increased heat and swelling in the leg, fevers or chills, and sometimes headaches. They need antibiotics to control the infection, and painkillers.
- *Open wounds.* After an injury, a person with podoconiosis is more likely to develop an open wound that may not heal easily. Careful wound care using clean techniques and local dressing materials will be needed, most likely at a health centre.
- *Deep fungal infection* (a fungus has taken root deep in the swollen tissues). The patient may notice black dots on the surface of the skin. They need hospital treatment.
- *Skin cancer.* Looking carefully, you will see an ulcer with a rolled edge (like rolled *injera*). This needs hospital treatment.

39.3.5 Prevention of podoconiosis

Here is the good news – because the disease is a reaction to soil particles, wearing shoes every day to protect the feet from the soil will prevent it completely! So if children wear shoes all the time, the next generation will not suffer from podoconiosis.

Summary of Study Session 39

In Study Session 39, you have learned that:

1 Trachoma is one of the leading causes of blindness in Ethiopia; it is due to infection with *Chlamydia trachomatis* bacteria, transmitted from person to person by flies, on hands and clothing, and sometimes also from mother to newborn if the bacteria are in the birth canal.

2 Patients with active trachoma (grade TF or TF+TI) should be treated at community level with tetracycline eye ointment. More severe grades of trachoma should be referred for specialist treatment, often involving simple surgery to stop the eyelashes from rubbing the cornea.

3 Scabies is a severe skin inflammation caused by reactions to a microscopic parasitic mite that burrows into the skin. The irritation can seriously impair the quality of life of affected children.

4 Good personal hygiene, particularly washing the face, body and clothes with soap and clean water, and environmental hygiene, including disposal of rubbish and other waste, and using latrines, are important ways to prevent trachoma and scabies.

5 Podoconiosis is a non-infectious type of elephantiasis (swollen leg) caused by reactions to particles of red clay soil entering the skin. It can be prevented if children grow up wearing shoes all the time.

6 People with podoconiosis can be successfully treated in the community using simple foot hygiene, ointment, elastic bandages, socks and shoes. Sometimes, patients with podoconiosis need urgent referral for treatment of 'superinfection' with bacteria or fungi, open wounds, or skin cancer.

7 If you educate people that podoconiosis is not infectious and can be treated and prevented, the stigma and rejection that patients often experience can be resolved.

Self-Assessment Questions (SAQs) for Study Session 39

Now you have completed this study session, you can assess how well you have achieved its Learning Outcomes by answering the following questions. Some of the questions test your knowledge of earlier study sessions in this Module. 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 39.1 (testing Learning Outcomes 39.1, 39.2, 39.3 and 39.4)

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

A Zinash is a 16-year-old girl who has had eye problems for the last four years. There are white bands inside her swollen red eyelids. You should immediately refer her to hospital.

B A newborn with red and swelling conjunctiva should be treated by putting tetracycline ointment into the eyes.

C Corneal opacity is reversible through treatment with tetracycline ointment.

D Scabies can be treated successfully with tetracycline ointment.

E The SAFE strategy for preventing trachoma stands for surgical treatment, antibiotics, face washing and environmental sanitation.

F Disability resulting from podoconiosis and lymphatic filariasis can be reduced by foot and leg hygiene, exercising the affected part and raising the legs when sitting or sleeping.

G Trachoma, scabies and podoconiosis are all communicable diseases found in conditions of poverty, overcrowding and poor access to clean water and sanitation.

SAQ 39.2 (testing Learning Outcomes 39.3 and 39.4)

If you see a girl with discharge coming from her eyes and flies landing on her face (Figure 39.19), what should you advise her family**?**

Figure 39.19 A girl with eye discharges and flies on her face.

SAQ 39.3 (testing Learning Outcomes 39.1, 39.2 and 39.3)

Name at least three communicable diseases that can result in blindness.

In each case, briefly state the cause of the eye problems.

SAQ 39.4 (testing Learning Outcomes 39.1, 39.2, 39.3 and 39.4)

How many diseases can you remember learning about in this Module where the symptoms are at least partly caused by allergic reactions by the patient's immune system to foreign material getting into the body?

In each case, briefly describe the foreign material.

Study Session 40 General Principles of Public Health Surveillance

Introduction

In Study Sessions 3–39, you have studied the major communicable diseases in Ethiopia. Communicable diseases spread easily from person to person in the community and can cause many illnesses and deaths. In this study session you will learn in detail about **public health surveillance**, which consists of close observation, recording and reporting of cases of important communicable diseases or conditions in your community. A good understanding of public health surveillance will enable you to detect the occurrence of *excess cases* of communicable diseases in your locality (that is, more than expected), and report them to the higher authorities.

Using public health surveillance data, you can also assess the magnitude (or burden) of major communicable diseases in your locality by counting the number of cases occurring over a period of time. Collecting and analysing public health data will help you to plan appropriate measures to control communicable diseases, for example, distributing appropriate medicines and educating the community about disease prevention. This study session will describe in detail the basic concepts of public health surveillance, the types of surveillance and the activities you will undertake in recording and reporting disease.

Learning Outcomes for Study Session 40

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

40.1 Define and use correctly all of the key words printed in **bold**. (SAQs 40.1, 40.2 and 40.3)

40.2 Explain the purposes of public health surveillance in Ethiopia and illustrate the features of a high-quality surveillance system. (SAQs 40.1, 40.2 and 40.3)

40.3 Describe the difference between passive, active and mixed public health surveillance systems. (SAQs 40.2 and 40.3)

40.4 Describe the activities you should conduct in your public health surveillance role as a rural Health Extension Practitioner. (SAQs 40.1, 40.2 and 40.3)

40.1 Public health surveillance

Public health surveillance of communicable diseases involves continuous data collection, examination of the data (data analysis), interpretation of the data, and dissemination of the information to concerned bodies such as the District Health Office and the nearby Health Centre. Based on the information, health workers like you, supported by the higher authorities, can take appropriate disease control measures. Surveillance activities are information loops that start with data collection and end with appropriate disease control measures, as shown in Figure 40.1 (on the next page).

Figure 40.1 Information loop involved in surveillance of diseases.

As part of a healthcare team with reponsibility for around 500 families in your community, you will routinely need to collect, analyse and interpret health-related data, and send reports of your findings to the nearby Health Centre. In addition, during an outbreak or epidemic of infectious disease (i.e. an increase in the expected number of cases), you will need to work with other health team members to actively find new cases in your catchment area. In the following sections, we will present detailed descriptions of the activities needed for surveillance as set out in the boxes in Figure 40.1.

40.2 Data collection and recording

Gathering and recording data about diseases in your community is a very important activity. As part of your routine practice, you are expected to collect health data from patients when they come to your Health Post. You are also expected to collect data during home visits about illnesses and deaths due to major communicable diseases, as well as about other health-related factors such as nutrition, immunization coverage and use of family planning methods. During data collection, you should record basic information about patients, such as their age, sex, address, symptoms of the illness and suspected disease or disorder (for example, injuries, spontaneous abortions, etc.)

Never collect data that you cannot or will not use, because it is a waste of your time, energy and resources.

Table 40.1 shows an example of data on cases of disease/disorders recorded at Zemen Health Post. Remember, you should only collect data that you can use to improve health programmes in your area.

Table 40.1 Diseases and other health problems recorded at Zemen Health Post during three days in 1996 (Ethiopian calendar).

Serial no.	Date seen	Name	*Kebele*	Sex	Age (months/ years)	Signs and symptoms	Suspected disease/ disorder
01	6/5/96	A.M.	C	M	6 mths	Cough, fever, difficulty in breathing	Pneumonia
02	6/5/96	T.F.	A	M	2 yrs	Fever, cough, rashes	Measles
03	6/5/96	N.N.	C	M	22 yrs	Laceration (cuts) on right arm	Injury
04	6/5/96	Y.E.	C	F	28 yrs	Pregnancy, fever, anaemia	Malaria
05	7/5/96	I.L.	B	F	7 mths	Fever, bulging fontanel	Meningitis
06	7/5/96	R.E.	B	F	8 mths	Fever, cough, difficulty in breathing	Pneumonia
07	7/5/96	K.L.	D	F	4 yrs	Fever, vomiting, diarrhoea	Malaria
08	7/5/96	T.I.	A	M	13 yrs	Fever, headache, bodily pains	Malaria
09	7/5/96	A.F.	D	F	10 yrs	Fever, severe muscle pains with paralysis of the lower limbs	Poliomyelitis
10	7/5/96	D.O.	D	F	24 yrs	Fever, headache, neck stiffness	Meningitis

Serial No.	Date seen	Name	*Kebele*	Sex	Age (months/ years)	Signs and symptoms	Suspected disease/ disorder
11	8/5/96	K.M.	A	M	22 yrs	Watery diarrhoea	Diarrhoea
12	8/5/96	U.G	A	F	20 mths	Fracture, left upper arm	Injury
13	8/5/96	P.F.	C	M	23 mths	Cough, fever, rashes	Measles
14	8/5/96	H.I.	C	F	24 yrs	Vaginal bleeding at four weeks pregnant	Spontaneous abortion
15	8/5/96	G.T.	C	F	21 yrs	Fever, shock	Malaria
16	8/5/96	W.T.	A	F	16 yrs	Five weeks of cough, fever, weight loss	Tuberculosis
17	8/5/96	R.Y.	B	M	26 mths	Diarrhoea, vomiting, dehydration	Diarrhoea
18	8/5/96	A.C.	C	M	1 yr	Fever, cough, difficulty in breathing	Pneumonia

40.3 Analysis and interpretation of public health data

Data analysis is the organisation and systematic examination of the data you have collected. **Data interpretation** is the process of understanding and communicating the meaning of your data. These are the next steps in surveillance after data collection and recording. Before you can explain what your data means (interpretation), you need to organise the data in a meaningful way, and then analyse the data. A particularly useful analysis to carry out is to calculate the number and types of new cases (the *incidence rate*) of every disease or disorder, and see how the occurrence is changing over time. This section shows you how to do this.

Techniques of data analysis and interpretation are given in the Module on *Health Management, Ethics and Research.*

40.3.1 Counting the number, percentage and types of cases

In order to count the number of cases of a particular disease or disorder, you need to be able to decide if a person really has that condition or not. You make your diagnosis based on criteria given in a **case definition**, i.e. a set of standard descriptions of the disease. You will learn about case definitions in detail in Study Session 41.

To calculate the percentage of cases that are due to a particular disease or disorder, you *divide* the number of cases of that condition (e.g. malaria) by the total number of cases of all diseases and disorders combined, and *multiply* the result by 100.

For example, there were four cases of malaria in the three days covered by the data in Table 40.1, and 18 cases in total of all diseases or disorders. The percentage of malaria cases is therefore:

$4 \div 18 \times 100 = 22.2\%$.

So 22.2% of all cases seen in those three days in Zemen Health Post were due to malaria.

Now complete Activity 40.1 on the next page.

Activity 40.1 Ranking causes of disease/disorder in order of magnitude

Take a pen or pencil and a sheet of paper, and draw a table ranking the causes of disease/disorder shown in Table 40.1 according to their magnitude (i.e. the largest number at the top and the smallest number at the bottom). For each disease/disorder listed in your table, give the number of cases seen, and calculate the percentage of the total cases that were due to this cause.

Comment

Your table should look like Table 40.2 below.

- Use your version of Table 40.2 to answer the following question. What is the highest ranking (i.e. most common) disease/disorder among people attending the Zemen Health Post during the three days of data collection, and what is the second most common diagnosis?
- Malaria is the most common disease/disorder and pneumonia is the second most common diagnosis, as Table 40.2 shows.

Table 40.2 List of causes of disease/disorder seen at Zemen Health Centre during three days, ranked in order of magnitude (based on data in Table 40.1).

Disease/disorder	Number of cases	Percent of total cases
Malaria	4	22.2% (4/18)
Pneumonia	3	13.6% (3/18)
Measles	2	11.1% (2/18)
Injury (laceration, fracture)	2	11.1% (2/18)
Meningitis	2	11.1% (2/18)
Diarrhoea	2	11.1% (2/18)
Tuberculosis	1	5.5% (1/18)
Polio	1	5.5% (1/18)
Abortion	1	5.5% (1/18)

40.3.2 Incidence rate

The **incidence rate** is a very useful measure of the frequency of *new* cases of a disease or disorder occurring in your community over a given period of time (usually a year, month, or a week during new outbreaks). Calculating the incidence rate at intervals enables you to assess whether a particular health condition is improving or getting worse in your community over time.

The incidence rate is calculated using a simple formula, which has a *numerator* (the number above the line in a fraction) and a *denominator* (the number below the line in a fraction). To calculate the incidence rate for a particular disease/disorder, you need to know:

- The total number of new cases of that condition seen in a particular population (country, region, town, village) during the period you are interested in (this is the numerator)

- The total number of people in the population you are interested in, during the same period (this is the denominator).

You divide the numerator by the demoninator and multiply the result by 1,000. This is the traditional way of expressing an incidence rate, as the number of new cases of the disease/disorder per 1,000 people in the population. The formula is given in Box 40.1.

Box 40.1 Formula for calculating the incidence rate of a disease/disorder

Incidence rate per 1,000 population =

$$\frac{\text{Number of new cases occuring in the population in a given period of time}}{\text{Total number of people in the same population during the same period of time}} \times 1{,}000 \text{ population}$$

■ Imagine that there were 50 new cases of typhoid fever in your community during June 2010. The total population of your community was 5,000 people. Calculate the incidence rate of typhoid in your community in that month.

□ The number of new cases of typhoid = 50
and the total population = 5,000.

Divide 50 by 5,000 and multiply the result by 1,000 to calculate the incidence rate per 1,000 people in this population:

$$\text{Incidence rate per 1,000 population} = \frac{50}{5{,}000} \times 1{,}000 = 10$$

Therefore, the incidence rate of typhoid in June 2010 in this community was 10 new cases in every 1,000 people in the population.

40.3.3 Analysing public health data by person, place and time

The distribution of a disease can be described by recording which person was affected (who), the place where the case occurred (where) and the time when it occured (when). Information about the person affected should include their age, sex, ethnic group, religion, occupation and marital status (Figure 40.2, on the next page). Place of illness may be household, *kebele* or *woreda*. Time of illness can be recorded as a day, week, month or year.

Figure 40.2 Public health data about a population should record the age, sex, ethnic group, religion, occupation and marital status of each individual. (Photo: Basiro Davey)

- Can you describe the distribution of malaria and pneumonia in Table 40.1 by the *age* of the patients (compare those aged five years old or younger, with those aged over five years), and the *sex* of the patients? Express your answer in words and construct a table showing the distribution of cases based on their age and sex.

- Three out of the four malaria cases occurred in patients above the age of five years; all three pneumonia cases occured among children under five years. Three out of four cases of malaria occured in females, while two out of three cases of pneumonia occured in males. Table 40.3 shows this distribution.

Table 40.3 Distribution of malaria and pneumonia cases at Zemen Health Centre during three days, by the age and sex of the patients.

Age/sex of patients	Malaria cases (4)	Pnuemonia cases (3)
Age		
< = 5 years	1	3
> 5 years	3	0
Sex		
male	1	2
female	3	1

The symbol < = means 'less than or equal to'. The symbol > means 'greater than'.

40.3.4 Comparing data in different time periods

In order to assess your progress in preventing communicable diseases and other disorders in your community, it is essential to compare the incidence rate (explained above) of each condition at different times (e.g. in the present year compared to the previous year).

- Suppose that the incidence rate of typhoid in a community was 10 per 1,000 population in 2009, whereas in 2010 it was 50 per 1,000 population. How has the incidence of typhoid in this community changed?

- The incidence of typhoid has increased sharply – it was five times higher in 2010 than it was in 2009, having increased to 50 per 1,000 population from 10 per 1,000.

When the incidence of a disease has increased compared to the previous figure, it may indicate an epidemic, so you should immediately report it to the Health Centre and/or District Health Office. It is also important to describe the distribution of cases by age, sex and place of residence. You will learn more about epidemic surveillance and reporting in Study Sessions 41 and 42.

40.4 Reporting public health surveillance data and getting feedback

After you have analysed and interpreted your public health surveillance data, you should prepare a report and send it to your supervisor at the nearby Health Centre. For monthly reports, you can summarise the data as in Tables 40.1 to 40.3. For **immediately reportable diseases** (diseases that should be reported within 30 minutes), such as polio and cholera, you should use other reporting forms which are described in Study Session 41. The Health Centre or District Health Office will use your report for planning and allocation of resources, such as drugs and other Health Post supplies (Figure 40.3). They may also use the data to improve health services, assess the progress of activities of the health institutions and control an epidemic.

Figure 40.3 Your reports help in the effective planning and allocation of resources for your Health Post. (Photo: Basiro Davey)

Always try to get oral or written feedback on your report from your supervisor at the Health Centre and/or officials at the District Health Office, because they can help you to improve your work.

40.5 Linking surveillance information to practice

A national surveillance system collects information about communicable diseases from all health facilities in the country. Surveillance is important at all levels of the health system, including your Health Post. Each institution is responsible for sending reports about disease to health offices at a higher level, at the time specified by the health authorities. Reports contain information about the types of diseases seen, the numbers of people affected by the disease, and their age, sex, place of residence and so on.

The Ethiopian Federal Ministry of Health (FMOH) analyses the data from health facilities (Hospitals, Health Centres and Health Posts) all over the country. Based on these data, the top ten causes of illness and death in adults and in children under five years are determined.

Note that an important purpose of public health surveillance is to give you and other health professionals an 'early warning' so you can take rapid and effective action against epidemics of communicable diseases. You are part of the national surveillance system and you can obtain useful information about communicable diseases in your catchment area, which will help you to prevent and control infection more effectively.

In summary, the information collected from health facilities is useful to:

- Describe the magnitude and distribution of diseases by place, time and personal characteristics such as age and sex
- Allocate resources such as drugs to the District Health Offices based on the magnitude of diseases
- Identify epidemics in time before they spread
- Evaluate progress towards their control.

Remember that there is no reason to carry out surveillance if the data collected are not used to improve health programmes, or to deliver better services or to control diseases in the community. Your collection and interpretation of data should help you to take action, for example to control outbreaks related to food or waterborne diseases, measles, malaria and other types of infectious diseases common in your area. These actions will be covered in Study Session 42 when we talk about epidemics and outbreaks of diseases.

40.6 Types of public health surveillance

There are three basic types of surveillance systems – passive, active and mixed surveillance – and you need to know about and do them all.

40.6.1 Passive surveillance

Passive surveillance refers to the collection of data by health facilities as part of their routine work of diagnosis and treatment (Figure 40.4). It is called 'passive' because the data is obtained only from the people who seek help from the health services – the health workers make no additional effort to contact other individuals. In Ethiopia, there is a passive surveillance system based on *monthly activity reports* and weekly reporting of **notifiable diseases**, i.e. diseases that must be reported to the health authorities. Most communicable disease outbreaks should be reported by telephone or radio to your Health Centre (as you will learn in Study Session 41).

Figure 40.4 A health worker collecting health data as part of her routine practice; here she is asking mothers about the immunization status of their infants. (Photo: UNICEF Ethiopia/Indrias Getachew)

Figure 40.5 shows the flow of passive surveillance information in Ethiopia. Under this system, your Health Post and other facilities are required by the Federal Ministry of Health (FMOH) to report all collected data about diseases in your community on a regular basis. The reports are made routinely at agreed intervals (e.g. every month) without being requested. As the solid arrows in Figure 40.5 indicate, Health Posts report surveillance data to Health Centres, the Health Centres report data to the *woreda* District Health Offices, and so on until the information reaches the FMOH, the highest level. The broken arrows show that exchange of information also occurs in the opposite direction.

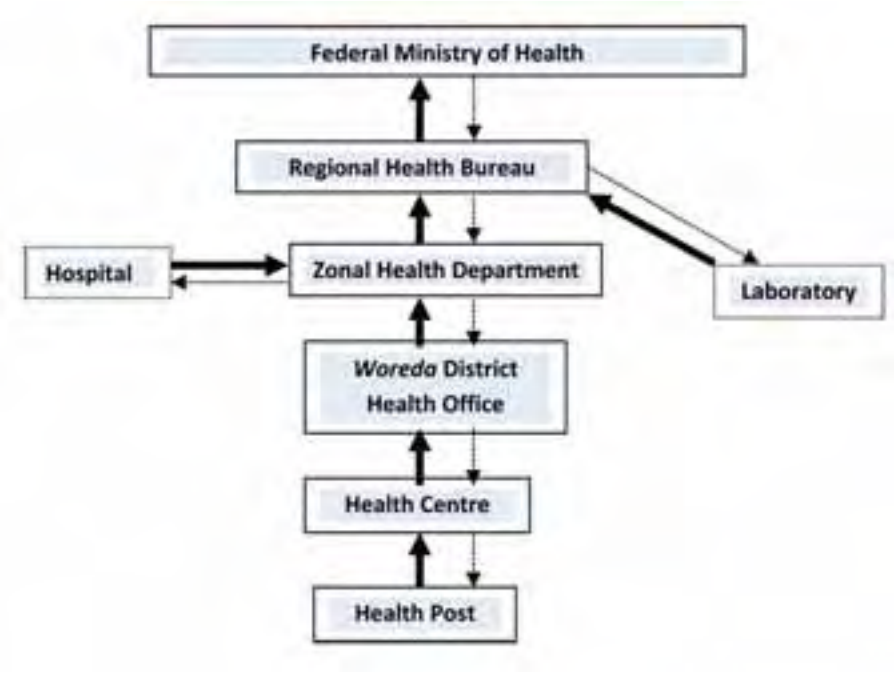

Figure 40.5 Passive surveillance information flow in Ethiopia. The solid arrows show the initial route of information flow. The broken arrows show that contact and information can also flow in the opposite direction.

■ What do you think is the importance of the solid arrow from the Laboratory to the Regional Health Bureau (RHB) in Figure 40.5?

□ Laboratory confirmation of a clinical diagnosis is important in providing accurate data on confirmed cases of communicable diseases in the community.

Passive surveillance is cheap to operate, because it takes place as part of routine health-service work, and it helps you and the higher authorities to monitor the occurrence of many diseases and other health problems. However, it has some disadvantages. The surveillance reports may take a long time to reach the highest level, and some key information may be lacking (e.g. if the health worker forgets to collect data on a statistic such as the sex or age of some patients).

■ What gaps could there be in the data on diseases/disorders in a community if the data are only collected through passive surveillance?

□ Passive surveillance misses all the cases out in the community in people who haven't sought help from the health services. This gap is a particular concern in remote areas, where people may not be able to access health services easily.

40.6.2 Active surveillance

The second type of surveillance is called **active surveillance**, in which the health professionals actively seek to collect data from all possible cases in their area, under instruction to do so from a higher level in the health system. Active surveillance is usually conducted in relation to a specific disease or disorder, or it seeks to assess the takeup of a particular health service (e.g. family planning or immunization). Active surveillance data are collected because the higher health authorities request a specific surveillance report, instead of waiting for Health Posts or other health facilities to send them routine reports. In this sense, it is the opposite of passive surveillance.

Figure 40.6 shows the information flow under active surveillance in Ethiopia. The solid black arrows indicate that the FMOH, at the highest level of the health system, takes the first step and requests surveillance data from all lower levels of the health system. Intermediate levels contact those below, all the way down to the level of your Health Post. As the broken arrows show, your Health Post prepares the requested data and sends it back to the Health Centre, the Health Centre sends the data to the *woreda* District Health Office, and so on to the highest level. Note, that without a request from a higher level, the active surveillance report would not have been prepared and submitted.

Figure 40.6 Active surveillance information flow in Ethiopia. The solid arrows show the initial requests for information. The broken arrows show how the requested information flows back up the system.

Active surveillance can also be a type of *event-based surveillance*, which refers to unstructured data gathered from sources such as media reports, community concerns and rumours. For example, if there is a rumour about a measles outbreak in your community, the Health Centre will ask you to report if there are any new cases of measles during a defined period of time.

You will then have to actively collect data about new cases of measles by making house-to-house visits in your catchment area and reporting back to the Health Centre (Figure 40.7).

Figure 40.7 A Health Extension Practitioner collecting health information from a woman in a rural household. (Photo: Federal Ministry of Health, Ethiopia: *Health Extension Program Profile in Ethiopia*, 2007)

40.6.3 Mixed surveillance

Mixed surveillance means combining passive and active surveillance systems. This can work well, leading to better monitoring of communicable diseases and other health problems. Disease control programmes for HIV/AIDS, polio and malaria use a combination of passive and active surveillance systems.

So far, we have described to you the background needed to understand surveillance systems in Ethiopia. Box 40.3 summarises the features of a high-quality public health surveillance system in *any* country.

Box 40.3 Features of good public health surveillance

A high-quality public health surveillance system:

- Involves and encourages the community to report all cases of diseases and other health problems
- Uses both active and passive surveillance for effective disease control and prevention
- Collects only useful data, using a simple data collection method
- Uses laboratory services to confirm clinical diagnosis of disease
- Reports data to the higher level when required and without delay
- Quickly takes the right actions to improve services or programmes after data are reported.

Summary of Study Session 40

In Study Session 40, you have learned that:

1 Public health surveillance consists of ongoing activities of data collection, analysis, interpretation and reporting to higher levels of the health system, with the ultimate aim of preventing and controlling communicable diseases and other health problems.

2 Surveillance is useful to assess the magnitude of health problems, to identify epidemics before they can spread further, to allocate appropriate resources, and to evaluate the progress of interventions and other health services provided by the health facilities.

3 Surveillance programmes can be passive, active or mixed (passive and active) in their procedures for collecting and reporting health-related data.

4 In passive surveillance, you are expected to collect, analyse and interpret data from patients and clients and send reports to the Health Centre as part of your routine work at the Health Post.

5 In active surveillance, you are asked to actively visit households to collect information related to specific diseases or health issues.

6 You should regularly report surveillance data to the nearby Health Centre or District Health Office, keeping to any deadlines; you should request feedback on your report to help you improve your work.

Self-Assessment Questions (SAQs) for Study Session 40

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 40.1 (tests Learning Outcomes 40.1, 40.2 and 40.4)

Look at Figure 40.8 below. The surveillance activities have been arranged in the *wrong order*! List the letters from the boxes in the correct order in which these activities should be carried out.

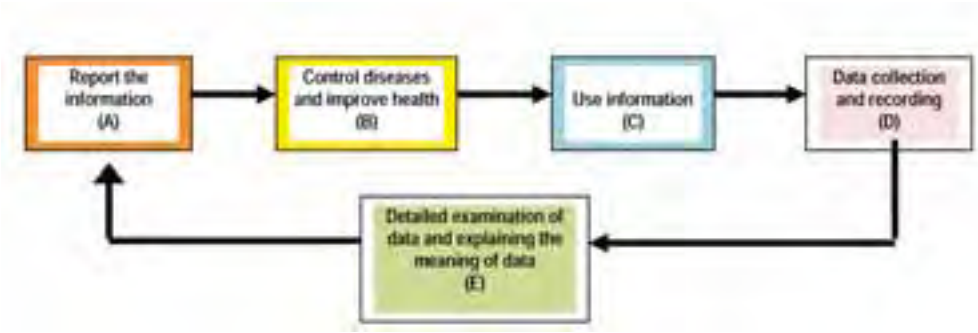

Figure 40.8 These surveillance activities are arranged in the wrong order!

SAQ 40.2 (tests Learning Outcomes 40.1, 40.2, 40.3 and 40.4)

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

A During surveillance in your community, you should always collect as much information as possible, even if you do not use it.

B One of the major purposes of public health surveillance is to detect an epidemic before it can spread very far.

C A good surveillance system uses passive and active surveillance methods to collect and report the most complete data.

D Regular recoding and reporting of public health data is not essential in a high quality surveillance system.

E Active surveillance covers many more diseases compared to passive surveillance.

SAQ 40.3 (tests Learning Outcomes 40.1, 40.2, 40.3 and 40.4)

In 2010, the District Health Office asked you to visit all households in your village to check for the presence of a cough lasting more than two weeks in adults (that is, people aged 15 years or older). The total adult population was 4,000 people in that year. Following this request, you visited all households and identified 100 people who had a cough lasting more than two weeks. Of these 100 people, 10 had a confirmed diagnosis of tuberculosis (TB) after laboratory investigation.

(a) What kind of surveillance did you conduct in the example above?
(b) Calculate the incidence rate of tuberculosis in adults in your village.

Study Session 41 Integrated Disease Surveillance and Response

Introduction

In Study Session 40 we considered what public health surveillance means and the activities it involves. In this study session, we will consider the **Integrated Disease Surveillance and Response (IDSR)** system. IDSR involves carrying out disease surveillance activities using an integrated approach. An integrated approach means that data on all important diseases will be collected, analysed, interpreted and reported in the *same* way, by the *same* people who normally submit routine report forms on health-related data. In this study session, we will also consider the *case definitions* of priority diseases in Ethiopia, and how priority diseases are reported. Proper understanding of IDSR, the case definitions and reporting methods will enable you to identify, register, analyse and report priority diseases quickly and accurately to the proper authorities. These activities are essential in order to ensure that priority diseases in your community can be prevented and controlled.

Learning Outcomes for Study Session 41

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

41.1 Define and use correctly all of the key words printed in **bold**. (SAQs 41.1, 41.2 and 41.3)

41.2 Describe the key features and importance of the Integrated Disease Surveillance and Response (IDSR) system in Ethiopia. (SAQs 41.1 and 41.3)

41.3 Explain how you should use case definitions to identify and report cases of priority diseases and conditions in your community. (SAQs 41.1, 41.2 and 41.3)

41.1 Importance of the Integrated Disease Surveillance and Response (IDSR) system

IDSR brings many surveillance activities together to try and make sure that priority diseases can be controlled and prevented more effectively. The IDSR system requires that all important communicable diseases within a health facility are reported together, using the human and other resources already available within that facility. Collecting, analysing and reporting priority diseases in this way has several advantages:

- First, it is cheap, since the same health personnel and reporting formats are also used for routine reports of health-related data.
- Second, it creates an opportunity to computerise all the available data at the central level.
- Third, it provides training and capacity building opportunities for health personnel to develop new skills.
- Fourth, it encourages community participation to detect and respond to disease epidemics.

Thus, IDSR is a cost-effective surveillance system which addresses the major health problems of Ethiopia. Many other countries in sub-Saharan Africa have adopted a similar IDSR system.

■ From what has been mentioned above, is IDSR a passive or active surveillance system? Think back to Study Session 40 and give reasons for your answer.

□ IDSR is a passive surveillance system as the data used are collected during routine health work. Active surveillance, on the other hand, uses data collected *after* a request from higher authorities for specific information.

41.2 Priority diseases for IDSR in Ethiopia

Priority diseases are diseases that fulfil one or more of the criteria in Box 41.1.

Box 41.1 Priority disease criteria

- They have a high potential for causing epidemics
- They have been targeted for eradication or elimination
- They have significant public health importance (causing many illnesses and deaths)
- They can be effectively controlled and prevented.

Currently, there are 20 **reportable priority diseases or conditions** in Ethiopia, which are included in the IDSR system (Table 41.1). As the table shows, these 20 priority diseases are further classified into 'immediately' or 'weekly' reportable diseases. Some of the priority diseases, such as avian influenza, pandemic influenza A, cholera, measles, meningitis and relapsing fever are likely to spread quickly and to affect a large number of people. Therefore, you should always be alert for such diseases in your community, and report immediately to a health centre if you suspect, or are unsure about, a case.

Table 41.1 List of reportable priority diseases and conditions in Ethiopia in 2010 (International calendar).

I. Immediately reportable diseases (report within 30 minutes to higher authority)		**Description of the disease**
1	Acute flaccid paralysis (AFP)	Polio is the major cause of AFP (see Study Session 4 of this Module)
2	Anthrax	An acute bacterial disease, transmitted from animals to humans (zoonosis), manifested by skin lesions and (rarely) respiratory symptoms, e.g. shortness of breath
3	Avian human influenza	An acute viral disease of the respiratory tract, transmitted from birds to humans, characterised by fever, headache, muscle pain, prostration, runny nose and other symptoms of head cold, sore throat and cough
4	Cholera	Bacterial disease that causes profuse, watery diarrhoea (see Study Session 34)

5	Dracunculiasis/ Guinea worm disease	An infection of the deep part of the skin by a worm, manifested by blister formation and discharge of the worm when the affected leg of the patient is immersed into water
6	Measles	A viral disease manifested by a whole-body rash, cough and sore eyes (see Study Session 4)
7	Neonatal tetanus	A rapidly fatal bacterial disease of newborns manifested by neck stiffness, convulsions, sensitivity to bright light and inability to feed due to locked jaw (see Study Session 3)
8	Pandemic influenza A (H1N1)	An acute viral disease of the respiratory tract, transmitted from animals to humans, characterised by fever, headache, muscle pain, prostration, runny nose and other symptoms of head cold, sore throat and cough
9	Rabies	A viral disease affecting the nervous system, transmitted by the bite of a rabid dog (see Study Session 38)
10	Severe acute respiratory syndrome (SARS)	A rapidly fatal severe viral respiratory infection associated with gastro-intestinal symptoms such as diarrhoea
11	Smallpox	A viral disease manifested by a rash (but this disease has been eradicated from the world)
12	Viral haemorrhagic fever (VHF)	An acute viral disease manifested by fever, muscle pain and bleeding
13	Yellow fever	An acute viral disease of short duration, transmitted by mosquitoes, manifested by fever, muscle pain and headache
II. Weekly reportable diseases		
14	Dysentery	A bacterial or amoebic disease manifested by bloody diarrhoea (see Study Sessions 33 and 34)
15	Malaria	An acute febrile disease with chills, headaches and muscle pain, caused by plasmodium parasites transmitted by mosquitoes (see Study Sessions 5 to 12)
16	Malnutrition	A condition caused by shortage of protein, or carbohydrate or vitamins or minerals
17	Meningitis	A bacterial disease manifested by fever and stiffness of the neck (see Study Session 3)
18	Relapsing fever	A bacterial disease, transmitted by human body lice, manifested by episodes of fever, headache and muscle/joint pain (see Study Session 36)
19	Typhoid fever	A bacterial disease manifested by fever, headache, joint pain and diarrhoea (see Study Session 33)
20	Typhus	A bacterial disease, transmitted by human body lice, manifested by sustained high fever, headache and muscle/joint pain (see Study Session 36)

■ What is the difference between eradication and elimination? (Think back to Study Session 2 of this Module).

□ **Elimination** is reduction to zero (or a target very close to zero) of cases of a particular communicable disease in a particular geographic area. **Eradication** is the elimination of a communicable disease from the whole world. Polio, guineaworm disease and neonatal tetanus have been targeted for global eradication by the World Health Organization (WHO).

In addition to the reportable diseases and conditions listed in Table 41.1, you should report the health emergencies or emergency conditions listed in Box 41.2. The term **cluster** refers to a larger-than-expected number of cases with similar symptoms, but without clear evidence (at this time) that they are connected in any way. The increase in cases in a cluster could simply be a coincidence, but it could also be a sign that an **epidemic** is beginning, i.e. the rise in number is due to transmission of the infectious agents between cases. That is why you should report the conditions in Box 41.2 immediately.

Box 41.2 Health emergencies or conditions to report immediately

- Clusters of respiratory illness (including upper or lower respiratory tract infections and difficulty in breathing)
- Clusters of gastrointestinal illness (including vomiting, diarrhoea, abdominal pain, or any other gastrointestinal distress)
- Influenza-like symptoms and signs, such as fever, cough and runny nose
- Clusters of symptoms or signs indicating the possibility of meningitis (stiff neck, sensitivity to bright light, severe headache, etc.)
- Clusters of rash-like symptoms
- Non-traumatic coma (unconsciousness which is not due to an injury), or sudden death.

41.3 Role of the Health Extension Practitioner in IDSR

As a Health Extension Practitioner working and living in a community, you are likely to know the residents well (Figure 41.1). Your relationship with the community is very important and should help you in your surveillance activities. You can teach the community about priority diseases and conditions in the area so that they are aware of such diseases and report them to you. With good community participation, you can perform surveillance activities (outlined in Box 41.3) in your catchment area much more effectively.

Figure 41.1 Your relationship with the community is very important and should help you in your surveillance activities. (Photo: Basiro Davey)

Box 41.3 Role of Health Extension Practitioners in IDSR activities

Your roles are to:

- Identify cases of priority diseases and conditions in the community by using case definitions (see Section 41.4 below)
- Report any cases or possible cases to the nearest Health Centre as soon as possible
- Study suspected cases, identify everyone who is affected, and determine where and when the disease is most common
- Actively search for other cases in the community by doing home visits; inform the community about cases in the area and work with community members to find more cases
- Assist the District Health authorities to treat cases and to control the spread of the disease
- Mobilise and educate the community to prevent the disease from spreading
- Keep your community informed about the cases that have been identified and how they are being managed.

41.4 Case definitions of priority diseases

You learned in Study Session 40 that a case definition is a set of standard criteria used to help you to separate true cases (those with the disease) from suspected cases that do not have the disease. Health workers in hospitals and Health Centres should use **standard case definitions** for reporting suspected priority diseases, i.e. a definition that has been agreed and should be used by all health professionals at higher levels within the country. Standard case definitions should be applied in the same way to all the persons examined.

Standard case definitions classify cases as confirmed or suspected. A **confirmed case** shows all the typical symptoms of a disease and the infectious agent or other cause has been positively identified in a laboratory investigation. For example, in a confirmed case of malaria, the patient shows symptoms typical of malaria, such as fever, headache and joint pain, the rapid diagnostic test (RDT) is positive, and laboratory investigation of a blood smear has confirmed that the person is infected with the *Plasmodium* parasites that cause malaria (Figure 41.2). On the other hand, a **suspected case** of malaria means that the person shows symptoms of malaria, but a laboratory investigation either has not been conducted yet, or has failed to find evidence of the parasite that causes malaria.

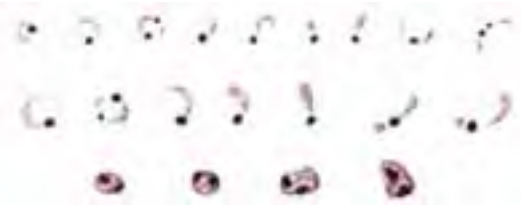

Figure 41.2 Developmental stages of the malaria parasite (*Plasmodium* species); laboratory tests demonstrating these parasites in a patient's blood confirms a case of malaria.

A **community case definition** is a simplified version of the standard case definition, adapted to suit the needs and resources of Health Extension Practitioners/Workers, community health volunteers, community members, traditional healers and birth attendants. It is useful to make a poster showing these definitions for the Health Post wall in the local language. Table 41.3 summarises community case definitions for some of the priority diseases in Ethiopia.

Table 41.3 Simplified community case definitions for use in identifying and reporting suspected priority diseases during community surveillance.

Priority disease	**Simplified community case definition**
Acute watery diarrhoea in children aged under 5 years	Any child having loose stools within the last 24 hours, or showing danger signs of loss of fluid from the body (dehydration)
Cholera	Any person aged 5 years or older with lots of acute watery diarrhoea
Diarrhoea with blood and mucus	Any person with diarrhoea and visible blood and mucus in the stools
Epidemic typhus	Any person with sudden onset of headache and fever with chills, and general muscle pains, with or without spots (rash)
Guineaworm	Any person with a history of emergence of worms from the leg
Leprosy	Any person with loss of sensation and/or weakness in the muscles of the hands, feet or face; or loss of part of the hands or feet
Malaria	Any person with fever, or fever with headache, back pain, chills, sweats, muscle pain, nausea and vomiting
Measles	Any person with fever and spots (rash)
Meningitis	Any person with fever and neck stiffness
Neonatal tetanus	Any newborn who is normal at birth, but after two days becomes unable to suck or feed
Polio	Any acute paralytic disease
Plague	Any person with painful swelling(s) under the arms or in the groin area; in an area where plague is endemic, any person with a cough, chest pain and fever
Pneumonia	Any child less than 5 years of age with a cough and fast breathing, or difficulty in breathing
Relapsing fever	Any person with a fever that returns following a previous fever
Tuberculosis	Any person with a cough lasting three or more weeks
Typhoid fever	Any person with fever, constipation or diarrhoea, confusion (delirium) and with the body in a passively prone position (prostration)
Viral haemorrhagic fever	Any person who has an unexplained illness with fever and bleeding, or who died after an unexplained severe illness with fever and bleeding
Yellow fever	Any person with fever and yellowing in the white part of the eyes, or yellowing of the skin

As a Health Extension Practitioner, you need to teach the community about these community case definitions of common diseases (Figure 41.3). The community can recognise and report common diseases to you if they understand these case definitions. The advantage of using community case definitions (instead of standard case definitions) is not only that they are simpler to understand. They are also 'broader' than standard case definitions, which means that more suspected cases will be identified using the community case definition, and fewer cases will be missed.

Figure 41.3 A health worker teaching mothers the community case definition of malnutrition in children. Malnutrition is a weekly reportable condition. Simple definitions of immediately reportable diseases can also be taught in meetings like these. (Photo: UNICEF Ethiopia/Indrias Getachew)

41.5 Reporting of priority diseases

Complete and reliable reporting of surveillance data throughout the country is vitally important, so that programme managers, surveillance officers and other healthcare staff can use the information for action. The 20 priority diseases and conditions of concern shown in Table 41.1 are classified into two categories (immediately reportable and weekly reportable), depending on their epidemic potential and whether (like polio and neonatal tetanus) they have been targeted for elimination or eradication.

41.5.1 Immediately reportable diseases

Of the 20 priority diseases in Table 41.1, 13 must be reported immediately to the next reporting level. For these **immediately reportable diseases**, a single suspected case could signal the outbreak of an epidemic, so it is important to report any cases or suspected cases to the next level of the reporting hierarchy within 30 minutes. This means you should report cases to the nearest Health Centre within 30 minutes, the Health Centre reports to the District Health Office within 30 minutes, and so on up to the highest national level (see Figure 41.4 on the next page).

Figure 41.4 Direction of reporting of immediately and weekly reportable diseases.

When you encounter a case of an immediately reportable disease, first report the information verbally or by telephone, or by sending a text using the SMS short message service. An official written report using the modified **case-based reporting format** (see Appendix 41.1) should follow immediately after the verbal report. You should remember to record the affected person's address, age, sex, vaccination status and symptoms. You should also suggest a possible diagnosis – that is, which of the 13 immediately reportable diseases you suspect. The date of referral and your signature should also be on the reporting form. After completing the form, you should immediately send the patient to the Health Centre and check by telephone to confirm the arrival of the patient at the Health Centre.

41.5.2 Weekly reportable diseases

Currently, seven diseases and conditions are identified to be reported weekly to the next reporting level (see Table 41.1). Reports should include the total number of cases and any deaths seen during the week (Monday to Sunday). Reports should be sent to the Health Centre every Monday, using the **weekly reporting format** shown in Appendix 41.2. In this format, you are expected to record the name of the disease, as well as the age and sex of the patient, and the place where the case was diagnosed (Health Post or community). For suspected cases of malaria, the laboratory result based on the rapid diagnostic test (RDT) should also be recorded.

- Before you use the weekly reporting format, what types of analysis should you do if there is more than one case of a priority disease? (Think back to Study Session 40.)

□ You should organise and report the data according to the age and sex of the cases to see if any patterns are evident. As you should remember from Study Session 40, data should be analysed in this way before reporting.

In the final study session in this Module, we describe in more detail the actions you should take to investigate and manage an epidemic of a communicable disease in your community.

Summary of Study Session 41

In Study Session 41, you have learned that:

1 In the Integrated Disease Surveillance and Response (IDSR) system, important communicable diseases within a community are integrated and reported to higher levels in the health system, using the usual human and other resources of the health facility.

2 The advantages of the IDSR system are that it is cheap and provides a training opportunity for health workers. It also makes data about all priority diseases available at a central level.

3 Priority diseases have been identified in each country to be included in the IDSR system. They are major causes of illness and death in the population, they can easily cause epidemics, they can be controlled and prevented, and they can be identified using standard or community case definitions.

4 There are 20 priority diseases of public health importance included in the IDSR in Ethiopia. They are classified as immediately or weekly reportable diseases.

5 Immediately reportable diseases should be reported to a higher level within 30 minutes, using verbal methods (radio, phone, text), followed by written reports using the official immediate reporting format. Weekly reports are sent every Monday using the official weekly reporting format.

6 As a Health Extension Practitioner, you must keep a close watch for possible cases of priority diseases in your catchment area, and quickly report any suspected or unusual cases or clusters of symptoms to the nearby Health Centre for investigation and management.

7 Standard case definitions of priority diseases are applied at Health Centres and hospitals. Simplified community case definitions have been developed for use by Health Extension Practitioners/Workers, community health volunteers, traditional healers and birth attendants, and community members. It is part of your role to educate your community on the community case definitions of priority diseases, so that they can be detected and reported as soon as possible.

Self-Assessment Questions (SAQs) for Study Session 41

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 41.1 (tests Learning Outcomes 41.1, 41.2 and 41.3)

Ayele is a 30-year-old farmer who comes to your Health Post with profuse and frequent watery diarrhoea. He has lost a lot of fluid and is very weak, so he finds it difficult to walk. His family informs you that there are several similar cases among adults in their village. What should you do?

SAQ 41.2 (tests Learning Outcomes 41.1 and 41.3)

Which one of the following health problems is *not* an immediately reportable disease?

(a) Polio
(b) Avian influenza
(c) Rabies
(d) Malnutrition
(e) Neonatal tetanus

SAQ 41.3 (tests Learning Outcomes 41.1, 41.2 and 41.3)

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

A IDSR is a type of active surveillance where data on priority diseases is actively collected in the community.

B IDSR is cost-effective and helpful for integrating data on all reportable diseases at central level.

C To identify priority diseases in the community, community health workers and member of the community should use standard case definitions.

D Diseases targeted for eradication should be reported weekly to the higher level.

E One case of a disease cannot be an indication of an epidemic.

Appendix 41.1 Modified case-based reporting form for immediately reportable diseases

I. Address	Name of Health Post _____	Name of Kebele _____	Name of Woreda _____	Name of Zone _____
II. Patient identification	Age in years _____	Sex (M/F) _____	Occupation _____	Date of interview (d/m/y) ___ ___ ___
III. Vaccination status (if applicable)	Vaccinated for BCG (Yes/NO) _____	Number of doses of oral polio vaccine _____	Number of doses of pentavalent vaccine _____	Vaccinated for Measles (Yes/NO) _____
IV. Symptoms (write the major symptoms of the patient)				
V. Possible diagnosis (AFP, Cholera, Measles, Rabies, Anthrax, Neonatal tetanus, Avian influenza, Guineaworm, SARS, Yellow fever, Viral haemorrhagic fever or Smallpox)	_____			
VI. Treatment given	Antibiotic given (Yes/NO) _____	Treated by herbal medicine (Yes/NO) _____	Other treatment (Yes/NO) _____	
VII. Date and time of referral to the health centre	Date (d/m/y) ___ ___ ___	Time (local time) _____		
VIII. Name and Signature of the Health Extension Practitioner	Name _____	Signature _____		

Appendix 41.2 Weekly Reporting Format for Health Extension Practitioners

Name of Health Post_____ Kebele_____ Woreda_____ Date of reporting (d/m/y)_____

Name and signature of the Health Extension Practitioner _____

Serial No.	Name of suspected disease	Number of cases by sex, age, address and laboratory result (for malaria)								
		Age		Sex		Number of cases seen at the Health Post	Number of cases seen in village or community	Laboratory result (for malaria)		Remark
		<=5 years	Above 5 years	Males	Females			RDT positive	RDT negative	
1										
2										
3										
4										
5										
6										
7										

Study Session 42 Epidemic Investigation and Management

Introduction

In Study Sessions 40 and 41 you learned that one use of surveillance is to find out if there is an unusual increase in cases of any communicable diseases in your community, which could signal the start of an outbreak or epidemic. In this final study session, you will learn more about the different kinds of epidemics and how to investigate and manage them. A better understanding of epidemics will help you to detect an outbreak or epidemic of a communicable disease and report it immediately to the Health Centre and/or District Health Office. You are also expected to help the District Health Team in the control of any epidemics in your catchment area.

Learning Outcomes for Study Session 42

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

42.1 Define and use correctly all of the key words printed in **bold**. (SAQs 42.1, 42.3 and 42.4)

42.2 Describe the different types of epidemics. (SAQs 42.1 and 42.3)

42.3 Describe the purpose of epidemic investigation. (SAQ 42.4)

42.4 Explain in outline the basic principles of epidemic management. (SAQs 42.2 and 42.4)

42.1 What is an outbreak and an epidemic?

If there is an increase in cases of a disease compared with the expected number, but it lasts for only a short time, or it occurs only in a limited area (e.g. in a few nearby households), the rise may be referred to as an **outbreak**. As you will remember from Study Session 1 of this Module, an **epidemic** is also an *excess* of cases compared with the number *expected*. However, an epidemic is more general than an outbreak the increase in the number of cases continues far longer (possibly months or even years), and the cases are distributed across a wider area.

For example, it may be that during January to March there are normally fewer than 10 cases of tuberculosis (TB) in your *kebele*. If you found 30 cases of tuberculosis in a particular January, followed by 39 cases in February and 45 cases in March, then you would strongly suspect that there was an epidemic of TB in your community. You would then need to find out why TB had suddenly increased.

- Which disease often causes epidemics during the months of June, September and October in Ethiopia? Why are these the months when these epidemics most often occur?
- Malaria is the major vector-borne disease that causes epidemics in the months of June, September and October in Ethiopia. This is when the conditions are humid and warm enough and there are plentiful water collections for the vector mosquitoes to breed in. You learned about malaria in Study Sessions 5–12 of this Module.

42.2 Types of epidemics

Epidemics are classified into different types according to the source of infection and modes of transmission.

■ From Study Session 1 of this Module, briefly describe the two main modes of transmission of communicable diseases.

□ They are: (1) direct modes of transmission, such as from mother to child, or from faecally contaminated hands into the mouth; and (2) indirect modes of transmission, such as through vectors, contaminated air, water, food or objects such as cooking bowls and utensils.

Based on criteria such as this, epidemics are classified into three types:

- common source outbreaks
- propagated or progressive epidemics
- mixed epidemics.

We will look at each of them in turn.

42.2.1 Common source outbreaks

Common source outbreaks occur when the rise in cases of an infection occurs after a group of people all came into contact with the *same* unsafe source of infection (the common source), such as contaminated food or water. For example, imagine a wedding where food was prepared in the morning to serve to wedding guests in the evening. If the prepared food was left outside on a hot day under the sun until evening, bacteria might multiply in the food. If this food was served to the guests in the evening without reheating it thoroughly, many of the guests might fall ill from eating the contaminated food (Figure 42.1). This kind of epidemic is called a common source outbreak because the affected guests all ate the same contaminated food at the wedding.

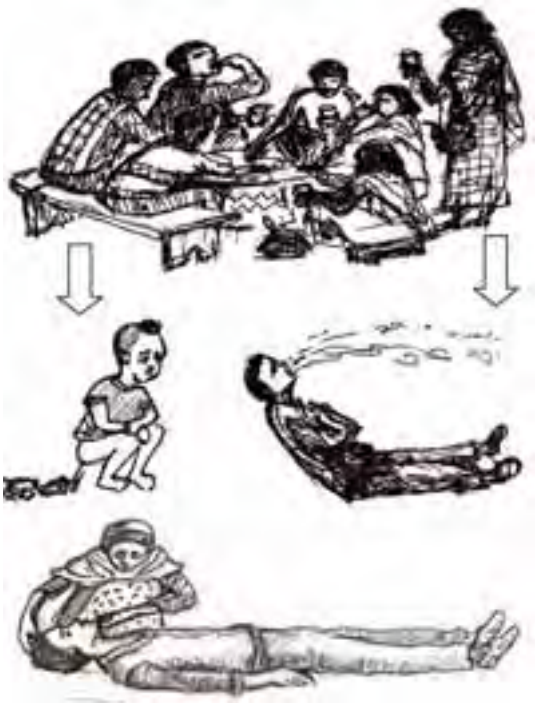

Figure 42.1 Guests eating contaminated food during the wedding become ill with diarrhoea and vomiting; the most severely affected are too ill to get up.

■ After the food had been prepared in the morning, explain what should have been done to make it safe to serve to the wedding guests in the evening.

□ Bacteria like moisture and warmth, and they multiply quickly in food left in hot sun for many hours. After the food had been prepared, it should have been kept covered in a refrigerator (Figure 42.2) or in a cool place inside the house, away from direct sun. The food should also have been reheated thoroughly before being served to the guests.

Figure 42.2 Refrigerating food reduces the risk of a common source outbreak of a foodborne infection.

A **point source outbreak** is a common source outbreak where the exposure period (e.g. the time at which the contaminated food was eaten) is short. This means that all cases who fall ill after eating the food (the common source) also have the same **incubation period**, i.e. the period between infection (eating the contaminated food) and the appearance of the first symptoms.

42.2.2 Propagated or progressive epidemics

Propagated or progressive epidemics occur when the infection spreads from person to person. The infectious agents causing the disease pass from one host to another, either *directly* from person to person (e.g. via hand shaking or kissing), or *indirectly* via vectors (e.g. mosquitoes in the case of malaria), or in water, food or another medium. The distribution of malaria cases is a good example of a propagated epidemic, because increased numbers of malaria cases occur again and again at different times. Propagated epidemics last longer than the common source outbreaks described above. This is because malaria will continue to spread in the community, as long as mosquitoes are present in the environment and there are people who carry the parasite.

■ Can you think of any epidemic-prone diseases that spread quickly in overcrowded conditions where there is poor sanitation and personal hygiene?

□ You may have thought of typhoid fever, cholera, shigellosis (bacterial dysentery), louse-borne relapsing fever and typhus. (Think back to Study Sessions 33 and 36.)

42.2.3 Mixed epidemics

Mixed epidemics show characteristics of both common source and propagated epidemics. So a mixed epidemic can start with a common source and be followed by a propagated spread. Mixed epidemics are often caused by foodborne infectious agents.

■ Typhoid fever can easily spread and become a propagated epidemic. Can you remember from Study Session 33 how the typhoid bacteria are transmitted from person to person?

□ Typhoid bacteria are transmitted from infected people to new susceptible hosts via contaminated food or water.

The organism that causes typhoid (*Salmonella typhi*) can survive in sewage for 14 days and in water for up to seven days. Water polluted by faecal matter is therefore the main source of infection for typhoid. If the whole community drinks water from the same water source (Figure 42.3), which has been contaminated with *Salmonella typhi,* there will be a common source outbreak of typhoid fever. The epidemic may continue to spread through faecal matter passing from person to person, if the people in the affected community do not improve their standards of personal hygiene, or if the water is not treated and made safe to drink. This type of spread of typhoid is called a propagated epidemic of typhoid.

Figure 42.3 Drinking water collected from the same unsafe source can expose a whole community to waterborne infection and lead to a common source outbreak, followed by a propagated spread. (Photo: Basiro Davey)

42.3 Epidemic investigation

Epidemic investigation is a set of procedures used to identify the cause, i.e. the infectious agent, responsible for the disease. It is also used to identify the people affected, the circumstances and mode of spread of the disease, and other relevant factors involved in propagating the epidemic. This is especially important if the epidemic has unusual features, if it presents a significant threat to public health, and it is not **self-limiting** (i.e. it does not end spontaneously without professional intervention).

Epidemic investigation is a challenging task for health workers. The main purpose of epidemic investigation is to control the spread of the disease before it causes more deaths and illness. As a Health Extension Practitioner, the first action you should take is to confirm the existence of an epidemic. To do this, you need to know the average number of cases of that disease during this specific month in your community in previous years, so you can compare that number with the current number of cases. Is there an excess number of cases or deaths from this disease compared to the usual occurrence? If there really are excess cases, you should report your findings to the District Health Office immediately. The reporting formats were given in Study Session 41.

The next steps (Box 42.1) will be taken by the District Epidemic Management Team, which is composed of many different health professionals such as doctors, nurses, environmental experts and others. These steps include confirming the cause (the infectious agent involved), the number of people affected (the cases) and the modes of transmission of the infection from cases to new susceptible hosts.

Box 42.1 Steps in an epidemic investigation

1 Establish the existence of an outbreak
2 Verify the diagnosis or causes
3 Define and identify cases:
   (a) Use a standard case definition (see Study Session 41)
   (b) Identify and count cases
4 Perform descriptive epidemiology, i.e. collect data on the age, sex, etc. of the cases and analyse the data to see if useful patterns emerge
5 Develop hypotheses to explain the occurrence of the epidemic:
   (a) Evaluate the hypotheses
   (b) Reconsider/refine the hypotheses
6 Carry out additional studies to confirm or reject the explanations for the epidemic:
   (a) Additional epidemiological studies
   (b) Other types of studies, e.g. laboratory tests, environmental investigations
7 Implement control and prevention measures:
8 Communicate findings to higher levels in the health system, community leaders and other local stakeholders.

42.4 Management of epidemics

Epidemic management activities include taking appropriate control measures, such as treating those who are ill to reduce the reservoir of infection, and providing health education to limit the transmission of the disease to others. Health professionals at higher levels will require your help in any measures needed to control the spread of the disease, such as giving drugs to people in the community and providing health education.

As mentioned above, you may be involved in the management of an epidemic once it is confirmed by the health authorities. The type of control measures you need to implement depend on the type of infectious agent, how the disease is transmitted, and any other factors contributing to the disease. Generally, your control measures should target the infectious agent, the source of any infection, and the treatment of those who became ill. Remember, the source of infection could be humans or animals, or non-living things in the environment.

If you do not implement the correct control measures, the epidemic may continue to spread in your area. For example, if contaminated food is the source of an outbreak in your community, you will need to control the outbreak by teaching the community about food hygiene (Figure 42.4), so they are not exposed to contaminated food. If it is caused by contaminated water, you should educate them not to drink the water until it is treated with chlorine. If mosquito breeding sites are the source of a malaria epidemic, you will need to teach the community to clear the breeding sites for mosquitoes.

Figure 42.4 Teaching community members about preparing food safely can prevent an epidemic of foodborne infection.

This short discussion of epidemic investigation and management brings the *Communicable Diseases* Module to a close. We hope that after studying the 42 study sessions and completing your practical training attachments, you will feel confident to identify, treat, refer, prevent and control communicable diseases effectively in your community, and report cases accurately and at the proper time.

Summary of Study Session 42

In Study Session 42, you have learned that:

1 An epidemic is the occurrence of more cases of a disease than would be expected in the population at that period of time. An outbreak is an increase in cases for a short time in a limited area.

2 A common source outbreak is an epidemic which arises from a single source of infection, and where most people fall ill after the same incubation period.

3 A propagated epidemic occurs when the infection spreads from one person to another, e.g. through the air, via a vector, via contaminated food or water, or during unprotected sexual intercourse.

4 A mixed epidemic can start with a common source and be followed by a propagated spread.

5 An epidemic investigation is conducted to rapidly identify the cause of an outbreak or epidemic and to take effective actions to contain and prevent the spread of the disease.

6 Epidemic investigation and management involves team work. Your role as a Health Extension Practitioner is to report the occurrence of an epidemic, to mobilise and educate the community, and to assist the District Health authorities in carrying out control and prevention measures as required.

Self-Assessment Questions (SAQs) for Study Session 42

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 42.1 (tests Learning Outcomes 42.1 and 42.2)

Explain the difference between common source and propagated epidemics, and give one example of each.

SAQ 42.2 (tests Learning Outcome 42.4)

If an outbreak is spread via a contaminated community water supply in your catchment area, what action should you take as a Health Extension Practitioner?

SAQ 42.3 (tests Learning Outcomes 42.1 and 42.2)

What differences would you expect to find if you could measure (a) the incubation period in an epidemic of HIV/AIDS in a village and (b) the incubation period in an epidemic caused by eating contaminated food at a birthday celebration?

SAQS 42.4 (tests Learning Outcomes 42.1, 42.3 and 42.4)

Suppose at your Health Post you have seen 11 cases in three days of people who have acute watery diarrhoea, and recorded them as in Table 42.1. One patient (case 7) died soon after arrival at the Health Post.

(a) Describe the distribution of the cases by the sex of the patients.
(b) What diagnosis do you suspect from reviewing these 11 cases? Explain your answer.
(c) What action should you take?

Table 42.1 Number of cases of acute watery diarrhoea recorded at a Health Post during a period of three days in 2002 (Ethiopian calendar).

Case	Age in years	Occupation	Sex	Address/*kebele*	Date illness began
1	25	Teacher	Male	01	Jan 3, 2002
2	29	Housewife	Female	01	Jan 4, 2002
3	45	Farmer	Male	01	Jan 5, 2002
4	35	Farmer	Male	01	Jan 4, 2002
5	38	Teacher	Female	01	Jan 5, 2002
6	25	Day worker	Female	01	Jan 4, 2002
7	10	Child	Male	01	Jan 4, 2002
8	29	Housewife	Female	01	Jan 4, 2002
9	22	Housewife	Female	01	Jan 3, 2002
10	39	Farmer	Male	01	Jan 3, 2002
11	21	Farmer	Male	01	Jan 5, 2002

Notes on the Self-Assessment Questions (SAQs) for *Communicable Diseases*, Part 4

Study Session 32

SAQ 32.1

A Poliomyelitis is caused by the poliovirus

B and E Shigellosis and cholera are both caused by bacteria

C and G Giardiasis and amoebiasis are caused by protozoa parasites

D and F Ascariasis and taeniasis are caused by helminths (worms).

SAQ 32.2

(a) Defaecation in the open fields increases the risk of faeco-oral diseases occurring because the soil becomes contaminated with the causal infectious agents. Infection can be transmitted to susceptible members of the community in several ways: via unwashed hands after defaecation, working or playing in the soil; unwashed or inadequately cooked fruit and vegetables grown in contaminated soil; and via flies crawling on faeces and then landing on food, utensils or hands.

(b) The prevention measures that this community could apply to reduce the risks are to build latrines for every household, dispose of faeces and other wastes safely, avoid open defaecation in fields, and adopt hygienic practices such as thorough handwashing and safe preparation of food.

SAQ 32.3

(a) This child is suffering from acute watery diarrhoea with signs of severe dehydration.

(b) You should advise the mother to take him to a health centre or hospital urgently. Give her enough ORS solution for the journey and tell her to feed sips of it to the child on the way. Go with them if you can, or send a clearly written referral note.

(c) Explain to the mother that the child's body has lost so much fluid and salts that his body systems are no longer functioning normally and his condition is potentially life-threatening. This is why he appears lethargic, his eyes are sunken, and his skin doesn't go back quickly when pinched.

SAQ 32.4

In addition to installing the protected water pump, the villagers should also use clean containers to collect and store water and clean drinking cups; wash their hands regularly and avoid their hands touching drinking water; and boil water before drinking it, or using it to wash fruit and vegetables, or mixing formula milk for babies. These measures will reduce the indirect transmission of faeco-oral diseases by contaminated water.

Study Session 33

SAQ 33.1

A is true. Typhoid fever is transmitted mainly indirectly, via contaminated food or water.

B is *false.* The characteristic manifestations of cholera are voluminous rice-water diarrhoea and vomiting – but not bloody diarrhoea.

C is true. Shigellosis is transmitted mainly by direct person-to-person contact.

D is true. Diarrhoeal diseases can lead to severe dehydration and shock.

E is true. Viruses are the commonest cause of diarrhoea in children.

F is *false.* Typhoid fever usually presents with constipation rather than diarrhoea in adults. The main symptom is continuous high fever.

SAQ 33.2

(a) In an adult patient with bloody diarrhoea, you should start immediate rehydration with ORS, and refer him/her to a higher health facility for laboratory diagnosis of the causative infectious agents and specific treatment.

(b) You should report the suspected case to the *woreda* Health Office and request assistance in preventing an epidemic. Ask the patient's family members and neighbours about the presence of other individuals with a similar illness, and advise all contacts of the patient to apply thorough hygiene measures, including handwashing with soap and water. Make sure they control the spread of the infectious agents by boiling or disinfecting clothes, bedding or utensils used by the patient; these articles must not be washed in water sources used for bathing or drinking.

SAQ 33.3

The completed version of Table 33.3 appears below.

Table 33.3 Incubation periods and most affected age-groups for common bacterial and viral faeco-oral diseases.

Disease	**Incubation period**	**Age group for most cases**
Cholera	2 hours to 5 days	All ages can be affected
Shigellosis	1 to 3 days	2 to 3 years
Rotavirus infection	2 to 3 days	Under 5 years
Typhoid fever	1 to 2 weeks	Over 5 years

SAQ 33.4

(a) Endemic means that rotaviruses and the diarrhoeal diseases they cause are 'always present' in the country at an approximately steady rate.

(b) Bacterial and viral diarrhoeal diseases are transmitted directly by hands contaminated with faeces that make contact with the mouth, and indirectly in contaminated food, water, soil and utensils (e.g. bottles used to feed milk to infants), and by flies that have crawled over faeces.

(c) The mother tells you that the infant is still breastfeeding, eating and drinking normally. As long as it is not dehydrated, there is no need to give ORS immediately. But the mother should be advised to go on breastfeeding as much as the child will drink, and feed other nourishing food and drinks with a very clean cup and spoon. She should wash her hands frequently and thoroughly with soap, particularly after changing the infant's nappy (diaper) or cleaning its bottom. Tell her she must bring the child back to see you immediately, or take it to the nearest health centre or hospital, if its diarrhoea persists or gets worse.

Study Session 34

SAQ 34.1

(a) The diseases that you should suspect as causes of bloody diarrhoea are shigellosis (bacillary dysentery) and amoebiasis (amoebic dysentery).

(b) The diseases that you should suspect as causes of watery diarrhoea include cholera or a viral diarrhoeal disease (although rotavirus infection is not common in adults).

(c) If the patient describes his condition as greasy diarrhoea, you should suspect giardiasis.

Irrespective of the type of diarrhoea, the adult patient should be started on rehydration with ORS and referred to a higher level health facility for laboratory investigation and treatment.

SAQ 34.2

(a) Your diagnosis is infection with ascaris worms (ascariasis). You should treat the five-year-old child with 1 tablet of albendazole (400 mg) or 1 tablet of mebendazole (500 mg) to be taken orally.

(b) You should also give health education to the mother and the community on measures to interrupt faeco-oral transmission via hand-to-mouth transfer of the ascaris eggs from the soil, and prevention of transmission in contaminated water and food. Using latrines, safe disposal of faeces, and avoiding open defaecation in fields prevents contamination of soils with faeces containing the worm eggs.

SAQ 34.3

(a) The common causes of anaemia to be considered include malaria, malnutrition, a recent history of bleeding, and hookworm infection.

(b) The evidence that suggests hookworm infections is the *absence* of other obvious causes (e.g. if malaria is not locally endemic, or the malaria rapid diagnostic test is negative), and the *presence* of risk factors for hookworm – walking barefooted in areas where faeces contaminate the soil.

(c) Whatever the cause, refer Abebe to a higher level health facility for laboratory diagnosis and treatment if he has hookworms, or diagnosis of another cause, and treatment for his anaemia.

SAQ 34.4

Some differences between amoebiasis and shigellosis are:

- Amoebiasis is more common in young adults, but shigellosis is more common in children below ten years
- Amoebiasis is an endemic disease that rarely causes an epidemic, whereas shigellosis (though also endemic) can rapidly spread and cause an epidemic
- The bloody diarrhoea in amoebiasis contains some formed stools, but in shigellosis only blood and mucus comes out when the patient strains to defaecate
- A patient with amoebiasis is rarely ill enough to remain in bed, whereas someone with shigellosis may be bedridden due to severe dehydration.

SAQ 34.5

(a) The route of exit for the eggs of ascaris worms and hookworms is the same – with the faeces. Prevention and control measures that are common to both diseases are use of latrines, safe disposal of faeces, and avoiding open defaecation in fields. This prevents contamination of soils with infected faeces. Another similarity is that routine deworming of children aged two to five years every six months with albendazole or mebendazole reduces the reservoir of both diseases in the community.

(b) The difference is that the route of entry for ascariasis is through the mouth, while for hookworm infection it is through the skin, usually on bare feet. Prevention and control measures for ascariasis involve prevention of hand-to-mouth transmission of the infectious agents, and avoiding contamination of food and drinking water. In addition, to the measures described in (a), prevention and control measures for hookworm include wearing shoes.

Study Session 35

SAQ 35.1

Fever, cough and fast breathing in old age can be indicators of severe pneumonia. Therefore, the man should be referred to a health centre or hospital immediately for further assessment and specialised treatment.

SAQ 35.2

A is *false*. A 40-day-old child with fast breathing should be immediately referred to a hospital or health centre for treatment. He may develop serious complications like pneumonia.

B is true. *Streptococcus pneumoniae* bacteria can cause acute otitis media and pneumonia.

C is *false*. Rheumatic heart disease is due to damage of the heart tissue by antibodies produced to attack Group A *Streptococci*. It is not caused by bacterial infection of the heart.

D is true. Bacterial pneumonia in children is usually more severe than viral pneumonia. The clinical manifestations of bacterial pneumonia include fever, cough, fast breathing, chest in-drawing and stridor. The clinical manifestations of viral pneumonia develop gradually and include fever, cough and wheezing.

E is *false.* There is not currently a vaccine available in Ethiopia to immunize against the Group A *Streptococci* that cause pharyngitis.

SAQ 35.3

Chest in-drawing, stridor, respiration rate faster than 40 breaths per minute, and the presence of general danger signs such as being unable to eat or drink, lethargy or loss of consciousness, indicate a classification of severe pneumonia in a four-year-old child.

SAQ 35.4

Co-trimoxazole (c) is the preferred drug for treating acute otitis media or non-severe pneumonia at Health Post level. If co-trimoxazole is not available, then (e) (amoxicillin) should be given.

SAQ 35.5

The completed version of Table 35.5 appears below.

Table 35.5 Prevention and control measures against ARIs.

Action	**Is it prevention?**	**Is it control?**
Early diagnosis and treatment		X
Adequate nutrition	X	
Immunization against respiratory tract infections	X	X
Reduction of indoor smoke pollution	X	
Coughing or sneezing into a cloth, or turning away from other people		X

Study Session 36

SAQ 36.1

(a) The major similarity in the way that relapsing fever (RF) and typhus are transmitted from person to person is that the infectious agents of both these vector-borne diseases are transmitted by the human body louse. Lice acquire the causative bacteria when they take a blood meal from an infected person, and they transmit the bacteria to new hosts when people come into close contact with infected lice in clothes, bedding or on bodies. The bacteria causing both diseases multiply in the gut of the louse. The infection enters the new host through breaks in the skin, caused mainly by scratching the itching louse bites.

(b) One difference is that the bacteria that cause RF are transmitted in the fluids leaking from crushed lice, whereas the bacteria that cause typhus are transmitted in infected louse faeces.

SAQ 36.2

There is poor personal hygiene in the village. Relapsing fever and typhus can quickly spread in such poor hygienic conditions if someone brings infected lice into the village on their body or clothes. You have to educate families to wash their clothes, bedding and bodies frequently to prevent diseases related to poor personal hygiene, particularly relapsing fever and typhus.

SAQ 36.3

A is *false*. Relapsing fever and typhus have similar clinical manifestations such as fever, headache, joint and muscle pains. It is very difficult to distinguish between them by clinical manifestations alone, without laboratory investigations.

B is *false*. Relapsing fever and typhus can occur at any season if poor hygienic conditions and overcrowding encourage lice infestation.

C is *false*. Treatment with drugs is not sufficient to control an epidemic of relapsing fever or typhus. Health education about personal hygiene, and delousing clothes and bedding with chemicals such as permethrin, are other necessary control measures.

D is true. The correct antibiotics can effectively treat relapsing fever and typhus if the patient is referred immediately.

E is true. Health workers are at risk from close contact with patients with RF or typhoid because they can get the infection from the body lice of the patient; therefore, close contact should be avoided.

SAQ 36.4

(a) Estifanos may have one of the febrile illnesses such as malaria, relapsing fever, typhus or typhoid fever.

(b) You should immediately refer him to the nearest health centre for further diagnosis and treatment. Visit his village to see the other sick persons and actively search for other cases, which you should immediately report to the District Health Office. There might be an epidemic of one of the febrile illnesses, which needs to be controlled by sustained preventive actions.

Study Session 37

SAQ 37.1

Malaria, relapsing fever, typhus, schistosomiasis, leishmaniasis, onchocerciasis and lymphatic filariasis are all vector-borne diseases prevented by integrated vector control methods. Did you remember all seven of these conditions?

SAQ 37.2

The completed table appears below.

Table 37.1 Four common vector-borne diseases and their vectors.

Vector-borne disease	**Vector**
Schistosomiasis	Freshwater snails
Leishmaniasis	Sandflies
Onchocerciasis	Blackflies
Lymphatic filariasis	Mosquitoes (*Culex* and *Anopheline* females)

SAQ 37.3

(a) The signs of this disease strongly suggest that the patient is suffering from visceral leishmaniasis.

(b) Inform the family that the disease is severe and life-threatening; immediately refer the patient to a higher health facility to confirm the diagnosis and begin treatment.

(c) Educate the family about the mode of transmission of the disease by sandflies biting humans to take a blood meal. Advise them to destroy all rubbish heaps and rodent burrows around the house, and fill cracks in walls where sandflies like to breed. They should agree to their house being sprayed with insecticide and they should cover exposed skin and sleep under insecticide-treated bed nets to avoid sandfly bites.

SAQ 37.4

(a) Cutaneous leishmaniasis is manifested by open skin ulcers, which may be large (see Figure 37.9). The skin lesions of onchocerciasis are characterised by changes in skin colour and the formation of large numbers of nodules (look back at Figure 37.15a).

(b) In addition to the physical disabilities and pain caused by these conditions, the disfiguring appearance of onchocerciasis nodules and cutaneous leishmaniasis ulcers often results in stigmatisation, discrimination and rejection of patients by their communities.

SAQ 37.5

(a) Highland lakes and rivers in several parts of Ethiopia (e.g. Ziway, Hawassa, Bishoftu, Wonji, Haromay, Jimma, Bahir Dar, etc.) are affected by *Schistosoma mansoni*, which affects the intestines. *Schistosoma haematobium*, which mainly affects the bladder is limited to lowland swampy land and floodplains in the Awash and Wabe Shebele valleys and along the border with the Sudan.

(b) Children are most at risk because they are more likely to go swimming in infected water, or stand in the water while fishing. They are also more likely than adults to stand in the water to urinate or defaecate. In addition to the pain caused by the disease, infected children are usually stunted in their growth and perform poorly at school.

Study Session 38

SAQ 38.1

(a) Mr Kebede has had a Category III exposure – he is bleeding after being bitten by a dog that showed abnormal behaviour.

(b) The correct and incorrect actions are listed below:

A is incorrect. Rabies is caused by a virus. Antibiotics kill bacteria – they have no activity against viruses.

B is incorrect. Suturing the wound seals the viruses inside the body and makes it more difficult to flush it with soap and water, detergent, alcohol or iodine.

C is the correct answer. Thoroughly clean the wound and send Mr Kebede to the nearest health facility for post-exposure prophylaxis.

D is incorrect. Mr Kebede's wound is only bleeding a little bit. He does not need IV fluids! Admitting him to the Health Post delays referring him for urgent vaccination and rabies immunoglobulin treatment. The delay threatens his life!

SAQ 38.2

(a) Kemal has had close contact with a dog that has shown some abnormal behaviour, but there are no signs of any bites or scratches on his body and there are no breaks in his skin. Therefore, he is in Category I – no exposure.

(b) Kemal's family should be advised to search for the dog and approach it with great care. It should be destroyed if its behaviour is abnormal; otherwise it should be kept contained for ten days to see if it develops any signs of rabies and killed if it does. They should ensure that Kemal has no further contact with this (or any other) dog, because children are at high risk of being bitten.

SAQ 38.3

A is *false*. It is almost inevitable that a person will die if they develop symptoms of rabies, no matter what medical treatment they receive.

B is true. Taeniasis causes discomfort in people who have a tapeworm in their intestines, but the disease is almost never fatal.

C is *false*. Thorough cooking kills the tapeworm larvae embedded in the meat and prevents their transmission to humans who eat the meat.

D is true. The common symptoms of taeniasis are abdominal pain and the appearance of flat white worms in the stools.

E is true. Open defaecation in grazing lands is a risk factor for taeniasis, because the eggs deposited in human faeces are eaten by cows; the lifecycle of the tapeworm is completed when the larvae become cysticerci in the cows' muscles and people eat infected raw or undercooked beef.

Study Session 39

SAQ 39.1

A is true. Zinash has scarring of the conjunctiva (white bands inside the eyelids), i.e. trachoma grade TS. Therefore, she should be referred to hospital for surgical treatment.

B is true. A newborn with red and swollen conjunctiva could have got the infection from its mother during birth and should be treated with tetracycline eye ointment (1%).

C is *false.* Corneal opacity is a permanent type of damage and cannot be improved by treating with tetracycline ointment.

D is *false.* Scabies is caused by a parasite and can't be treated by tetracycline ointment, which is used to treat grade TF and TI trachoma. A child with scabies should be treated using BBL lotion.

E is true. The SAFE strategy for preventing trachoma stands for surgical treatment, antibiotics, face washing and environmental sanitation.

F is true. Disability resulting from podoconiosis and lymphatic filariasis can be reduced by foot and leg hygiene, exercising the affected part, and raising the legs when sitting or sleeping.

G is *false.* Podoconiosis is not a communicable disease – it is caused by contact with red clay soils, not an infectious agent. However, trachoma and scabies *are* communicable diseases found in conditions of poverty, overcrowding and poor access to clean water and sanitation.

SAQ 39.2

The family of the girl should be educated about face washing with soap and clean water every day to remove the eye discharges. Tell them that the presence of eye discharge and poor personal hygiene will transmit trachoma bacteria to other people through flies landing on the face, and dirty hands and clothing touching the eyes.

SAQ 39.3

Measles, onchocerciasis and trachoma are the three major communicable diseases that can cause blindness. In Study Session 3 of this Module, you learned that measles can cause blindness, particularly among malnourished children who are lacking vitamin A. In Study Session 37 you learned that onchocerciasis can affect the eyes and cause so-called 'river blindness' because the insect vector (blackflies) needs fast-flowing water to breed. Trachoma causes blindness due to corneal damage resulting from bacterial infection of the conjunctiva.

SAQ 39.4

Several of the communicable diseases you have learned about in this Module have clinical manifestations that are due to allergic reactions by the patient's immune system to foreign material introduced into their bodies. The foreign material may be the infectious agent itself: for example, in tuberculosis, leprosy, schistosomiasis, leishmaniasis, onchocerciasis, lymphatic filariasis and trachoma – or the allergic reaction may be to scabies mites. You may also have noted that the allergic reaction to body lice bites causes itching and scratching, which enables the infectious agents of relapsing fever and typhus to enter the body through breaks in the skin. Podoconiosis is due to an allergic reaction to red clay soils penetrating the skin of bare feet.

Study Session 40

SAQ 40.1

The correct order of surveillance activities should be: D, E, A, C and B (refer to Figure 40.1).

SAQ 40.2

A is *false.* You should only collect data which is useful for the control of communicable diseases.

B is true. Detection of an epidemic is one of the major purposes of surveillance. Surveillance can also be used to assess the magnitude of health problems, to allocate resources based on disease burdens and to evaluate progress of activities by the health facilities.

C is true. A combination of active and passive surveillance is one of the indicators of a high quality surveillance system.

D is *false*. Regular recording and reporting is one of the essential elements of a surveillance system. Without proper recording and reporting, action against communicable diseases cannot be taken.

E is *false*. Active surveillance covers specific diseases (not all diseases), unlike a passive surveillance system.

SAQ 40.3

(a) Finding cases of TB through house-to-house visits based on the recommendation of the District Health Office is an example of active surveillance.

(b) In the total adult population of 4,000, there were 10 confirmed cases of TB. To calculate the incidence rate, divide 10 by 4,000 and multiply the result by 1,000, to express the incidence rate per 1,000 of the adult population.

$$\text{Incidence rate} = \frac{10}{4{,}000} \times 1{,}000 = 2.5 \text{ per } 1{,}000 \text{ of the adult population}$$

Therefore, the incidence rate of TB in 2010 in this community was 1 case per 1,000 population.

Study Session 41

SAQ 41.1

Profuse and frequent watery diarrhoea in adults may be an indication of the occurrence of a cholera epidemic. You should report the situation within 30 minutes to the Health Centre. You should verify the existence of similar cases in the community and educate the community on environmental sanitation, such as using a latrine, ensuring a safe water supply for drinking and cooking, and using personal hygiene measures such as hand washing with soap to prevent the transmission of diarrhoeal diseases. Ayele should be started on oral rehydration solution (ORS, see Study Sessions 32 and 33) and transferred to the Health Centre urgently for specialist treatment.

SAQ 41.2

(d) is the correct answer. Malnutrition is a weekly reportable health problem, not an immediately reportable priority disease. Polio, avian influenza, rabies and neonatal tetanus are all immediately reportable priority diseases.

SAQ 41.3

A is *false.* IDSR is a type of passive surveillance where data for all important diseases are gathered routinely by health institutions.

B is true. IDSR is cost-effective, since the same human resources and formats are used to report all diseases in the community. It also creates an opportunity to integrate data on all important diseases at central level.

C is *false.* To identify cases in the community, community workers and Health Extension Practitioners should use simplified community case definitions. Standard case definitions are for use in Health Centres and Hospitals.

D is *false.* Diseases targeted for eradication, such as neonatal tetanus, should be reported immediately.

E is *false.* A single case of a disease can indicate an epidemic. For example, a single case of cholera or of acute flaccid paralysis may signal an epidemic of cholera or polio.

Study Session 42

SAQ 42.1

In a common source epidemic, there is a single source of infection and most people develop the disease after the same incubation period. Good examples are foodborne diarrhoeal diseases. In propagated epidemics, the disease is transmitted from person to person via, for example, a vector, respiratory droplets coughed or sneezed into the air, sexual contact, or some other direct or indirect method. Good examples are a malaria epidemic, or louse-borne relapsing fever or typhus.

SAQ 42.2

Educate the community to boil the water or add chemicals such as chlorine before drinking the water.

SAQ 42.3

(a) HIV/AIDS occurs in propagated epidemics. Therefore, in an HIV/AIDS epidemic, the people affected will not become sick after the same incubation period, because they were infected at different times and from different sources.

(b) By contrast, in a common source outbreak of a foodborne infection, most people will become sick after the same, single incubation period because they acquired the infection from the same food at the birthday celebration.

SAQ 42.4

(a) There are 6 males and 5 females with acute watery diarrhoea.

(b) The number of cases (11) is high in three days and may indicate the occurrence of a cholera epidemic. In particular, the death of a person over 5 years old from diarrhoea is an indicator of cholera (think back to Study Session 33).

(c) Immediately report these cases and your suspected diagnosis of cholera to the District Health Office for further investigation and management. Go into the community and see if you can find other similar cases. Educate community members on how they can prevent the spread of the infection.