MODULE

Pulmonary Tuberculosis

For the Ethiopian Health Center Team

Ethiopia Public Health
Training Initiative

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UNIT ONE

INTRODUCTION

1.1 Purpose and Use of the Module

This module is intended to serve as a general learning material about pulmonary tuberculosis by the health center team; Health Officers, Public Health Nurses, Environmental Health Technicians (sanitarians), and Medical Laboratory Technicians. It can also be used as a reference material for professionals working in health centre. The module may be used as a learning material in trainings, workshops, and seminars for members of the health centre team, community health workers, care givers and patients. The basic and general concepts about the disease and its causation, epidemiology, clinical picture, prevention and control strategies are discussed in simple and quite understandable way. It should be noted, however, that it is not a substitute for standard textbooks.

1.2 Directions for Using the Module

Before starting to read this module, please follow the directions given below:

- Study all the contents of the core module by starting with the pre test.
- Use a separate sheet of paper to write your answers and label it " Pre-test answers". The pre-test has two portions: Part one and Part two.

Part one : The questions are to be answered by all categories of the health center team.

Part two : The questions are prepared for the specific categories; Health Officer (HO), Public Health Nurse (PHN), Environmental Health Technician (EHT), and Medical Laboratory Technician (MLT).

Select and do the questions of the portion indicating your professional category.

- When you are through with the core module and sure that you have understood it proceed to read the satellite module corresponding to your profession or interest.

- Read the task analysis for the health centre team members (unit4) and compare with that of your own.

Note: You may refer to the list of glossary (unit5) and abbreviations (unit 6) at the end of the module for terms that are not clear.

UNIT TWO

CORE MODULE

2.1 Pre-Test

Answer the questions as appropriate on a separate answer sheet.

2.1.1 Part I: Pre-test questions for all categories of the health center team

Write true if the statement is correct or false if the statement is incorrect for questions 1-7; and give short answers for questions 8-12

1 Pulmonary tuberculosis is not a major public health problem in Ethiopia

2 Tuberculosis is a curable and preventable disease

3 Covering the mouth when coughing, can decrease the spread of pulmonary tuberculosis (PTB).

4 Shaking hands with a pulmonary tuberculosis patient can transmit the disease.

5 HIV/AIDS is a risk factor for developing pulmonary tuberculosis.

6 All patients with chronic cough lasting three or more weeks should be suspected as probable cases of pulmonary tuberculosis.

7 Follow up of cases of pulmonary tuberculosis is strictly the responsibility of health workers.

8 What are the risk factors for acquiring pulmonary tuberculosis?

9 What is the causative agent of pulmonary tuberculosis?

10 Mention the mode of transmission of pulmonary tuberculosis?

11 Write the most important and practical laboratory test to diagnose pulmonary tuberculosis?

12 What are the two recommended standard TB drug regimens?

2.1.2 Part II: Pre test questions for specific categories of the health center team

2.1.2.1 Questions to be answered by Health Officers

Write true if the statement is correct or false if the statement is incorrect for questions 1-10; and give short answer for questions 11-17.

1 Post primary pulmonary tuberculosis occurs due to re- infection only.

2 History of contact with smear positive adult PTB patient is one of the main criteria to diagnose PTB in children.

3 One can diagnose PTB if a one out of three sputum specimen is positive for AFB.

4 Most children with PTB are AFB positive on sputum examination.

5 Diagnosis of PTB by x-ray examination alone is reliable.

6 Patients with sputum positive PTB are treated with long course regimen.

7 INH is bactericidal and a commonly used anti-TB drug.

8 Thiacitazone can be given to a patient with PTB and HIV.

9 Ethambutol is contraindicated in children less than six years of age.

10 A patient is said to be treatment failure if she / he still remains sputum positive after two months of treatment.

11 Mention the two clinical stages in the pathogenesis of PTB?

12 Define a new smear positive PTB patient/ case.

13 List the important criteria to diagnose PTB in children.

14 What are the drugs used in the intensive phase of short course anti-TB chemotherapy for a newly diagnosed PTB smear positive patient?

15 What do you give for a three years old child who had close contact with pulmonary TB smear positive patient if the child has no signs and symptoms of PTB?

16 List the main side effects of INH and rifampicin.

17 What are the advantages and disadvantages of DOTS?

2.1.2.2 Questions to be answered by Public Health Nurses

Write true if the statement is correct or false if the statement is incorrect for questions 1-3; and give short answers for questions 4 and 5.

1 PPD is a specific diagnostic test for detection of pulmonary tuberculosis.

2 BCG can treat PTB.

3 BCG vaccine cannot prevent severe forms of TB.

4 Mention the essential anti-TB drugs.

5 State the action to be taken by the nurse for minor and major side effects of anti-TB drugs.

2.1.2.3 Questions to be answered Environmental Health Technicians (Sanitarians)

Choose the best answer for questions 1-4 and write short answers for questions 5-8.

1 Which of the following is the most efficient method to control PTB transmission at the source?

a) Allowing direct sun light to enter into living or working rooms.

b) Spitting into cans and finally disposing by burning

c) To cover the mouth when coughing and/or sneezing.

d) Preventive treatment.

2 What is the ideal living /sleeping/ space (area) recommended for adult person to prevent overcrowding?

a $0.1m^2$

b) $0.5m^2$-$1m^2$

c) $2m^2$- $3m^2$

d) None of the above

3. Which of the following has direct effect to kill TB bacilli?

a) Exhaust ventilation practice

b) Ultraviolet irradiation

c) Using facemasks

d) None of the above

4. Identify the method that is least effective in self-protection from exposure to PTB?
   a) Proper ventilation of living / working rooms effectively
   b) Treating active PTB cases.
   c) Wearing facemask to prevent inhaling infectious droplets.
   d) Allowing entrance of adequate sunlight to rooms.
   e) All of the above.
5. List five main preventive measures in the control of PTB.
6. Give one practical means of PTB control method at the source.
7. What are the major environmental control measures for PTB?
8. List six different teaching methods helpful to deliver messages about PTB prevention.

2.1.2.4 Questions to be answered by Medical Laboratory Technicians

Write true if the statement is correct or false if the statement is incorrect for questions 1-8 ; and give short answers for questions 9 and 10.

1 Sputum specimen taken at any time of the day is equally important for laboratory diagnosis of pulmonary tuberculosis

2 Acid fast bacilli are rod shaped organisms.

3 You must collect and examine two sputum smear samples from every pulmonary tuberculosis suspect.

4 Acid fast bacilli are observed through the microscope by oil immersion power

5 For the diagnosis of pulmonary TB the specimen must always be morning sputum.

6 Macroscopic examination of sputum is not part of laboratory diagnosis of PTB.

7 Mycobacterium tuberculosis can be stained easily using Gram's stain.

8 "Barakina" is one of the reagents used for concentration technique in the diagnosis of PTB.

9 Mention four methods used to get reliable and reproducible result during the diagnosis of PTB.

10 List the reagents used in Ziehl Neelsen staining technique.

2.2 Significance and Brief Description of Pulmonary Tuberculosis

The ever-increasing prevalence of pulmonary tuberculosis in Ethiopia has been made worse by the alarmingly increasing incidence of HIV/AIDS. Pulmonary TB today in Ethiopia is important not only for the magnitude of its cases, but also for the long-standing nature of the disease. The protracted schedule of its treatment consumes the meager health resources and poses difficulties to properly comply to the treatment regimens. The mortality rate of the disease is also increasing in pace with HIV/AIDS. At present the benefits of early diagnosis and treatment are also being challenged by the emergence of drug resistant mycobacterium strains.

Although pulmonary tuberculosis is one of the most contagious disease, it is preventable and treatable. Therefore, understanding the basic principles of prevention and treatment and designing applicable control strategy play a great role in the reduction of morbidity and mortality in the country.

2.3 Learning Objectives

Upon completion of the module, the reader will be able to:

1 Recognize pulmonary tuberculosis as one of the most important public health problems.
2 Define the causative agent, pathogenesis and clinical features of the disease.
3 Describe methods for the diagnosis of pulmonary tuberculosis.
4 Recognize the importance of appropriate treatment of cases in the prevention of drug resistance.
5 Describe strategies for the prevention and control of the disease.
6 Appreciate the role played by each category of health professionals.
7 Describe the principle of management.

2.4 Learning Activity 1

2.4.1 Case Study

W/o Amina Salat a 36 years old women, came to Alemaya Health Center on 5/11/97 with complaints of cough, productive sputum, weight loss and night sweating of eight weeks duration. She visited a health station in her village for the above complaints and was given injections for a week, but the symptoms worsened. Up on advice from her neighbor she came to Alemaya Health Center.

She is widowed, and illiterate. Her husband died six months back, who never appeared to health institution for his chronic cough.

There were five children living with her, the youngest being one year old and the others six , four, three and two years old. As of her statement, the youngest child , Ali had cough and fever since the last 15 days. He also had decreased appetite and weight loss. None of the children were immunized against vaccine preventable diseases. The family lived in a village 70Km away from Alemaya with no electricity and clean water supply. She used to lead the family life by selling fruits and vegetables after the death of her husband. Her monthly income was about 50 Birr and all the family members live in a small one room ‘tukul’ with no windows. Their two goats and one cow spend the night in the same tukul and the house served as a kitchen.

2.4.2 Questions Related to the Case Study

Answer the following questions based on the case study given above.

1 What do you think the health problem of W/o Amina?

2 What do you comment on the advice given by neighbors?

3 How would you see the living conditions of Amina's family?

4 What measures would you take in the family?

2.5 Definition

Pulmonary tuberculosis is a chronic infection of the lung caused by bacteria.

2.6 Epidemiology

About one third of the world's population is infected with tuberculosis. Every year three million people die from tuberculosis, mostly in developing countries where it kills one in five adults. The World Health Organization (WHO) had predicted a global tuberculosis epidemic, causing 30 million deaths during the 1990s.The number of new pulmonary tuberculosis cases world-wide is expected to increase from around seven million in 1990 to over ten million by 2000. Nearly 75% of PTB cases in the developing countries belong to the economically active group of the population. It also causes unprecedented levels of infection and deaths among women and girls. This makes TB the leading cause of death among women of reproductive age group.

In Ethiopia according to report of planning and programming department the Ministry of Health (MOH) in 1995 tuberculosis was one of the leading causes of out patient morbidity, ranking fourth (3.7 %), and the third reason for hospital admissions constituting 9.4 % of all cases admitted in hospitals. Furthermore, it was the first cause of hospital death, constituting 27% of all patients who died in hospitals. According to the MOH report in 1992 E.C. (1999/2000 G.C), TB was one of the leading causes of outpatient morbidity, ranking 8^{th} (3.35%): For additional information on latest implementing DOTs regional figures see annex I and annex II.

The National Tuberculosis and Leprosy Control Program *(*NTLCP*)* estimates that the annual number of new cases amount to about 90000 of which about 45% are open pulmonary tuberculosis cases. Some of the main reasons suggested for the widespread of pulmonary tuberculosis are HIV infection, neglect of tuberculosis program, rapidly growing slums with crowded living conditions, lack of access to modern health care and deficient medical services. A study conducted in Addis Ababa in 1999 has shown that 45.3% of Acid Fast Bacillus positive pulmonary tuberculosis cases were found to be HIV positive.

In Harar Tuberculosis Control Center (Eastern Ethiopia), between 1996 and 1998, a total of 8,629 sputum specimens were examined, of which 1357 (15.7%) were positive for acid-fast bacilli.

Risk factors which are identified to be important for development of the disease are:

- Poor nutritional status/poverty.
- Infection with HIV.
- Increased virulence and /or increased dose of bacilli.
- Increased susceptibility of infants and the elderly.
- Pulmonary TB contacts: those with cavitary PTB are at higher risk than those with non-cavitary PTB. For infants, contact with non-smear positive PTB cases is even significant.
- Miscellaneous: Hormonal therapy, diabetes mellitus (three to four times increase of risk), alcoholism, silicosis, etc.

The disease is transmitted by means of invisible droplet nuclei containing the organisms that have left the reservoir during breathing, sneezing or coughing. Transmission generally occurs indoors where droplet nuclei can stay in the air for long time.

Figure 2.1. An open PTB patient is the main source of infection in community.

2.7 Etiology and Pathogenesis

Pulmonary tuberculosis is caused by the bacillus called M*ycobacterium tuberculosis.* Occasionally it can also be caused by Mycobacterium bovis and Mycobacterium african but of much less magnitude.

The organism is an acid-fast bacillus. It is a non-motile, non-spore forming, aerobic organism. It grows and multiplies slowly, and it is killed by heat, pasteurization, boiling and Ultra Violet (UV) light. The bacilli may live for long periods in the dark and when refrigerated. They do not survive long when exposed to daylight, but are very resistant to drying.

A healthy individual is infected by inhaling the droplets, which settle and grow in the lungs resulting in the development of primary infection, which usually passes unnoticed. Depending on the circumstances a person with primary infection may progress after a latent period of months or years to post primary TB, which results in more extensive involvement of the lung tissue.

2.8 Clinical Features

Suspect a patient for pulmonary tuberculosis when presenting with the following signs and symptoms:

- Persistent cough for more than three weeks
- Sputum production which may or may not be blood stained.
- Weight loss.
- Chest pain.
- Shortness of breath
- Intermittent fever, night sweats.
- Loss of appetite, fatigue and malaise
- History of contact with a smear positive PTB cases.

2.9 Diagnosis

- Clinical features (mentioned above),
- Laboratory diagnosis:
  - Sputum smear microscopy: It is the most important and practical confirmatory test. It involves the use of Ziehl Neelsen technique for acid fast staining.
  - Culture: It is usually employed for evaluation of anti-tuberculosis drug resistance but not for routine diagnostic purpose in Ethiopia.
- Tuberculin skin testing: Used for screening and diagnostic purpose in a community with low prevalence of TB. This is particularly helpful in children suspected of TB who are under six years of age and have not been vaccinated with BCG.
- Chest X-ray: May reveal tuberculous lesions in the affected lungs. But diagnosis by means of X-ray examination only, in patients suspected of PTB, is unreliable. It is only suggestive or supportive evidence.

2.10 Case Management

2.10.1. Aims of Anti-TB drug treatment

The principal aims of anti-TB treatment are the following:

- To cure the patient of PTB,
- To prevent death from active PTB or its late effects,
- To prevent TB relapse, and
- To decrease and prevent PTB transmission to others.

In the majority of cases, treatment of PTB is successfully achieved by means of adequate chemotherapy alone. Adequate and successful chemotherapy relies on the choice of:

- Appropriate combination of drugs,
- Correct dosage, and
- Regular intake for sufficient period.

Chemotherapy is considered to be adequate if it fulfils the following.

- When it cures patients;
- When it rapidly and substantially reduces the number of actively multiplying bacteria, and
- When it prevents the development of resistance to the drugs.

Pulmonary TB treatment regimens according to the TLCT and WHO recommendations are combinations of drugs. A portion of these drugs would help to weaken and stop multiplication of the bacteria but may not kill them. These are called bacteriostatic drugs .The other drug groups are called bactericidal which have the capacity of destroying the bacteria. Bombardment of the bacteria with these drug combinations would help to eliminate the bacteria and reduce development of drug resistance if administrated and taken in appropriate manner.

2.10.2 Phases of Chemotherapy

There are two phases of treatment:

- Intensive (initial) phase: the first two or three months of treatment.
- Continuation phase: the remaining duration of treatment.

2.10.3 Standard Drug Regimens

There are two recommended standard TB drug regimens:

- Directly Observed Treatment Short Course (DOTS), which is for eight months; in DOTS the patients are given the drugs under observation by the health worker for the first two months. This direct supervision by health worker ensures patient adherence to the treatment and is given for short period of time. However, in DOTS modality of TB treatment services should be available as close to home as possible.
- Long course chemotherapy (LCC), which is for 12 months.

2.10.4 Drug Resistance

There are two types of drug resistance:

- **Primary resistance:** resistance to anti TB drugs in a person who has not taken anti TB drugs previously.
- **Secondary resistance (acquired):** resistance to anti TB drugs in a person who has been treated with anti TB drugs previously.

The most common reasons for the development of resistance are:

- Incorrect prescription and inadequate anti-TB drug combination,
- Irregular supply or use of drugs (anti-TB drug treatment not properly taken, and lack of supervision and follow up).

2.11 Prevention and Control

2.11.1 Objectives

- To interrupt transmission of the infection thereby reducing the incidence of the disease;
- To treat patients in order to achieve their cure and prevent death from the disease

2.11.2 Strategies

The WHO recommended treatment strategy for detection and cure of tuberculosis is Directly Observed Treatment, Short course. The five elements of DOTS policy package are:

- Government commitment to a national TB programme;
- Case detection through 'passive' case - finding (sputum smear microscopy for PTB suspects);
- Short-course chemotherapy for all smear - positive PTB cases (under direct observation for, at least, the initial phase of treatment);
- Regular, uninterrupted supply of all essential anti-TB drugs;
- Monitoring system for programme supervision and evaluation;

2.11.3 Preventive Measures

- Proper detection and treatment,
- BCG (Bacillus Calmete Guerin) vaccination,
- Preventive chemotherapy to high-risk groups,
- Improving housing conditions (proper ventilation and sunlight), and
- Health education.

2.11.4 Control Measures

- Passive and active case detection,
- Examination of contacts,
- Provision of chemotherapy,
- Absentee retrieval,
- Concurrent disinfection,
- Reporting of cases, and
- Surveillance and monitoring

2.11.5 Health Education

Health education ensures community involvement and raises the awareness about the effects and preventive measures of the disease. Health education should not be confined to those individuals, who come to health institutions, but should be given at different areas including schools, factories, or during important community gatherings, etc... It is important to include the following core points in informing about PTB using simple terms and based on scientific principles.

- Explain the causative agent.
- Explain how the disease is spread.
- Give clear instructions on the need for regular and uninterrupted treatment,
- Explain the importance of follow up.
- Explain the preventive and control measures.
- Encourage patients to undergo volunteer HIV counseling and test.

2.12 Learning Activity 2

Role Play (for group exercise)

- Objectives:
  - To stimulate/sensitize the learners about the disease.
  - To demonstrate that role-play can be used as a teaching method.
- Instruction:
  - Use the following story as a hint to practice role-play if your learning is taking place as a group.
- Story of a coughing patient

A coughing smoker patient who is spitting here and there comes to visit health institution supported by a relative. After a brief history of his illness, he is examined by a health officer and ordered to have different laboratory examinations. Finally, health education is given to the attendants in the health institution in which the coughing patient and his helper also attend

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UNIT THREE

SATELLITE MODULES

3.1 SATELLITE MODULE FOR HEALTH OFFICERS

3.1.1 Directions for Using This Module

- Before reading this satellite module be sure that you have completed the pre-test and studied the core module.
- Continue reading this satellite module.

3.1.2 Learning Objectives

After completion of this module the reader will be able to:

- Diagnose PTB in children and adults.
- Describe the common anti-TB drugs, their mode of action, the dose, route of administration, their adverse effects and contraindications.
- Treat and follow Pulmonary TB patients.
- Organize TB prevention and control program.

3.1.3 Learning Activity

Continued from the core module (section 2.4)

The health officer in Alemaya Health Center examined her and the pertinent findings were a chronically sick looking patient with: Temperature of 38 degree Celsius and respiratory rate of 18/minute. Her weight was 45Kg, the conjunctivae were pale, and there was no swelling of the lymph –nodes. There was no clubbing but there were crepitations in the right lung with bronchial breath sounds. She was sent to the laboratory. The blood sample, two spots and one morning sputum specimens were taken.

Accordingly the results were as follows:

WBC count-- 7500/mm3

Hgb -------- 8gm%

Sputum microscopy:

1st day spot: No AFB seen

2nd day morning: Positive for AFB (++)

2ND day spot: Positive for AFB (++)

Answer the following questions based on the case study.

1. What is your diagnosis?
2. Did the health officer request proper laboratory tests? if not what should be included?
3. How do you manage the patient to ensure high compliance if the patient has to go to her village?

Case study continued:

The health officer on duty, after assessing w/o Amina's result put her on the short course directly observed treatment(DOTS) further more the Health officer advised Amina t complete her initial (intensive phase) treatment by staying in town around the health center. Similarly, she was also informed to collect the drugs monthly for the continuation phase from the health center. W/o Amina insisted that she has five children at home where there is no body to take care of them at home. She requested if she could obtain the drugs from the clinic near her village. Nevertheless the Health officer replied that she was examined in the health center and should continue taking the medication being around the health center. W/o Amina now has no other options than following the advice given. Sometime she has to travel to back home to see her children. Under such circumstances she had missed taking the drugs for two to three days every week. However, the health center allowed Amina to take the drugs for the time she missed by considering her problems.

Answer the following questions based on the case study.

1 What do you advise Amina about her children?
2 What is your opinion about the treatment advice given to Amina at the health center?
3 Do you suggest any other possible treatment and follow up strategies for Amina?
4 What is your opinion about the interruption of treatment for two to three days per week?
5 What about compensating the drugs for the missed time?
6 How could you address treatment of PTB for patients who are in a situation like Amina?
7 What could be the possible consequences of interrupting the drugs?

3.1.4 Pathogenesis

3.1.4.1 Primary Tuberculosis

Primary infection occurs on first exposure to tubercle bacilli mostly in childhood. It may also occur in some cases in adulthood. Initial contact with M. tuberculosis occurs by inhalation. The organism is deposited at the periphery in the terminal alveoli of the lung. This deposition is called the ghon focus. The body responds to this initial deposition by an early exudative response by polymorphonuclear leukocytic infiltration, oedema and fluid accumulation at the alveolar spaces. Local spread of bacteria occurs commonly from ghon focus into the hilar lymph nodes. The ghon focus and related hilar lymphadenopathy form primary complex. From primary complex the organism may spread through the blood stream into different organs. An adequate cell mediated immunity occurs about 4-6 weeks after primary infection, not all infected cases develop clinical symptoms (disease). The size of infecting dose of bacilli and strength of immune responses determine what happens next.

Out comes of primary infection:

- No clinical disease occurs in more than 90% of cases. The immune response stops the multiplication of bacilli. Bacilli may persist in tissue for many years and positive tuberculin test is the only indication of infection.
- Hypersensitivity reaction: This is due to hypersensitivity of the body to the tuberculin protein of the bacteria.

  E.g. erythema nodosum
- Pulmonary and pleural complication.

  E.g. Patient may develop pulmonary tuberculosis.
- Disseminated disease: It can involve more than one organ.

  E.g. Lymph node and lung.

3.1.4.2 Post primary PTB

It occurs after latent period of months or years after primary infection. It may occur either by reactivation or by re infection.

- Reactivation means that dormant bacilli, persisting in tissues for months or years after primary infection, starts to multiply. This may be due to weakening of the immune system, such as HIV infection.

- Re infection means a repeated infection in a person who has already previously had a primary infection. The lesion usually affects the upper lobe of the lungs.

3.1.5 Clinical Features

In addition to what is mentioned in the core module, in some cases the patient may have clubbing of fingers and with purulent sputum, crepitations and/or bronchial breath sounds on auscultation. Chest examination may be normal, or have signs of lung collapse, fibrosis, or pleural fluid accumulation.

3.1.6 Diagnosis

3.1.6.1 In Adults

- Clinical Features.
- Sputum examination: three sputum specimens must be examined by Ziehl-Neelsen (acid fast) staining technique. PTB positive is diagnosed when at least two smear results are positive for AFB or one sputum specimen is positive with additional x-ray abnormality.
- Radiological examination*:*
- Diagnosis by means of X-ray examination only is unreliable. It should be interpreted in conjunction with signs and symptoms and it should be done after sputum examination.
- Tuberculin test:
- It is a purified protein derivative (PPD) injected intradermaly on flexor surface of forearm between wrist and elbow. It is helpful in non BCG vaccinated children under six years of age. A reaction of 10 mm or more in children can be taken as very suggestive of TB.
- Sputum culture*:*
- It is complex and takes several weeks. Therefore, it is not useful as a primary diagnostic method.

3.1.6.2 In Children

Only small proportion of children with pulmonary TB are smear positive for AFB.

Diagnosis of TB can be made when any three of the following are present or two in case of protein calorie malnutrition (PCM).

- Strongly suggestive TB signs and symptoms.
- History of close contact with PTB smear positive adult.
- X- ray finding compatible with TB.
- Positive tuberculin test in non- BCG vaccinated children.

3.1.7 Case Management

3.1.7.1 Points that should always be considered

- Always three sputum specimens should be examined in suspected cases.
- Use only recommended drug combinations.
- Convince the patient and his/her family the need to complete the full course of treatment.
- Tell the patient about the disease, the drugs used and the possible undesirable side effects of the drugs.
- Make sure all children under the age of six who have a family member with pulmonary tuberculosis are screened for symptom of tuberculosis and give the correct treatment or preventive chemotherapy.
- Be kind and sympathetic to the patient.
- Keep accurate daily records of all individual patients.

3.1.7.2 Things that should not be done

- Never treat a patient with probable pulmonary tuberculosis without examining the sputum.
- Never give a single drug alone.
- Never add a single drug alone to a drug combination if the patient is getting worse.

- Never fail to follow up the patient and make sure he/she has the full recommended course of treatment.
- Do not start tuberculosis treatment until a firm diagnosis has been made.

3.1.7.3 PTB Drugs and Treatment Regimens

- Drugs used in Ethiopia.

Essential anti tuberculosis drugs used in Ethiopia and their mode of action is given in the table3.1.1 below.

Table 3.1.1: Anti tuberculosis drugs and their mode of action.

No.	Essential anti-TB drugs and their abbreviation	Mode of Action
1.	Isoniazid (H)	Bactericidal
2.	Rifampicin(R)	Bactericidal
3.	Pyrazinamide (Z)	Bactericidal
4.	Streptomycin (S)	Bactericidal
5.	Ethambutol (E)	Bacteriostatic
6.	Thioacetazone (T)	Bacteriostatic

- Contraindications and side effects of anti TB drugs:
  - Absolute contraindications:
    - Children below six years of age..... Ethambutol
    - Pregnancy..... Streptomycin
    - Epilepsy ..... Isoniazide
    - Severe kidney damage ..... Streptomycin and Ethambutol
    - Severe liver damage ..... Rifampicin, pyrazinamide and Isoniaz id
    - HIV infection ..... Thioacetazone
  - Side effects:

Common and rare side effects of anti TB drugs are shown in the following table.

Table3.1.2: Side effects of Anti - Tuberculosis drugs.

Drugs	Common side effects	Rare side effects
Rifampicin	Jaundice, anorexia, vomiting, abdominal pain	Itching with/without rashes thrombocytopenia, anuria
Isoniazid	Jaundice, peripheral neuritis	Fever, skin rash, convulsion, psychoses
Pyrazinamide	Arthralgia	Gastrointestinal symptoms, skin rash, anemia
Streptomycin	Vestibule disturbance, deafness, renal damage (also to foetus)	Severe skin rashes
Ethambutol	Optic neuritis	Skin rash
Thioacetazone	Exfoliative dermatitis (involving mucus membrane)	

3.1.7.4 Case management Flow Chart

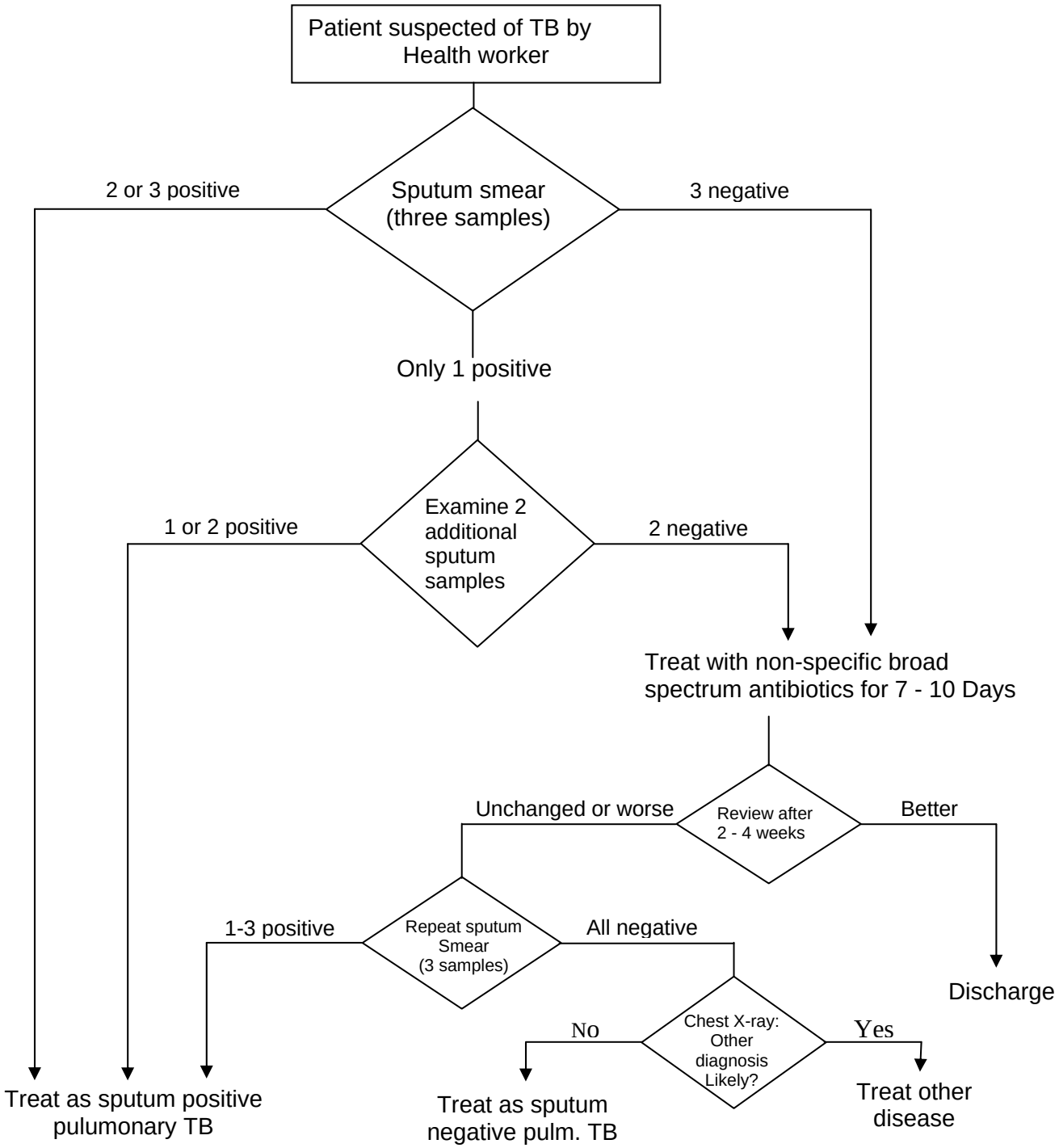

Fig: 3.1.1. Management flow chart for pulmonary tuberculosis.

3.1.7.5 Case Definitions

New case: a patient who has never had treatment of TB or has been on treatment for less than four weeks.

Relapse case: a patient declared cured or treatment completed of any form of TB in the past, but who is found to be smear positive.

Treatment failure: a patient who, while on treatment remains or becomes smear positive at the end of fifth month or later after commencing treatment.

Defaulter: a patient who has been on treatment for at least four weeks and whose treatment has been interrupted for more than eight consecutive weeks or cumulative period of more than 12 weeks.

Treatment after default: A patient who had previously been recorded as defaulted from treatment and returns to the health service with smear positive sputum.

Cured: a patient who is smear negative one month prior to completion of treatment and at least at one previous occasion.

Treatment completed: a patient who has completed treatment but in whom smear result is not available at least on two occasions.

3.1.7.6 Phases of Anti- TB Treatment

There are two phases of treatment:

- Initial phases (two or three months):

  During this phase, there is rapid killing of tubercle bacilli. Infectious patients become non-infectious within about two weeks.
- Continuation phase:

  The drugs eliminate the remaining tubercle bacilli. Killing the remaining bacilli prevents relapse after completion of treatment.

3.1.7.7 Treatment regimens

There are three different treatment regimens and each regimen is recommended for defined groups.

- **DOTS (Directly Observed Treatments Short Course):**

  Indications of DOTS:

  - Sputum positive new PTB cases,
  - Sputum negative new PTB cases who are seriously ill,
  - Relapse, treatment failures or return after default (all only when PTB positive after LCC),
  - Return after a default who are PTB negative after DOTS,
  - All forms of TB in children.

In DOTS, four drugs are given during the intensive phase and two drugs during the continuation phase. For detailed description see annex III.

- **Long Course Chemotherapy (LCC):**

  This is a 12- month treatment regimen .It is prescribed to the following group of patients:

  - New sputum negative patients with pulmonary tuberculosis,
  - Sputum negative cases returning after defaulting long course chemotherapy,
  - New tuberculosis patients who are eligible for DOTS but do not have access to treatment center which is prepared for DOTS.

  In Long course chemotherapy (LCC) three drugs are given during the intensive phase (first two months) and two drugs are given during the continuation phase (last ten months). For detailed description see annex III.

- **Re-treatment regimen;**

Re-treatment regimen is prescribed for:

- Relapse after DOTS,
- Treatment failure after DOTS,
- Return after default who are PTB smear positive after DOTS.

It is important to decrease development of multiple drug resistance.

In re- treatment regimen five drugs are given during the first two Months, four drugs during the third month of the intensive phase and three drugs are given in the continuation phase for five months. For detailed description see annex III.

3.1.7.8 Follow-Up

Remember the following points on follow up of pulmonary tuberculosis patient on treatment.

Clinical assessment

- Disappearance of symptoms like; cough, fever, sweating, and loss of appetite.
- Measure body weight.
- Inquire about possible drug side effects.
- Inquire about drug compliance.

Laboratory assessment

- If the direct smear is negative at the end of eight weeks, the continuation phase can be started.
- If the smear is positive at the end of eight weeks of intensive treatment with DOTS, the intensive phase daily treatment should be continued for four more weeks with E, R, H, and Z. After this additional four weeks of intensive treatment, continuation phase must be started regardless of the result of sputum examination.
- If in the continuation phase of treatment the result of sputum at the end of fifth month is negative, the patient is allowed to continue with the same treatment. If the result of sputum is positive at five months or more after the start of chemotherapy, the patient is declared a treatment failure and must start a full course with re-treatment.
- Improvement in hemoglobin and erythrocyte sedimentation rate (ESR).

- If the patient sputum fails to smear convert at the end of three months of re treatment refer the patient for culture and drug susceptibility test of sputum to the higher center.

3.1.8 Prevention and Control

In addition to what is mentioned in the core module:

- All children under the age of six who have family member with PTB smear positive should properly be screened and receive either full course of anti TB treatment or preventive chemotherapy.
- If the child does not have symptom of TB and Tuberculin test is not available, give preventive chemotherapy for six months (Isoniazid 5 mg/Kg/body weight) .If the child has symptoms of TB treat accordingly.
- BCG (live attenuated vaccine)
  - Protects children from severe forms of TB,
  - Contraindicated for children with AIDS,
  - Given as early in life as possible.

Now you are through with the core and satellite modules, but there are still some activities remaining as stated below.

1. **Read the task analysis of the different categories of The Health Center Team on unit 4.**
2. **Do the questions of pre-test as a post-test.**

   N.B: Use a separate answer sheet.

3. **Compare your answers of the pre and post- tests with the answer keys given on annex IV and evaluate your progress.**

3.2 Satellite Module for Public Health Nurses

3.2.1 Directions for using this Module

- Before reading this satellite module, be sure that you have completed the pre-test and studied the core module.
- Continue reading this satellite module.

3.2.2 Learning Objectives

After going through this module you will be able to:

- Perform the tuberculin skin testing procedure.
- Carry out the nursing management for PTB cases in health center and in home.
- Explain the dose, mode of action, side effect and contraindication of anti TB drugs.
- Administer BCG vaccination.
- Give health education for prevention and control of pulmonary tuberculosis.

3.2.3 Tuberculin Skin Testing: Mantoux or Purified Protein Derivative (P.P.D.) Testing

The tuberculin skin testing is intradermal test. It is based on the fact that the principal immunological response to tuberculosis is the development of cell mediated immunity which becomes detectable a few weeks after natural infection or immunization with BCG. It is usually done in children under six years of age.

3.2.3.1 Site of Injection

It is injected in to the intradermal layer of the skin on the flexor surface of the fore arm between the wrist and the elbow.

3.2.3.2 Technique of Administration

- Choose an area of skin at the flexor surface of the forearm between the wrist and elbow.

- Don’t clean the forearm with antiseptic. If you use soap and water, see the arm is dry before carrying out the test.
- Hold the syringe close and flat to the skin so that the tip of the needle touches the skin as it is introduced with the bevel up.
- The direction of the needle should be length wise on the arm. Use properly marked tuberculin syringe and a long intradermal needle.
- Inject 0.1 ml. of the tuberculin solution strictly intradermally producing a lump in the skin 5-6 mm. in diameter. You must produce a lump in the skin otherwise the test would be wrongly done.
- Mark the lump by encircling the site with a pen to ensure the accurate reading.
- Discard any unused tuberculin solution into a proper place.

3.2.3.3 Reading and reporting the test result

The result of the test is read after 72 hours in the following ways:

- Read the test reaction in a good light with the forearm slightly flexed at the elbow.
- First inspect the area for the presence of induration by slightly palpating across the injection site from the area of normal skin to the margin of induration.
- Then, the horizontal (transverse) diameter of the induration (not erythema) is measured in millimeter at its widest part i.e, transversely.
- Measure it with a transparent ruler of 10 cm in length and report the result to the medical officer. An induration measuring 10 mm or more is considered a positive reaction or highly suggestive of PTB in non BCG vaccinated children.
- The skin test result may be false negative in patients with HIV/AIDS, malnutrition, severe bacterial and viral infection, cancer or taking immunosuppressive drugs (e.g. steroids).
- The skin test result may be false positive in BCG vaccinated children, infection with atypical mycobacterium, repeated injection of P.P.D. at the same site or allergy to contaminants to the P.P.D.

3.2.4 Nursing Case Management of PTB

It includes:

- Patient education on adherence to chemotherapy, importance of supplementary nutrition, prevention of transmission to other members of the family and drug resistance.
- Universal precaution must be used in hospitalized patients.
- Direct care provision for debilitated patients.
- Emotional support and change in behavior about misbelief of TB.

Figure: 3.2.1 Directly observed therapy helps to cope development of drug resistance.

Anti PTB drugs *used in Ethiopia*

Essential anti-tuberculosis drugs used in Ethiopia and their mode of action are given in table 3.2.1 below.

Table 3.2.1 Anti- tuberculosis drugs and their mode of action

No	Essential anti-TB drugs and their abbreviation	Mode of Action
1.	Isoniazid (H)	Bactericidal
2.	Rifampcin (R)	Bactericidal
3.	Pyrazinamide (Z)	Bactericidal
4.	Streptomycin (S)	Bactericidal
5.	Ethambutol (E)	Bacteriostatic
6.	Thioacetazone (T)	Bacteriostatic

- ***Contraindications and side effects of anti-tuberculosis drugs***
- Absolute Contraindications:

The drugs listed below are absolutely contraindicated in the following specific groups.

- Children below six years--- Ethambutol
- Pregnancy ---------- Streptomycin
- Epilepsy ---------- soniazid
- Severe kidney damage--- Streptomycin and Ethambutol
- Severe liver damage ------ Rifampcin, Pyrazinamide and Isoniazid
- HIV infection ---------- Thioacetazone

- Minor Side effects:

The following minor side effects may occur:

- Rifampcin---------- Anorexia, vomiting, abdominal pain, itching with/without rash
- Isoniazid---------- Fever, skin rash
- Pyrazinamid--------- Arthralgia
- Streptomycin-------- Pain in the site of injection
- Thioacetazone----- Nausea, vomiting , diarrhoea

- Actions to be taken by the nurse*:*
  - With persistent reactions (three to five days) discontinue the treatment temporarily.
  - Give symptomatic treatment.
  - Re-institute the treatment as soon as reactions disappear. If symptoms persist, consult the medical officer.
- Major side effects:

The following major side effects may occur and require immediate attention.

- Rifampcin-- Jaundice, thrombocytopenic purpura, and anuria
- Isoniazid--- Jaundice, peripheral neuritis, psychoses
- Pyrazinamide-- Acute gout, jaundice
- Streptomycin--- Severe skin rashes, erythroderma, vestibule disturbance, deafness
- Ethambutal----- Optic neuritis
- Thioacetazone --- Exfoliative dermatitis (Steven-Johnson's Syndrome)

- Actions to be taken by the nurse:
  - Discontinue the treatment.
  - Consult a medical officer.
  - Refer the patient to the hospital for admission.

N.B. For more information on dosages of anti-tuberculosis drugs refer to annex III.

3.2.5 BCG Vaccination

BCG is a live attenuated strain of bovine tubercle bacilli. The vaccine protects children from severe forms of TB such as TB meningitis and miliary TB. There is no absolute contraindication of BCG vaccination except in children with AIDS. It is given as early as possible in life (preferably at birth). For dose and route of administration see table 3.2.2.

Table 3.2.2 Age, dose and route of administration of BCG vaccination:

Age of child	Dose	Route	Site of injection
<1 year	0.05 ml	Intradermal	Right upper deltoid
≥1 year	0.1 ml	Intradermal	Right upper deltoid

- Normal Reaction after BCG injection:

The BCG bacilli grow very slowly. A small red tender swelling about 10 mm appears around the place of immunization after about two-three weeks. Then, the swelling will become a small abscess. The abscess heals by itself and leaves a permanent round small scar about 5 mm. The scar is useful because it indicates that the child has had the vaccine.

- What to do in such reaction:

  - Tell mothers about the normal reaction.
  - Advise mothers not to put any medicine on the sore and to keep it clean.
  - Instruct to leave it open or cover it with dry dressing only.

- What to do for abnormal reaction:

Sometimes there is severe local inflammation, or a deeper abscess or the lymphatic glands near the elbow or in the axilla swell. This may be because the needle was not sterile, deep injection under the skin given by mistake, or large dose of vaccine given.

  - If the reaction remains local no treatment is needed, except a dry dressing.
  - If a very large ulcer forms or if the lymphatic glands swell refer the child to the medical officer for advice. Some of these children may need treatment.

Now you are through with the core and satellite modules, but there are still some activities remaining as stated below:

1. **Read the task analysis of the different categories of the health center team on unit 4.**
2. **Do the questions of the pre-test as a post-test.**

   N.B: **Use a separate answer sheet.**

3. **Compare your answers of the pre and post-tests with the answer keys given on annex IV and evaluate your progress.**

3.3 Satellite Module for Environmental Health Technicians (Sanitarians)

3.3.1 Directions for using this Module

- Before reading this satellite module be sure that you have completed the pre-test and studied the core module.
- Continue reading this satellite module.

3.3.2 Learning Objectives

After studying this module the learner will be able to:

- Describe the methods of PTB control at the source.
- Explain the environmental control measures for PTB.
- State the principles of treatment in the control of PTB.
- Participate in vaccination programs.
- Give health education at individual, family and community levels

3.3.3 Learning Activity

A case study continued from the core module (section 2.4)

W/o Amina Salat is highly sociable with her neighbours. She used to call many of her immediate neighbours for the coffee ceremony. She usually serves coffee in the mornings and afternoons in her small and warm tukul where five to six people including herself enjoy the coffee drinking. Her neighbours observing Amina's frequent coughing, advised her to wear warm cloths and stay in the house because the cold weather may aggravate her disease which they consider it a disease caused by cold "Dhukuba Qilensa ("Bird Beshita"). Amina never covers her mouth when coughing.

Amina is also highly liked by small children in the community. Children of the immediate neighbors gather in the evenings (until they are called by their parents for dinner) around the fireplace in Amina's home with her children. These are mostly friends of her children. Amina usually sits beside the children telling them traditional folktales which they attentively listen. Nevertheless, these days her stories are frequently interrupted by the chest pain and rigorous coughing while trying to tell the children the stories. At times, she spits on to the ash near the fire place and often observes her sputum containing blood. But still the curious children wait for her to finish the stories for them. When she feels better she would continue to tell them the folktales.

Questions for Discussion

1. What is your opinion about Amina's relation with her neighbours in the transmission of PTB?
2. What do you think about the gathering of the small children around Amina to listen to her stories?
3. How relevant was the advice given from the neighbours about her disease "Dhukuba Qilensa "?
4. What advice would you give to the community members in Amina's village and to Amina?
5. What environmental measures do you suggest to prevent disease transmission in cases such as Amina's?

3.3.4 Prevention and Control

The elements in a sound control program will be based on all what is known of the epidemiology, pathogenesis, clinical aspects and bacteriology of the disease.

Specific measures aimed at the control of PTB are those which:

- Will enhance specific resistance,
- Foster early diagnosis,
- Prevent spread of infection, and
- Provide properly applied treatment and rehabilitation of patients.

Based on these principles, the following are recommended preventive measures in the control of PTB:

- Control at the source
- Environmental control
- Treatment
- BCG vaccination
- Health education

3.3.4.1 Control at the source

- Covering the mouth when coughing or sneezing:

  As a general principle, it is more efficient to control a contaminant at the source than after it is dispersed in the environment. Effective chemotherapy is by far the most desirable form of source control, but transmission can occur before patients are suspected, diagnosed, and placed on effective therapy. The simplest mechanical method of control at the source is to cover the mouth when coughing or sneezing. At the mouth, respiratory droplets have not yet evaporated to become droplet nuclei. The droplets have enough momentum to impact the hand or tissue paper and thus be prevented from contaminating the air. While potentially helpful in reducing the number of droplet nuclei generated, covering coughs requires co-operation and does not constitute effective control alone.

- Face masks:

  Ideally patients could wear facemasks continuously but are unlikely to co-operate. Masks can not contain the force and volume of vigorous coughing, become wet with potentially infectious secretions and may then become

  effective atomizers when struck by a blast of air during a cough. Therefore it is not an adequate form of source control, but it may serve to decrease the risk of transmission to other people. So a TB suspect or a patient if possible, should wear a mask when moving from one part of a hospital to another. Health workers often wear mask to protect themselves against TB. (E.g. when working in the TB ward). In fact a mask is generally not very good at protecting the person wearing the mask from inhaling other people's infectious droplets.

3.3.4.2 Environmental control

Figure3.3.1 Improved housing decreases transmission of PTB.

- Adequate Ventilation:

By room ventilation, either by opening windows or by forced air vents, micro organisms found in room air are moved to the outdoors and dilutes those remaining with fresh outdoor air. Good and adequate ventilation helps reduce PTB transmission indoors.

There are two forms of ventilation of rooms: dilution ventilation and exhaust ventilation.

- Dilution ventilation can be achieved through door and window openings by two means:
  - Through ventilation: this is where the orientation of windows or doors in a room is arranged in a face to face or parallel position to each other.
  - Cross ventilation: this is where the position of the openings of windows or the openings of the doors are oriented in a diagonal arrangement, i.e. located on adjacent walls.
- Exhaust ventilation is a system of expelling the polluted air from a room forcefully using mechanical methods such as fans and where there is a simultaneous replacement by fresh air. Air from isolation rooms should be vented to the outdoors or disinfected before being re-circulated. Air should flow from corridors into isolation rooms but where this is not possible, air in both rooms and corridors should be disinfected.

- Avoid overcrowding:

Overcrowding is an environmental problem aggravating the transmission of pulmonary tuberculosis. In conjunction with poor ventilation, overcrowding facilitates inhalation of the organism by direct transmission from patients and indirectly from the polluted room atmosphere. Therefore, the considerations for space are crucial in relation to the residential environment to prevent transmission of the disease.

N.B. The ideal for residential space environment and housing is 1.5 persons per living room for a proper room air volume ratio. The recommended living and sleeping space per adult is $2m^2$ to $3m^2$ floor space. Our health education thus should focus on directing the public awareness towards this goal.

- Exposure To Direct Sunlight / Ultraviolet Germicidal Irradiation (UVGI):

  UVGI is well suited to disinfect the air in buildings where a hazard of PTB transmission has been identified. Sunlight is a source of ultraviolet light, which can kill TB bacilli. Therefore, ideally wards should have large windows to allow the entrance of unobstructed sunlight. Similarly, homes should also have means to allow for direct entry of sunlight into the rooms.

3.3.4.3 Treatment

- Active PTB treatment:

  From the public health point of view, the best way to prevent PTB is to provide effective treatment to the infectious PTB cases. This interrupts the chain of transmission. Good treatment programs are the best prevention programs.

- Preventive treatment:

  The aim of preventive treatment is to prevent progression of M. tuberculosis infection to disease state. A six-month course of preventive treatment is effective. However, preventive treatment for all individuals infected with M. tuberculosis is not a recommended TB control strategy. It is not feasible and cost-effective to try to identify and treat all individuals infected with M. tuberculosis who don't have clinical disease. The disease develops in only 10% of all individuals infected with M. tuberculosis.

  However, it is possible to identify certain groups of people with high risk progressing from M. tuberculosis infection to PTB disease; e.g. children under six years. It may be cost-effective to target preventive treatment to these high-risk groups.

3.3.4.4. Bacillus Calmete Guerin (BCG) Vaccination

BCG is a live attenuated vaccine derived originally from M. bovis. The benefit of BCG is to protect young children against disseminated and sever TB, e.g. TB meningitis and miliary TB. BCG has little or no effect in reducing the number of adult cases of PTB. The expanded program on Immunization (EPI) has a role in reducing PTB. BCG is not the only immunization in the EPI, which may help to protect a child against TB. Measles and whooping cough lower a child's resistance and may predispose the child to PTB. Therefore, whenever children visit health institutions, their immunization records should be checked. If they have not received scheduled immunizations, encourage the mothers to complete the courses.

3.3.4.5 Health Education

Figure 3.3.2 Proper health education ensures community involvement.

- Patient education:

PTB suspects and patients should be taught about simple measures how to decrease the risk of transmitting PTB. These include:

- Covering the mouth with the hand or using a handkerchief when coughing, or sneezing.
- Using sputum pots with lids.
- Advice to turn head aside not to directly cough on people.

- Public health education:

Education of the patient, family, contacts, health workers and community members in general about the disease as a public health problem and the importance of appropriate treatment is absolutely necessary.

Different methods of health education could be used to deliver the important messages in PTB prevention and control. The following methods may be used to teach people in an interesting way:

- Telling a story
- Using simple words
- Showing something/demonstration
- Singing of songs
- Using a drama / role play
- Encouraging discussions, etc.

Now you are through with the core and satellite modules, but there are still some activities remaining as stated below:

1. **Read the task analysis of the different categories of health center team on unit 4.**
2. **Do the questions of the pre-test as a post-test.**

   N.B.: Use a separate answer sheet.
3. **Compare your answers of the pre and post-tests with the answer keys given on annex IV and evaluate your progress.**

3.4 Satellite Module for Medical Laboratory Technicians

3.4.1 Directions for Using this Module

- Before reading this satellite module be sure that you have completed the pre-test and studied the core module.
- Continue reading this satellite module.

3.4.2. Learning Objectives

At the end of this module, the learner will be able to:

- Collect sputum specimen in appropriate time using suitable containers.
- Identify the important dyes used in the Ziehl-Neelsen staining technique.
- Prepare sputum smear.
- Perform Zihel Neelsen staining technique.
- Identify the acid-fast bacilli (AFB).
- Be aware of the possible causes of errors in Ziehl Neelsen staining technique.
- Conduct and keep appropriate recording and reporting systems.
- Practice quality control activities.

3.4.3 Collection of Sputum Specimens

For reliable laboratory diagnoses of sputum smear, a properly collected sputum specimen is mandatory. A pulmonary tuberculosis suspect should submit three sputum samples for microscopy. The chances of finding tubercle bacilli are greater with three sputum samples than with two samples or one sample. Secretions build up in the airways over night. So an early morning sputum sample obtained deep from the lung (not saliva) is more likely than a sample later in the day to contain tubercle bacilli. It may be difficult for an out- patient to provide three early morning sputum samples. Therefore, in practice an outpatient usually provides sputum samples as follows:

- Day one, sample one: Patient provides an “on the spot” sample under supervision when she / he presents to the health institution.

  Give the patient a sputum container to take home for an early morning sample to be submitted for the following day.

- Day two, sample two: Patient brings an early morning sample.
- Day two, sample three: Patient provides another “on the spot “sample under supervision.

If a patient can’t give a sputum sample, health personnel may advice him to produce a good cough and bring up some sputum. An inpatient can provide three early morning sputum samples under supervision.

N.B. For children who cannot spit out sputum, gastric wash is possible source of specimen.

3.4.4 Laboratory Diagnosis of PTB

3.4.4.1 Microscopic Examination of Sputum for Acid Fast Bacilli (AFB)

Figure 3.4.1 Sputum smear microscopy is the most important and practical method for the diagnosis of PTB.

Mycobacterium tuberculosis is non-capsulated, straight or slightly curved rod shaped organism. The organism is difficult to stain by the Gram's technique because of its resistant cell wall. However, when stained by the Ziehl Neelsen method, the organism stains red and is acid fast (AF), which is the most important characteristic of Mycobacterium. Acid fastness of Mycobacterium means that when the organisms are stained with carbol fuchsin in the Ziehl Neelsen technique, they are able to retain the red color when washed with acid solutions. The acid fastness of Mycobacterium is due to their thick cell wall which is made up of waxes and lipids that have high content of mycolic fatty acids and that is why Ziehl Neelsen technique is employed to stain Mycobacterium.

N.B The physical appearance of sputum (macroscopic examination) should be recorded. The possible descriptions include the colour with its consistency (watery, mucouid, mucoprulent, purulent and blood stained).

- Ziehl Neelsen staining technique:

This technique is the most widely used method in the identification of AFB from sputum smears in different small laboratories.

- Principle of the test

A smear is made on a slide and fixed to prevent the specimen from being washed off. Then the slide is heated to melt the waxy substance found on the cell wall of the bacteria which enables the stain to penetrate and stain the organisms.

A. Direct Method

- Procedure

1. Using an applicator stick transfer purulent part of the sputum to a slide and make a thin smear. If the sputum contains large blood clots, transfer portion of the specimen to another container and add a few drops of saponin solution to lyze the clots and free the organisms.
2. Allow the smear to air-dry in a safe place.
3. Fix the smear with one or two drops of 70% ethanol or methanol for two to three minutes or by passing the slide about three times over a flame.
4. Cover the smear with the filtered carbolfuchsin stain and heat the stain until vapour just begins to rise (do not over heat) and allow the heated stain to remain on the slide for five minutes.

5. Wash the stain with clean water.
6. Cover the smear with 3 % acid - alcohol for about 2 minutes until the smear looks pale-pink.
7. Wash off the stain with clean water.
8. Cover the smear with methylene blue (malachite green) stain for 30 seconds.
9. Wash off the stain with clean water.
10 Wipe the back of the slide and place it in a draining rack for the smear to air dry.
11 Finally, examine the smear microscopically with the oil immersion objective (100x) to look for AFB.

- Results of Ziehl Neelsen technique
  - Acid fast bacilli: red straight or slightly curved rods, occurring singly or in small groups.
  - Cells: blue/ green.

➢ Back ground material: blue /green

- Sensitivity of Sputum Smear Microscopy
- Sputum smear microscopy for tubercle bacilli is positive when there are at least 10,000 organisms present per one milliliter (ml) of sputum.
- False positive results of sputum smear microscopy

  A false positive result means that the sputum smear result is positive even though the patient does not really have pulmonary tuberculosis. This may arise because of the following:
  - Red stain stained by scratches on the slide.
  - Accidental transfer of AFBs from a positive slide to a negative one.
  - Contamination of the slide or smear by environmental Mycobacterium.
  - Various particles that are acid fast, for example food particles, precipitates and other microorganisms.
- False negative results of sputum smear microscopy

  A false negative result means the sputum smear result is negative even though the patient really does have pulmonary tuberculosis.

This may arise because of:

- Problems in collecting (patients provide inadequate samples, inappropriate sputum container used and sputum lasts too long before smear microscopy).
- Processing (faulty sampling of smear, faulty smear preparation and staining).
- Inadequate time and attention spent in examining sputum smear.
- Misidentification of patient, incorrect labeling of sample and mistakes in documentation.

▪ Reporting of sputum smears

If any definite red bacilli are seen, report the smear as AFB positive and give an indication of the number of bacteria as present on table 3.4.1.

Table 3.4.1:Report of AFB sputum Examination.

Number of bacilli seen in a smear	**Result reported**
No AFB per 100 oil immersion fields	No AFB is seen
1-9 AFB per 100 oil immersion fields	Scanty
10-99 AFB per 100 oil immersion fields	+ (1+)
1-10 AFB per oil immersion field	++ (2+)
> 10 AFB per oil immersion field	+++ (3+)or above

If only one or two acid fast bacilli (AFB) are seen, request a further specimen from the patient. If no red bacilli are seen after examining the area of the smear, report the smear as 'No AFB seen' and don't report 'Negative'. This is because organisms may be present but not seen in those fields examined. The laboratory technician must examine all three sputum samples from each TB suspect. He/she must record the result of each sputum sample with the laboratory reference number in the laboratory registration book and on the sputum request form.

N.B. A person is considered to be tuberculosis patient if at least two slides are positive for AFB out of the three sputum smears.

B. Concentration technique using "Barakina"

Application of barakina to sputum specimen in concentration technique is used to kill some micro organisms, which are normal flora of upper respiratory tract and spitted out with sputum. The barakina also inactivates the virulence of Mycobacterium tuberculosis. More over, it also helps to digest the mycolic fatty acid found on the cell wall of the bacteria. Hence, the bacteria can easily concentrate through centrifugation from the sputum specimen and this enhances the chance of positivity.

- Procedure

1. Add approximately equal volume of sputum and 5% barakina in to 10 ml test tube.
2. Using vortex, shake well the specimen with "barakina".
3. Centrifuge the mixed specimen for five minutes at 1500-2000 revolutions per minute (if there is no centrifuge put the mixed sample over night).
4. Decant the supernatant and make smear on microscopic slide using the sediment.
5. Stain the slide using acid fast stain.
6. Finally, using oil immersion objective, look for the presence or absence of the bacilli.
7. Record and report the result according to the system discussed under Ziehl Neelsen staining technique as indicated in table 3.4.1.

3.4.4.2 Culture

Culture is a process of propagation of microorganisms on artificial media which contains required nutrient that promote the growth of organisms. It is a complex laboratory test, which takes several weeks to yield results. It is therefore, not useful as a primary diagnostic method in our country. However, culture can be used in specialized laboratories for surveillance of drug resistance.

3.4.4.3 Quality Control

The precision and accuracy of microscopic diagnosis of pulmonary tuberculosis is influenced by many factors. Some of the factors that can affect the result are using of improperly prepared staining solutions and examination of stained smears for very short period of time.

Strategies that are used to get reliable and reproducible laboratory result is called quality control program. Some of the major components of quality control program are:

- Proper identification and instruction of patients.
- Using of non-saliva specimen.
- Checking of new staining solutions using known positive and negative sputum specimen.
- Examine at least 100 fields (for five minutes) before reporting the result. Generally, following of good laboratory procedural techniques will grant the accuracy and precision of test results.

Now you are through with the core and satellite modules, but there are still some activities remaining as stated below:

1. **Read the task analysis of the different categories of health center team on unit 4.**
2. **Do the questions of the pre-test as a post- test.**

   N.B: Use a separate answer sheet**.**

3. **Compare your answers of the pre and post-tests with the answer keys given on annex IV and evaluate your progress.**

3.5 Satellite Module for Community Health Workers

3.5.1 Introduction

3.5.1.1 Purpose and uses of the module

Community health workers are intended to use this module. It is believed to provide them with basic information needed at the grass-root level to serve the community in the prevention and control of pulmonary tuberculosis (PTB). It helps them to recognise their role in case finding and management necessary in prevention of the disease.

3.5.1.2 Direction for using this module

Start with the pre-test questions. Use a separate answer sheet.
Study the text including the task analysis.

3.5.2. Pre-test

Answer either ”true" if the statement is correct or “false” if the statement is incorrect for questions 1-7 and write short answers for question 8.

1. Pulmonary tuberculosis is caused by cold air.
2. A person with long-standing cough could be suspected as a case of pulmonary tuberculosis.
3. We should not advise to open the windows in a house where there is a PTB patient.
4. Pulmonary tuberculosis cannot be cured by medicines (drugs).
5. Community health workers have great role in prevention and control of pulmonary tuberculosis.
6. Pulmonary tuberculosis can be transmitted by shaking hands of a pulmonary tuberculosis patient.
7. Doors and windows of houses should not be opened as external air can aggravate the spread of the disease.
8. List the methods used in the prevention and control of PTB.

3.5.3 Learning Objectives

After studying this module, the learner will be able to:

- Recognize that PTB is a disease of public health importance.
- Identify the cause and mode of transmission of pulmonary tuberculosis.
- Recognize that PTB is a curable disease.
- Participate in the prevention and control of PTB

3.5.4 Significance of the Problem

The problem of pulmonary tuberculosis in the world in general and in Ethiopia in particular is increasing inspite of efforts made to alleviate its burden on socio-economic developments. This could be due to overcrowding, poor housing condition and ventilation, poor nutrition, inadequate entry of sun light, inadequate health service facilities, diseases like HIV / AIDS and lack of awareness of the people about the causes and prevention of the disease.

Therefore, the disease results in death of a large group of productive force which are useful for socio-economic development.

3.5.5 Definition, Cause and Disease Development Process of Pulmonary Tuberculosis

3.5.5.1 Definition

Pulmonary tuberculosis is a disease of the lungs. It is caused by germs. Germs are very small living things that cannot be seen by our naked eyes.

3.5.5.2 Disease Development Process

The germs that cause the disease after being inhaled with air get into the lungs of normal persons. In the lungs the germs multiply and destroy the lungs and the person gets sick.

3.5.6 Location and Functions of Human Lungs

Human beings have two lungs in their chest cavity, right and left lung. The function of these two lungs is for breathing in and out atmospheric air. When germs attack the lungs, the person will have breathing problem and may die from it unless the patient gets proper medical treatment.

3.5.7 Mode of Transmission and How Much the Disease is Common in Ethiopia

Pulmonary tuberculosis is transmitted when a patient coughs, sneezes, or spits. During these actions, the patient breathes out germs into the air, and when another person inhales air, the germs will enter the lungs along with the air and infection develops.

The disease is very common in our country. It affects all age groups in the community. For example, in Harar, in 1997/98 out of 4168 patients examined in a hospital 569 (14 %) were found to have this germ in their sputum. So we can see how much the disease is affecting the community.

3.5.8 Factors Favoring Transmission of Pulmonary Tuberculosis

- Over crowding:

  A patient who has active tuberculosis may cough on other people living closer or sleeping together in overcrowded room. Thus, transmission of PTB can be facilitated.

- Lack of Ventilation:

  A patient with cough may contaminate the air unless it is well ventilated by opening windows and doors in a household. This contaminated air will be inhaled by healthy people and may cause pulmonary tuberculosis.

- Immunization:

  A child who is not vaccinated against TB is more likely to have a severe infection and die from it. The vaccine is called BCG. Hence, vaccinating children with BCG can reduce the chance of suffering and death from the disease.

- Under nutrition:

  A person who is not properly fed with balanced food gets pulmonary tuberculosis easily. To prevent this people especially children need feeding with balanced diet.

- HIV / AIDS:

  Any person infected with HIV / AIDS is more likely to get pulmonary tuberculosis and to die from the disease because of reduced body resistance. So we need to protect the community by providing health education on the preventive measures against HIV / AIDS.

3.5.9 Identification of Pulmonary Tuberculosis cases

The following are methods for identifying PTB patients:

- Clinical history and
- Laboratory methods

Clinical History of Patients

A person who is suffering from pulmonary tuberculosis may have the following symptoms (in combination or alone).

- Cough for more than three weeks
- Fever
- Night sweating
- Loss of appetite
- Weight loss
- Sputum (with or without blood).
- Generalized body weakness.

Laboratory methods

- Sputum Test:

  Any person who has coughed and sputum production for more than three weeks must go to a health unit for sputum examination to be checked for presence of germs using a microscope.

Note: A microscope is an instrument that enables health workers to see the germs.

3.5.10 Management of Pulmonary Tuberculosis Patients

Pulmonary tuberculosis is curable by using modern medicines (drugs). But these medicines should be taken for a long period without interruption even if the patient feels improved. These medicines are available in health institutions and should be taken in combination as ordered by the health workers. Otherwise a patient will not be cured.

- How long should a patient take medication?

  There are two types of treatment methods:

  - Directly observed treatment short course (DOTS): patients who are under this treatment method take drugs for eight months (under direct observation of the health worker for the first two months).
  - Long course treatment: patients under this method of treatment take drugs for 12 months.

3.5.11 Methods of Prevention and Control of Pulmonary Tuberculosis

Following are the methods for the prevention and control of pulmonary tuberculosis.

- Proper case finding and referral for treatment to health institutions: unless patients are detected early and get treatment they will continue transmitting the disease to other people and may die from the disease.
- Immunization: mobilize community for immunization program in their living area in collaboration with health workers and community leaders.
- Health education on: nutrition, modes of transmission, preventive and control methods.
- Promote environmental sanitation in community: this minimizes the transmission of the disease especially through proper opening of windows for ventilation and allowing entrance of direct sun light into houses.
- Follow up of patients for completion of their treatment and tracing of defaulters (patients who discontinue the medicine before completion).

3.5.12 Task Analysis for Community Health Workers

Table 3.5.1 Knowledge -objectives and activities

Learning Objectives	Learning Activities
.To define pulmonary tuberculosis	- Study that PTB is disease of the lungs. - Study the parts and general functions of the lungs.
To describe the causes of PTB	- Identify that PTB is caused by germs and not by evil-eye , heredity or other factors.
.To state the modes of transmission of PTB	- Recognize that PTB is transmitted through breathing of air containing germs from a sick person when coughing and sneezing.
.To identify the major conditions that indicate PTB	- Study the signs and symptoms of PTB. - Understand the relation between HIV / AIDS and PTB.
.To study factors initiating occurrence of PTB	- Study the relation between poor housing conditions, malnutrition and lack of vaccination with BCG - Understand the importance of adequate treatment of PTB.
To identify the most important preventive measures of PTB	- State that early and adequate treatment of open PTB cases is important control measure. - State the need for covering of the mouth when coughing and sneezing. - Study the importance of good ventilation and direct sunlight into living rooms and the need to decrease overcrowding. - Study the importance of community health education including the need for proper nutrition and vaccination.

Table 3.5.2. Attitude- objectives and activities

Learning Objectives	Learning Activities
To appreciate that PTB is preventable, treatable and curable	- Advocate PTB patients should receive adequate treatment. - Initiate patients to seek treatment early. - Give health education on prevention and control methods of PTB at any opportunity.
To believe that PTB is a public health problem	- Give emphasis on health education to individuals, families and communities at any occasion. - Recognize the relationship between PTB and HIV/AIDS.

Table 3.5.3 Practice-objectives and activities

Learning Objectives	Learning Activities
To detect cases of PTB early	- Identify and refer patients with signs and symptoms of PTB. - Record and refer suspected PTB cases.
To follow cases defaulting	- Trace patients missing from treatment - Make follow up of referred PTB cases
To participate in preventive and control activities	- Provide health education. - Mobilize the community for vaccination. - Counsel patients to take their medication properly. - Keep records of PTB cases. - Write reports about activities accomplished.

- **Now you are through with the module, but in order to evaluate yourself you need to do the pre-test as a post-test.**
- **Use a separate answer sheet.**
- **At last compare your answers of the pre and post- tests with the answer- keys given on section 3.5.13 and evaluate your progress.**

3.5.13 Answer Keys to Pre And Post-test for Community Health Workers

1. False
2. True
3. False
4. False
5. True
6. False
7. False
8. a Proper patient finding and referral
   b. Immunization
   c. Health education
   d. Promoting sanitation
   e. Follow up of patients and defaulter tracing.

3.6 Take Home Message for Care Givers/ Self-care

The following points are basic information on pulmonary tuberculosis (PTB).

- PTB is disease of the lungs.
- It is caused by Germs. Germs are small living things that cannot be seen by our naked eyes.
- The germs contaminate air when a PTB patient coughs or sneezes.
- The disease is transmitted by inhaling the air contaminated with the germs.
- The disease shows the following signs and symptoms:
  - Cough for more than three weeks
  - Sputum stained with blood
  - Fever
  - Night-sweating
  - Loss of appetite
  - Loss of body weight.
  - Generalized body weakness.
- The disease is curable with modern medicines.
- The medicines are taken for a long time. A patient must take them regularly without interruption as directed by health institution.
- Failure to take the drugs regularly as directed by health workers will aggravate the disease and the patient may die. Moreover, it is risk for the transmission of the disease.
- The disease can be prevented by the following methods:
  - Early detection and proper treatment of the patient.
  - Covering of the mouth when coughing and sneezing.
  - Allowing adequate ventilation and direct sunlight into the house.
  - Avoiding overcrowding.
  - Vaccination of children.
  - Improvement of nutritional status.
  - Prevention of HIV / AIDS.

UNIT FOUR

ROLE AND TASK ANALYSIS FOR THE DIFFERENT HEALTH CENTER TEAM MEMBERS

Table 4.1Knowledge-Objectives and Activities

Learning Objectives	Learning Activities			
	HO	**PHN**	**EHT**	**MLT**
To describe the nature of PTB	- Define PTB - Study the cause, the pathogenesis and clinical manifestations.	- Define PTB - Study the cause, the pathogenesis and clinical manifestations	- Define PTB - Study the cause, the pathogenesis and clinical manifestations	- Define PTB - Study the cause, the pathogenesis and clinical manifestations
To describe the risk factors in the transmission of pulmonary tuberculosis and its relationship with HIV/ AIDS	- Identify and enumerate the risk factors - Study the relationship between PTB and HIV / AIDS	- Identify and enumerate the risk factors - Study the relationship between PTB and HIV/ AIDS	- Identify and enumerate the risk factors - Study the relationship between PTB and HIV AIDS	- Identify and enumerate the risk factors - Study the relationship between PTB and HIV/AIDS
To understand the diagnostic approaches of PTB	- Study history and physical examination - Study laboratory diagnostic methods - Identify the most applicable laboratory diagnostic method - Study PTB diagnosis in children	- Study history and physical examination - Recognize laboratory diagnostic methods - Study skin test procedures	- Study the signs and symptoms of PTB - State the relevant laboratory diagnostic methods	- State the signs and symptoms - Study the laboratory diagnostic procedures - Study how to Identify AFB using Ziehl Neelsen staining technique - Study the concentration technique - Study how to record and report the result

Learning Objectives	Learning Activities			
	HO	PHN	EHT	MLT
To describe the global magnitude of the problem of PTB and its public health importance in Ethiopia	- Study the epidemiology - State the modes of transmission - Study the reasons for high prevalence of the disease	- Study the epidemiology - State the modes of transmission - Study the reasons for high prevalence of the disease	- Study the epidemiology - State the modes of transmission - Study the reasons for high prevalence of the disease	- Study the epidemiology - State the modes of transmission - Study the reasons for high prevalence of the disease
To describe the treatment strategies of PTB and dangers of drug defaulting	- Study the treatment strategies and regimens, dosage, side effects and contraindications according to NTLCP - Study drug resistance and dangers of defaulting	- Study the treatment strategies and drug regimens, dosage, side effects, and contraindications according to NTLCP - Study drug resistance and dangers of defaulting	- Study the drug treatment strategies - Study the dangers of drug resistance and defaulting	- Study the drug treatment strategies - Study the dangers of drug resistance and defaulting
To describe the methods of prevention of PTB	- Identify the proper PTB preventive methods - Case detection - Treatment - BCG vaccination - Preventive chemotherapy - Improving housing condition - Health education	- Identify the proper PTB preventive methods - Case detection - Treatment - BCG vaccination - Preventive chemotherapy - Improving housing condition - Health education	- Identify the proper PTB preventive methods - Case detection - Treatment - BCG vaccination - Preventive chemotherapy - Improving housing condition - Health education	- Identify the proper PTB preventive methods - Case detection - Treatment - BCG vaccination - Preventive chemotherapy - Improving housing condition - Health education
To describe the National PTB control Programme	- Recognise the control methods - Case detection - Examination and tracing of contacts - Chemotherapy - Defaulter tracing - Case reporting - Surveillance and monitoring	- Recognise the control methods - Case detection - Examination and tracing of contacts - Chemotherapy - Defaulter tracing - Case reporting - Surveillance and monitoring	- Recognise the Control methods - Case tracing - Tracing of contacts - The essentials of chemotherapy - Defaulter tracing - Case reporting - Surveillance and monitoring	- Recognize control methods - Case detection - Examination of cases and contacts - The essentials of chemotherapy - Defaulter tracing - Case reporting - Surveillance and monitoring

Table 4.2 Attitude-Objectives and Activities.

Learning Objective	Learning Activities			
	HO	**PHN**	**EHT**	**MLT**
To give value that PTB is a major public health problem	- Advocate the social, economic and health impact of PTB	- Advocate the social, economic and health impact of PTB	- Advocate the social, economic and health impact of PTB	- Advocate the social, economic and health impact of PTB
To believe that prevention and control measures reduce the transmission of PTB	- Give emphasis on health education	- Give emphasis on health education	- Give emphasis on health education	- Give emphasis on health education
To believe that sputum smear microscopy for AFB is a key step in the diagnosis of PTB	- Give emphasis on sputum smear microscopy	- Give emphasis on sputum smear microscopy	- Give emphasis the importance of sputum smear microscopy	- Give emphasis on the importance of sputum smear microscopy
To believe that PTB is preventable, treatable and curable.	- Give emphasis on health education	- Give emphasis on health education	- Give emphasis on health education	- Give emphasis on health education
To appreciate the relationship between PTB and HIV/ AIDS	- Increase community awareness about HIV/ AIDS	- Increase community awareness about HIV/ AIDS	- Increase community awareness about HIV/AIDS	- Increase community awareness about HIV/AIDS

Table 4.3 Practice-Objectives and Activities

Learning objectives	Learning Activities			
	HO	PNH	EHT	MLT
To carry out appropriate laboratory examination procedures	- Do AFB staining - Interpret the result - Record and report	- Collection of sputum specimen and registration - Recording the laboratory result	- Give health education on the need for laboratory investigation	- Collection of sputum specimen - Disinfection - Do AFB stain - Recording and reporting - Do quality control test
To participate in the immunization programme (EPI)	- Organize and co-ordinate. - Monitoring and evaluation - Give health education	- Give vaccination - Maintain cold chain system - Co-ordinate the EPI programme - Recording and reporting - Monitor and evaluate the programme - Give health education	- Co-ordinate the EPI programme - Maintain cold chain - Monitor and evaluate the programme - Give health education	- Give health education. - Participate in the vaccination programme
To involve in the preventive measures of PTB	- Give health education - Prescribe appropriate treatment - Detect and trace cases - Follow up of cases - Prescribe preventive treatment	- Give health education - Administer proper treatment - Follow up of cases - Make case detection and tracing	- Give health education - Case tracing and follow up - Demonstrate proper housing condition: ventilation, over crowding, and sun light	- Give health education - Case detection and follow up

Learning Objectives	Learning Activities			
	HO	**PHN**	**EHT**	**MLT**
To carry out control measures of PTB	- Recording and reporting - Surveillance and monitoring - Case detection, tracing and follow up - Analysis of task	- Recording and reporting - Surveillance and monitoring - Case detection, tracing and follow up - Do concurrent disinfection	- Recording and reporting - Surveillance and monitoring - Detection of suspects - Case tracing and follow up - Do concurrent disinfection	- Perform concurrent disinfection. - Surveillance and monitoring - Case tracing and detection

UNIT FIVE

GLOSSARY

Air Vent	-	An opening or hole allowing air to pass through.
Atomize	-	Reduce to fine particle.
Bactericida	-	It is the process of killing pathogenic or potentially pathogenic microorganisms by the application of biological or chemical agents.
Bacteriostatic	-	It is the process of preventing the growth and multiplication of pathogenic or potentially pathogenic microorganisms.
B.C.G	-	(Bacillus Calmette Guerin) it is a vaccine derived (prepared) from Mycobacterium bovis, and used to protect particularly young children against disseminated and sever tuberculosis .
Bevel	-	Sloping edge of a needle
Decantation	-	Is the process of getting rid of the upper supernatant solution after centrifugation of a given material.
Disinfection	-	It is the selective elimination of certain undesirable organisms in order to prevent their transmission.
Sterilization	-	It is the freeing of an article (material) from all forms of microorganisms.
UVGI	-	(Ultra violet Germicidal Irradiation) is a technique of killing germs (micro organisms) by the use of sunlight which is a source of Ultraviolet light rays .
Ventilation	**-**	The act or process of setting air current in motion by the use of either natural force of air diffusion or mechanical apparatus to or from a given space.
Vortex	-	Is an apparatus that is used for mixing of two different substances. (liquids) E.g. sputum with “barakina”’.
Chemotherapy	-	Treatment with chemical drugs.

UNIT SIX

ABBREVIATIONS AND REFERENCE

AFB	Acid Fast Bacillus
AIDS	Acquired Immune-Deficiency Syndrome
BCG	Bacillus Calmette Guerin
DOTS	Directly Observed Treatment, Short Course(for TB)
EHT	Environmental Health Technician
EPI	Expanded Program on Immunization
HO	Health Officer
HIV	Human Immunodeficiency Virus
LCC	Long Course Chemotherapy
MLT	Medical Laboratory Technician
M.tuberculosis	Mycobacterium tuberculosis
NTLCP	National Tuberculosis and Leprosy Control Program
P.P.D	Purified Protein Derivative
PTB	Pulmonary Tuberculosis
TB	Tuberculosis
TLCT	Tuberculosis and Leprosy Disease Prevention and Control Team
UV	Ultra Violet
UVGI	Ultra Violet Germicidal Irradiation
WHO	World Health Organization

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UNIT SEVEN

ANNEXES

ANNEX I

Table 7.1. Tuberculosis Case Finding 1993 E.C. Data from DOTS Implementing Zones Compiled From Regional Quarterly Reports Submitted To the TLCP, MOH - Ethiopia

REGION	SMEAR - POSITIVE CASES STARTING TREATMENT										SMEAR-NEGATIVE		EXTRA-PULMONARY		TOTAL NEW	TOTAL CASES
	TOT PTB+	**%TOT**	**NEW PTB+**	**%TOT NEW**	**RLPS**	**%P+**	**FAIL**	**%P+**	**DEFLT**	**%P+**	**PTB-**	**%TOT NEW**	**EPTB**	**%TOT NEW**		
Tigray	1924	20%	1833	19%	80	4%	4	0.2%	7	0.4%	3532	36%	4330	45%	9695	9786
Amhara	5779	30%	5380	29%	205	4%	47	0.8%	147	2.5%	6284	34%	6976	37%	18640	19039
Oromiya	11206	40%	10713	39%	300	3%	69	0.6%	124	1.1%	8436	30%	8618	31%	27767	28260
Somali	1772	56%	1622	54%	64	4%	41	2.3%	45	2.5%	607	20%	784	26%	3013	3163
SNNP	8612	48%	8164	47%	178	2%	82	1.0%	188	2.2%	4645	27%	4663	27%	17472	17920
Harari	226	23%	216	22%	4	2%	3	1.3%	3	1.3%	488	50%	274	28%	978	988
Addis Ababa	4227	36%	3829	34%	300	7%	31	0.7%	67	1.6%	4088	36%	3372	30%	11289	11678
Dire Dawa	727	38%	666	36%	36	5%	9	1.2%	16	2.2%	914	49%	295	16%	1875	1936
Grand total	34473	37%	32423	36%	1167	3%	286	0.8%	597	1.73	28994	32%	29312	32%	90729	92779

REGION	PTB+ AGE < 15Y		PTB+ :TREATMENT PRESCRIBED				SMEAR AT 2 MONTHS OF PTB+ CASES REGISTERED PREVIOUS QUARTER								
	P+<15y	%New	SCC	% New	LCC	%New	Reg	Done	% Reg	Pos %	% Done	Neg	% Done	N.D	%Reg
Tigray	80	4%	1817	99%	16	1%	1752	1440	82%	47	3%	1393	97%	312	18%
Amhara	316	6%	4303	80%	1077	20%	3950	3091	78%	144	5%	2947	95%	859	2%
Oromiya	752	7%	10612	99%	101	1%	10588	8032	76%	176	2%	7856	98%	2556	24%
Somali	123	8%	1535	95%	87	5%	1442	1331	92%	173	13%	1158	87%	111	8%
SNNP	641	8%	7439	91%	725	9%	6770	5235	77%	229	4%	5006	96%	1535	23%
Harari	6	3%	216	100%	0	0%	220	205	93%	13	6%	191	94%	16	7%
Addis Ababa	120	3%	3821	100%	8	0%	3712	3479	94%	122	4%	3357	96%	233	6%
Dire Dawa	9	1%	666	100%	0	0%	711	660	93%	40	6%	620	94%	51	7%
Grand Total	2047	6%	30409	94%	2014	6%	29145	23472	81%	944	4%	22528	96%	5673	19%

ANNEX II

Table7.2. TLCP Ethiopia: Regional Reports; TB Results of Treatment Cohrt Starting 1991 -92 (4 - '91 to 3-'92) Reported In 1993 E.C.

SMEAR - POSTIVE PATIENTS TREATED WITH SHORT COURSE CHEMOTHERAPY															
Region	Total Evaluated	CURED	COMPL	SUCCESS	RATE	DIED	%	FAIL	%	DEFAULT	%	TRANSF	%	SM+ Reg	Not evaluated
Tigray	1797	1287	175	1462	81%	127	7%	4	0%	114	6%	90	5%	1876	53
Amhara	1053	657	187	844	80%	76	7%	9	1%	71	7%	53	5%	1575	0
Oromiya	7305	4846	732	5578	76%	590	8%	53	1%	869	12%	215	3%	8856	236
Somali	545	404	19	423	78%	43	8%	17	3%	48	9%	14	3%	557	0
SNNP	5622	2714	1728	4442	79%	284	5%	117	2%	529	9%	250	4%	7795	0
Harari	162	127	-	127	78%	10	6%	1	1%	8	5%	16	10%	165	3
Dire Dawa	195	123	34	157	81%	11	6%	4	2%	14	7%	9	5%	195	0
Addis Ababa	2912	2193	214	2407	83%	265	9%	21	1%	169	6%	60	2%	2939	10
Total SCC	19591	12351	3089	15440	79%	1406	7%	226	1%	1822	9%	707	4%	23958	302

REGION	PATIENTS ON LONG COURSE CHEMOTHERAPY												
	TOTAL	CUREED	COMPL	SUCCES	RATE	DIED	%	FAIL	%	DEFAULT	%	TRANSF	%
Tigray	26	18	5	23	88%	1	5%	0	0%	2	8%	0	0%
Amhara	522	82	246	328	63%	24	5%	9	2%	142	27%	19	4%
Oromiya	1315	512	384	896	68%	57	4%	7	1%	292	22%	65	5%
Somali	12	3	3	6	50%	0	0%	1	8%	1	8%	0	0%
SNNP	2173	589	901	1490	69%	100	5%	27	1%	336	15%	90	4%
Harari	-	-	-	-	0%	0	0%	0	0%	0	0%	0	0%
Dire Dawa	-	-	-	-	0%	0	0%	0	0%	0	0%	0	0%
Addis Ababa	17	13	-	13	76%	0	0%	2	12%	0	0%	2	12%
Total	4065	1217	1539	2756	68%	182	4%	46	1%	773	19%	176	4%

SCC+LCC	23656	13568	4628	18196	77%	1588	7%	272	1%	2897	12%	883	4%

REGION	PATIENTS ON RETREATMENT CHEMOTHERAPY													REGISTERED
	TOTAL	CURED	COMPL	SUCCES	RATE	DIED	%	FAIL	%	DEFAULT	%	TRANSF	%	
Tigray	43	27	3	30	70%	8	19%	2	5%	3	7%	0	0%	43
Amhara	80	16	40	56	70%	6	8%	1	1%	10	13%	1	1%	80
Oromiya	473	296	46	342	72%	46	10%	13	3%	47	10%	25	5%	544
Somali	29	23	2	25	86%	2	7%	1	3%	1	3%	0	0%	29
SNNP	236	142	72	214	91%	10	4%	20	8%	10	4%	2	1%	236
Harari	8	6	-	6	75%	0	0%	1	13%	0	0%	1	13%	8
Dire Dawa	39	18	8	26	67%	5	13%	3	8%	2	5%	3	8%	39
Addis Ababa	210	153	10	163	78%	22	10%	3	1%	16	8%	3	1%	1121
Total	1118	681	181	862	77%	99	9%	44	4%	89	8%	35	3%	1100

Registered new cases that are not evaluated are in both LCC and SCC groups. In the overall outcome of smear-positive cases (LCC + SCC) these are counted as defaulters

Annex III

Treatment Regimen Recommended by Tuberculosis and Leprosy Disease Prevention and Control Team (TLCT), Ministry of Health

Table7.3 Directly Observed Treatment Short Course (DOTS): 2S (RHZ) /6 (EH).

Duration of treatment	Drugs	Adolescents and Adults Pre-treatment weight			
		20-29kg	**30-37kg**	**38-54kg**	**>55kg**
Intensive Phase (8 weeks)	(RHZ 150/75/400)	1½	2	3	4
	S	.50gm	.75gm	.75gm	1gm
	Or	Or	Or	Or	Or
	E400	1	1½	2	3
Continuation phase (6 'months')	(EH 400/150)	1	1½	2	3

Key:

RH 150/75 Combined tablet consisting of 150 mg rifampicin and 75 mg Isoniazide.

E 400 Tablet consisting of 400 mg Ethambutol

S Streptomycin injection.

For patients aged 50 and over the maximum does of streptomycin should not exceed 750mg. Streptomycin should not be given to pregnant women and has to be replaced by Ethambutol. During the intensive phase of DOTS, the drugs have to be collected daily and have to be taken under the direct observation of a health worker. During the continuation phase the drugs have to be collected every month.

Table 7.4 DOTS regimen for children of 6 and below or seriously ill:

2S (RHZ) 4(RH) or 2(RHZ)/4(RH)

Duration of treatment	Drugs	Child pre-treatment weight			
		Below 7kg	7-9 kg	10-12 ¾	13-19kg
Intensive phase (8 weeks)	(RHZ 150/75/400)	1/3	1/2	3/4	1
	S	.125gm	.125gm	.250gm	.250gm
Continuation phase (4 'months')	(RH 150/75)	1/3	1/2	3/4	1

S is to be used as the fourth drug in the intensive phase if the child is smear positive or seriously ill. During the intensive phase of DOTS, the drugs have to be taken under the direct observation of a health worker or the mother. During the continuation phase the drugs have to be collected every month and be taken under the direct observation of the mother.

Table 7.5 Long course regimen for TB: 2S(TH)/ 10(TH) or 2S(EH)/10(EH)

Duration of treatment	Drugs	Child pre -treatment weight		Adolescent and adult pre-treatment weight			
		Under 9kg	10 -19kg	20-29kg	30-37kg	38-54kg	>55kg
	S	.125gm	.25gm	.50gm	75gm	.75gm	1gm
Intensive phase (8 weeks)	(TH 50/100) (TH 150/300) Or (EH 400/150)	1/2	1	1/2 Or 1	1 Or 1½	1 Or 2	1 Or 3
Continuation phase (10 'months')	(TH 50/100) Or (EH 400/150)	1/2	1	1/2 Or 1	1/2 Or 1½	1 Or 2	1 Or 3

For patients 50 years of age and above, the dose of streptomycin should not exceed 750 mg. Streptomycin should not be given to pregnant women and has to be replaced with Ethambutol. Preferably all pregnant women should be treated with DOTS (with Ethambutol).

- In-patients who are suspected to have co-infection with HIV Thioacetazone must be replaced by Ethambutol. Children in this group, who are 6 years of age or below only receive H in the continuation phase. Children older then 6 years of age may receive E with regular visual examination.

Table 7.6 Re-treatment regimen: 2SE (RH) Z/1E (RH) Z/5E_3 (RH) $_3$

Duration of treatment	Drugs	Child pre-treatment weight	Adult pre-treatment weight		
		20-29kg	30-37%	38-54kg	>55kg
Intensive phase (8 weeks)	(RHZ 150/75/400) S E 400	1½ .50gm 1	2 .75gm 1½	3 .75gm 2	4 1gm 3
Intensive phase (third 'month')	(RHZ 150/75/400) E 400	1½ 1	2 1½	3 2	4 3
Continuation phase (5 'months') (3 times weekly)	(RH 150/75) H 100 E 400	1½ 1/2 1	2 1 2	3 2 3	4 3 4

5 E_3 R_3 H_3= 5 months of treatment with a combination of E, R and H three times a week on alternating days.

Streptomycin should not be included in the re-treatment for pregnant women. Throughout the duration of re-treatment, including the continuation phase, the drugs have to be taken under the direct observation of a health worker.

Annex IV

Keys to Pre and Post-Test for the Health Center Team.

Part I (for section 2.1.1)

Answers for Pre and posttest for all Categories of the Health Center Team

1. False
2. True
3. True
4. False
5. True
6. True
7. False
8. Refer section 2.6, on risk factors
9. Mycobacterium tuberculosis
10. Air born

11 Sputum smears microscopy examination.

12 Short course directly observed treatment (DOT) and Long Course Chemotraphy (LCC)

Part II (for section 2.1.2)

Answers for Pre and post-test to Each Category of Health Center Team

For Health Officers (for section 2.1.2.1)

1. False
2. True
3. False
4. False
5. False
6. False
7. True
8. False
9. True
10. False
11. Primary pulmonary TB and post primary pulmonary TB
12. A patient who has never had treatment of TB, or has been on treatment for less than four weeks.
13. Diagnosis of TB can be made when any three of the following are present or two in case of protein calorie malnutrition.
    - Strongly suggestive TB sign and symptoms.
    - History of close contact with PTB smear positive adult.
    - X- ray finding compatible with TB.
    - Positive tuberculin test in non- BCG vaccinated children.
14. Rifampicin, INH, pyrazinamide and streptomycin or ethambutol.
15. Preventive anti TB chemotherapy for 6 months (INH.5 mg/kg body weight).
    Jaundice, anorexia, peripheral neuritis etc
16. INH- jaundice, peripheral neuritis
    Rifampicin- jaundice, anorexia, vomiting, abdominal pain, itching with or with out rash thrombocytopenia. anuria
17. DOTs ensures a patient adherence to treatment. It is also given for short period of time (8 months instead of 12 months). However, DOTS modality of TB patient services should be available as close to home as possible.

For Public Health Nurses (for section 2.1.2.2.)

1. False
2. False
3. False
4. a. Isoniazid (H)
   b. Rifampicin (R)
   c. Pyrazinamid (Z)
   d. Streptomycin (S)
   e. Ethambutol (E)
   f. Thioacetazone
5. The action to be taken for minor side effect
   a. With persistent side effect three to five days discontinue the treatment temporarily
   b. Give symptomatic treatment.
   c. Reinstitute the treatment as soon as side effect disappears. If symptoms persist consult the medical officer.

Actions for major reaction

   a. Discontinue treatment
   b. Call for consultation for a medical officer.
   c. Refer the patient to the hospitals for admission.

For Environmental Health Technicians (sanitarians) (for selection 2.1.2.3)

1. C
2. C
3. B
4. C
5. a. Control at the source
   b. Environmental control
   c. Treatment
   d. BCG Vaccination
   e. Health education
6. Covering the mouth when coughing and sneezing or treatment.
7. a. Ventilation
   b. Avoid overcrowding
   c. Exposure to direct sunlight.
8. a. Telling a story
   b. Using simple words
   c. Showing something
   d. Singing of songs
   e. Using drama / role play
   f. Encouraging discussion

For Medical Laboratory Technicians (section 2.1.2.4)

1. False
2. True
3. False
4. True
5. False
6. False
7. False
8. True
9. a. Proper identification and instruction of patients
   b Using of non-saliva specimen
   c. Checking of the quality of staining solutions
   d. Examine at least 100 fields (for five minutes) before reporting the result.
10. a. Carbolfuchsin
    b. 3 % acid alcohol
    c. methylene blue

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