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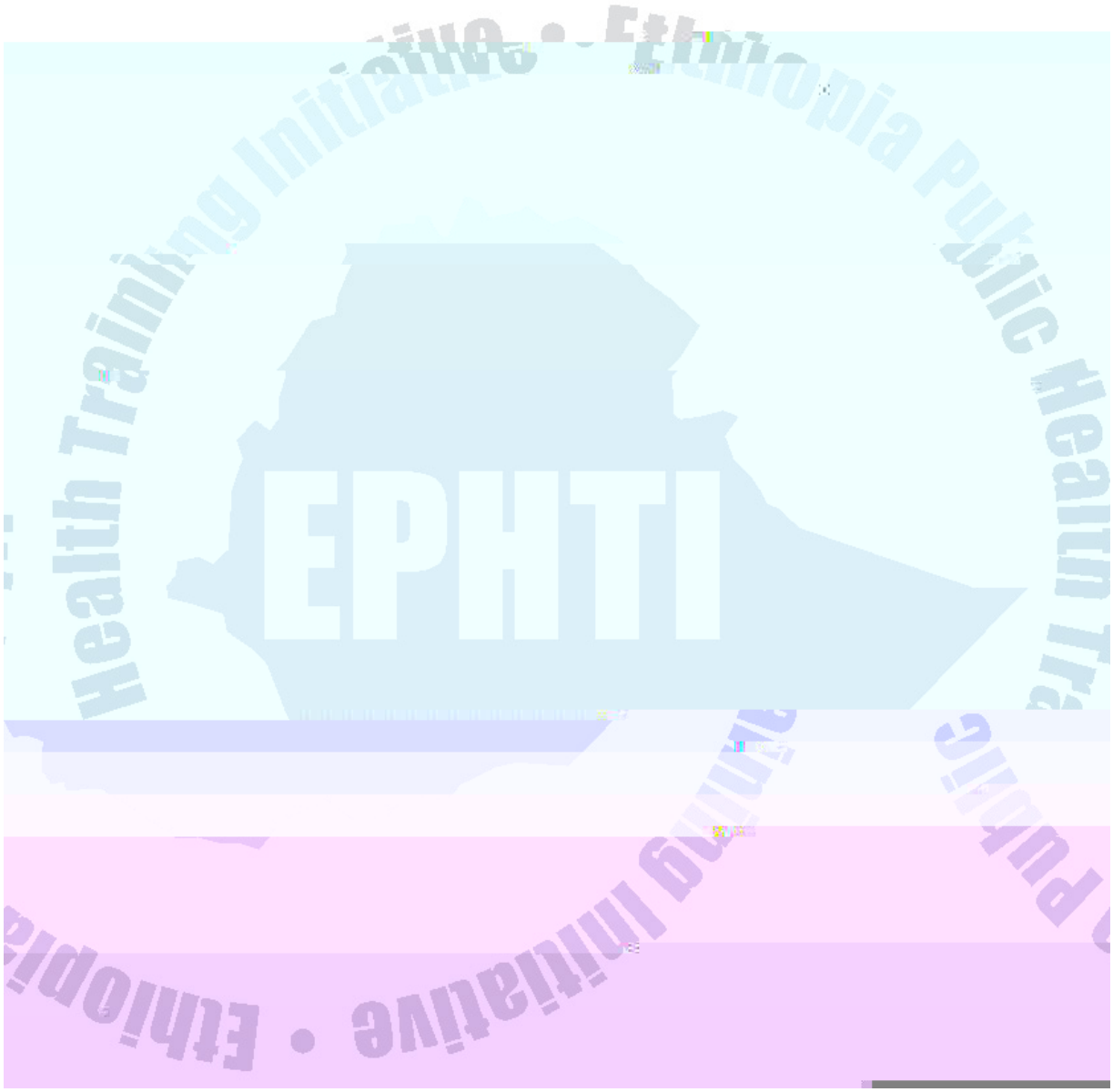

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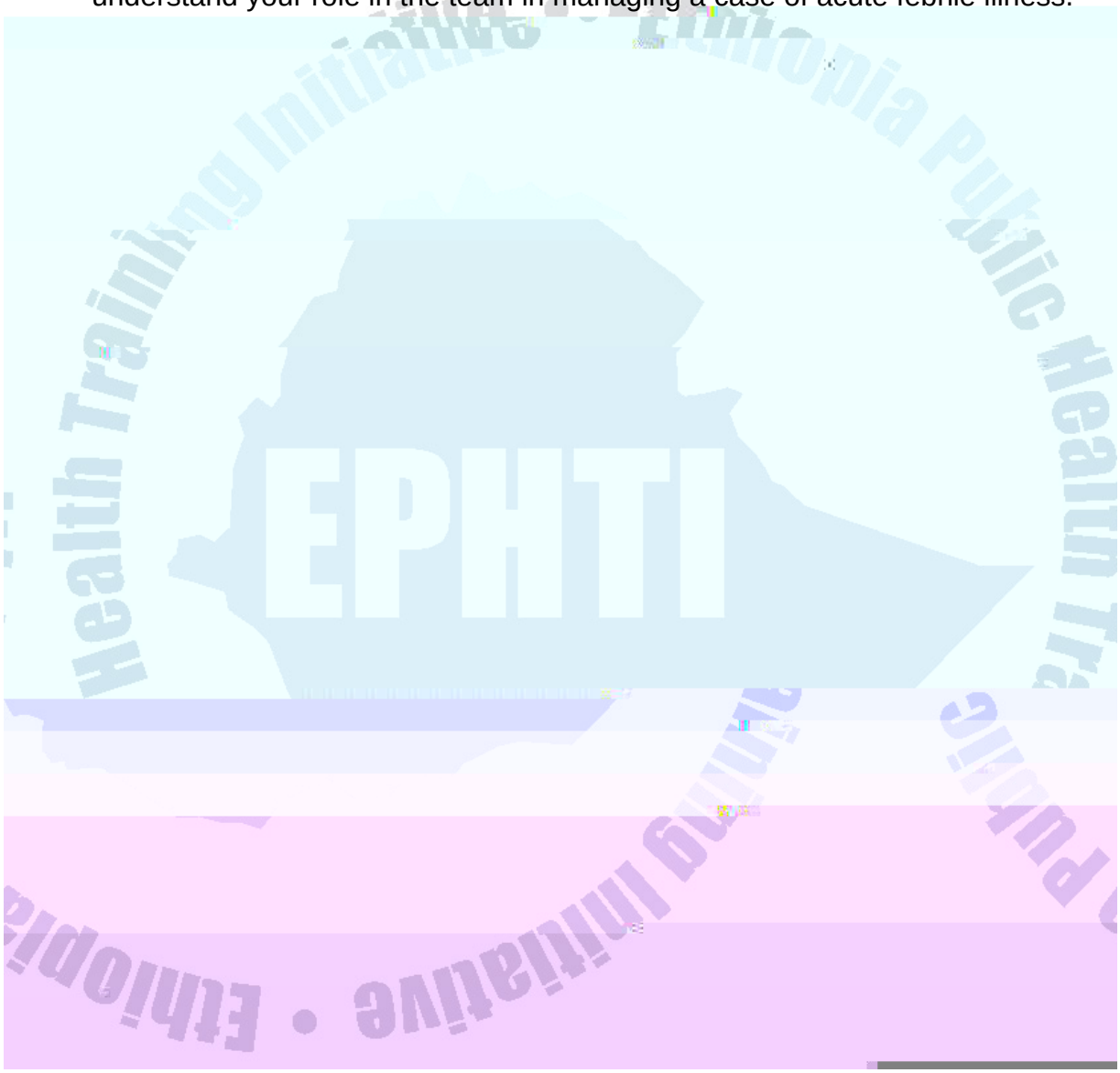
1.2.4. Evaluate yourself by referring to the key given in Section 7.1 and 7.2

1.2.5. Read the case study and try to answer questions.

1.2.6. Use the listed references and suggested reading materials to substantiate and supplement your understanding of the problem.

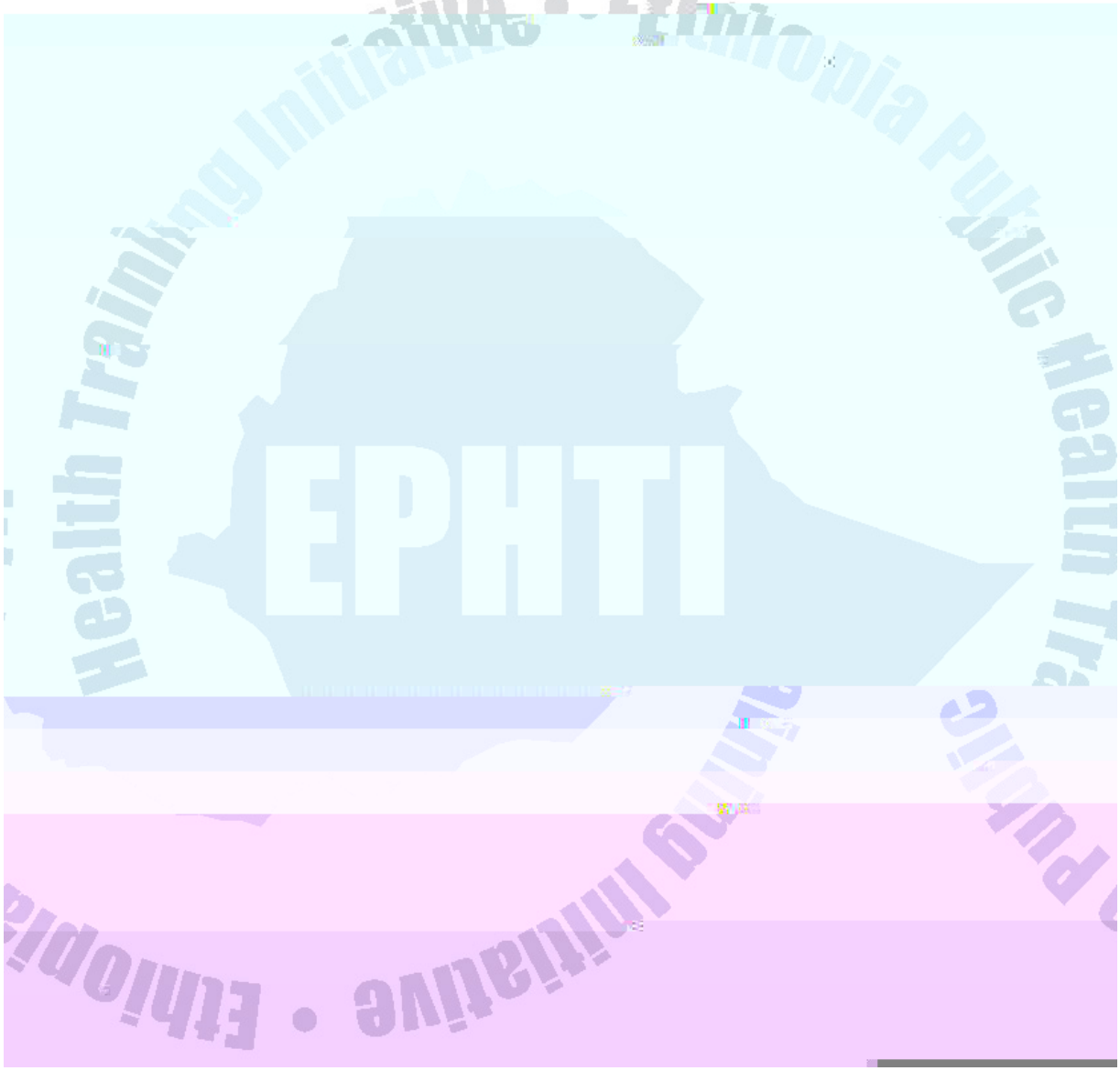
1.2.7. Look at the satellite module and the task analysis related to your field to understand your role in the team in managing a case of acute febrile illness.



UNIT TWO

CORE MODULE

2.1. Pre- and Post-tests 4.0st-test/Pagination TEdF9 T-0 78.02D90 61919.4th Off



4. Which of the following is not a relevant history in the clinical workup of a patient with acute febrile illness
    A. Travel history
    B. Transfusion history
    C. Exposure to animals
    D. Geographic areas of living
    E. None of the above
5. Which of the following is not suggestive of the diagnosis of typhoid fever?
    A. Remittent fever
    B. Sensorial changes
    C. Rigid board like abdomen
    D. Massive splenomegaly in the second week
    E. None of the above
6. Which of the following laboratory investigations is more sensitive for typhoid fever diagnosis in the first week?
    A. Widal titer of 1: 160 or a four fold rise in the titer
    B. Blood culture
    C. Urine culture
    D. Stool culture
    E. A and B
7. Which of the following is not true about the epidemiology of acute febrile illnesses in Ethiopia?
    A. Tick born typhus is a very common cause of epidemics in Ethiopia
    B. The peak of meningitis occurs during the dry seasons when the humidity of air is very low
    C. Typhoid infection is a dose dependent phenomenon in that even if small number of the typhoid bacilli enters into the body, clinical infection may not happen.

D. Poverty and poor personal hygiene and environmental sanitation are associated to be the main risk factors for both for the louse born relapsing fever and louse born typhus fever.

E. Mixed epidemic of typhus and relapsing fever may occur in the same locality.

Hajikedir Abdella resides in the highlands of Bale where the weather is very cold. In his small "tukul" himself, his wife and their eight children sleep next to one another. As the weather was very cold, they cuddle next to one another to get warmth. They do not wash clothing and body for fear that they will be cold. One day Hajikedir developed chills, rigors and intermittent fever associated with myalgia and arthralgia. The following day, two of his sons experienced the same kind of problem.

8. From the above story what is the possible cause of fever in that Hajikedir's household?
   A. Louse borne relapsing fever
   B. Tick borne typhus fever
   C. Meningitis
   D. Typhoid fever
   E. Malaria

9. Suppose Hajikedir comes to you in the health service unit, what will you do for him?
   A. Confirm the diagnosis after proper history, physical examination and blood film examination for Borrelia
   B. Secure IV line and give him procaine penicillin 600,000 and then tetracycline 250 mg Po QID for 3-5 days
   C. Control fever with antipyretics
   D. Visit his home to treat the rest of the family members and delouse their clothing and educate them on the importance of personal and environmental hygiene
   E. All of the above

10. Considering the living conditions of Hajikedir mentioned above, what risk factor do you identify for the different causes of acute febrile illness?
    A. Overcrowded living condition for meningitis
    B. Poor personal hygiene for relapsing fever and typhus fever
    C. Poor personal hygiene for typhoid fever
    D. Overcrowd living conditions for influenza and common cold
    E. All of the above

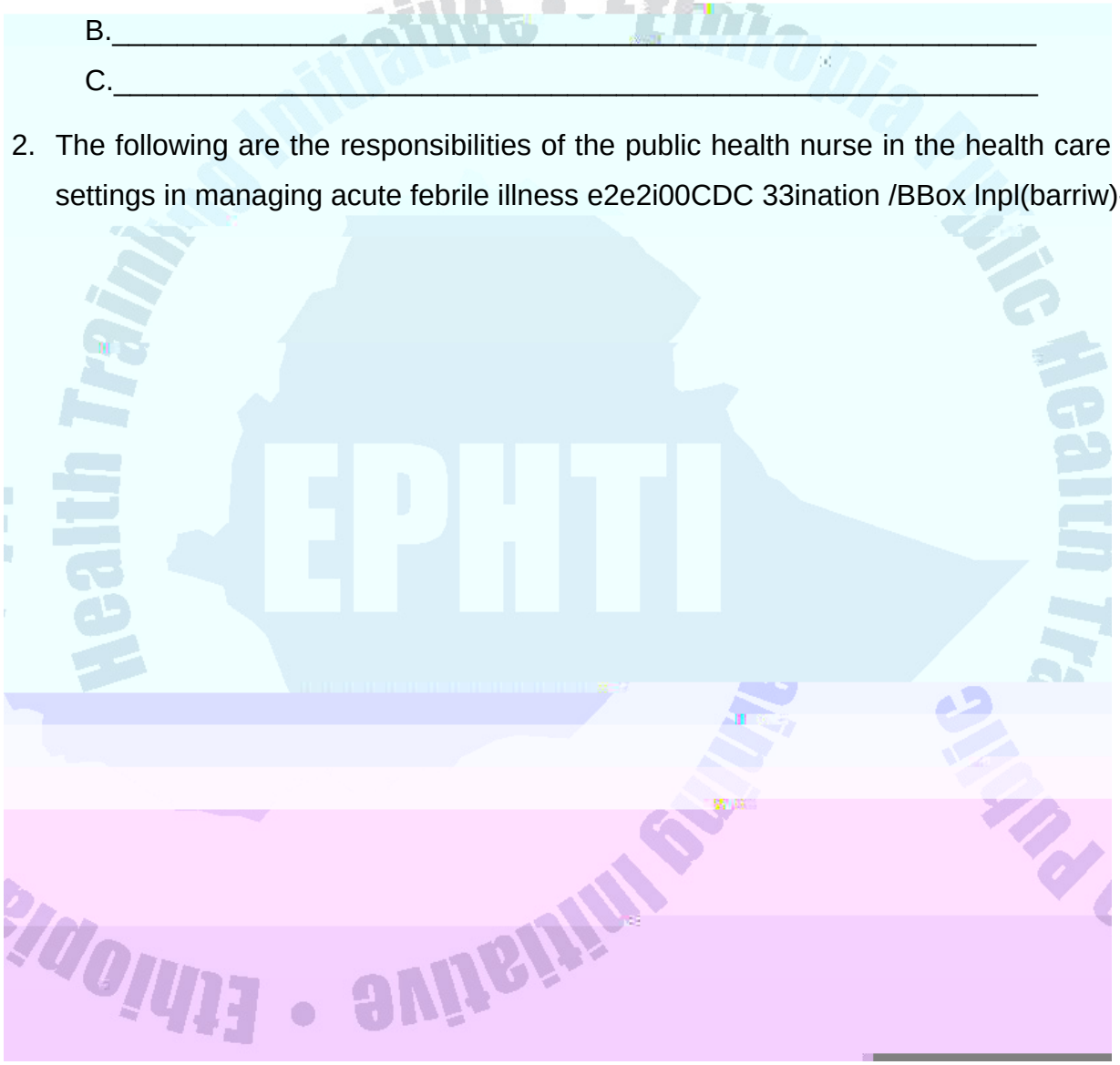
11. Which of the following is not true about the thresholds for predicting the occurrence of epidemic meningococcal meningitis and appropriate management?
    A. 5 cases of meningitis /100,000 population is the alert threshold for an epidemic and needs preparation for early control.
    B. 10 cases of meningitis /100,000 population for two consecutive weeks is the epidemic threshold for non-vaccinated areas
    C. 15 cases of meningitis/100,000 population for two consecutive weeks, is epidemic threshold for vaccinated areas.
    D. All of the above
    E. None of the above

12. Which of the following is a suggestive finding for the diagnosis of meningitis?
    A. Nuchal rigidity with high grade fever
    B. High grade fever with heapatosplenomegaly
    C. Headache and projectile vomiting
    D. Antecedent upper respiratory tract infection followed by high grade fever and sensorial changes
    E. All of the above except B

2.1.2. Public health Nurses

Answer the following questions accordingly,

1. List the roles of the public health nurse in a team approach to the management of acute febrile illness
   A. _____
   B._____
   C._____
2. The following are the responsibilities of the public health nurse in the health care settings in managing acute febrile illness e2e2i00CDC 33ination /BBox lnpl(barriw)-ealt mans



6. What measure do you take to limit the reaction?
    A. Administer low dose of antibiotic
    B. Observe the patient
    C. Secure IV line and get fluids ready
    D. All of the above
7. What care do you give for the patient with reaction?
    A. Observe the patient closely
    B. Monitor vital signs
    C. Administer IV fluids
    D. Measure intake and outputs
    E. All of the above

2.1.3. Medical Laboratory Technicians

1. Acute febrile illnesses can be caused by:
    A. N.meningitidis
    B. S.typhi
    C. S.paratyphi
    D. Borrelia species
    E. All of the above

2. The advantage of a thick blood film over a thin blood film is:
    A. More specific
    B. Less specific
    C. All of the above
    D. None of the above

3. The best specimen for the diagnosis of typhoid fever in the first week of infection is:

A. Blood
B. Cerebrospinal fluid
C. Urine
D. Stool
E. A and B

4. The preferred site for a skin puncture during blood collection in infants is:

A. Finger tip
B. Plantar surface of the heel
C. Great toe
D. B & C
E. All of the above A, B and C

5. In the laboratory Borrelia species can be investigated by:

A. Thick blood film
B. Thin blood film
C. Both thick and thin blood films
D. None of the above

6. Salmonella antigens that are usually investigated for typhoid and paratyphoid are:

A. O antigen
B. H antigen
C. Both
D. None of the above

7. Causes of false gram reaction in gram staining include:

A. Cell wall damage due to antibiotic therapy
B. Excessive heat fixation
C. Use of iodine solution, which is too old
D. All of the above
E. All except A

8. List at least **four** factors that enhance the spread

14. Identify areas where water could be contaminated:
    a.
    b.
    c.
    d.
15. Identify factors that contribute to malaria transmission:
    a.
    b.
    c.
    d.
16. List the important control measures for malaria:
    a.
    b.
    c.
    d.
17. Identify areas (conducive environment) where epidemic typhus outbreak may take place:
    a.
    b.
    c.
    d.

2.2. SIGNIFICANCE AND BRIEF DESCRIPTION OF THE PROBLEM

1. Typhus Fever:

Typhus is known to Ethiopia as "*Tessibo Beshita*" indicating the seriousness of the disease. The disease existed in the country for centuries, but the first epidemic was reported in 1866, in army camps and prisons. Epidemics of louse-borne typhus and cases of flea borne typhus were repeatedly reported by Italian health workers during the Italian occupation in 1930s and 1940s. Chloramphenicol and tetracycline, developed in 1940s, have resulted in a significant decline in the incidence of typhus

worldwide. In the 1960s, and 1970s, most cases of louse borne typhus, in the world were reported from Ethiopia, Rwanda and Burundi. Between 7000 and 16,000 cases were reported annually to the Ethiopian Ministry of Health during the period 1952-1980. Fewer cases (2,000 to 4,500) were reported between 1987 and 1990 from all administrative regions. During the last phase of the civil war in 1990 and 1991, serious outbreaks of louse-borne typhus occurred in army camps, relief shelters, and rural villages.

2. Relapsing Fever:

Epidemic relapsing fever is caused by *Borrelia recurrentis* and is transmitted from man to man by pediculous humanis (the body louse). Following ingestion of an infected blood meal by the louse, the spirochetes penetrate, migrate to and multiply in the hemolymph and remain viable there throughout its life span (several weeks). Human infection results following crushing

cases of relapsing fever are normally reported during the cool season (August to December).

3. Meningococcal Meningitis:

Meningococcal meningitis, an acute disease characterized by high morbidity and mortality during epidemics, is of considerable public health importance in Ethiopia, Sudan and other countries in the Sahel. Ethiopia lies within the “meningitis belt” of sub-saharan Africa, which extends from Mali across the semi arid sahel zone South of the Sahara. (From Senegal in the West to Ethiopia in the East of Africa). In Ethiopia, there has been bouts of meningitis cases and deaths due to meningitis at different times (Table 1).

Table 1. Number of case of meningitis and deaths in Ethiopia from 1981 to 2002.

YEAR	Cases	Deaths
1981	50000	990

1901. Outbreaks were reported in 1935, in the 1940s and 1950s, in 1964, 1977, and 1981 to 1983 and 1988-89. Where as earlier epidemics are thought to have spread from west Africa to Ethiopia, the 1988-89 epidemic spread with pilgrims returning from Mecca.

4. Typhoid Fever

The disease is found worldwide but as one of the fecal oral group of bacilli its prevalence will be determined largely by hygienic standards. Its prevalence has indeed been used as an indicator of the level of community hygiene. In Ethiopia Typhoid fever is one of the commonest causes of morbidity and mortality.

2.3. Learning objectives

2.3.1. General Objectives:

The purpose of this course is to equip the students (trainees) with the appropriate knowledge, attitude and skills required to effectively identify and manage cases as well as prevent and control acute febrile illnesses.

The general objectives are: After completion of the course the student will be able to:

Identify and manage febrile cases.

Demonstrate effective prevention strategies in the control of febrile illness.

2.3.2. Specific Instructional Objectives

For effective management of case of AFI, at the end of the training the student will have the following knowledge, attitude and behavioral outcomes:

1. Define and identify the types of febrile illnesses.
2. Enumerate the causes and risk factors of febrile illness.
3. Describe the magnitude and contribution of febrile illness to the overall health problems both locally and throughout the country.
4. Describe the pathogenesis of acute febrile illness.
5. Identify and describe the clinical manifestations of common febrile illnesses and their complications.

6. Demonstrate the process of assessing a patient with fever.
7. List the diagnostic methods and procedures for a case with fever.
8. Describe the principles and methods of treatment of a patient with fever.
9. Select the appropriate treatment for the common causes of fever.
10. Describe essential care that is needed to be given to a case of fever at home.

Since almost everyone in the family assists in the farm activities all the time, their clothes are torn and dirty. Clean clothes are worn only on holidays. Because of such practices and the lack of time the people of Sulula do not wash their clothes and take regular baths. Even if they do, they use only plain water to wash, since such commodity is viewed as a luxury rather than a necessity.

The family size in Sulula village is large as compared to other localities. This village has been relatively healthy for a long time basically because of its fertile soil, hardworking farmers, highland climate and almost no outside contact. Therefore, raising a family and living occurs with virtually no death of children or adults except some due to old age or accident.

Lately, however, all those glorious events are replaced with grief and strife as a result of uncontrolled population growth, resulting in reduced farm areas and overcrowded conditions. Farmers, especially young adults started migrating to nearby towns and cities in search of work. Those that leave the village end up being daily laborers sleeping in verandahs and small rooms with other laborers. Some cannot tolerate such living and hence, they will go back to their villages. Apart from this, as families grow larger, the living condition in the house becomes more congested and overcrowded. Actually, everyone accepts such living conditions as they can cuddle next to each other and keep themselves warm.

As the living condition deteriorated in the village, further sickness and death became more common in this highland village. People mostly suffer from headaches, backaches and intermittent fevers and loss of appetite and many other symptoms. What is troubling the villagers most was once such disease is seen in one person the other family members are sure to get it. If they are lucky no one dies from that family but almost all become debilitated making them unable to be as productive for many days or weeks.

There is no organized health facility in the village except the one available in Gere Gera village a half `day walk from Sulula village. Sometimes health workers visited them but what they told them was something they could not understand.

Now, the villagers understand the problem of having contact with the sick people. Therefore, when a family member is sick the household is isolated and will not be visited by the neighbors.

In one of such outbreaks in the village a relative of a family who lived in the city came to visit them and found three of the family members sick. The visitor was shocked to find all his dear families sick and decided to take them to a clinic in the city where he lives.

In the health center, the patients were striped of their clothing and their hair was cut and they were admitted for continued treatment. The physician visited them together with other staff members daily. They asked the patients where their village is; whether or not there is a health facility, or whether others have such health problems, whether they have enough water in the village, etc. They started to give them all information. Because of the staff's interest in their problems, the villagers became friendly.

After they got well and strong they were discharged. However, the health workers promised that they would visit them in their village in the very near future. The discharged patients also promised that they would wait for them at the roadside with mules and they would start brewing "Tella" as soon as they are back. And so they departed each thinking about the other in many different ways.

Question

Describe the ecological conditions of the village that may have predisposed the villagers to such illness.

Why did the health workers shave their hair and remove their clothing?

What do you think will they do with the clothing?

Why did neighbors not visit the villagers where there was sickness?

What do you think was the disease?

Discuss the general measures you would take when such patients come to the health center.

What are the precautions the health workers take while the patients are admitted in the health center?

Why do you think the health workers are visiting the village?

2.5. DEFINITION

Acute febrile illness is defined as a disease characterized by an increase of body temperature more than 37.5 ^{0}C resulting from infectious process.

2.6. EPIDEMIOLOGY

2.6.1. Typhus Fever

Louse-borne typhus is caused by Rickettsia prowazeki and is transmitted through the bite and feces of lice (pediculus humanus). Man is the only reservoir host. This form of typhus is, like relapsing fever, a classic example of an illness that is associated with war, malnutrition, crowding, and poor hygiene. Numerous local epidemics have been reported since the 1940s in Ethiopia, especially in prisons, refugee camps, relief shelters, and rural villages. Changing and washing of clothes once a week reduces the density of lice significantly.

Louse-borne typhus infections increase during the cool, rainy seasons, with persisting famine, political unrest, poor hygienic conditions, and crowded living conditions which are potential for large outbreaks. Flea-borne typhus is caused by Rickettsia typhi (formerly called R. mooseri), which is transmitted from rats to man by a variety of lice, mites, and fleas, especially the rat flea (Xenopsylla cheopis).

The occurrence of rickettsia conori, the agent of tickborne typhus (also known as boutonneuse fever and Kenya tick typhus), and rhiphicphalus and other tick vectors feeding on dogs and various investigators have reported livestock. Tick-borne typhus is believed to occur in both the highlands and lowlands of Ethiopia.

2.6.2. Relapsing Fever

There are three essentials in the cycle of transmission. When a louse infected with Borrelia recurrentis, is crushed onto the skin of the host, its gut fluid containing the organism can enter the host's blood through broken skin or any abrasion. If the population is highly susceptible, there can be a major outbreak; this has been well documented, particularly when people have been severely malnourished and living in crowded conditions.

Epidemic relapsing fever is caused by borelia recurrentis and is transmitted from man to man by pediculous humanis (the body louse). Following an ingestion of an infected blood meal by the louse, the spirochetes migrate to and multiply in the hemolymph and remain viable there throughout its life span (several weeks). Human infection results following crushing of the lice during scratching allowing an infected hemolymph to enter through the abraded skin.

Whereas tick-borne relapsing fever is widespread in Africa, the louse-borne infection is largely limited to Ethiopia, Somalia and Sudan. Relapsing fever is rapidly spread and causes high mortality rates in Ethiopia during war, civil unrest and famines.

When a large number of people are on the move, they sleep together and it is not at all difficult to understand how easy it is for the lice infecting one individual to infect another. Endemic relapsing fever is transmitted by ticks called Ornithodoros and epidemic relapsing fever caused by several species of Borellia. Following an ingestion of infected blood meals, spirochetes invade all tissues of their arthropod host including salivary glands and reproductive tract. This allows trans-ovarian passage of the spirochetes perpetuating the arthropod infection. Human infection occurs when saliva, coaxial fluid or excrement released by the arthropod during feeding comes in contact with abraded skin thereby permitting the spirochetes to penetrate the skin. These ticks are nocturnal

2.6.3. Meningococcal Meningitis

Meningococcal meningitis appears in epidemics when the relationship between parasite, host (man) and environment are favorable for the spread of infection. Otherwise the bacteria are commensal in nasopharynx of up to 25% or more of healthy people. Different factors favor the occurrence of meningitis epidemic

2.6.3.1. ENVIRONMENTAL FACTORS: The climate, in the 'meningitis belt' of Africa and elsewhere plays an important role. In Africa the semi-arid zone called the 'Sahel' is characterized ecologically by scarce vegetation with a typical dry climate in the winter months and a desert wind. This unusual climatic and ecological entity seems to facilitate the spread of meningitis because of a favorable microclimate in human habitations- small, closed, mud- walled houses in which there is practically no light or ventilation. The degree of crowding and of air pollution by oral airborne bacteria in these houses was observed to parallel the incidence of meningitis. The epidemic begins in the dry season when the absolute humidi

2.6.3.2. HOST FACTORS: Humoral immunity (pre-existing antibody against N.meningitides) is probably the most important host factor in determining whether or not a person will become ill. People can become immune in three ways: 1) by vaccination 2) by carriage of N. meningitides in the nose or throat or 3) by carriage of other bacteria that stimulate cross reacting antibody. Humoral immunity may also be important in determining whether the community is at risk of an epidemic. Epidemics may not occur until humoral immunity to a particular strain in a population has declined. This may explain the 8-12 year cycle of epidemic meningitis that has been observed in the meningitis belt.

2.6.3.3. N.MENINGITIDES SERGROUPS AND OTHER STRAIN CHARACTERISTICS

The risk of epidemic meningitis differs between N. menigitidis sero-groups. N. meningitides sero group A is the main cause of epidemic meningitis in Africa. N. meningitidis sero group C has caused occasional epidemics in Africa. N. menigitidis sero group B has not been associated with epidemics in Africa's "meningitis belt" , but has caused epidemic in other parts of the world. Other N. meningitidis serogroups such as Y have not been associated with epidemics. However, sero type W135 has resulted in epidemic in Brukina Fasso and Niger according to a report on the WHO/AFRO Bulletin, resulting in a case fatality rate of 11.5 in Burkina Fasso and 8.82 in Niger.

Within a particular sero-group, certain strains of N.meningitidis may be more likely to cause epidemics than other strains. A particular sero group A strain, designated "clonal group III-1" has caused recent epidemics in Nepal, Saudi Arabia, Chad, Ethiopia, Kenya, United Republic of Tanzania, Burundi and Cameroon as well as other countries.

Studies had shown that the risk factors for meningitis during epidemics include: Crowded living conditions, low socioeconomic status, malaria, poor nutritional status and prior upper respiratory tract infections.

2.6.4. Typhoid Fever

Typhoid is transmitted by water or food contaminated by Salmonella typhi. As it is waterborne, a small infecting dose can cause the disease in someone who drinks polluted water. As so many water sources are inadequately protected in Ethiopia, the disease is very common, particularly among overcrowded urban migrants who often live in wretched conditions. It can also be described as water borne disease since it results from fecal or urinary contamination of food and drink. Subjects who are particularly susceptible to typhoid infection include those patients with chronic schistosomiasis who may become chronically infected homozygous sickle cell subjects and HIV patients. All are liable to develop chronic invasive salmonella. The mechanism is uncertain but it may be due to reduced complement-mediated opsonizing activity and deficient macrophage function. An infected person passes the bacteria in urine or stool. 10% of convalescent patients become chronic carriers as their gall bladder continues to discharge typhoid bacilli for up to 3 months after onset of infection. Patients acutely infected also pass the organism in to their urine before treatment is given. The nature of intestinal pathology dictates that most new infections come from either recent cases or from carriers.

The incidence of typhoid rises at the end of the dry season when the rural water supply is lowest and people congregate at the source of water: The infection is more common from October to February when the rain helps spread already contaminated water supplies. Untreated, 10-25% of people with typhoid fever die, but mortality is much less with treatment.

2.7. ETIOLOGY AND PATHOGENESIS OF FEBRILE ILLNESS

Fever could be a manifestation of bacterial or any other disease, which may have wide range of severity. Benign infections in a normal host include bacterial diseases (otitis media, pharyngitis, impetigo, bacterial meningitis, relapsing fever, typhoid fever, typhus fever) and viral disorders include (pharyngitis, rhinitis, pneumonia).

Severe bacterial infections if untreated lead to significant morbidity and mortality. These include sepsis, pyogenic meningitis, bacterial pneumonia, osteo-articular

dig out the associated history and investigations thereof. Sometimes there could be a double infection (there could be two causes of fever). It is not uncommon to see a case of typhoid fever to have malaria in addition, a case of malaria presenting with cough etc.

Generally most febrile illnesses may have the following manifestations:

Symptoms

- Fever
- Loss of appetite (Anorexia)
- General malaise and prostration
- Myalgia and arthralgia
- Chills
- Rigors
- Headache
- Cough
- Vomiting
- Convulsion

Signs

- Hepatomegaly
- Splenomegaly
- Rash
- Neck stiffness (Nuchal rigidity)
- Sensorial change

2.9. DIAGNOSIS (ASSESSMENT)

Clinical History

A serious consideration needs to be given to the chronology of symptoms in relation to the use of drugs. A careful occupational history should include:

- Exposure to animals, toxic fumes, potential infectious agents, possible antigens, febrile patients (infected individuals in home, work place or school)
- Geographic areas of living

Travel history

Unusual hobbies

Dietary habits (raw or uncooked food)

Contact with household pets

Animal (insect) bite

Transfusion history

History of allergy (hypersensitivity)

History of immunization

History of substance use (tobacco, marijuana)

Family history of tuberculosis, febrile diseases, infectious diseases, collagen vascular diseases (arthritis)

History of unusual familial symptomatology like deafness, urticaria, bone pain, polyserositis, anaemia.

Haemoglobinopathies, (ethnicity)

Pattern of the fever (sustained, intermittent, remittent, relapsing, hectic)

Patients who are newborns, elderly, having chronic renal failure, chronic liver disease, bacterial shock, patients on glucocorticoids, may fail to generate fever

A. INDIVIDUAL CASES

Management of individual cases demands proper history and meticulous physical examination to clinically rule out all possible causes of fever in that area. Consideration of appropriate laboratory investigation will also assist in narrowing down the list of possible differential diagnoses and arriving at the right diagnosis.

Epidemiological considerations are also essential in backing up the clinical work up of a febrile patient. Once the diagnosis is confirmed, the treatment should be instituted promptly accordingly (see the satellite module for health officers, algorithm). While managing individual cases one should make note of their addresses and see if there is any clustering of the cases.

B. EPIDEMIC (OUTBREAKS)

Surveillance for early detection of epidemics

Surveillance is an on going collection, analysis and interpretation of data about people's health. Health officials use the information to plan, implement and to evaluate health programmes and activities. The purpose of surveillance is to:

- Detect outbreaks early
- Plan vaccination campaigns
- Estimate how many people become sick or die
- Assess the extent of outbreak
- See if the outbreak is spreading and where
- Decide whether the control measures are working

It is not difficult to identify an epidemic after it has begun, but it is most important to detect the epidemic early enough for the preventive measures like vaccination campaign to have an impact. Provide feedback of the surveillance data to peripheral levels to promote cooperation and interest in the surveillance system.

Epidemics are defined by the number of attack rates substantially above the usual rate of diseases. The attack rate is the number of cases that occur in a given area, in a given time and it is expressed as a rate per 100,000 population in the case of meningoccocal meningitis.

For instance, the thresholds for predicting the occurrence of meningitis epidemics include:

5/100,000 is the alert threshold for epidemic and needs preparation for early control.

10/100,000 for two consecutive weeks is the epidemic threshold for no vaccinated areas.

15/100,000 populations for two consecutive weeks, is epidemic threshold for vaccinated areas.

This attack rate of 15 people per 100,000 populations for two weeks is called the "**threshold attack rate**" and warrants the commencement of vaccination campaigns. This threshold attack rate is best at detecting epidemics when applied to populations between 30,000 and 100,000. If health facilities have catchment populations of less than 30,000, reports from several facilities should be combined so that the total population is at least 30,000. An area with a reporting population of greater than 100,000 should be divided into smaller ones for the purpose of meningitis

following list of steps need not always be undertaken in the order given and some are done concurrently.

1. Verification of the diagnosis

Take as detailed history as possible from the informants

Make tentative differential diagnosis

Make all arrangements including laboratory equipment for ascertaining the tentative differential diagnosis

Do clinical and laboratory studies to confirm the diagnosis. This should be done except in few situations where the urgency demands immediate action on the basis of the clinical diagnosis alone.

2. Verify the existence of an epidemic

The existence of an epidemic could be ascertained by comparing the current incidence of the disease with its usual incidence in the community. Approximate estimates of previous incidence of the disease could be obtained from clinical and hospital data and by questioning the local people.

3. Identification of affected persons and their characteristics

3.1. Case definition: It is important to define what constitutes a case so that field workers can distinguish between a case and a non-case. This definition may be modified later but it is important to develop a definition before searching for cases.

3.2. Details of each confirmed or suspected case: this must be taken in order to obtain a complete picture of the epidemic. The usual details are: age, sex, occupation, address, recent movements, details of symptoms and other details depending on what is suspected. All this information is best recorded on specially prepared record forms.

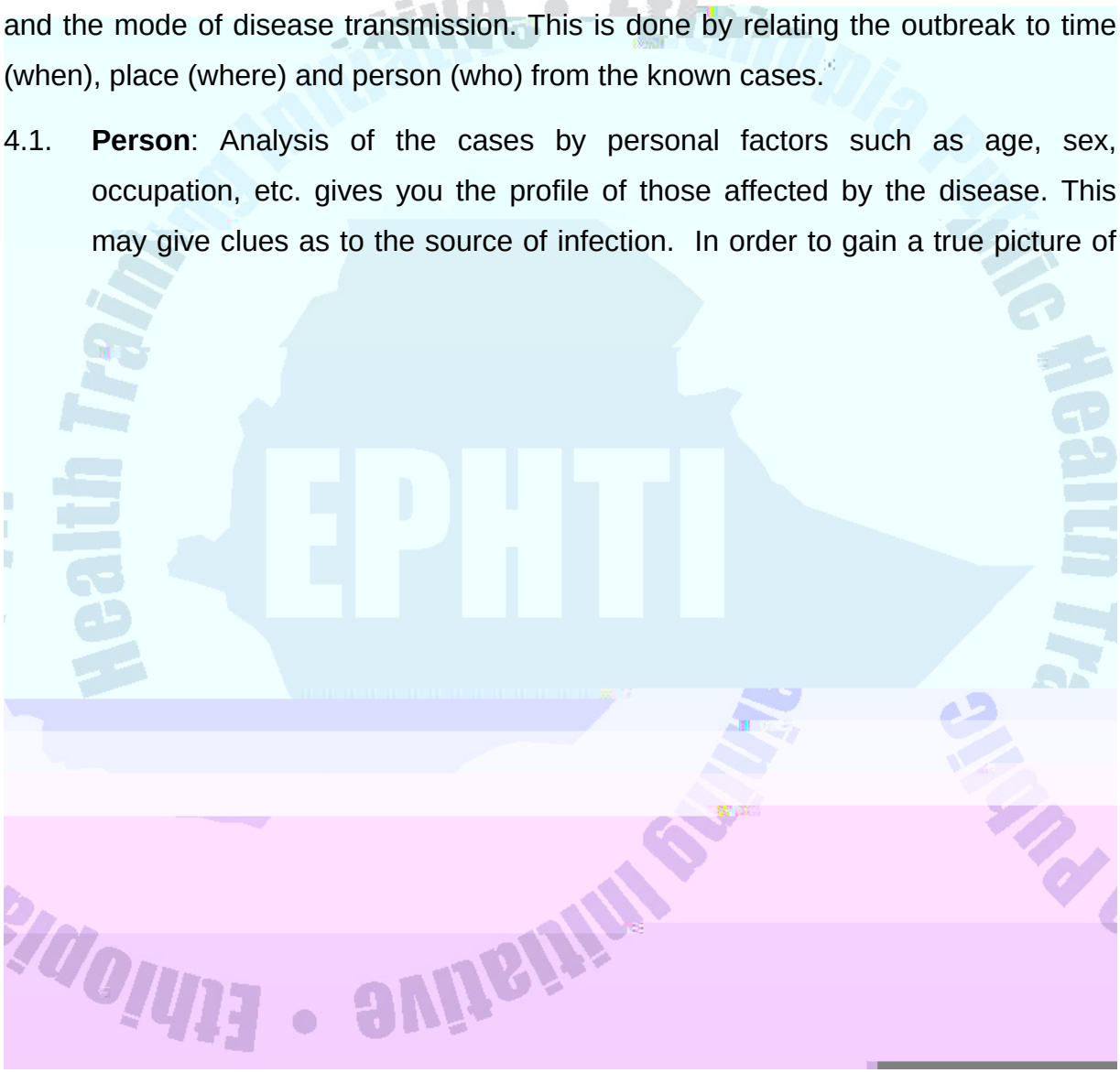
3.3. Active search for additional cases: this step is extremely important. Some of the cases may be mild and can only be identified by careful interviewing of all persons who are related in time and place with already known cases. In the

case of food poisoning, all persons who attended the meal should be identified and interviewed. All health facilities including dispensaries and village health workers should be visited for cases that were not reported.

4. Descriptive analysis

This process is essential to provide the basis for determining the sources of infection and the mode of disease transmission. This is done by relating the outbreak to time (when), place (where) and person (who) from the known cases.

4.1. **Person**: Analysis of the cases by personal factors such as age, sex, occupation, etc. gives you the profile of those affected by the disease. This may give clues as to the source of infection. In order to gain a true picture of



risk of acquiring the disease. Compare the ill population (cases) with the well population with regard to exposure to the postulated source. Make appropriate attempts to confirm epidemiological findings by laboratory tests (samples of blood, feces, food, and so on).

6. Management of the epidemic

6.1. Treatment of cases – the first action is to treat cases

6.2. Prevention of spread and commencement of control measures- depending on the type of the disease the immediate measures include:

Chemoprophylaxis for immediate contacts

Immunization

Isolation of affected persons(quarantine)

Attack sources and mode of transmission

- Protection of water sources
- Food hygiene
- Vector control

Health education: This has a large part to play in preventing the spread of the epidemic

6.3. Writing a report: There are three types of reports

Popular account for laymen

Account for Ministry of Health

Report for publication in journals

6.4. Continued surveillance of the population: this is to detect further changes in incidence and to ensure the effectiveness of the selected control measure.

2.11. Prevention and control of Acute Febrile Illnesses

Acute febrile illnesses are those illnesses that are caused basically by poor personal hygiene, poor food hygiene, overcrowding (poor housing, poor ventilation) and poor environmental hygiene. The diseases listed under this are relapsing fever, typhus fever, typhoid fever, malaria, and viral infections such as acute febrile respiratory

diseases. Most of these diseases can be easily prevented by means of proper hygienic practice and behavior change.

The diseases mentioned above are transmitted in the following way.

1. Louse borne relapsing fever and typhus fever

Human beings are the most preferred habitat for lice. All three types of lice live at different foci in our body. The body louse accommodates itself in the folds of clothing; the head lice live in the hair; and the crab lice live in the damp and warm areas of our body. All this benefits lice if they are undisturbed, by washing and ironing of cloth, washing the hair and combing, and taking regular bath using soap. Such exercise disturbs their habitats. Unhygienic conditions favor the lice. Regular washing of clothes, hair and body with soap as well as combing hair and ironing clothes prevent lice.

Lice also like warm and humid conditions. This is provided by the person himself and by the environment he lives in. Such an environment as crowded and unventilated housing favors an easy migration of lice from one person to the other.

Transmission of the germ that causes relapsing fever or typhus fever is activated by bites and by the feces that are deposited on the body and get access through a crack in the body which usually is caused by itching following bites by the insect. In the case of relapsing fever, the microorganisms from the louse enter into the body of a person when the infected louse is crashed over the body surface or due to scratching of the itching caused by the bite of the tick. A community or nation wide epidemic could arise as a result of louse infestation and overcrowded conditions.

There are also other insects that transmit relapsing fever and typhus. These insects are ticks and fleas. Ticks transmit a disease known as tick born relapsing fever and fleas transmit Murine typhus. Both diseases are not common in Ethiopia, although the insects are present. The two diseases may sometimes cause mixed epidemics in the same locality.

Prevention

Since the main cause of the disease is being infested by lice, prevention should concentrate on teaching individuals about :

- Body hygiene which includes regular bathing, regular ironing of clothing or exposing it to the sun,
- Avoid overcrowded living
- Improve ventilation
- Apply insecticide to the hair, clothes and bedding
- Institutions such as prisons that are crowded with hundreds of inmates in a single cell should arrange a steam barrel where the inmates themselves do periodic steaming. Clothes of incoming prisoners could also be steamed before they are admitted to cells.

2. Typhoid fever and paratyphoid fever

Typhoid fever is another illness that is common in Ethiopia. Typhoid and paratyphoid fevers are caused by bacilli bacteria, which enter the body and invade the intestine. Salmonella typhi, the causative agent of typhoid fever is transmitted through intestinal discharges. d feTc o242othes of inco

Washing of cooking and eating utensils using soap and hot water, dry them on a rack and store them in a cabinet and out of the reach of children and animals such as dogs, cats and chickens.

Conduct hygiene education for the general public and especially for food handlers of mass catering institutions such as prisons, restaurants and hospitals.

Cooks from such institutions should be checked periodically to restrict carriers from working in food preparation areas.

3. Malaria

Malaria is a disease that propagates itself due to lack of management of the immediate human environment. Malarial mosquitoes breed in areas with stagnant water (such as ponds, false banana leaves, tin cavity and old tires).

The mosquito usually bites at dusk or during the night. In the course of feeding blood mosquitoes may ingest malaria parasite from an infected person. After prolonged development of the parasite inside the mosquito it would be infective to a healthy person upon injection into humans by the mosquito. The transmission continues to affect many people in certain localities.

Prevention

Sustainable prevention and control could only be effected if the environment where the mosquitoes breed is modified to a non-supportive environment. This is accomplished by filling or draining ponds and other water bodies near houses, burying tin cans, periodically draining water contained in false banana leaves, spraying water bodies with burnt oil to suffocate the larvae, etc.

Although expensive and unsustainable residual insecticide spraying of the inside of the house is also very helpful.

Using impregnated (treated) bed nets, screening windows and other entrance is also one aspect of preventive measures that one may be able to afford.

UNIT THREE

STATELLITE MODULES

3.1. SATELLITE MODULE FOR HEALTH OFFICERS

3.1.1. INTRODUCTION

3.1.1.1. Purpose of the module

The ultimate purpose of this training module is to produce competent health officers who can correctly identify and effectively manage cases of acute febrile illness both in clinical and community settings.

3.1.1.2. Direction for using the satellite module

This satellite module can be used in the basic training of health center teams particularly health officers who are in the training and service programs. In order to make maximum use of the satellite module, the health officer should follow the following directions.

3.1.1.2.1. Do the pretest for satellite module of Health Officers in Section 2.1. of the Core Module

3.1.1.2.1. Check or read the Core Module very thoroughly

3.1.1.2.2. Read the case study and try

3.1.2 HEALTH OFFICERS

3.1.2.1. Pre and Post Test for the Satellite Module of Health Officers

See the pre and posttests for the health officers in the core module under unit 2, Section 2.1.

3.1.2.2. Significance and Brief Description of the Problem

See the part under Unit 2 Section 2.2 in the core module.

3.1.2.3. Learning Objectives

For effective case management of acute febrile illnesses, the health officer student will be able to do the following at the end of the training

1.

3.1.2.7. ETIOLOGY AND PATHOGENESIS

Febrile illnesses could be caused by infectious microbial causative agents which mainly include:

Bacteria: Meningitis, otitis media, tonsillitis, pneumonia, relapsing fever, typhoid fever, typhus fever, bacillary dysentery, pyelonephritis, Arthritis, Brucelosis

Virus: Rhinitis (common cold),

Spirochetical rashes (syphilis, relapsing fever)*, rickettsial rashes (typhus)*
VACULITIS/HYPERSENSITIVITY REACTIONS: acute rheumatic fever*, lupus erthematosus, Henoch-Scholein purpura, serum sickness*, StevenJohnson syndrome*, Kawasaki's disease, drug reactions(e.g. Quinidine, vaccines)
Cancers: leukemia*
Metabolic: excessive dehydration*, thyrotoxic crisis*

*Potentially dangerous if rapid intervention not done.

3.1.2.8. CLINICAL FEATURES (SIGNS AND SYMPTOMS AND DIFFERENTIAL DIAGNOSIS)

Differential diagnosis of acute febrile illnesses. and their most prominent clinical manifestations *(* = Most prom Mo.es)*

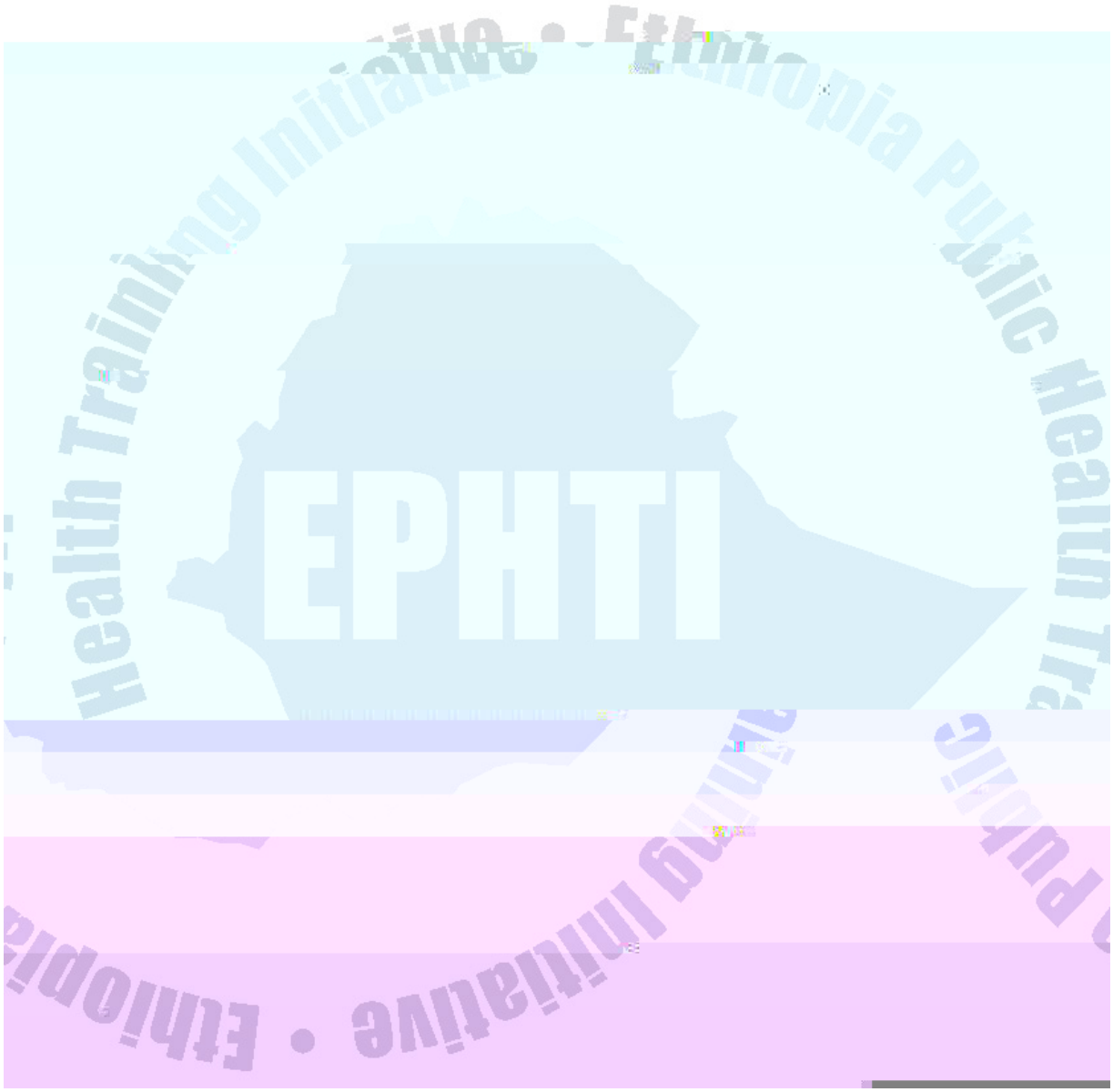
2. **Acute Onset with Chills and Petecchial Rash**

Typhus	**Relapsing Fever**	**Meningococcemia**
*a. Rash occurs later in the diseases mostly over the back and buttock, rare in Ethiopia (tick born)	*a. Rash occurs mostly over the pectoral area	*a. Rash is diffuse occurs early in the disease
*b. Fever high and sustained, it may be relapsing	*b. Fever high and sustained	*b. Fever irregular
*c. very severe headache	Moderate headache	Usually no headache unless meningitis occurs, then stiff neck is also present
*d. Toxemia and mental confusion	d. Alert	d. Alert
e. Occasional splenomegaly (10-25%)	*e. frequent splenomegaly	e. Occasional splenomegaly (10-25%)
f. Occasional epistaxis	*f. Frequent epistaxis	f. Occasional epistaxis
g. Back and leg pains	g. Calf pains	g. Arthralgia with poly arthritis in 10%
h. Non productive cough	h. Non productive cough	Preceding upper respiratory tract infection
i. WBC 12,000	i. WBC15, 000 or more	i. WBC 15,000 or more
j. Fever decreases in 24-48 hours with therapy. Patient looks toxic for another week	j. Fever decreases in 12 hours with therapy. Patient wants to go home in 24 hours	j. Fever decreases in 24 hours with therapy
k. Occurs in all ages	k. Occurs in all ages	k. Occurs primarily in children

**Viral exanthemas caused by measles, roseola and rubella and other non infectious causes of rash and fever like drugs and idiopathic thrombocytopenic purpura are important differential diagnosis.

3b. Acute Onset With Chills, Splemonomegaly And Leukopenia

MILIARY TB	BRUCELLOSIS	KALAAZAR	MALARIA
a. Acute onset	a. Onset insidious in		



4. Acute Onset with Chills And Localizing Signs

PNEUMONIA	PRIMARY PULMONARY TB	PYELONEPHRITIS
*a. Onset acute	*a. Onset gradual	*a. Onset acute
*b. Fever high and sustained	*b. Fever irregular	*b. Fever high and sustained
*c. Single shaking chill	*c. May have multiple chills	*c. May have multiple chills
**d. Severe pleuritic pain is common	d. Occasionally have pleuritic chest pain	**d. Marked CVA tenderness
*e. Usually in young adults	*e. Usually in children	*e. Children and women of child bearing age or old men.
**f. Cough with thick "rusty" sputum	**f. Cough with thick sputum, often with blood	**f. Cloudy urine and dysuria
*g. WBC 15,000	*g. Leucopenia	*g. WBC 15,000
*h. Gram + diplococci in sputum	*h. AFB in sputum	*h. Bacteria and WBC in un-spun urine

5. Gradual Onset of Fever

TYPHOID	BRUCELLOSIS	KALAZAR
a. Onset of fever gradual, rising in stepladder fashion for one week.	a. Onset insidious in about 50%. May be acute	a. Onset of fever usually insidious but may be acute
b. Fever remittent and sustained	b. Fever intermittent at first, may later be undulating	b. Fever intermittent or remittent at first later may be undulating. At times double quotidian fever occurs
c. Toxic appearance	c. Patient often looks quite	

Drug Treatment Regimen for Acute Febrile Illnesses

3.2. SATELLITE MODULE FOR PUBLIC HEALTH NURSES

3.2.1. INTROUDUCTION

3.2.1.1. Purpose and use of the module

In this satellite module under the general headings of AFI (Acute Febrile Illness), typhoid fever, meningitis, relapsing fever, and typhus will be considered. The main purpose of this satellite module is to equip the trainees with knowledge and skills required to identify and manage efficiently the aforementioned cases. The public health nurse can use this satellite module in their pre-services or in service training programme.

3.2.1.2. Direction for using the satellite Module

For better understanding of this module, the public health nurse are should do the following:

Do pre test pertinent to your field in Unit 2 Sections 2.1 of the core module.

3.2.2. SATELLITE MODULE FOR PUBLIC HEALTH NURSES

3.2.2.1. Pretest and posttest

See the Core Module Unit 2, Section 2.1.

3.2.2.2. Significance and brief description of the problem

See the Core Module Unit 2, Section 2.2.

3.2.2.3. Learning Objectives

The main objectives of this Satellite Module is to equip the trainees with the appropriate knowledge, and skills required to efficiently identify and manage cases` as well as prevent acute febrile illnesses.

3.2.2.3. Learning Activities

Read the story of Sulula village so that you will be able to discuss questions in Section 2.12. of this module.

3.2.2.5. Definitions

Refer to the core module Unit 2, Section 2.5.

3.2.2.6. Epidemiology

Refer to the core module Unit 2, Section 2.6.

3.2.2.7. Etiology and pathogenesis

Refer the core module Unit 2, Section 2.7.

3.2.2.8. Clinical features (Symptoms and signs)

Refer to the core module Unit 2, Section 2.8.

3.2.2.9. Diagnosis

Refer to the core module Unit 2, Section 2.9.

3.2.2.10. Case management

Role of the Public Health Nurse in Acute Febrile Illness.

The Public Health Nurse does have a role in:

Diagnosing the case accurately.

Promptly providing treatment

Following the cases to the end point

Providing continuous follow up

Reporting accurately to the concerned body

Participating actively in epidemic control system

Investigating the case

Mobilizing the community for prevention activities

Analyzing data from the peripheral level for epidemiological links, trends and achievement of control targets.

Providing feedback to the peripheral level

Organizing essential logistics

Responsibility of the PHN in the AFI

a) In health care setting

Isolation of patients

Institute barrier nursing (wearing gloves, masks)

Replace fluid and electrolytes

Provide appropriate prescribed therapy

Detection and prompt management of complications

Temperature >40^{o}C

Perspiration

Poor oral intake

Bladder distention due to loss of urge to void during the toxic state

Retention of feces

Supportive Nursing Intervention:

1. Use of side rails for patient safety
2. Bed in low position
3. Sedation
4. Soft restraints if necessary
5. Tepid water sponging
6. Increased fluid intake to prevent dehydration
7. Observation for bladder distention
8. Enema under low pressure to prevent perforation
9. Change of position and skin care

Monitoring For Complication:

Intestinal hemorrhage is the most common complication occurring in 4-7% of patients during the third week, signs are:

Apprehension

Sweating

Pallor

Weak rapid pulse

Hypotension

Bloody or tarry stool

Nursing Intervention:

Managed by supportive measures such as

Cross-matched and perfectly screened blood transfusion

Intravenous fluid replacement with multivitamins combinations.

Intestinal perforation occurs most common by in 3rd week

Intestinal content may spill in to abdominal cavity causing peritonitis

If such conditions developed in the patient, the possible manifestation are:

Acute abdominal pain (lasts few seconds & stops) and at times the pain may be persistent if irritation is persistent.

Abdominal tenderness & rigidity during examination.

Nursing intervention includes preoperative nursing care which consists of:

Checking vital signs

Giving information about the type of operation

Providing enema

Maintaining nothing per OS (NPO) for 12 hours

Consent form signed

Inserting naso-gastric tube

Opening an IV line to administer fluid and correct electrolyte imbalance.

Teaching the patient deep breathing exercises

Providing premedication

Inserting urinary catheter.

Making ready cross-matched and screened blood ready.

Preparing an anesthesia bed.

Notifying the operation room personnel.

Postoperative care

Check the vital signs every 30 minutes for the next two hours and every two hours for the next 6 hours and every 8 hours then after. If the patient becomes unstable the vital signs should be taken more frequently.

Maintaining NPO until the gag reflex and the bowel movement return.

Provision of a fluid diet depends on the condition of the patient and the order of the physicians.

Check the IV line

Provide mouth, back and body bath.

Measure the input and output and record.

Give medication as ordered.

Notify immediately if you observe unusual conditions.

Check the operated site and change the dressing every day.

Remove the stitch after 7 days post operatively

Encourage and support the patient to get out of bed after 24 hours postoperatively.

Implement deep breathing exercises.

Nursing Management of Meningitis:

The goal of nursing management is:

To promote the healing process within the shortest period of time.

To prevent complications

To maintain body temperature

To keep patients' normal feeding pattern

To maintain normal function of internal organs.

To keep skin integrity.

Patients with meningitis are severely ill and toxic; this requires the most skilled nursing care. They resent all interference, so, great patience on the part of the nurse is needed in order to make sure that the patient gets sufficient fluids. In the early stage the patient will be able to take only fluids with glucose; as soon as specific treatment has had effect, light diet will be possible. The patient is best nursed in subdued light on account of the photophobia. Quietness is essential as noise is poorly tolerated.

* The prognosis may depend on supportive care given

Common problems and their nursing interventions

Provision of ordered medication on time.

Examining the patient for other focal infection.

2. Dehydration

Provide IV fluids based on order.

Start fluid diet as soon as possible and encourage the patient to take as he/she tolerates.

Measure input and output.

3. Decubitus Ulcer

Frequent change of positions

Provision of back care and massage

Change of bed sheet and linen as soon as possible

Avoiding wet cloth

Encouraging the patient to be out of bed if his/her condition allows.

4. Airway obstruction

Protection during seizure while comatose.

Take care for vomits and oral discharge.

5. Infection.

Early diagnosis and treatment

Provision of the ordered medications

Giving chemoprophylaxis for contact cases.

Encourage the patient to have deep breathing excercises.

6. Confusion

Observe patient's condition very frequently.

Make sure that the patient has been accompanied by someone

Be aware of the complication of meningitis:

- Changes in respiration, low pulse rate, high blood pressure, papillary changes or decreased responsivene

- Sudden appearance of skin rash and bleeding from veni-puncture sites may indicate disseminated intra-vascular coagulation.
- Persistent or recurrent fevers

5. Ensure adequate nutrition

Carefully monitor the administration of IV fluids and nutrients

Insert NGT when necessary

Initiate oral feeding as soon as possible if the patient's condition allows.

-

Give specific instructions regarding medications to be administered at home.

Nursing Management of Relapsing Fever

The goals of nursing management are:

To reduce disease transmission

To promote the healing process of an infected person

To prevent any complication that may arise.

To delouse patients

*** Supportive nursing measures**

Decreasing high temperatures.

Maintaining skin integrity

Observing drug reactions

Encouraging fluid and dietary intake

Combating generalized discomfort

Monitoring vital signs

Nursing management of typhus

The goal of nursing management is:

1. To prevent disease transmission
2. To avoid complications
3. To promote the healing process

Supportive nursing measures are used to combat fever, restlessness, and pain, and to promote comfort.

Position the patient carefully because he/she may have severe edema and necrosis from vasculitis.

The circumference of the abdomen, arms and legs are measured once or twice per day to determine the extent of edema.

Intake and output records are kept and evaluated to assess for oliguria, because the patient may develop renal failure as a result of poor tissue perfusion from vascular degeneration

Reduce fever by instituting the ordered antipyretic or using the nursing measure such as tepid sponging.

Prevent secondary infection

i. By early ambulation
ii. By deep breathing exercise and deep coughing technique
iii. Ensuring adequate nutrition
iv. Encouraging high fluid intake

3.3. SATELLITE MODULE FOR MEDICAL LABORATORY TECHNICIANS

3.3.1. INTRODUCTION

3.3.1.1. Purpose of the module

This module helps laboratory technicians to participate in the team management of acute febrile illnesses, with a particular emphasis on the laboratory investigations. The module is designed to be used by the medical laboratory technicians as a member of the health center team for both the pre-service and in-service training levels.

This part of the module stipulates the role of laboratory technicians in the identification, diagnosis, management and prevention of acute febrile illnesses as part of the health center team.

3.3.1.2. Direction for using the satellite module

1. Do the pretest in Section 2.1.2.3. in Unit 2 of the Core Module
2. Read the core module thoroughly
3. Use listed references and suggested reading materials to supplement your understanding of the problem.
4. Read the story of people in Sulula village in the core module and discuss the questions related to your profession
5. Do the post test in Section 2.1.3 in Unit 2 of the Core Module and evaluate yourself by referring to the key in Unit 7, Section 7.2.3.

3.3.2. Learning Objective

By using this Satellite Module and other reference materials, trainees will be able to:

1. Demonstrate collection of appropriate specimens
2. Explain how to handle appropriate specimens
3. Describe how to preserve appropriate specimens
4. Explain when to examine appropriate specimens
5. List what to look for in appropriate specimen examination
6. Carry out macroscopic examination of different specimens
7. Carry out microscopic examination of different specimens
8. Identify the haemoparasite through microscopic examination

3.3.2.1. Pre and posttest

3.3.2.5. Laboratory Diagnosis of Acute Febrile Illnesses

Different microorganisms cause acute febrile illnesses; as a result, there are different laboratory procedures for their diagnosis. For an accurate laboratory diagnosis of AFI, the following should be taken into consideration:

3.3.2.5.1. Collection of specimen

The reliability of the results obtained will depend largely on the care taken in collecting specimens. The following precautions should be taken in handling the specimens

Collection of a sufficient quantity

The sample that is going to be collected shall be of sufficient

7. Wipe away the first drop of blood, using a clean piece of dry gauze or tissue. This drop is contaminated with tissue fluid and will interfere with laboratory results if used .The succeeding drops are used for tests.
8. If a good puncture has been made, the blood will flow freely. If it does not, use gentle pressure to make the blood form a round drop. Excessive squeezing will cause dilution of the blood with tissue fluid.
9. Collect the specimens by holding a capillary tube to the blood drop or by touching the drop to a glass slide. Rapid collection is necessary to prevent coagulation, especially when several tests are to be done using blood from the same puncture site.
10. When the blood samples have been collected, have the patient hold a sterile, dry piece of gauze or cotton over the puncture site until the bleeding has stopped.

PROCEDURE FOR VENIPUNCTURE

1. Assemble the necessary equipment:
    a. For a vacuum tube system (the Vacutainer method): Thread the short end of the double-pointed needle into the holder and tighten securely. Place the vacuum tube in the holder and push the tube forward until the top of the stopper meets the guide mark in the holder. The point of the needle will thus be embedded in the stopper without puncturing it and losing the vacuum in the tube.
    b. For a needle and syringe system. Remove the syringe from its protective.

7. Apply the tourniquet so that it can be easily released. The tourniquet should not be left in place unless the technician is ready to proceed immediately with the venipuncture.
8. Cleanse the skin at the venipuncture site thoroughly by rubbing well with 70% alcohol.
9. With the patient's cooperation, grasp the elbow with your left hand and hold the arm left extended. Anchor the vein with your thumb, drawing the skin tight over the vein to prevent it from moving. Ask the patient to open and close the fist.
10. Using the assembled vacuum tube system or syringe and needle, try to enter the skin first and then the vein, at a 30-40^0 angle. Enter the vein with the bevel of the needle up.
11. With the vacutainer system, when in the vein, push the vacuum tube into the needle holder all the way so that the blood flows into the tube. Blood will fill the tube under this vacuum.
12. With the syringe and needle system, if the vein has been entered, blood will spontaneously enter the syringe. In persons with low venous pressure, the plunger of the syringe is withdrawn slightly to make certain the needle has entered the vein. Blood should enter the syringe if the needle is in the vein properly. Withdraw the blood by using the left hand to pull back the plunger while steadying the syringe with the right hand.
13. When sufficient blood has been withdrawn, release the tourniquet. Place a dry gauze pad over the needle and puncture site and gently withdraw the needle.
14. Instruct the patient to hold the gauze pad over the venipuncture site for 2 or 3 minutes.
15. With the vacutainer system, remove the tube form the vacutainer system, remove the tube from the vacutainer holder and, if anticoagulation is used, invert several times gently to mix the blood with the anticoagulant. Label the tubes with the patient's name, hospital number, and other information required by the hospital.

16. With the syringe and needle system, remove the needle from the syringe and gently expel the blood into the tube. Avoid foaming or the rupture of the cells by using gentle pressure on the plunger of the syringe. Stopper the tube and invert gently to mix anticoagulant with the blood, if anticoagulant is used. If a vacutainer tube is used to hold the blood, push the needle through the stopper and allow the blood to collect in the tube under the vacuum in the tube. Label the tube properly. Use scoop technique of recapping needles.
17. Reinspect the venipuncture site to ascertain that the bleeding has stopped. If bleeding has stopped, apply a Band-Aid over the wound; otherwise continue to apply pressure until the bleeding stops. Do not leave the patient until the bleeding stops. Blood is used as a sample for serological diagnosis of AFI. The following procedure are indicated for AFI.

3.3.2.5.2. Widal test for Typhoid fever and paratyphoid fever

This is a serological technique, which tests for the presence of salmonella antibodies in a patient's serum. It is used when tests detecting antigen are not available. It is also used in the investigation of salmonella food poisoning.

When investigating typhoid fever, four the patient's serum is tested for O and H antibodies. (Agglutinins) against the following antigen. Suspensions usually (against stained suspensions):

S.typhi, O antigen suspension 9,12

S.typhi, H antigen suspension d

When testing for paratyphoid A, B, or C the following antigens are required

S.paratyphi A, O antigen suspension, 1, 2, 12

S.paratyphi H antigen suspension, a

S.paratyphi B, O antigen susupension, 1, 4, 5, 12

S.paratyphi B, H antigen suspension, b phase 1

S.paratyphi C, O antigen suspension, 6, 7

S.paratyphi C, H antigen suspension c phase 1

Principle: A series of dilutions of serum are made on physiological saline. A suspension of agglutinable organism with “H” and “O” salmonella antigen is added and the mixture is incubated. Finally the higher dilution giving 2+ agglutination is determined.

There are two methods to perform the Widal test: test tube and slide method. Due to the nature of the technique that involves the test tube method, it is rarely performed at health centers. The slide method being simple and relatively easy and cheap it is often performed in health centers. The slide method cannot differentiate between recent and past infection, as it is difficult to determine the titre. The test tube method is a diagnostic test. This indicates that when the test becomes positive using the slide test one shall confirm with the test tube method.

Salmonella contains two major antigens.

Somatic antigen (O antigen)

Flagella antigen (h antigen)

Additionally, in some species there is another antigen called Vi antigen (virulent antigen)

Slide method

Procedure

1. Using a 0.2 ml or 0.2 ml graduated to 0.01 ml, place 0.08, 0.04, 0.02, 0.01 and 0.005 ml of serum on 4 or 5 squares respectively on a glass plate for each antigen.
2. Shake the antigen bottle well. The antigens used for the tube method are not to be used for the slide method. Add a drop of antigen to each square (slide). The dropper should deliver .003 ml of antigen per drop or use a 0.1 ml pipette.
3. Mix using a clean applicator stick for each different antigen. Start with the largest dilution and move to the smallest;
4. Tilt the slide back and forth for 2 minutes.
5. View against a black background.
6. Grade as 4+, 3+, 2+, 1+, $\pm$, 0 and report the highest titer showing 2+ reaction.

The squares could be ordinary microscopic cover slips.

NB. The correct type of antigen shall be used and the test controls shall be included during performance of the test. These controls are EH, EO, BH, BO, AH, AO and occasionally CH and CO. This procedure can be modified by different manufacturers, and as a result, it is advisable to follow the manufacturer's directions

N.B *Always run quality controls for every procedure.*

3.3.2.5.3. Lab Diagnosis of Relapsing Fever (RF)

There are two forms of relapsing fever

Louse borne relapsing fever: caused by Borrelia recurrentis which is transmitted from human to human by the human head/body louse (Pediculus humanus).

Tick born relapsing fever: caused by Borrelia dutoni which is transmitted from human to human by soft ticks of genus Ornithodorus.

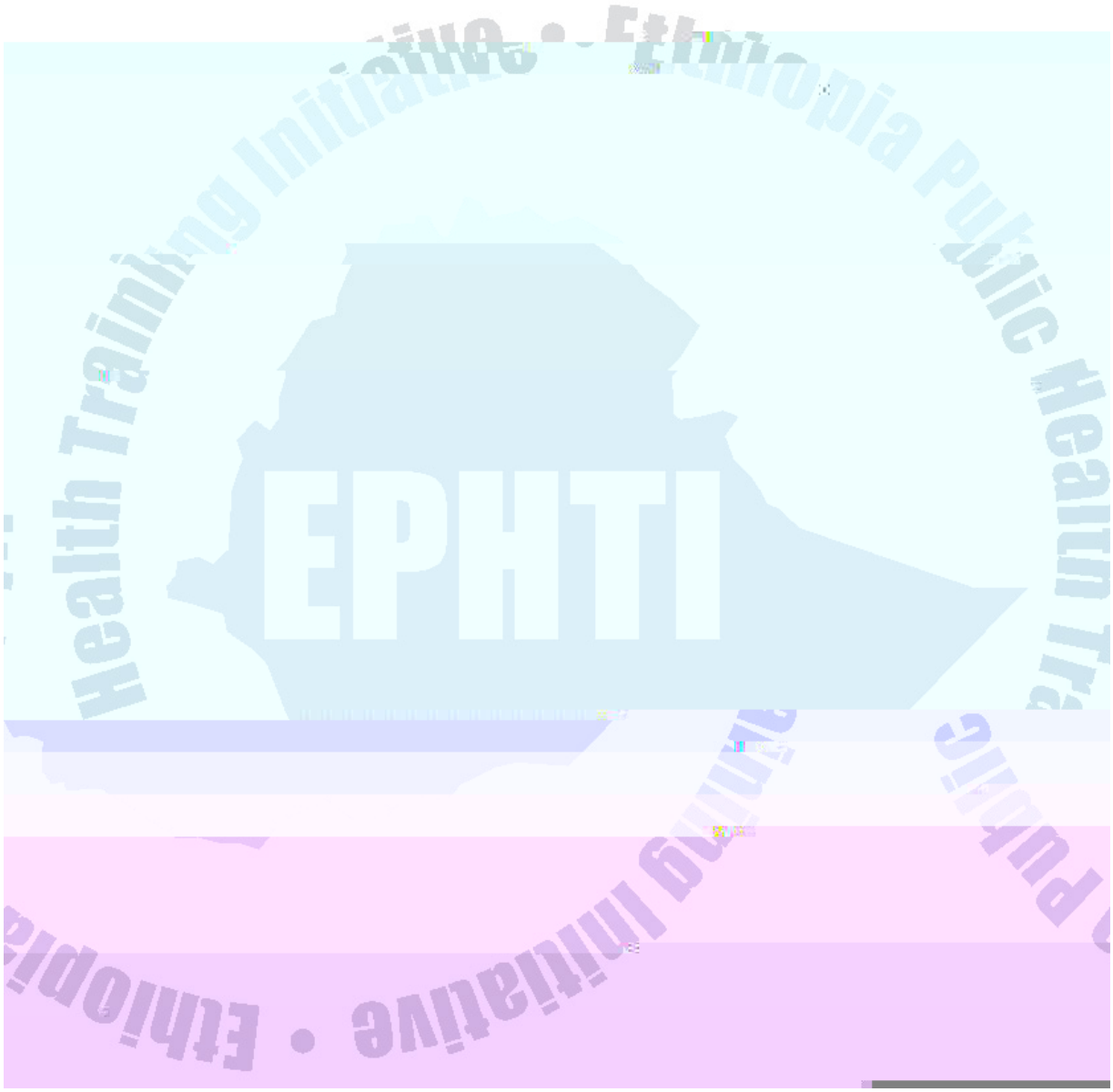
The laboratory diagnosis of RF is mainly by making use of blood film. There are two types of blood film. These are thin and thick blood films. The thick blood film can concentrate the parasites and hence is more sensitive than the thin blood film. For the investigation of RF both methods are used.

For the collection of blood sample (skin puncture refer to the section under blood sample collection).

Procedure for preparation of thin and thick blood films.

1. Cleanse the lobe of the finger (or heel if an infant) using a swab moistened with 70% alcohol. Allow the area to dry.
2. Using a sterile lancet, prick the finger or heel. Squeeze gently to obtain a large drop of blood. Collect the blood preferably in a small plastic bulb pipette.
3. Using a completely clean grease-free microscope slide and preferably malaria slide card, add a small drop of blood to the centre of the slide and a large drop about 15 mm to the right.
4. Immediately spread the thin film and thick blood film using a smooth edged slide spreader. Blood from anemic patients needs spreading more quickly with the spreader held at a steeper angle.

5. Without delay (using the end of a plastic pipette or piece of stick), spread the



For practical purposes and availability of the reagents, Giemsa staining technique will be discussed.

Giemsa Staining Technique

Required

Giemsa stain

Buffered water, pH 7.1-7.2

Or buffered saline, pH 7.1-7.2

Procedure

1. Immediately before use, dilute the Giemsa stain as required. E.g. 10% solution for 10 minute staining (measure 45 ml of buffered water, pH 7.1-7.2 in a 50 ml cylinder. Add 5 ml of Giemsa stain to 50 ml mark 0 and mix gently).
2. Place the slides face down wards, in a shallow tray supported on two rods, in a Coplin jar or in a staining rack for immersion in staining troughs. Thick blood films must be thoroughly dried and thin blood films must be fixed (methanol for 2 minutes).
3. Pour the diluted stain into a shallow tray, Coplin jar, or staining troughs. Stain for 10 minutes.
4. Wash the strain from the staining container using clean water (need not be distilled or buffered). Important: Flushing the stain from the slides and staining container is necessary to avoid the films being covered with a fine deposit of stain.
5. Wipe the back of each slide clean and place it in a draining rack for the preparation to air-dry.
6. Examine the blood film first by 40x objective and then with 100x oil immersion.

Results

Borrelia species- large spirochete measuring 10-20 x 0.5 micro meters with uneven size coils.

Red cells-gray to pale mauve

Reticulocytes-grey blue

Nuclei of neutrophils-dark purple

Granules of neutrophils-Mauve purple

Granules of eosinophils-red

Cytoplasm of mononuclear cells - blue grey

Reporting

Reporting should include the following information

Indicate whether the blood film is positive for Borrelia species or not.

The numbers of bacteria present, whether many, moderate or scanty

Gram reaction of the bacteria, whether cocci,diplococci, streptococci, rods, or coccobacilli. Also, whether the organisms are intracellular or extracellular.

Presence and number of pus cells

Presence yeast cells and epithelial cells

N.B *Always run quality controls for every procedure.*

3.3.2.5.4. Weil-Felix reaction for typhus fever.

This test is not specific for typhus fever as the antigen is prepared from Proteus bacteria and detects antibodies produced due to rickettsial and proteus infections. It is an example of hetrophile antibody (antibodies that react with an entirely different organism and phylogenetially unrelated to the organism or antigen responsible for their production). This test is not practical in Ethiopian heath centers as a result of the laboratory facilities.

3.3.2.5.5. Laboratory Diagnosis of malaria

Refer to module on malaria.

3.3.2.5.6. Laboratory Examination of Meningitis

Meningites is caused by N.meningitides. The specimen of choice is CSF which is usually collected by experienced health officer or physician. The laboratory investigation of meningitis at health centre level is mainly by gram staining. There are also other supportive tests on CSF like protein estimation, sugar estimation, cell count and others.

Gram staining procedure:

Gram staining reaction is used to help identify pathogens in specimens by their Gram reaction (Gram positive or Gram negative) and morphology. Bacteria is divided in to two groups based on Gram reaction: Gram positive and Gram negative.

Required

crystal violet stain

Lugol's iodine

Acetone-alcohol decolorizer

Neutral red (0.1 % w/v) or safranin

Procedure

1. Prepare the smear of CSF on clean glass slide in optimum time.
2. Let the smear dry by air
3. Fix the dried smear by applying methanol for 2 minutes.
4. Cover the fixed slide with crystal violet stain for 30-60 seconds.
5. Rapidly wash off the stain with clean water. Note: when the tap water is not clean, use filtered water or cleaned boiled rainwater.
6. Tip off all the water, and cover the smear with Lugol's iodine for 30-60 seconds
7. Wash off the iodine with clean water.
8. Decolorize rapidly (few seconds) with acetone alcohol. Wash immediately with clean water. *Caution:* Acetone alcohol is highly flammable, therefore use it well away from an open flame.
9. Cover the smear with neutral red stain for 2 minutes.
10. Wash off the stain with clean water.
11. Wipe the back of the slide clean, and place it in a draining rack for smear to air-dry.

12. Examine the smear microscopically, first with the 40x objective to check the staining and to see the distribution of material and then with the 100x oil immersion objective to report the bacteria and cells.

Results

Gram positive bacteria------- Dark purple

Gram negative bacteria------ Pale to dark red

Nuclei of pus cells ---------- Red

Epithelial cells---------- Pale red

Reporting

The report should include the following information

- Numbers of bacteria present, whether many, moderate, few or scanty.
- Gram reaction of the bacteria, whether gram positive or gram negative
- Morphology of the bacteria, whether cocci, diplococci, streptococci, rods or coccobacilli. Also, whether the organisms are intracellular.
- Presence and number of pus cells
- Presence of yeast cells and epithelial cells

Variations in Gram staining (causes of false gram positive and false negative)

Gram positive organisms may lose their ability to retain crystal violet and stain Gram negatively for the following reasons:

- Cell wall damage due to antibiotic therapy or excessive heat fixation of the smear.
- Over decolorization of the smear.
- Use of an iodine solution which is too old, i.e. yellow instead of brown in color (always store in a brown glass or other light opaque container).
- Smear has been prepared from an old culture

Gram negative organisms may not be fu5(i 0 -2.22 T Tc ive]TJstaiapphas -0.0005 Tc81.72 Td.7

3.3.2.5.7. Laboratory Examination of Stool

The commonest causes of fever with GI manifestations necessitating stool examination are bacillary dysentery and typhoid fever. Some of the features which help to differentiate bacillary dysentery from dysentery caused by other conditions like amoebiasis microscopically are the following:

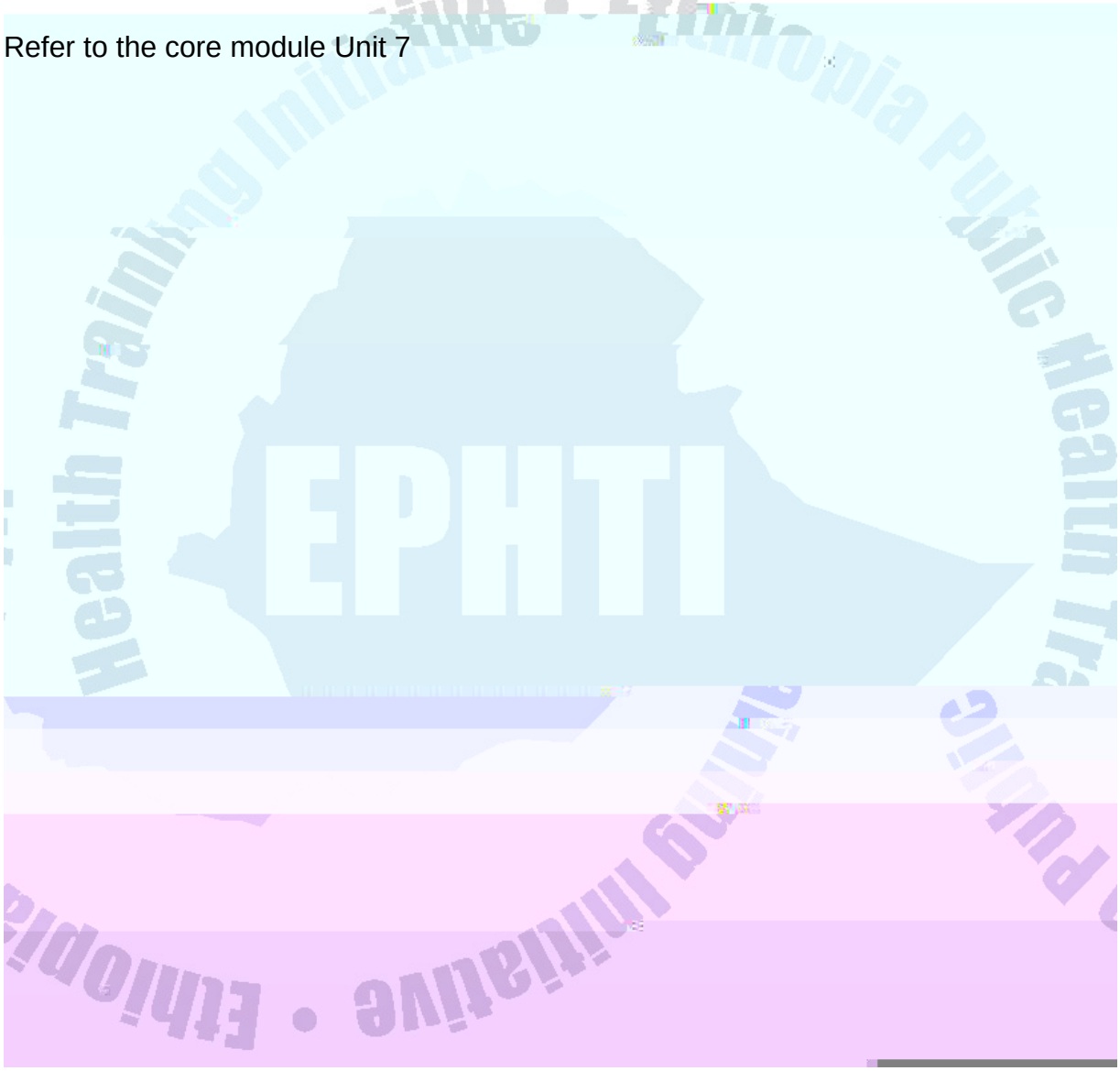
Amoebic dysentery	Bacillary dysentery
- Few pus cells	

3.3.2.9. References

Refer to the core module Unit 6

3.3.2.10. Annexes

Refer to the core module Unit 7



3.4.2. SATELLITE MODULE FOR SANITARIANS

3.4.2.1. Pretest and posttest: Please refer to Section 2.1-2.4 in the Core Module

3.4.2.2. Significance and brief description of the problem: please refer to Section 2.2 in the Core Module

Goal

The ultimate goal of this training module is to produce competent sanitarians that can understand the disease transmission mechanism of acute febrile illness (AFI) and carry out effective and sustainable preventive measures in their control in community settings together with the team and the communities.

3.4.2.3. Learning Objectives

At the end of the training students will be able to:

1. Describe ways of preventing AFI.
2. Describe why personal hygiene, domestic and environmental hygiene practices prevent AFI.
3. Describe the ways and advantages of preparing a behavioral, target in designing effective health education programme to prevent AFI.
4. Describe the importance of target audiences.
5. Understand all the mechanisms or routes of (faecal-oral) transmission of disease.
6. Describe the control methods for vector borne febrile illnesses.

3.4.2.4. Learning activity (case Study) "the story of people in Sulula village": Please refer to the story in Section 4.1 in the core module and the exercise to section 2.9 in this Unit.

3.4.2.5. Definition:

Please refer to Section 2.5 in the core module

3.4.2.6. Epidemiology:

Please refer to Section 2.6 in the core module

3.4.2.7. Etiology and pathogenesis;

Please refer to Section 2.7 in the core module.

3.4.2.8. Prevention of AFI

Acute febrile illnesses could be prevented and controlled if one can keep his/her personal hygiene, control the immediate human environment from being littered by refuse and feces, using sanitary latrines, clean water, food at all times and practice good hygiene behavior. Personal hygiene includes:

Proper disposal of feces and solid waste (environmental hygiene)

Vector control

Food hygiene

Water sanitation

Most of the diseases that cause AFI will come under the above headings either in personal hygiene, water waste or vector.

A sanitarian is advised to examine the five environmental health domains to see their role in the transmission of the diseases.

1. Personal Hygiene

Personal hygiene, especially hand washing, is the most important factor in preventing typhoid and paratyphoid disease transmission. Mothers, caregivers, cooks who may

be carriers can contaminate food and drinks unless they practice proper hand washing.

What is proper hand washing? It is washing hand using soap, ash or any other cleansing materials: It is a behavior which must be practiced by every one in the family more so by caregivers and cooks. Hand washing should be performed immediately:

The other personal hygiene practice is keeping of self, housing and compound as clean as possible or else fly borne, and louse borne diseases will spread.

- After using latrines
- After cleaning child's bottom or cleaning child feces
- After cleaning houses
- Washing and ironing clothing especially night cloth and under wears
- Washing of hair, shaving, or trimming short at all times.
- Take regular baths

2. Proper disposal of human feces

Human feces contain many types of disease causing organisms including those that could cause typhoid and paratyphoid fevers. Isolating feces is one of the most essential barriers (first barrier) for typhoid fever. Isolation can be effected by many methods, which include the traditional pit latrines.

The most important thing to consider is not only to have latrines but:

- The latrine should be sited away from water source (about 30 meters) and kitchen (10 meters)
- The latrine must be constructed in such a way that guarantees privacy and will not cause any accident
- It should be cleanable and cleaned regularly
- The latrine hole should be covered or vented to avoid fly breeding
- There should be a hand washing facility attached to the latrine so that users will practice hand washing.

3. Water protection and use

Water though essential for life is incriminated in harboring many disease organisms. Water is contaminated in many ways in different areas. The areas of contamination are:

- At the source by surface runoffs, animal wastes, and from an underground infiltration
- When women or children are drawing it with no precaution for hygiene.
- From a dirty cover that people use to cover water during transport
- During storage and drawing water from storage especially when water is drawn by dipping.

Therefore, the second important barrier in the prevention of typhoid is to prevent access of the contaminant (*Salmonella typhi.*). The methods of protection are:

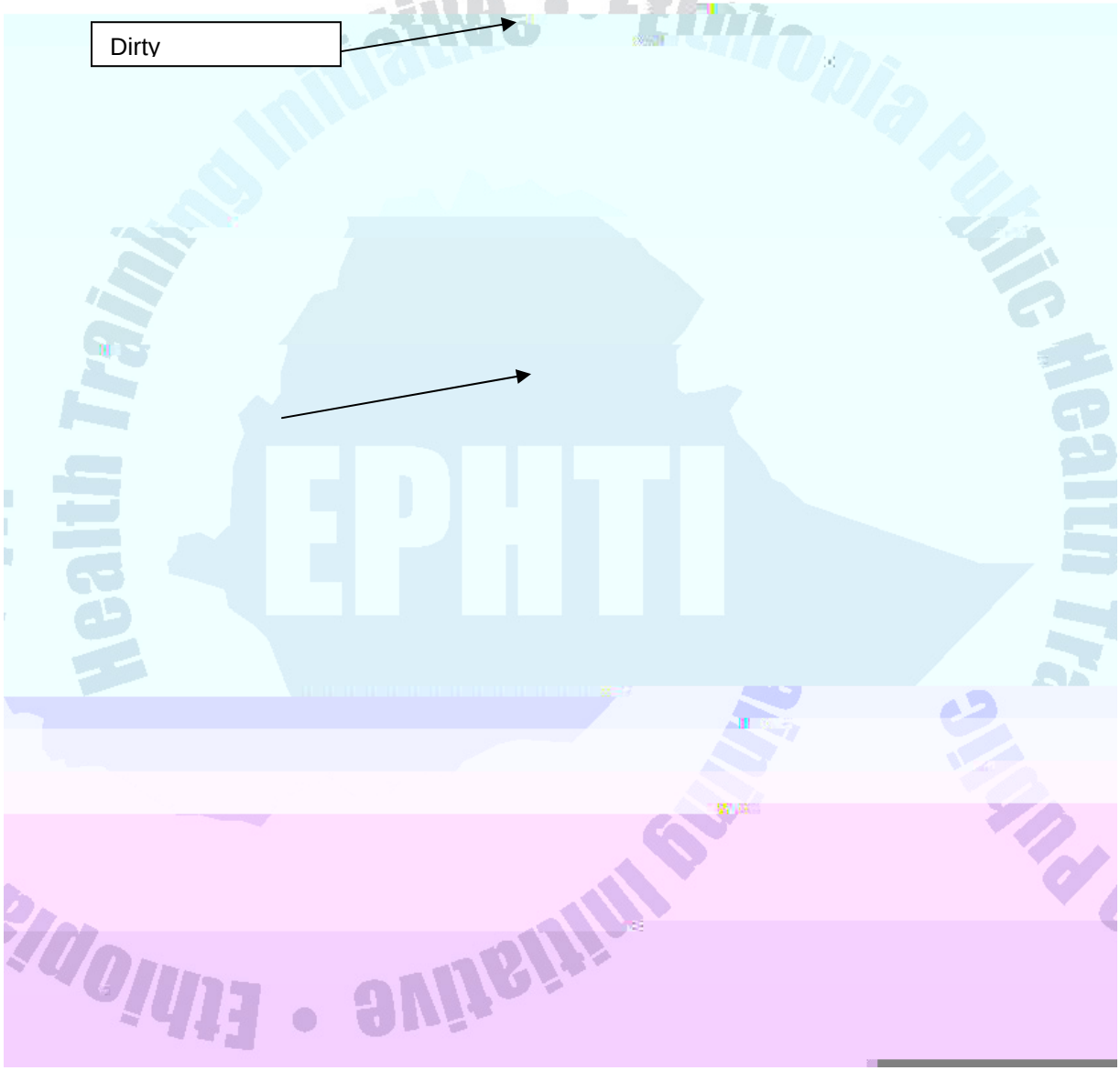
- Protection of the water source so that there will not be contamination from the surface, subsurface or animals.
- Cleaning water containers during or before water fetching
- Using clean covering materials
- Storing water in clean containers that are small enough to lift and pour rather than dipping

4. **Food Hygiene**

Food is one of the sources for the transmission of diseases such as AFI. This is usually from handling the food, cooking and preserving practices.

Food can be contaminated:

From the source


Dirty

Based on the above domains, the role of the sanitarian in the prevention and control of AFI is to design a health and hygiene education program.

Health Education

It has to be understood that one of the problem in the spread of AFI is lack of knowledge or information. Giving health education should be:

Targeted (to whom should a health education program be prepared and delivered)

Simple (short and to the point facts have to be given to the target audiences)

Convincing (target audience should be able to get the point and demonstrate it).

Timely (proper time, place, and condition should be selected).

Before undertaking a health education program, the following must be analyzed.

1. Behavioral analysis

   What are the current behaviors with regard to:

   Personal hygiene /hand washing

   Food sanitation

   Latrine use

   Water hygiene

   Vector control

   Housing and ventilation

2. Select target behaviors

   What target behavior do you want to change?

3. Are there examples that you want to build on:

   For example people wash hands with soap after eating but not before eating

4. What methods should be used to educate the target audience

    Person to person or face to face (interpersonal communication)

    Group discussion

    Role playing

5. What channels

    Posters

    Tape recorders

    Flip charts

Almost all AFI are killers or debilitating diseases especially for the poor and underserved rural population in Ethiopia. It is very important that the team and especially the sanitarian devote their time to conveying a sustained health and hygiene education program in their communities. Forming a health committee is also essential so that the community will be mobilized through them. Community participation in solving such problems as acute febrile illnesses will guarantee sustainability for such problems that concern Ethiopia.

3.4.2.9. Role and task Analysis

Refer to the core module Unit 4

3.4.2.10. Glossary & Abbreviation

Refer to the core module Unit 5

3.4.2.11. References

Refer to the core module Unit 6

3.4.2.12. Annexes

Refer to the core module Unit 7

3.5. SATELLITE MODULE FOR PRIMARY HEALTH WORKERS

getir"), Typhus ("Tesibo"). These diseases are the major causes of mortality and morbidity in Ethiopia. They are epidemic prone diseases, which at times result in outbreaks.

3.5.2.7. Causes

Different germs that get into our body through different routes cause acute febrile illnesses. The germs could get into our body through the bite of lice or ticks (typhus and relapsing fever), by droplets in 7gs

Physical Examination

- Vital signs-pulse rate, respiratory rate, temperature and rash, neck stiffness.

3.5.2.10. Case Management

- Discuss and demonstrate how to measure temperature
- Advise the mother/care giver to give more fluid and food without interruption
- Give drugs to control fever and febrile convulsion
- Refer cases if indicated

3.5.2.11 Prevention and Control

Prevention

Body hygiene

1. What factors contribute to development of acute febrile illnesses?
2. What do you think are the preventive measures?

3.5.2.13. Role and task Analysis

Refer to the core module Unit 4

3.5.2.14. Glossary and Abbreviations

Refer to the core module Unit 5

3.5.2.15. References

Refer to the core module Unit 6

3.5.2.16. Annexes

Refer to the core module Unit 7

3.6. TAKE HOME MESSAGE FOR MOTHERS/ CAREGIVERS

The caregiver should bear in mind the following messages:

UNIT FOUR

TASK AND ROLE ANALYSIS

Table 1. Knowledge objects and specific tasks of the Health Center Team

	Learning objective (expected outcome)	**HO**	**PHN**	**EH**	**MLT**	**Activities**
Knowledge	Define and describe causes and types of AFI	Define and describe causes and types of AFI	Define and describe causes and types of AFI	Define and describe causes and types of AFI	Define and describe causes and types of AFI	Define AFI and characterize the differential diagnosis and types of fever
	List the causes and risk factors for AFI	List different causes of AFI and their association with the different risk factors.	List different causes of AFI and their association with the different risk factors	List different causes of AFI and their association with the different risk factors.	List different causes of AFI	List the different causes of AFI and explain their association with the different risk factors. Differentiate the different causes using the clinical workup.
	Describe the pathogenesis of AFI	Elaborate the mechanisms of development of infection of different causes of AFI	Elaborate the mechanism of development of infection of different causes of AFI	----------	----------	Indicate the different steps existing in the development of infection or different cause of AFI

	List the major information methods, and targets for health education in the control of AFI.	Describe methods of giving health education on the control and prevention of outbreaks of AFI. Identify target groups or areas of focus.	Describe methods of giving health education on the control and prevention of outbreaks of AFI. Identify target groups or areas of focus.	Describe methods of giving health education on the control and prevention of outbreaks of AFI. Identify target groups or areas of focus.	Describe methods of giving health education on the control and prevention of outbreaks of AFI. Identify target groups or areas of focus.	Identify current behavior Identify target behavior Identify target audience List methods of communication

Table 3. Attitude objects and specific tasks of the Health Center Team

	Learning Objective (Expected out come)	HO	PHN	EH	MLT	Activities
Attitude	Advocate for the utilization of health services in reducing morbidity and mortality due to AFI.	Instruct community health workers (CHW) mothers and caregivers the importance of visiting health services in reducing morbidity and mortality due to AFI	Instruct CHW mothers and caregivers the importance of visiting health services in reducing morbidity and mortality due to AFI	Instruct CHW mothers and caregivers the importance of visiting health services in reducing morbidity and mortality due to AFI	Instruct CHW mothers and caregivers the importance of visiting health services in reducing morbidity and mortality due to AFI	- Advise CHW to educate mothers and caregivers (patients) for utilization of health services (HS) for early treatment and prevention of mortality due to AFI. -Advise (care givers) and patients the role of early visiting of HS in the prevention of mortality and disability from AFI
	Promote feeding of patients/ children with AFI	Advocate continued feeding of a patient with AFI	Advocate continued feeding of a patient with AFI	Advocate continued feeding of a patient with AFI.	Advocate continued feeding of a patient with AFI	-Educate mothers (caregivers) / patients and community health agents, about the importance of proper feeding of a patient with AFI
	Promote utilization of prescribed drugs for the treatment and control of AFI	Advise mothers caregivers, and CHW to promote proper utilization of prescribed drugs for the treatment and control of AFI	Advise mothers caregivers, and CHW to promote proper utilization of prescribed drugs for the treatment and control of AFI	Advise mothers caregivers, and CHW to promote proper utilization of prescribed drugs for the treatment and control of AFI	Advise mothers caregivers, and CHW to promote proper utilization of prescribed drugs for the treatment and control of AFI	Teach about the importance of taking prescribed drugs in the treatment and control of AFI
	Uphold the idea that AFI is caused by microorganisms and not by evil eye or curse from gods or spirits.	Educate mothers, caregivers and CHWs that AFI is caused by microorganisms	Educate mothers caregivers and CHWs that AFI is caused by micro organisms	Educate mothers caregivers and CHWs that AFI is caused by microorganisms	. Educate mothers caregivers and CHWs that AFI is caused by microorganisms	Educate the mothers, caregivers and CHWs that AFI is caused by different microorganisms.

Table 4. Practice objects and specific tasks of the Health Center Team

	Learning Objective (Expected out come)	HO	PHN	EH	MLT	Activities
Practice (skill)	Demonstrate the process of assessing a patient with AFI and identify its complications.	Take an appropriate history and perform a proper physical examination. Order relevant laboratory investigations for a case with AFI and assess conditions that herald the rise of outbreak.	Assess vital signs and determine the existence of fever and other complications of AFI.	Assess environmental and social risk factors for the development of AFI and possible outbreaks	Assess the specimen from a case with AFI for the existence of pathogenic microorganisms incriminated as the causes of AFI	-Ask about relevant symptoms - Look, and feel for relevant signs and decide the lab Investigation needed for the proper diagnosis for AFI -perform the relevant laboratory tests
	Demonstrate how to treat the patient with different cases of AFI	Use different modalities for the treatment of a case of AFI and an outbreak of AFI. Indicate the modalities for the follow up and surveillance	Use nursing care and follow-up mechanisms appropriate for the case of AFI	_____		---------- order appropriate antibiotic carry out proper nursing care conduct proper follow up and surveillance
	Demonstrate proper communication methods in delivering health education pertaining to AFI	Display effective communication skills in giving health education to mothers/ caregivers and CHWs on treatment and control of AFI.	Display Effective communication skills in giving health education to mothers / caregivers and CHWs on treatment and control of AFI.	Display effective communication skills in giving health education to mothers/ care givers and CHW on treatment and control of AFI.		------ Identify practical ways of educating mothers / caregivers and CHW on treatment prevention and control AFI.

Table 5. Knowledge objects and specific tasks of the community health workers and caregivers

Table 6.

Table 7. Knowledge objects and specific tasks of the community health workers and caregivers

	Learning Objective (Expected out come)	CHW	Caregiver	Activities
Practice				

UNIT FIVE

GLOSSARY

1. **Agent:** A biological, physical, or chemical entity capable of causing diseases.
2. **Acute:** Sharp, severe used to describe illness having a rapid onset, short course, and pronounced symptoms.
3. **Antipyretic:** Agent, which reduces the possibility of damage to body cells by lowering body temperature in case of high fever. Also relieves pain associated with fever and illness.
4. **Bactericide:** An agent, which kills bacteria.
5. **Carrier:** In epidemiology, a person who is well (exhibits no sign or symptoms of an infection) but harbors microorganisms and spreads infection.
6. **Chemoprophylaxis:** The administration of a chemical (including antibiotics) to prevent the development of an infection or the progression of an infection to clinical disease.
7. **Chronic:** Of long duration or frequent recurrence.
8. **Decubitus ulcer:** Inflammatory breakdown of the skin and subcutaneous tissue due to prolonged, unrelieved pressure on bony prominences.
9. **Delusion:** Fixed, demonstrable, false beliefs that are not amenable to logical persuasion and are not attributable to a client's culture or religion.
10. **Endemic:** Peculiar to a specific region or people in epidemiology used to describe disease that occurs continually in a given community or geographic area.
11. **Enteric barrier:** Mechanism for preventing transmission of infection by direct or indirect contact with infected feces.
12. **Epidemic:** Unusual increase in the incidence of diseases from a baseline for that population.

13. **Etiology:** Cause of a disease that could be a biological, chemical or physical agent.
14. **Fever:** High body temperature considerably above the normal range usually above 37.5^0c.
15. **Host:** An organism that harbors and provides life to another organism. In epidemiology the patient is described as host.
16. **Petechiae:** A small red or purple spot on the skin due to tiny areas of inflammation or bleeding under the skin. Collection of petechaie looks like bruises.
17. **Prognosis:** Outcome of a disease, which could be cure, disability or death.
18. **Respiratory barrier:** Procedure designed to prevent the transmission of organisms by droplets nuclei. For example, wearing of masks when in proximity to the patient.
19. **Susceptible:** A person or animal lacking sufficient resistance to a particular pathogenic agent to prevent diseases if or when exposed.
20. **Virulence:** The degree of pathogenicity of an infectious agent.

Morgan M.T.: Environmental Health, second edition, 1997.

Parry T, Pathucheary SD: Significance and value of the widal test in the diagnosis of typhoid fever in an endemic area: Journal of Clinical Pathology, 1983; 36:471-5.

Parry. CM, Hoa TTN, Diep TS, et al: Value of a single tube Widal test in the diagnosis of typhoid fever in Vietnam, Journal of clinical Microbiology: September 1999, 37 (9):2882-6.

Teka G.E: Water Supply Ethiopia, AA University press, 1982.

Q.No.3.

A. Encourage parents to visit the patient and help in his care and provide them the opportunity to express their feels and anxiety.

B. Discuss `complications

C. Give specific instructions.

Q.No.4. C

Q.No.5. C

Q.No.6. E

Q.No.7. E

7.3. Medical Laboratory

Q.No.1. E

Q.No.2. D

Q.No.3. A

Q.No.4. D

Q.No.5. C

Q.No.6. C

Q.No.7.D

Q.No.8.E

Q.No.9. B

Q.No.10.A

7.4. Answer keys for sanitarians

Q.No. 1. B

Q.No. 2. C

Q.No. 3. A

Q.No. 4. B

Q.No. 5. B

Q.No. 6. A

Q.No. 7. A

Q.No. 8

A. Over crowded living conditions
B. Poor personal hygiene
C. Poor environmental hygiene
D. Poorly ventilated living conditions

Q.No. 9.

A. Personal hygiene
B. Environmental sanitation
C. Avoid overcroweded living conditions
D. Steam clothing
E. Ventilate your houses

Q.No. 10.

A. Contact with meninigitis patient
B. Living inn an overcrowded condition
C. Not being vaccinated for meningitis

Q.No. 11.

A. Avoid over crowded living condition
B. Take meningitis vaccianation
C. Isolate the meningitis patient

Q.No. 12.

A. Soil type
B. Distance from water point
C. Distance from the residence house
D. Gradient to the water point

7.5. THE AUTHORS

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