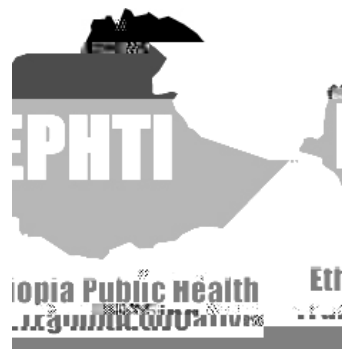


MODULE

Leishmaniasis

For the Ethiopian Health Center Team



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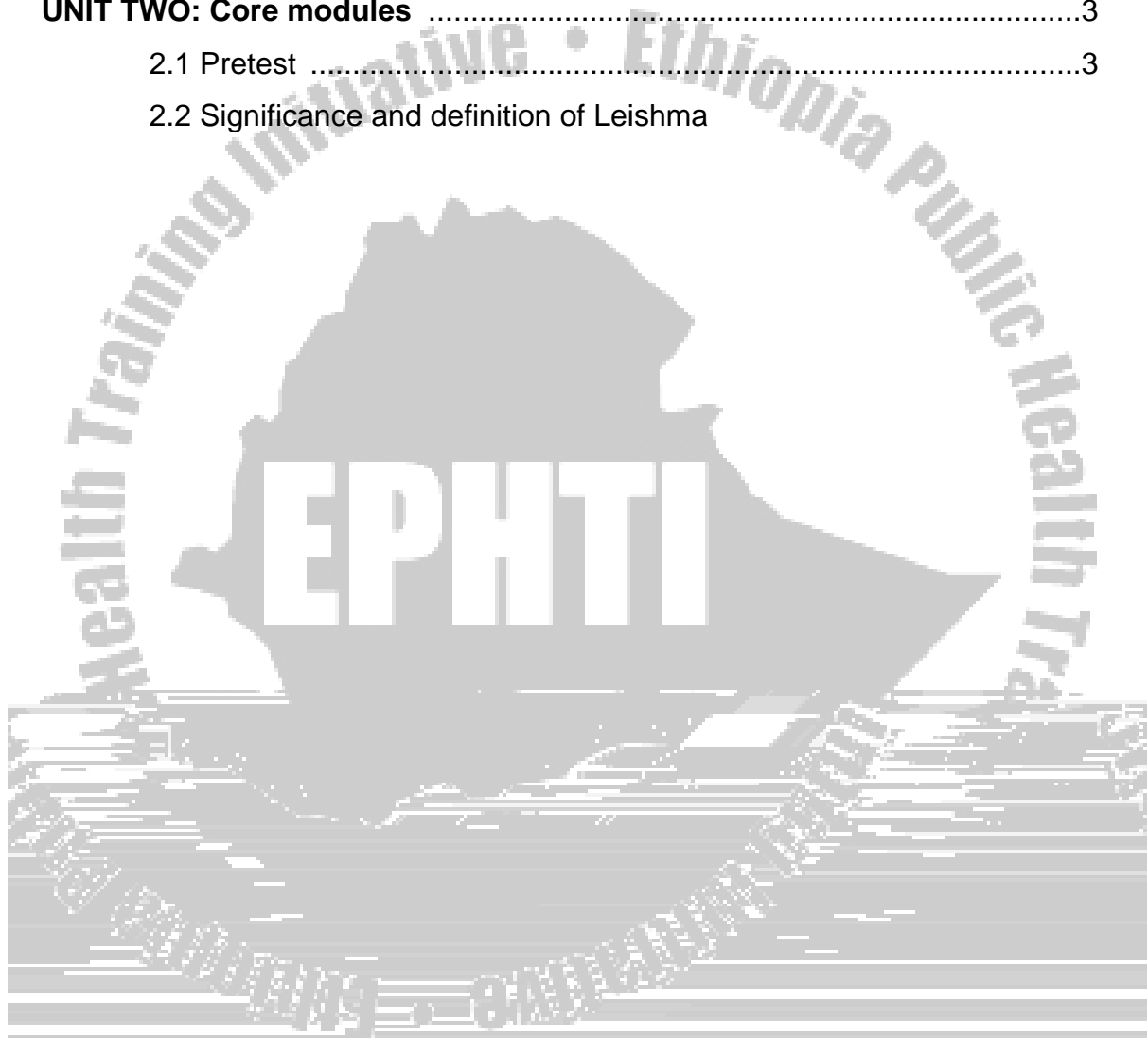
In collaboration with the Ethiopia Public Health Training Initiative, The Carter Center,
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UNIT ONE

INTRODUCTION

1.1 Purpose and use of the modules

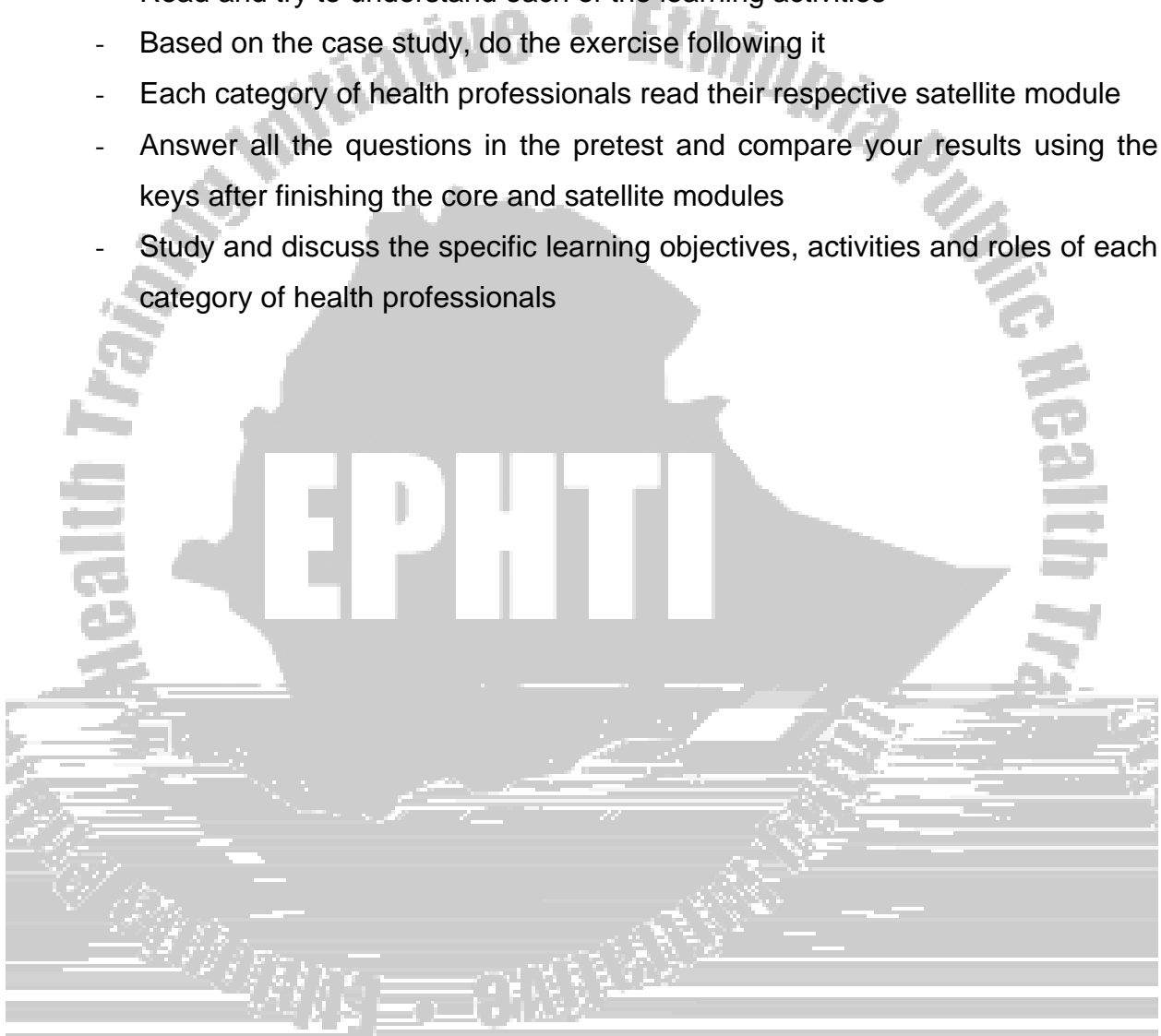
This module is prepared for public health officers, public health nurses, environmental health officers and laboratory technologists who need to work as cooperative team members. Other categories like clinical nurses and other members of health centre team could also use this module.

The module will serve as a practical guide to the management of several forms of leishmaniasis. It is believed that this module will provide the background knowledge for health centre team staff in different disciplines with a practical approach. However, it doesn't mean that it should substitute for other reference materials and text books.

The module emphasizes team work. The core module gives details of what all categories of members of a health centre team should know. The satellite modules

1.2 Direction for using the modules

- Try to study and answer all the questions in the pre test, that is for all categories in the core module (section 2.1.1), and specific questions to your category (2.1.2).
- After the pretest go through the core module
- Read and try to understand each of the learning activities
- Based on the case study, do the exercise following it
- Each category of health professionals read their respective satellite module
- Answer all the questions in the pretest and compare your results using the keys after finishing the core and satellite modules
- Study and discuss the specific learning objectives, activities and roles of each category of health professionals



UNIT TWO

CORE MODULE

2.1 Pretest

Before going into the core module attempt to answer all questions.

2.1.1 All categories of the Health center Team

1. What group of organisms causes leishmaniasis _____?
2. The vectors important for leishmania transmission are called _____?
3. List the types of possible reservoir of the leishmania parasite
4. What types of leishmaniasis do you know? _____
5. List the Leishmania parasites available in Ethiopia
6. Which one is the commonest route of leishmania transmission
 - a. Blood transfusions
 - b. Sexual
 - c. Sandfly bite
 - d. Transplacental
 - e. Accidental inoculation
7. People at high risk of developing leishmaniasis are:
 - a. Adults living in endemic areas
 - b. Children in endemic areas
 - c. Travelers to endemic areas
 - d. Pregnant mothers
 - e. B and C
8. What diagnostic method is commonly used in our set up?
 - a. Giemsa stain of aspirate and slit skin smear
 - b. Culture
 - c. Animal inoculation
 - d. ELISA
 - e. Biopsy
9. Which geographical sites of our country harbor the disease?

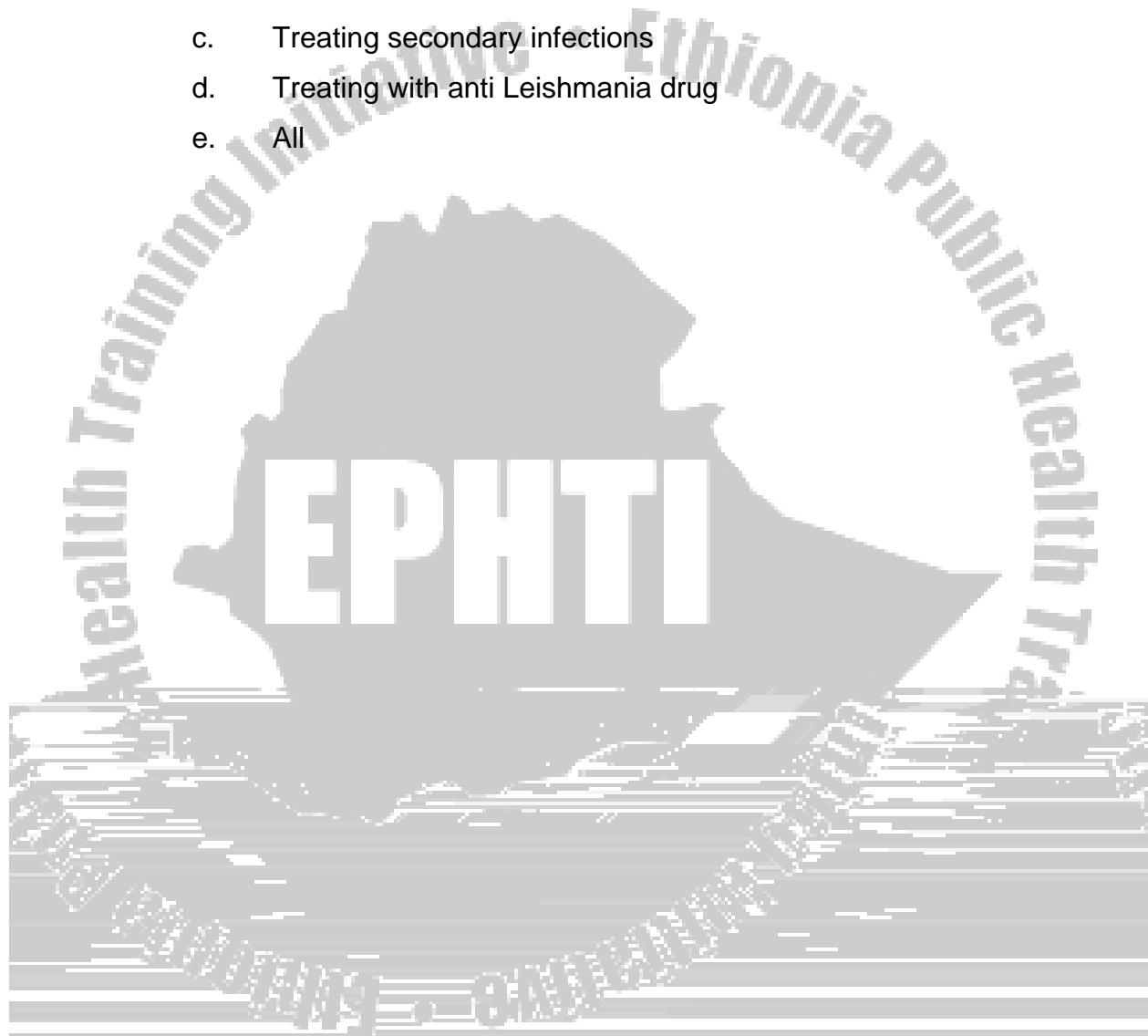
10 . What general Leishmania control measures could be taken?

2.1.2 Pretest for specific categories of the health center team

2.1.2.1 Health Officers and Public health Nurses

1. Which one is the average incubation period of visceral leishmaniasis
 - a. 2 –6 months
 - b. 1-3 weeks
 - c. 2 –4 days
 - d. 2 –10 yrs
 - e. None
2. The clinical manifestations of visceral leishmaniasis do not include
 - a. Fever
 - b. Hepatosplenomegally
 - c. Wasting
 - d. Grey discoloration of skin
 - e. Loss of consciousness
3. When are sand flies active?
 - A. During the day
 - B. Dusk to dawn
 - C. Always
 - d. Noon
4. Why do female phlebotomiae need to suck blood _____?
5. The stages of the parasite in humans and sand flies are respectively called _____ and _____.
6. The types of cutaneous leishmaniasis are _____?
7. Kala – azar is applied for visceral leishmaniasis due to _____?
8. Visceral Leishmaniasis can give rise to all forms of fever
 - a. True
 - b. false

9. The leishmania parasites in samples taken from patients seen under the microscope are called_____?
10. Leishmaniasis involving mucosa of mouth and nose is known as_____?
11. The management of visceral Leishmaniasis includes
- a. Correcting nutritional deficiency
 - b. Blood transfusion
 - c. Treating secondary infections
 - d. Treating with anti Leishmania drug
 - e. All



5. Among the following diagnostic means one has little value in the diagnosis of cutaneous leishmaniasis.
- A. Examining slit skin smears for amastigotes
 - B. Testing leishmania antibodies in serum
 - C. Culturing the material collected from nodule
 - D. None
6. In Formol gel (aldehyde) test, whitening and gelling of serum within 20 minutes indicates a _____
- A. Positive test
 - B. Negative test
7. Among the following tests one is non-specific for the diagnosis of VL
- A. ELISA
 - B. IFAT
 - C. DAT
 - D. Formal gel test
8. One is not true when using Giemsa staining technique
- A. The stock should be diluted 1:10 to stain the smear
 - B. Diluted Giemsa staining solution can be used for longer than 24 hour
 - C. The PH of the solution should be 7-7.3
 - D. Buffered saline can be used to dilute the stock stain
9. Among the following samples which is best for the diagnosis of cutaneous leishmaniasis
- A. Spleen aspirate
 - B. Bone marrow aspirate
 - C. Buffy coat smear
 - D. Slit skin smear
10. Identify a species that is not relevant to Ethiopia
- A. L.Donovani
 - B. L.aethiopica,
 - C. L.major
 - D. L.mexicana

2.1.2.3 Environmental Health Science Technologists

Instruction – choose the best answer

- 1) Why insecticidal control of sand fly larvae remains impossible?
 - a. The breeding sites of most species are unknown or secretive
 - b. Even when the breeding sites are identified, they are too diverse and impractical to reduce larval number
 - c. Their larvae float on water surface and hides itself
 - d. A and B
- 2) Which of the following **is not** true about the external morphology of phlebotomus sandflies
 - a. The palps are as long as the proboscis
 - b. Hairy appearance
 - c. Have long and stilt like legs
 - d. Their wing held erect over
- 3) The eggs of sand fly are deposited:
 - a. On surface water
 - b. On cracks and holes in the ground
 - c. On floating substance of water
 - d. All
- 4) Larva of phlebotomine sand fly development depend on the following **except**

- 6) Which of the following methods can effectively prevent phlebotomine sand flies?
- By destroying the reservoir
 - By forest clearance
 - By applying insecticides
 - All
- 7) Which of the following is an impractical method for prevention of leishmaniasis?
- Environmental management
 - Destroy the reservoirs
 - Personal protectives
 - Applying insecticides
- 8) Which of the following **is not** the characteristics of phlebotomine sand fly
- Active during night and dusk
 - Rest in dark moist areas
 - Active only during the day
 - Endophilic and exophilic
- 9) Which of the following is a protective method of leishmaniasis at the individual level?
- Reducing breeding sites
 - Applying insecticides
 - Using replants
 - Forest clearance
- 10) The epidemiology of leishmaniasis is largely determined by
- The species of sand flies, their ecology and behavior
 - The availability of the wide range of hosts
 - The species and strains of leishmania parasites
 - All
- 11) 'Forest – free- belt' means
- Afforestation
 - Forest clearance
 - Kill wild reservoirs
 - Filling cracks or burrows

12) Old world Leishmaniasis is transmitted by-----

- a. Phlebotomus species
- b. Lutzomia species
- c. Anopheles species
- d. Culex species

2.2 Significance and Brief Description of Leishmaniasis

Leishmaniasis is one of the causes of morbidity and mortality in Ethiopia. It has been reported that cases of leishmaniasis occur in western parts of the country mainly and also in southern & eastern regions. People living in the low lands of aforementioned areas have always been at risk.

2.3 Learning objectives

Upon the completion of the activities in this module, the learner will be able to:

- 1- Describe, e completedm-0.0004 Tc0.1completedment8jec[(been Tw()Tjt11.675 0 g06 Tc0.0028 6o0

2.4 Case study: Learning Activity One

Ato Debebe Melaku is a 30 yr old, male who has recently come to Humera to find work. Humera is a town located in the north western border



5. What could be the cause of the progressive increase in the abdominal girth?
6. Does a pale and grey face tells anything about the diagnosis?
7. If the patient gives a previous history of sore over the skin on one of the



cutaneous leishmaniasis was 3.6-4.0%, with a peak value of 8.55 in the 0-10 years old age group in Ochollo (Gemu Gofa).

Geographical distribution

Global: Leishmaniasis are widely distributed around the world. They range over intertropical zones of America, Africa and extend into temperate regions of South America, southern Europe and Asia. Their extension limits are latitude 45° north and 32° South.

Geographical distribution of the diseases depends on sand fly species acting as vectors, their ecology and the conditions of internal development of the parasite.

Ethiopia: Several studies have definitively demonstrated that VL occurs in northwestern Ethiopia (Humera, Metema), Segen and Woito valleys in Gemu Gofa. Sporadic cases of VL have been diagnosed from Wolkayit Tsegede (Gondar), Gibdo, Raya, and Kobo (Wello), Kijawa (Gambella) and Gelana (Sidamo) and Genale (Bale) river basins. Recently a devastating epidemic occurred in Humera with an estimated annual incidence of 1,500-2,000 cases. Due to high mortality, occurrence of epidemics, and high incidence of the disease in 15-45 age group leishmaniasis has become one of the leading health problems in Ethiopia.

Cutaneous leishmaniasis (CL) occurs in highlands of Ethiopia. Transmission occurs in Cuttaber (Dessie), Aleku (Wellega), and Ochollo (Gemu Gofa). In Ochollo the overall prevalence of localized CL was 3.6-4.0%, with a peak value of 8.55 in the 0-10 years old age group. Sporadic cases of CL have been diagnosed from many localities in the northern, central, and southern high lands of Ethiopia.

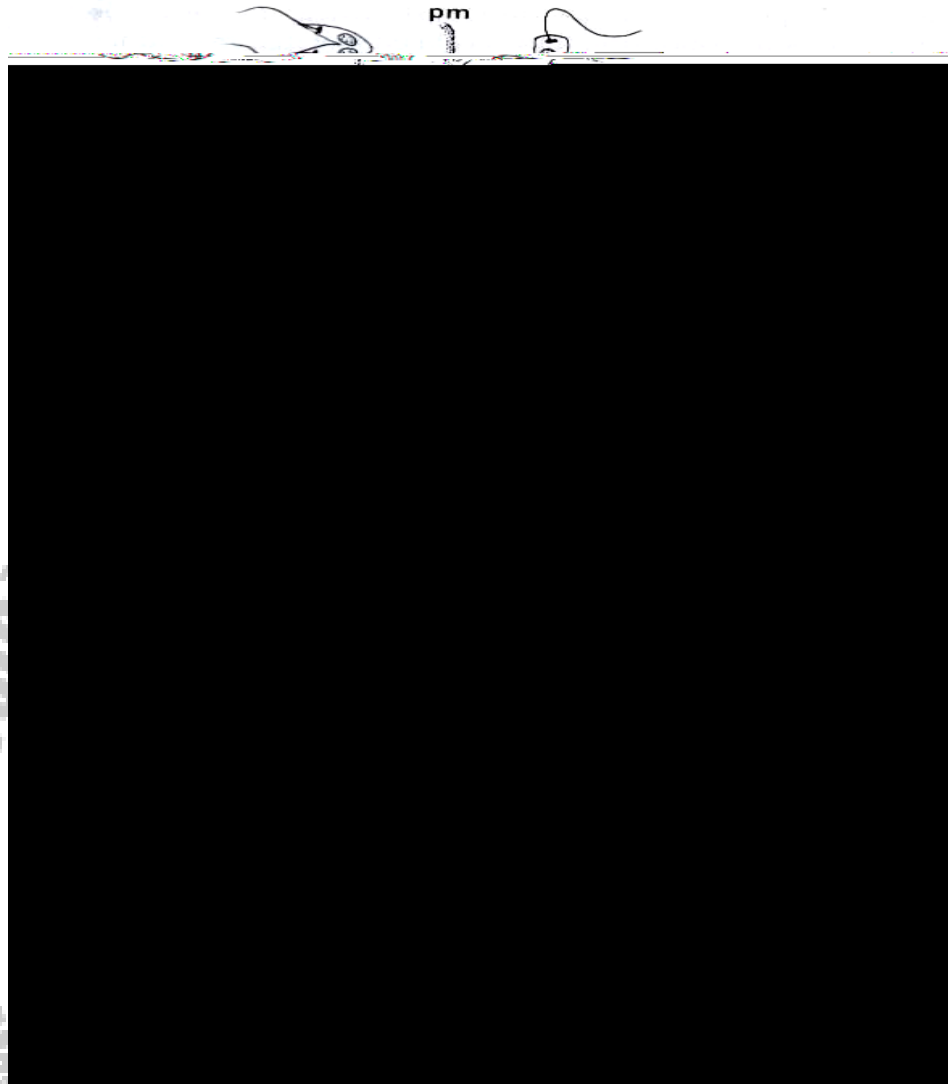
Vector

Sand flies are Diptera of the family psychodidae, subfamily phlebotominae. There are about 30 spp of sandflies in the Genera phlebotomus and Lutzomyia, which can transmit at least 20 different species of leishmania parasites.

Their life cycle includes two different biological stages; the flying adult and the development phases of egg, larva and pupa.

The adults are small flying insects of about 2-4mm in length, with a yellowish hairy body. During the day, they rest in dark & sheltered places such as burrows of rodents bark of old trees, in ruined buildings, cracks in house walls, and in house hold rubbish.





Picture: Life Cycle of Leishmania Parasites

Transmission

Leishmaniasis is a vector borne disease. It is mainly transmitted from the reservoir host to the healthy individual by the bite of female phlebotomus sand fly. The inoculation of promastigotes through the sand fly bite is the usual method of leishmaniasis transmission.

In visceral leishmaniasis, a few cases of congenital and of blood transfusion transmission have been reported. Exchange of syringes has been incriminated to

explain the high prevalence of *L. infantum* /HIV infection in intravenous drug abusers in southern Europe.

Predisposing factors

Young children, travelers who are non-immune, refugees displaced people and laborers entering in to Leishmania area are groups who are at risk of getting Leishmaniasis. In general, males are more predisposed to develop the disease as they are usually engaged in activities, which will make them more accessible to the sand fly bite.

Population movements, such as rural to suburban migrations are factors for visceral Leishmaniasis extension, by exposing thousands of non- immune individuals to the risk of infection. Economic developments resulting in movement of population caused dramatic out breaks in parts of the world. People in rural areas with limited access to health services are the most affected.

Immunodeficient patients, particularly those with HIV infection, have been found to develop visceral Leishmaniasis more frequently when compared to normal individuals.

The determinants for transmission of Leishmania include:

1. Availability of elevated temperature and wet soil rich in organic material (for completion of life cycle of sand flies)
2. Leishmania control programs to reduce sandfly population, rodent reservoir population and the rate of amount of infection.

2.7 Etiology and Pathogenesis

(A) Etiology

The disease is caused by species of Leishmania.

Leishmania are dimorphic parasites, which present as two principal morphological stages: the intra cellular amastigotes in the mononuclear phagocytic system of mammalian host, and flagellated promastigote in the vector.

Classification: there are different species of the genus Leishmania, the majority of which commonly infect humans in whom they are responsible for various types of diseases: visceral, cutaneous (of diffuse or localized types) and mucocutaneous leishmaniasis.

The parasite has been classified into two subgenera: Leishmania sensu stricto present in both Old world and New Worlds, and viannia restricted to the New World. With in these two subgenera various species complexes were individualized.

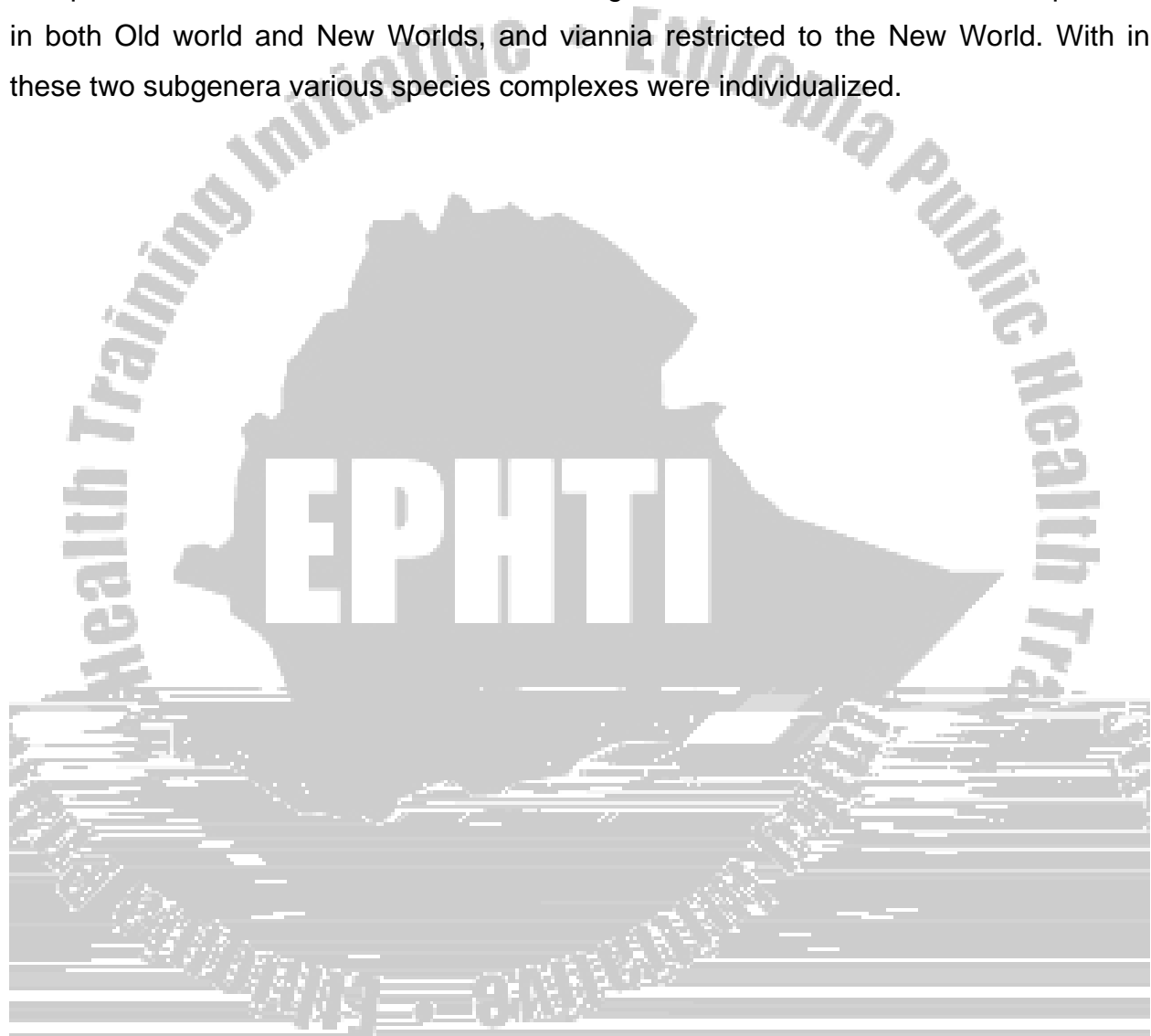


Table: Major Leishmania species that cause disease in humans

Species	Clinical Syndrome	Geographical Distribution
Subgenus <i>sensu stricto</i>		
L. donovani complex		
L. donovani	VL (PKDL , OWCL)	China, Indian. Subcontinent South Western Asia, East Africa
L. infantum	VL (OWCL)	China, Indian subcontinent Southwestern Asia, East Africa, Southern Europe.
L. chagasi	VL(NWCL)	Central and South America
L. mexicana complex		
L. mexicana	NWCL(DCL)	Texas, Mexico, South and Central America
L. amazonensis	NWCL(ML, DCL, VL)	Panama and South America
L. tropica	OWCL(VL)	India, Central Asia, South western Asia, Middle East, North & Central Africa, East Africa
L. Major	OWCL	India, Central Asia, South western Asia, Middle East, North and Central Africa, East Africa
L. aethiopica	OWCL(DCL)	Ethiopia, Kenya
Subgenus <i>viannia</i>		
L. (V). braziliensis	NWCL (ML)	Central and South America
L. (V.) guyanensis	NWCL (ML)	South America
L. (V.) Panamensis	NWCL (ML)	Central America, Venezuela , Columbia, Equador, Peru
L.(V).peruviana	NWCL	Peru
Abbreviations-VL-Visceral Leishmaniasis; PKDL-Post Kala-Azar Dermal Leishmaniasis; OWCL-Old World Cutaneous Leishmaniasis, NWCL-New World Cutaneous Leishmaniasis; DCL-Diffuse Cutaneous Leishmaniasis; ML-Mucosal Leishmaniasis		

(B) Pathogenesis

The bite of an infected sand fly results in the intradermal inoculation of promastigote stage of *Leishmania*. Within the dermis of mammalian skin, promastigotes escape complement activation and they are phagocytosed by macrophages where they transform to amastigotes.

Inside macrophages they have the capacity to resist intracellular digestion and they divide mitotically.

When the intracellular development of the amastigotes remains localized at the inoculation site, various cytokines are released and cell reactions are generated, resulting in the development of localized lesion of CL. In other instances the parasite spread to the organs of the mononuclear phagocytic system, giving rise to VL. Amastigotes may also spread to other cutaneous sites as in diffuse cutaneous Leishmaniasis (DCL) or to mucosal sites in the case of mucocutaneous Leishmaniasis (MCL).

The localization of the parasite to the various organs of the patient results in the clinical expression of the disease. It is directly related to the tropism of the parasite species. In that sense, the genus *Leishmania* can be divided broadly into viscerotropic (*L. donovani*, *L. infantum*) and dermatropic (roughly all the other species). *L. braziliensis* and more rarely *L. panamensis* are known for their secondary mucosal spread. In spite of this general tropism of species some exceptions occur. Thus well-established viscerotropic species can occasionally be res

In CL, interactions of patient's immune system with parasites result in spectrum of clinicopathological changes. The histological patterns range from a diffuse granuloma containing large numbers of macrophages with amastigotes (DCL), to hypersensitive tuberculoid granuloma with many Langhans giant cells (Leishmaniasis recidivans). Between these two, non-healing forms of CL, characterized by an epidermal and dermal infiltrate consisting of histiocytes containing amastigotes, lymphocytes and plasma cells occur.

VL is a disease of the mononuclear phagocytic system, commonly affecting the spleen, lymph nodes and bone marrow. But other organs and tissues can be involved as they contain elements of the monocytic phagocytic system.

2.8 Clinical Features

(A) Visceral Leishmaniasis (VL)

Incubation Period

The incubation period is difficult to evaluate precisely. It is generally 2-6 months, but can range from 10 days to many years.

Disease Onset

The onset of disease may be sudden or gradual, the overall condition of the patient is usually good in the early stages.

Symptoms and signs

- **Fever**

Fever is the major symptom with rapid rise in sudden onset and slow rise in gradual onset. It is intermittent and irregular, with double or triple rise per day usually to 38 – 39⁰ c, but possibly reaching 40 – 41⁰c. It lasts for some weeks followed by apyrexial period.

- **Weight loss**

Asthenia, loss of appetite and prominent muscle wasting of extremities is prominent feature in well-established VL

- Splenomegaly
Splenomegaly appears early and is almost invariably present. The spleen size increases regularly with duration of the disease eventually extending down to the left hypochondrium
- Hepatomegaly
Less frequent and appears later than Splenomegaly. Liver is slightly enlarged and painless. Rarely jaundice appears in later stages and is poor prognostic sign.
- Diarrhea
Frequently reported and is due to ulceration of digestive mucosa
- Cough
Can occur as a result of pulmonary involvement with a dry, non-productive cough.
- Anemia
Responsible for extreme paleness of skin and mucosa, giving grey appearance of patients (hence kalazar – black fever)
- Bleeding
Episodes of bleeding as epistaxis and rarely bleeding from gums, purpura, and petechiae can occur
- Ascites
Considered as a late sign and bad prognostic sign, sometimes associated with edema and pleural effusions.

(B) Cutaneous Leishmaniasis (CL)-Oriental sore

CL presents as skin lesions, which are generally localized, without involvement of the mucosa, and not generalized infection. They occur on exposed parts of the body accessible to sandflies: face, hands, forearms and lower limbs. Rarely, dermatotropic parasites may give rise to disseminated CL, with multiple nodules on large areas of the skin.

Localized Cutaneous Leishmaniasis (LCL): All species of Leishmania can cause localized CL.

- Incubation period ranges from weeks to months
- Starts as erythematous papule to reach its definitive size in a few weeks
- The mature lesion is well defined with regular outline, round to oval in shape, variable dimension (0.5 – 10 cm on diameter) and usually multiple.
- It can be ulcerative or dry with papulo nodular lesion covered by scales

The cutaneous lesion is similar with localized cutaneous leishmaniasis and the mucosal involvement start with the nasal mucosa later on destroying the nasal septum. The buccal mucosa is involved at later stages and the disease can progress to lips, palate and larynx.

(D) Post Kala-Azar Dermal Leishmaniasis (PKDL)

After a latent period of 1 year following kala-azar cure, skin lesions can appear in around 20% of cases. Beginning as depigmented macules, turn in to papular and then to nodular eruptions. Located initially on the face they can extend to the whole body.

2.9 Leishmaniasis and Immunosuppression

The number of Leishmania cases, particularly of the visceral form, associated with immunosuppression has increased regularly over the past 15 or so years.

Cases of VL during HIV infection have regularly been recorded at various foci in the world.

The spread of AIDS to rural areas where visceral leishmaniasis is endemic, and the spread of VL to suburban areas, has resulted in a progressive increasing overlap between the two diseases. Coinfected people are usually found to be young adults who are IV drug users showing that interhuman transmission can take place via syringe sharing.

The diagnosis of VL during HIV infection coincides with a serious state of immunosuppression as 90% of patients have less than 200CD₄⁺ cells/ml. Most patients present with VL, and dermal Leishmaniasis are less frequently found during immunosuppression.

The concern is that AIDS and visceral leishmaniasis are locked in a vicious circle of mutual reinforcement. Visceral leishmaniasis accelerates the onset of full-

blown AIDS, and shortens the life expectancy of HIV-infected people, while HIV increases the spread of visceral leishmaniasis.

2.10 Diagnosis

- (1) History of residence and travel to leishmaniasis endemic areas
- (2) Clinical history and physical finding
- (3) Laboratory finding

Definitive diagnosis is based on the detection of the parasite or its DNA samples

Sample Collection

- Bone marrow and spleen aspirations for visceral leishmaniasis
- Superficial skin / Mucosal scraping for cutaneous and mucocutaneous leishmaniasis

Detection methods

- The sample collected can be
 - § Stained with panoptic May Grunwald Giemsa stain
 - Amastigotes seen in monocytes or out side; called Leishman Donovan (LD) bodies
 - § Cultured – NNN medium
 - _Grow as promastigotes
 - § Inoculated into lab animals (Golden Hamster)
 - § Molecular diagnosis by DNA detection or PCR technique
- **Direct Agglutination Test (DAT):** Patients serum is serially titrated with extracted antigens of Amastigotes of local strains. A positive result requires local verification.

- **Formol Gel (Aldehyde) test:** It is simple and inexpensive test, but non-specific, which detects marked increase in IgG.

2.11 Case management

(A) Visceral Leishmaniasis

1. Provision of anti-leishmania drug
2. Correcting Nutritional deficiencies
3. Blood transfusion in case of severe anemia
4. Treating secondary bacterial infection

Drugs

1. Antimonials

- Sodium stibogluconate (pentostam®), meglumine antimonite (Glucantime®) are available. They have poor oral absorption; hence have only parenteral route.
- Supplied: -
 - Sodium stibogluconate as 100mlbott (100mg sb^v /ml)
 - Meglumine antimonite as 5ml ampule (85mg sb^v /ml)
- Dose is 20 mg sb^v /kg per day for 28 days daily
- Appropriate dose is mixed with 50ml of 5% dextrose in water and infused over at least a 10-minute interval.
- Usually a single course is not sufficient and should be repeated after a pause for complete cure
- Side effects

Intolerance signs - shivers, fever, arthralgia, myalgia, skin rash

Toxic effects- increased hepatic enzymes, pan cytopenia, subclinical pancreatitis and ECG changes

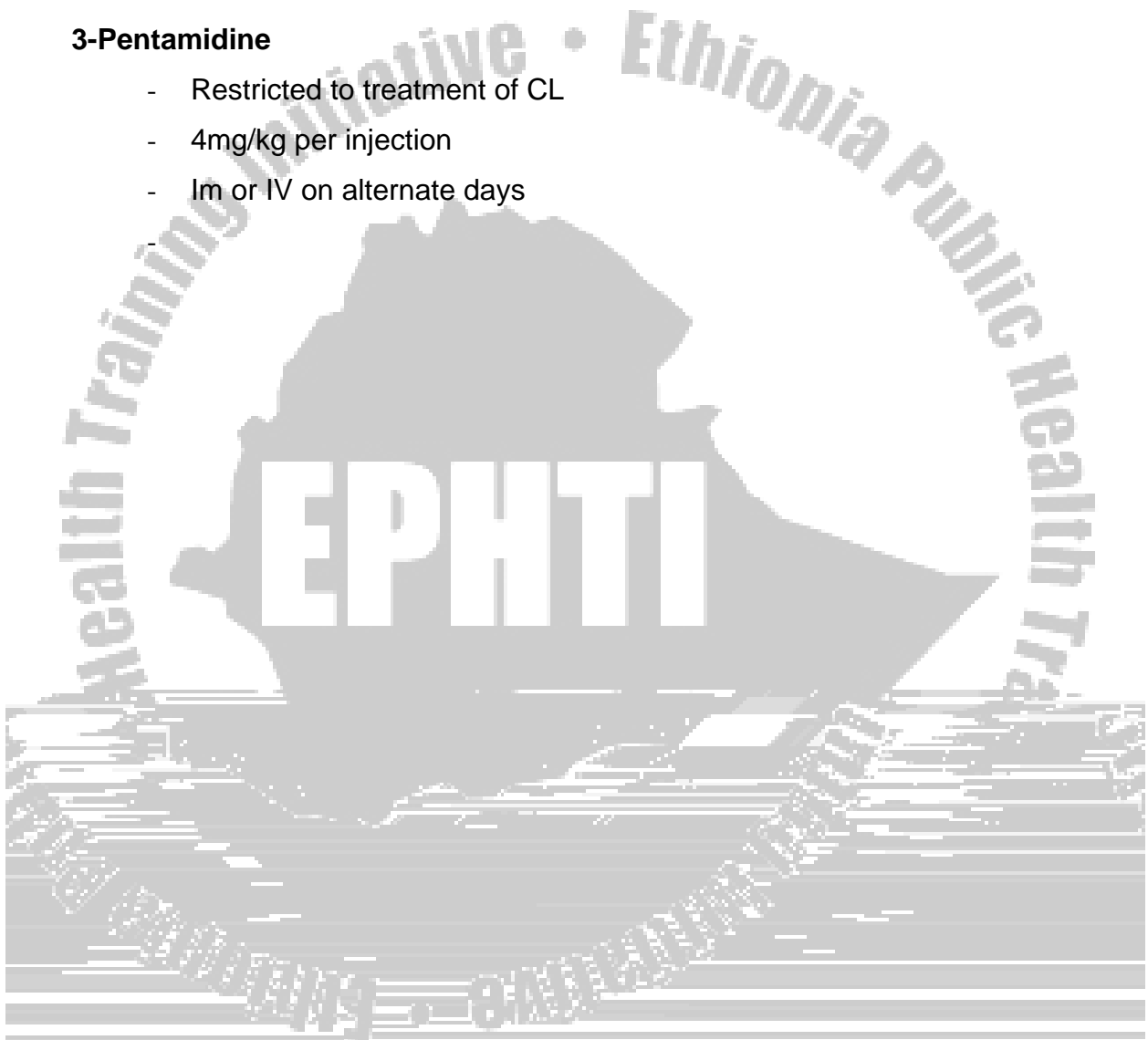
2-Amphotericin B

- Powerful antileishmanial used in the treatment of severe Leishmaniasis (VL, MCL) or forms resistant to Antimonials

- It is alternative 1st line drug
- Formulated as a colloidal suspension which is administered as slow (6 –8 hr) IV infusion 0.5-1mg/kg dissolved in 500 ml dextrose 5% on alternate days
- 14-20 infusions for a total dose of 1.5gm

3-Pentamidine

- Restricted to treatment of CL
- 4mg/kg per injection
- Im or IV on alternate days



- Community participation

Individual prevention

- Avoiding risk of exposure: Avoid vicinity of sandfly breeding areas or resting sites
- Mechanical means: self protection form sandfly bite by wearing clothes, bed nets
- Chemical means: repellants applied to the skin

Collective measures

- Forest clearance: establishment of forest free zone of about 400 meters around human settlements
- Indoor residual spraying

Control

Aim of control

- Interrupt life cycle of parasite
- Limit or eradicate the disease

Targets are the vector and the reservoir

Strategies

Depend on ecology and behavior of the main targets

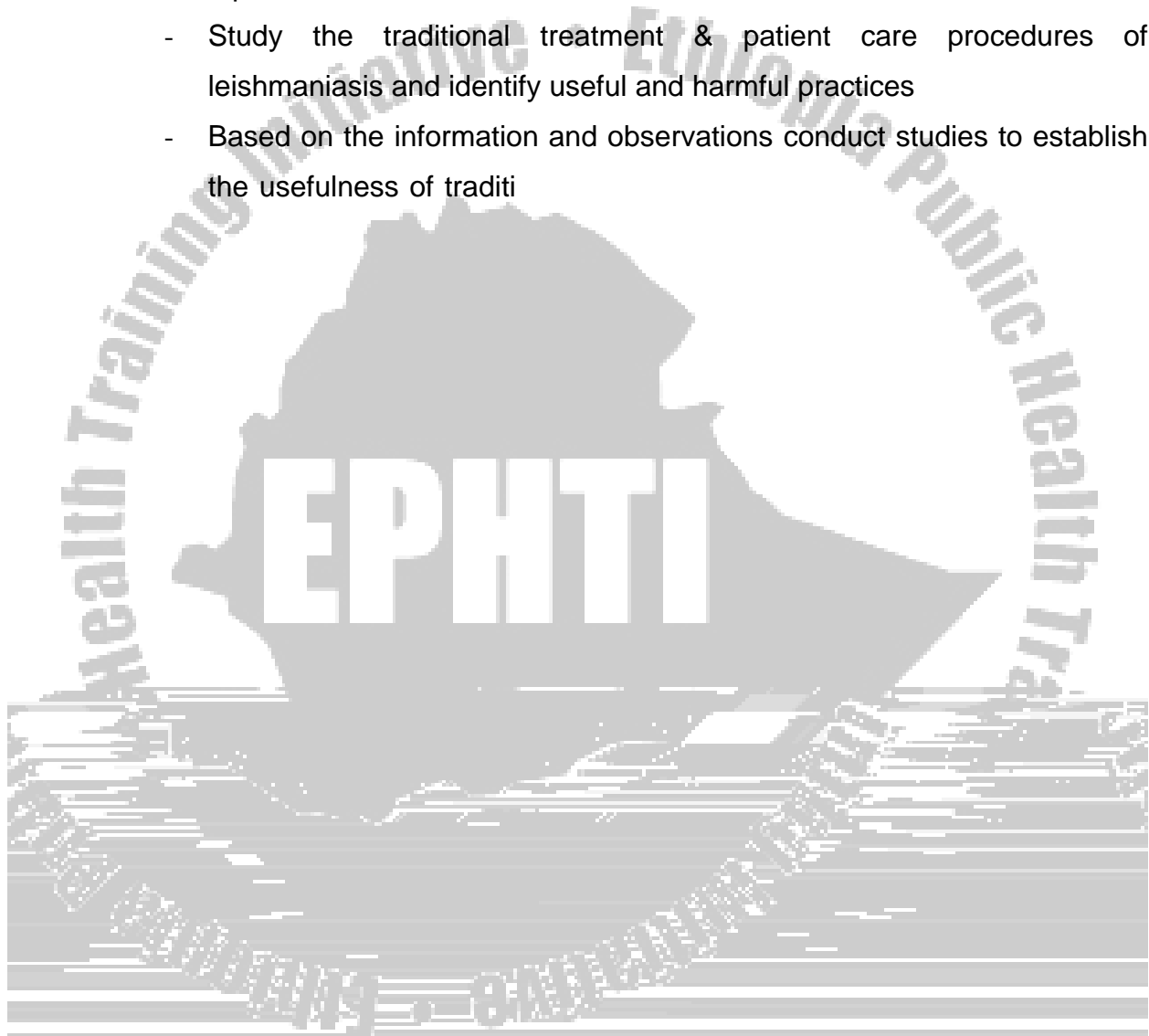
- Case detection and treatment: when reservoir is human
- Wild reservoir control: when reservoir are rodents, not applicable to other mammals
- Sandfly control

§ Destruction of breeding sites

§ Insecticide spraying



- Applying insect repellants on the skin
3. Early reporting to nearest health institution
 4. Community participation
 - Importance of community participation and
 - Intersectoral collaboration
 5. Traditional malpractice
 - Study the traditional treatment & patient care procedures of leishmaniasis and identify useful and harmful practices
 - Based on the information and observations conduct studies to establish the usefulness of traditi



UNIT THREE

SATELLITE MODULES

3.1 SATELLITE MODULE FOR HEALTH OFFICERS

3.1.1. Introduction

3.1.1.1 Purpose

This satellite module is prepared for health officer students. The module emphasizes mainly areas which were not covered by the core module.

3.1.1.2 Direction

- § Study the satellite module after going through the core module
- § You are advised to refer to the core module whenever necessary
- § After completing the satellite module answer all the questions in the pre and post tests
- § Compare the results with the previous performance

3.1.2 Learning Objectives: after going through this module the reader will be able to

1. Diagnose the different forms of Leishmaniasis
2. Describe the common anti leishmanial drugs, their dose, route of administration and adverse effects
3. Treat and follow patients having the different forms of Leishmaniasis
4. Organize Leishmania prevention and control programs

3.1.3 Definition

Leishmaniasis refers to various clinical syndromes that are caused by obligate intracellular protozoa of the genus *Leishmania* (order Kinetoplastida).

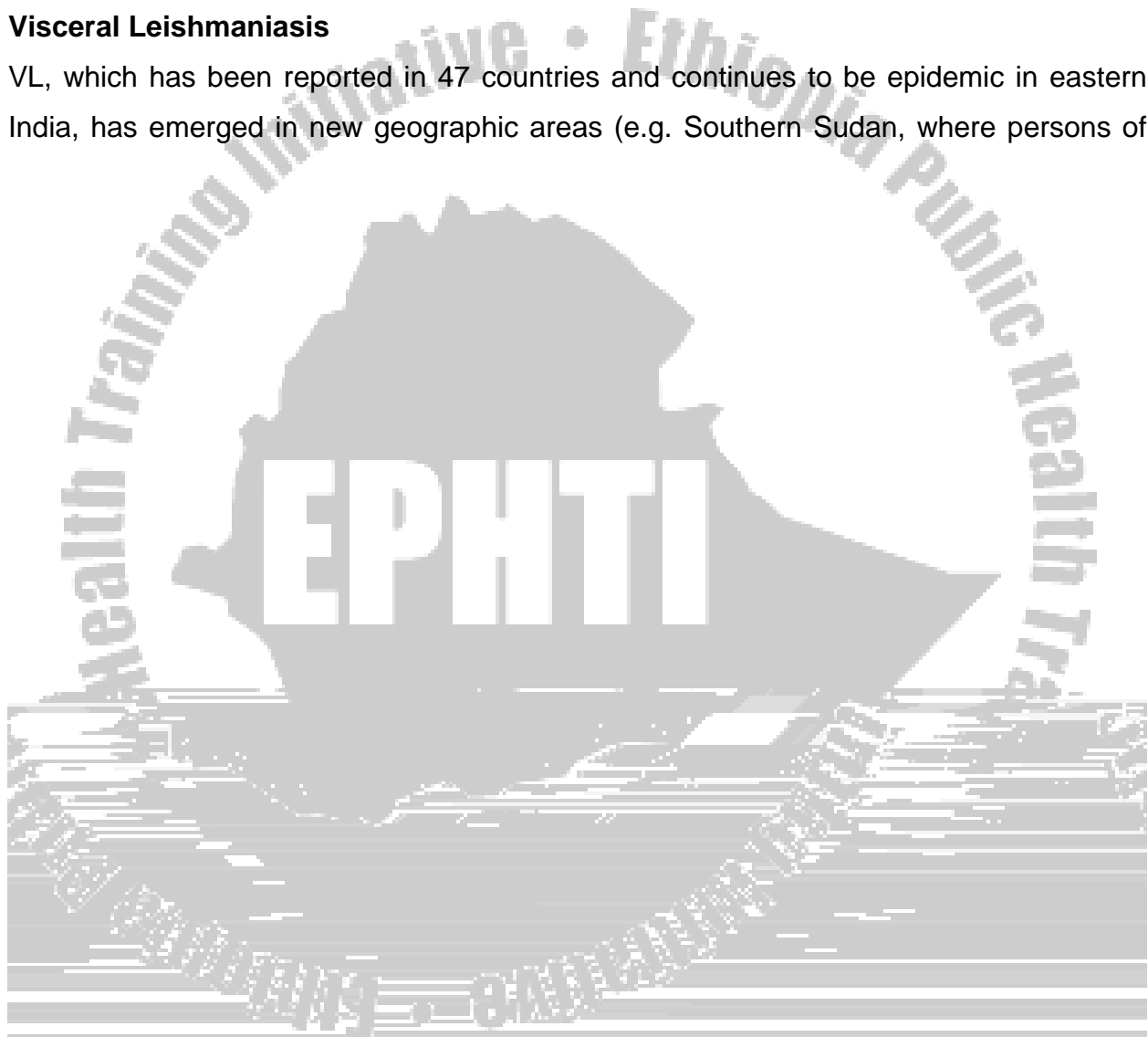
3.1.4 Epidemiology

Geographical distribution

Leishmaniasis is endemic in diverse ecologic settings in the tropics and subtropics, ranging from deserts to rain forests and from rural to peri-urban areas.

Visceral Leishmaniasis

VL, which has been reported in 47 countries and continues to be epidemic in eastern India, has emerged in new geographic areas (e.g. Southern Sudan, where persons of





3.1.5 Clinical features

Visceral Leishmaniasis: (in Hindi Kal-azar = 'black fever' indicating that the skin can turn gray)

Visceral infection can remain sub-clinical or can become symptomatic, with an acute, sub-acute or chronic course. In some settings inapparent infection far outnumber clinically apparent ones: malnutrition is a risk factor for the development of disease.

Incubation period (IP) – usually ranges from weeks to months but can be as long as years.

- Typically the patients are cachectic, febrile and are heavily parasitized and have life-threatening disease.
- Splenomegally (with the spleen most often soft and non tender) typically is more impressive than hepatomegally, and the spleen can in fact be massive.
- Peripheral lymphadenopathy is common in some geographic areas, including Sudan.

Laboratory findings:

In advanced disease include;

Pancytopenia- anemia, leukopenia (neutropenia marked eosinopenia, relative lymphocytosis and monocytosis) and thrombocytopenia- as well as hypergammaglobulinemia (chiefly involving IgG from polyclonal B cell activation) and hypoalbuminemia. Causes of anemia can include bone marrow infiltration, hypersplenism, autoimmune hemolysis, and bleeding.

Some patients develop, post-Kal-azar dermal Leishmaniasis [a syndrome characterized by skin lesions, including pigmented or depigmented macules, papules, nodules and patches that typically are most prominent on the face. These lesions can develop during or within few months after therapy (e.g. in E. Africa) or years after therapy (e.g. in India). Visceral infection can relapse.

Diagnosis

- Demonstration of the parasite on stained slides or in cultures of a tissue aspirate or a biopsy specimen (e.g. of spleen, liver, bone marrow, or lymph node).
- Diagnostic yield is highest for splenic aspiration (specifically, as high as 98% for splenic aspirates versus less than 90 percent for other specimens), but this procedure can cause hemorrhage.

Patients who have kal-azar typically carry a relatively heavy parasite burden; develop high titers of antibody to Leishmania (diagnostically useful but not protective); and have undetectable leishmania-specific cell-mediated immunity. (With leishmanin skin test reactivity as well as lymphocyte proliferation noted only after recovery).

Differential diagnosis

Include other tropical diseases that cause fever or organomegally (e.g. typhoid fever, miliary tuberculosis, brucellosis, malaria with tropical splenomegally syndrome)

Treatment

1. The pentavalent antimonial compound- sodium stibogluconate (pentostam) – 20mg of sb^v/kg given IV or IM once daily for 28 consecutive days is first line therapy.
 - Typically patients feel better and become afebrile during the first week of treatment.
 - Abnormal laboratory findings and Splenomegally improve during therapy but may take weeks or months to resolve.
 - Reappearance of eosinophils in the leukocyte differential count is a good sign.
 - The best indicator of permanent cure is freedom from clinical relapse during at least 6 months of follow up.
 - Repeat tissue sampling is indicated if the patient's status is in question.

- The possibility of HIV confection should be considered if the patient doesn't respond to therapy or repeated relapses.
2. In India (where unresponsiveness to sb^v therapy is becoming increasingly problematic, amphoterecin-B (0.5 to 1.0 mg/kg daily or every other day, given intravenously for a total dose of 7 to 20 mg/kg) has been found to be a highly effective, though potentially toxic, alternative.
 3. Pentamidine (2 to 4mg/kg daily for every other day, given intravenously or intramuscularly for at least 15 doses) is reasonably effective but may need to be administered in prolonged courses that are associated with toxicity.
 4. Formulation of liposomal amphotericin-B may prove highly effective and less toxic
 5. Various parenteral agents have been advocated as adjuncts to accelerate or improve the response to sb^v therapy.
 - Aminosidine (12 to 15 mg/kg per day, IV or IM)
 - Cytokine immunotherapy with subcutaneous injections of recombinant interferon- γ or granulocyte macrophage colony-stimulating factor.
 - Allopurinol
 - ketoconazole

VL in HIV infected persons:

VL is becoming an important opportunistic infection among persons infected with HIV-1 in geographic areas in which both infections are endemic.

- To date, most co-infections have been reported from southern Europe, where *Leishmania infantum* is endemic and visceral is no longer primarily a disease of young children. Co-infections are reported from Ethiopia.
- In HIV-infected patients, even relatively avirulent Leishmanial strains can disseminate to the viscera.
- Clinical Leishmaniasis in patients with HIV infection can represent newly acquired or reactivated infections. Most co-infected patients who have clinically evident Leishmaniasis have fewer than 200 CD 4 lymphocytes per micro liter.

- Co-infected patients can develop unusual manifestation of visceral leishmaniasis, in part because of atypical localization of the parasite (e.g. in the gastrointestinal tract)
- The diagnostic sensitivity of classic serologic methods is lower in co-infected than in immunocompetent patients (about 50 percent vs. 90 percent).
- On the other hand, parasitologic diagnosis by noninvasive means is easier in the case of co-infected patients.
- Co-infected patients may initially respond well to anti leishmanial therapy, albeit with more drug toxicity than is experienced by most immunocompetent persons. However, co-infected patients commonly have a chronic or relapsing course, seemingly irrespective of the drug regimens used for induction and suppressive therapy.

Cutaneous Leishmaniasis

Cutaneous Leishmaniasis has been reported from 61 countries. Traditionally it is classified as new world (American) or old world. Local names for new world disease include chiclero ulcer, pian bois (bush yaws), and uta; those for old world disease include oriental sore, bouton d'orient, Aleppo boil, and Baghdad sore.

In many affected regions, most cases occur in men who have forest related occupational exposures. The etiologic agents typically are those of the *L.mexicana* complex and the viannia group but also include *L.major*-like organisms and *L.chagasi*. Old world cutaneous leishmaniasis is caused by *L.tropica*, *L.major*, and *L.aethiopica* as well as *L.infantum* and *L.donovani*.

Incubation period: weeks to months

Local trauma can activate latent infection.

The first clinical manifestation is usually a papule at the site of the sand fly bite but is sometimes regional lymphadenopathy (sometimes bubonic) in *L. (V.) braziliensis* infection. Most skin lesions evolve from papular to nodular to ulcerative, with a central depression (which can be several centimeters in diameter) surrounded by a raised indurated border; some lesions persist as nodules or plaques. Multiple primary lesions,

Differential Diagnosis:

Tropical, traumatic and venous stasis ulcers, foreign body reactions, superinfected insect bites; impetigo fungal infection (eg. sporotrichosis), mycobacterial infection DCL and leishmaniasis must be differentiated from lepromatous leprosy and lupus vulgaris, respectively.

Treatment

Decision about whether and how to treat depend on

- the possibility of mucosal dissemination
- Lesion location (cosmetic implications), number, size
- evolution, and chronicity

When optimal efficacy is important sb^v = 20mg/kg (IV/or IM) once daily for 20 consecutive day; lower daily doses or shorter courses may have merit in some situations.

- pentamidine (3mg/kg IM, every other day for four doses) may be an effective alternative to sb^v.
- The imidazoles ketoconazole and itraconazole, allopurinol, and dapsone are probably modestly active.

Unless used in an adjunctive role, local or topical therapy should be considered only for the treatment of infection that doesn't have the potential for dissemination (eg for relatively benign lesions caused by *L. mexicana* or *L. major*). Examples of local approaches: application of ointment containing paromomycin and methylbenzethonium chloride, heat therapy and cryotherapy.

Mucosal Leishmaniasis

- Leishmanial infection of the nasopharyngeal mucosae is a relatively rare but potentially disfiguring metastatic complication of cutaneous leishmaniasis.
- Mucosal disease develops despite antileishmanial cell-mediated immunity and most commonly is caused by organisms of the viannia group (typically *L. (v.) braziliensis* but also *L. (v.) panamensis* and *L. (v.) guyanensis*).

- Although mucosal disease usually becomes clinically evident within several years after the healing of the original cutaneous lesions, cutaneous and mucosal lesions can exist simultaneously or can appear decades apart.

Typically, the original cutaneous lesions in these cases were not treated or were inadequately treated.

Clinical picture:

Mucosal involvement generally is manifested first by persistent unusual nasal symptom (e.g. epistaxis), with erythema and edema of the nasal mucosae, and then by progressive ulcerative, nasopharyngeal destruction.

Diagnosis:

Supportive laboratory data (e.g. a positive serologic test) are useful, but the scarcity of amastigotes makes parasitologic confirmation difficult.

Differential Diagnosis:

Sarcoidosis, neoplasms, midline granuloma, rhinoscleroma, paracoccidioidomycosis, histoplasmosis, syphilis, and tertiary yaws.

Treatment

Sb

3.1.6 Prevention and Control

Intervention strategies for prevention and control are hampered by the presence of many reservoir hosts and multiplicity of sandfly vectors. There are many eco-epidemiological entities each requiring distinct control strategies.

Prevention

Aim of prevention

- Avoiding host infection (Human or canine)
- Preventing subsequent progression to disease

Strategies

- Early diagnosis and treatment
- Prevent intrusion of people in to natural zoonotic foci
- Protect against infective bites of sand flies
- Health education
- Community participation

Individual prevention

- Avoiding risk of Exposure: Avoid vicinity of sandfly development or resting sites
- Mechanical means: self protection form sandfly bite by wearing clothes, bed nets
- Chemical means: repellants applied to the skin

Collective measures

- Forest clearance: establishment of forest free zone of about 400 meter around human settlements
- Indoor residual spraying

Control

Aim of control

- interrupt life cycle of parasite
- limit or eradicate the disease

Targets are the vector and the reservoir

Strategies

Depend on ecology and behavior of the main targets

- Case detection and treatment: when reservoir is man
- Wild reservoir control: when reservoir are rodents , not applicable to other mammals
- Sandfly control
 - § Destruction of breeding sites
 - § Insecticide spraying

Other Methods

- (i) Health talks
To individuals, groups and communities.
- (ii) media includes news papers , leaflets radio , television
- ³ (iii) Role plays and dramas
- (iii) Community participation

For successful environmental management

- mobilize community health workers, community leaders , women, other sector personnel such as in agriculture education , religious leaders etc
- Train selected community members on Leishmaniasis.

Topics for Health Education

1. Under taking Environmental control

- forest clearance
- Destroying rodent sites
- Identifying sandfly breeding sites and destruction of those sites

2. Reduction of contact between people and sandflies

- Selection of settlement sites , should be at least 400mts away from breeding and shading sites
- Clearing trees and vegetation around living , working areas
- Increase use of insecticide impregnated bed nets
- Use of screen on windows
- Wearing protective clotting

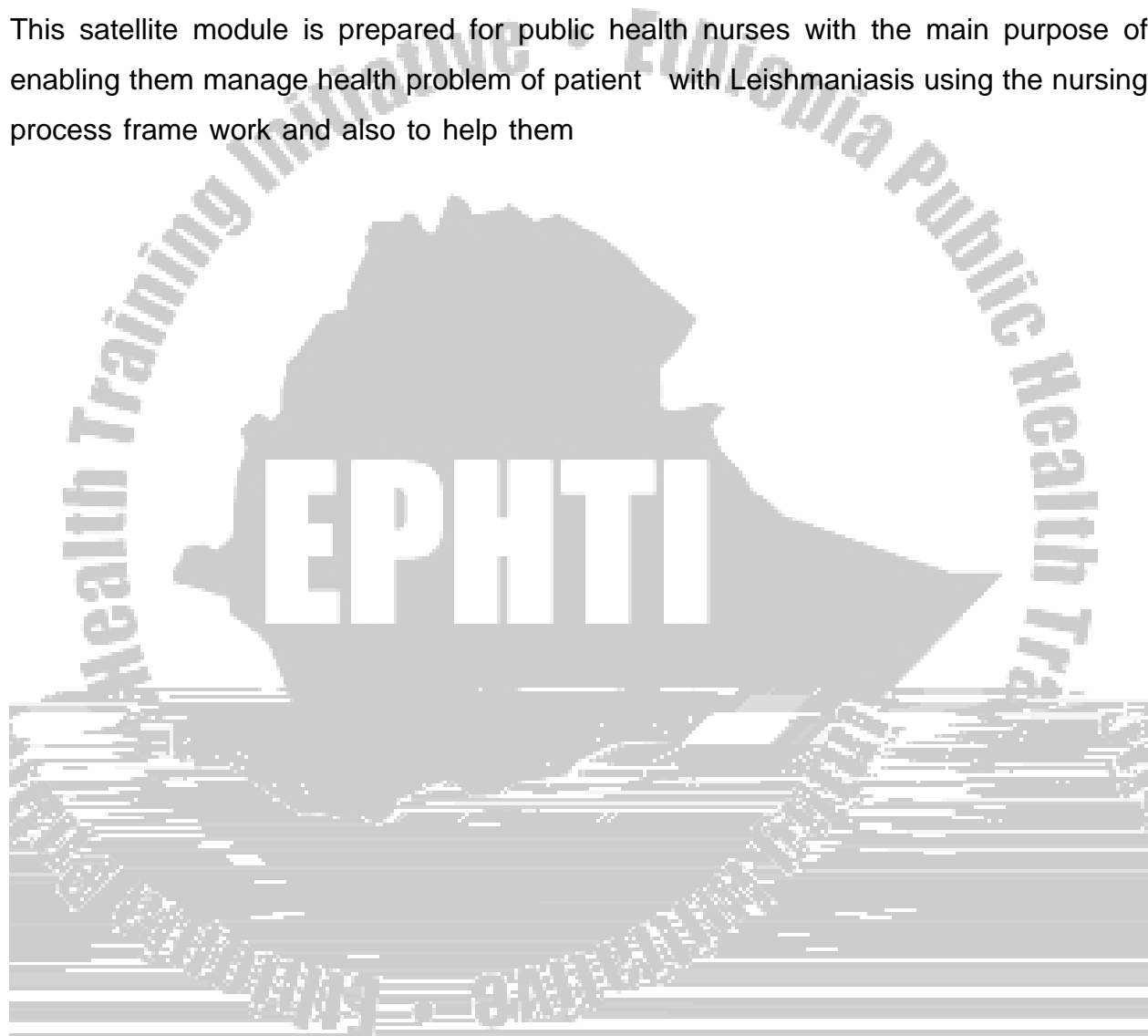


3.2 SATELLITE MODULE FOR PUBLIC HEALTH NURSES ON LEISHMANIASIS

3.2.1 Introduction

3.2.1.1 Purpose

This satellite module is prepared for public health nurses with the main purpose of enabling them manage health problem of patient with Leishmaniasis using the nursing process frame work and also to help them



3.2.3 Case study: Learning activity

Based on the case given on the core module try to answer the questions given below

Questions

1. What is the possible empirical diagnosis of the man? Why?
2. Mention the subjective and objective data that guided you to make appropriate nursing diagnosis
3. State the nursing diagnosis of the patient (potential and actual)
4. List your plan to meet the needs of the patient
5. Describe the important nursing interventions to solve the identified problems

3.2.4 Assessment

The depth and focus of the nursing assessment depends on several factors. These factors include the health care setting (e.g. Hospital Health center, home), the role of the nurse (qualification), and the need of patient. The nurse is often the first of the health care team members to come in contact with the patient and is often the care provider in the best position to assist with basic care. This may enable the nurse to assess patient's perception about Leishmaniasis and action taken to relieve symptoms, plan for treatment and expectations.

The health History and physical assessment for patients with Leishmaniasis of any type i.e. cutaneous (CL), Muco-cutaneous (MCL) and visceral (VL) should be made from the subjective and objective data gathered within the framework of the eleven functional health patterns. In addition with the patient profile, current patient treatment (medical or surgical) is an important point to be considered during nursing assessment.

Since the disease Leishmaniasis has three types such as cutaneous, Muco-cutaneous and visceral, specific assessment approaches are required. There fore important data to be considered are listed below.

3.2.4.1 Nursing assessment focus for patient with Cutaneous Leishmaniasis and Muco-cutaneous Leishmaniasis

For Cutaneous Leishmaniasis:

- § Focus on how the patient is coping with the skin condition, the appearance of skin lesion and tissue loss
- § Examine areas especially affected at the same time noting the number and



3.2.4.2 Nursing assessment for patients with visceral Leishmaniasis

- § Fever which is continuous intermittent or remittent or that can recur at irregular interval is noted
- § Hepatosplenomegally (soft and non tender)
- § Body wasting (weight loss).The amount should be monitored
- § Signs of anemia such as
 - § Weakness i.e. generalized body weakness
 - § Fatigue
 - § General malaise
 - § Pallor of skin and mucous membranes
 - § In severe cases when anemia worsens the following are noted
 - ³ Tachycardia on mild exertion (at Hgb 9-11g/dl)
 - ³ Exertional Dyspnoea (Hgb 7.5. gm/dl]
 - ³ Weakness (Hgb<6 gm/dl
 - ³ Dyspnoea (<3 gm/dl of Hgb)
 - ³ Cardiac failure at extremely low level hemoglobin of 2-2.5 gm/dl. Therefore, patient that develops severe form of anemia should be monitored for signs of possible CHF
- § Anorexia
- § Some times diarrhea may occur .If there is diarrhea look for sign and degree of dehydration
- § Peripheral lymphadenopathy
- § Patient with V.L should also be assessed for possible cutaneous Leishmaniasis called post- kalazar dermal Leishmaniasis
- § Patients who are taking any Medication or other treatment should be assessed for possible drug adverse effects.
- § Establish if patient has any complaint on current treatment

3.2.4.3 Common Nursing Diagnosis and Collaborative Problems for patient with Leishmaniasis

I. Nursing diagnosis

1. Knowledge deficit about the disease process and the therapeutic regimen
2. Impaired skin integrity related to lesion and secondary infection
3. Altered oral mucous membrane
4. Altered Nutrition less than body requirement
5. Activity intolerance related to weakness fatigue and general malaise
6. Altered body temperature (hyperthermia)
7. altered fluid and electrolyte balance (if diarrhea)
8. Body image disturbance related to embarrassment over appearance as a result of lesions ,scar, and skin discoloration especially on cosmetically sensitive areas
9. Pain related to skin lesions and treatment
10. Risk for altered skin integrity and wound infection
11. Potential adverse effects of drug treatment

II. Collaborative problems

- Delayed wound healing
- Infection
- Nutritional deficiency
- Bleeding

3.2.5 Planning and Implementation

The major goals in management of patient with Leishmaniasis of all type may include

- š Increased knowledge about disease and it's treatment
- š Attainment of tissue and skin integrity and prevention of potential complication
- š Attainment of oral mucosal integrity
- š Maintenance of normal body temperature
- š Avoidance of fluid and electrolyte deficit



- š To avoid potential alteration in skin integrity as a result of pruritis
 - Ø Tell the patient not to scratch his body to prevent secondary infection.
 - Ø Identify cause of pruritis and remove the cause
 - Ø



3.2.6.5 Tolerance of Normal activity

For patients that developed severe visceral Leishmaniasis and associated anemia the following Nursing interventions are to be considered

- § Plan care to conserve strength, physical and emotional energy
- § Encourage frequent rest period
- § Elicit family support a restful environment
- § Encourage ambulation and daily activities as tolerated
- § Resume activities gradually as blood studies return to normal.
Therefore monitor the Hgb and Hct level.
- § Encourage conditioning exercise for increased performance
- § Control bleeding (epistaxis)

a. If external nose is intact

- Ø Determine site of bleeding
- Ø Apply direct pressure
- Ø Sit patient upright with the head tilted forward to prevent swallowing and aspiration of blood
- Ø Compress the soft outer portion of nose against the middle septum for 5-10 minutes continuously

b. If massive ulceration and tissue loss

For Anterior nose bleed

Cauterization by chemical agent i.e. silver nitrate and Gel foam, topical vasoconstrictors such as adrenalin, phenylephrine

For posterior nose bleed

- A) Drug -moistened cotton pledgets inserted in to nostril to reduce blood flow; suction to remove excess blood and clots from the field of inspection
- B) Pack nose with petrolatum-impregnated gauze when origin of bleed can not be identified keep packing in place for 48 hours or up to 5-6 days if necessary to control bleeding.

3.2.6.6 Teaching the patient during discharge

- § Instruct to seek medical attention if recurrent bleeding can not be stopped
- § Review ways to prevent Epistaxis such as avoidance of
 - Forceful nose blowing
 - Straining
 - High altitude and
 - Nasal trauma
- § Instruct patient how to apply direct pressure
- § Provide adequate humidification to avoid drying

3.2.6.7 Absence of Hyperthermia or controlling hyperthermia

- § Monitor vital sign especially body temperature regularly
- § Give patient antipyretic
- § Increase fluid intake
- § Use other physical methods such as
 - § cold sponging
 - § Tipped sponging and
 - § Ventilation as need

3.2.6.8 Avoidance of fluid and electrolyte balance deficit

- § Assess for hypovolemia
- § Assess possible cause of diarrhea
- § Assess for dehydration such as decreased skin turgor, tachycardia, decreased pulse volume, decreased serum sodium
- § Encourage oral fluid replacement in the form of water, juice, and home based fluids
- § Keep an accurate record of intake and out put daily
- § Administer prescribed drug



2) Amphotericin B (antifungal antibiotic)

3 Usually given as second line treatment

3 For Muco-cutaneous

Dose administered over a period of 4-6 hours by slow intravenous (IV) infusion, starting at 0.1 mg/kg dose and gradually increasing to 1mg/kg

contra indication of amphotericin B

§ Renal dysfunctions

§ Laceration (Except when life threatening and treatable only with drug)

compatibilities: Do not mix with saline containing solution, parental nutritional solutions, amine glycosides, and penicillin.

Administration .Give with slow and direct push

Nursing considerations

Assess- for history of allergy

- Renal dysfunction
- Lactation
- Physical findings such as
 - Skin color and lesion
- Fever and chills
- Reflexes
- Bowel sounds
- Live reevaluation
- culture of area involved if needed

Implementation

§

- § Teach the patient about the possible side effects and possible warning signs that he should report

3.2.7 Post test

Direction: Try to answer the following questions based on the satellite module you have read.

1. List the possible nursing diagnoses that patient with Leishmaniasis may have
2. Mention the underlying causes that leads leishmanial patient develop progressive weakness
3. Characterize the type of fever that lieshmanial patient develop
4. List the predisposing factors that can lead lieshmaneal patient develop secondary infections
5. Mention the most terrible physical and psychological consequences that the patient with advanced stage of Muco-cutaneous Leishmaniasis may face and appropriate nursing response.
6. Why it is so important to involve patients family or caregiver in care of patient with leishmanial disease
7. Discus the way how patient's knowledge deficit can affect the health status of leishmanial patient
8. Mention the nursing intervention that you can implement to stabilize the patient's nutritional status
9. Mention the most important nursing consideration for patient taking anti lieshmanial drug such as antimonials (SSG) and Amphotericine B including their dose, preparation, and route of administrations

3.3 SATELLITE MODULE FOR MEDICAL LABORATORY TECHNOLOGISTS ON LEISHMANIASIS

3.3.1. Introduction

3.3.1.1. Use and purpose of the satellite module

This satellite module is prepared for medical laboratory technologists with the main purpose of enabling them to perform leishmania diagnosis effectively.

3.3.1.2. Direction

Readers are advised to study the core module before going into the satellite module.

- After completing the satellite module answer all the questions in the post test
- Compare your results with that of the pretest.

3.3.2 Learning objectives

Upon completion of the activities in this module you will be able to: -

- 1) Name the different types of specimen from which Leishmania parasites are recovered.
- 2) Name the specific laboratory techniques that help for diagnosing leishmania.
- 3) Know how each specimen is processed and examined
- 4) Differentiate the stages of Leishmania parasites

3.3.3 Pretest

1. ____ One of the following morphologic features cannot describe the amastigote stage
 - A) Round to oval in shape
 - B) Has free flagellum
 - C) Has eccentric nucleus
 - D) Has no undulating membrane
2. ____ Is the stage of Leishmania detected from a spleen aspirate
 - A. Promastigote
 - B. Amastigote
 - C. Trypomastigote
 - D. Epimastigote
3. ____ Causes visceral leishmaniasis
 - A. L.aethiopica
 - B. L.Major
 - C. L.donovani
 - D. L.tropica
4. ____ is the stage of leishmania obtained from culture media
 - A. Promastigote
 - B. Amastigote
 - C. Trypomastigote
 - D. Epimastigote
5. Among the following diagnostic tests one has little value in the diagnosis of cutaneous leishmaniasis.
 - A. Examining slit skin smears for amastigotes
 - B. Testing leishmania antibodies in serum
 - C. Culturing the material collected from nodule
 - D. None of the above
6. In Formol gel (aldehyde) test, whitening and gelling of serum within 20 minutes indicates a ____
 - A. Positive test
 - B. Negative test



3.3.4 Laboratory Diagnosis of Leishmaniasis

Leishmaniasis can be diagnosed in the laboratory by:

- A. Hematological investigations
- B. Parasitological examination
- C. Serological diagnosis

3.3.4.1 Diagnosis of Visceral Leishmaniasis (VL)

The laboratory diagnosis of visceral leishmaniasis is based on

(A) Hematological investigations

In VL, blood cell production becomes depressed and white cells, platelets, and red blood cells become sequestered in the spleen. Patients become anemic, leucopenic, and thrombocytopenic. During treatment a rising hemoglobin and white blood cell count indicate a good response.

The investigations include:

- Measurement of the hemoglobin (decreased value).
- White blood cell count (decreased count).
- Platelet count (decreased count).
- Erythrocyte sedimentation rate (raised due to increase in globulins)

(B) Parasitological examination

- Parasite can be demonstrated following staining and /or culture technique.

Staining techniques for smears

There are two staining techniques:

1. Giemsa's staining technique
2. Field's staining technique

Procedure for Giemsa staining technique:

1. Prepare 1: 10 diluted Giemsa stain solution by taking one part stock Giemsa



1. Examination of aspirates

Laboratory staff assists the medical officer performing the aspiration to ensure films of the correct thickness are made.

Note: a splenic aspiration must not be performed without training and experience because it may lead to fatal hemorrhage if done incorrectly.

Procedure for examining aspirates

1. Immediately after aspiration, make at least 2 thinly spread smears of the aspirate on clean slides. Only a small quantity of aspirate is required. Dilution with blood should be avoided.
2. Air-dry and then fix each smears, by immersing the slides in a container of methanol for 2- minutes
3. Stain the smears by the rapid Field's or Giemsa staining technique for thin films.
4. When the smear is dry, spread a drop of immersion oil on it and examine first with the 10x and 40x objectives to detect macrophages, which may contain amastigotes (the parasites can also be found outside macrophage cells). Use the 100x oil immersion objective to identify the amastigotes.

2. Examination of Buffy coat smear

The amastigotes can be found in Peripheral blood monocytes and less commonly in neutrophils. It can be detected in stained buffy coat smears prepared from EDTA (sequestrene) anticoagulated venous blood.

Note: When collecting the EDTA venous blood sample, also collect sufficient venous blood for the hematological and formol gel-screening test.

Procedure for examining buffy coat smear

1. Collect about 7 ml of venous blood. Dispense about 2 ml into an EDTA container and mix gently. Dispense the remainder into a dry glass tube (to provide serum for the formol gel test).

2. Using Pasteur pipette, aspirate the blood from the EDTA container
3. Insert the tip of the pipette to the bottom of narrow bore tube (e.g. Eppendorf plastic tubes or glass tube 6x50 mm) and fill the tube with blood, withdrawing the pipette as the tube fills.
4. Centrifuge the EDTA blood in tubes for 15 minutes at about 1000 gravitational force.
5. Using Pasteur pipette, carefully remove and discard the plasma above the buffy coat.
6. Transfer a drop of the buffy coat on slide and spread to make a thin smear.
7. Air-dry the smear and fix it with methanol for 2 minutes
8. Stain the smear by Giemsa technique or Field's rapid technique for thin films
9. When the smear is dry, spread a drop of immersion oil on it and examine first with the 10x and 40x objectives to detect macrophages, which may contain amastigotes (the parasites can also be found outside macrophage cells). Use the 100x oil immersion objective to identify the amastigotes.

II. Culturing

If culturing facilities are available, aseptically dispense any aspirate or blood into sterile culture medium and examine for promastigotes.

Procedure for isolation of *L. donovani* using NNN medium

1. Add the ingredients to the conical flask and heat with continuous mixing to prevent the agar from burning.
2. Add 3 ml of agar to bijou bottles or 5 ml of agar to culture tubes.
3. Sterilize the agar by autoclaving bottles or tube at 121⁰C for 15 min and allow to cool to approximately 50⁰C.
4. Add sterile rabbit blood to each bottle or tube (defibrinated or citrated) to give a final concentration of about 15%. Mix gently and leave to cool in a sloped position. As 1.725 TD0.0015llow t0u()aide macr Tw[(asp)-df culturiTcTJeq9is7 Tm-c12 0 v b0

5. Samples of marrow or other material are inoculated into the condensate at the bottom of the slope. Do not add too much sample to the culture, as this will inhibit growth. Two or three drops only are sufficient and this should be added aseptically.
6. Check cultures for promastigotes after five, seven, and ten days. If no growth is observed, leave for 15 days and subculture into fresh medium and check as before.

C) Serological diagnosis

- In visceral leishmaniasis, specific antibodies as well as non-specific polyclonal IgG and IgM are produced.
- Several techniques have been developed to detect and measure specific anti-leishmanial antibodies in patients' sera. These include:
 1. Direct agglutination test (DAT)
 2. Rapid latex agglutination test
 3. Enzyme linked immunosorbent assay (ELISA)
 4. Indirect fluorescent antibody test (IFAT)

1. Direct agglutination test

- Ø Simple and reliable screening test.
- Ø The reagents are stable and inexpensive.
- Ø The antigen used in the test is a suspension of trypsin-treated amastigotes obtained from local strains, preserved in formalin and stained with coomassie brilliant blue

The test is performed in microtitration plates with the patient's serum being serially diluted. The test requires overnight incubation at room temperature. The endpoint of the test is taken as the last well where agglutination seen. The titre at which the DAT is reported as positive requires local verification.



Note

- Patients with multiple myeloma may give a positive formol gel test.
- Raised IgG levels (but not usually as raised as to give a positive formol gel test) are also found in other conditions such as:
 - Ø Chronic liver disease,
 - Ø Leishmaniasis,
 - Ø Trypanosomiasis
 - Ø Leprosy
 - Ø Pulmonary tuberculosis

- The formol gel test may be negative in conditions such as:
 - Ø Typhoid fever
 - Ø Hemolytic anaemia
 - Ø Chronic myeloid leukaemia
 - Ø Infective endocarditis

- Variable results are found in VL patients infected with HIV

3.3.4.2 Diagnosis of Cutaneous (CL) and Mucocutaneous Leishmaniasis (MCL)

The laboratory diagnosis of CL and MCL is by:

A. Parasitological examination

- I. Detecting amastigotes in smear taken from infected ulcers or nodules.
- II. Culturing ulcer material and examining culture for promastigotes.

I. Examination of slit skin smears for amastigotes



In South American MCL, the leishmanin test is positive and the reaction may be sufficiently aggressive to cause necrosis in the center of the area of induration

Negative reaction

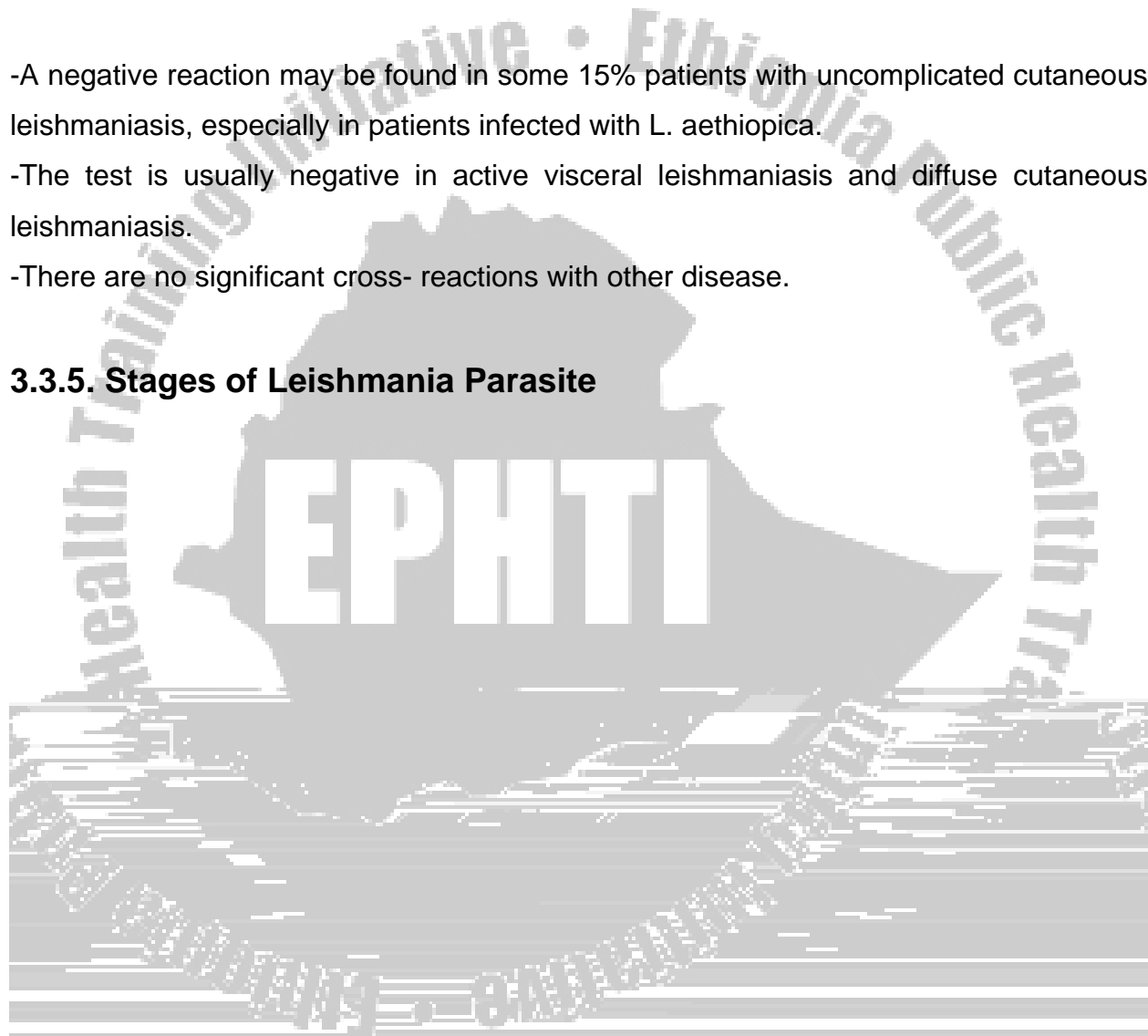
The reaction is considered negative when the area of induration is less than 5 mm in diameter.

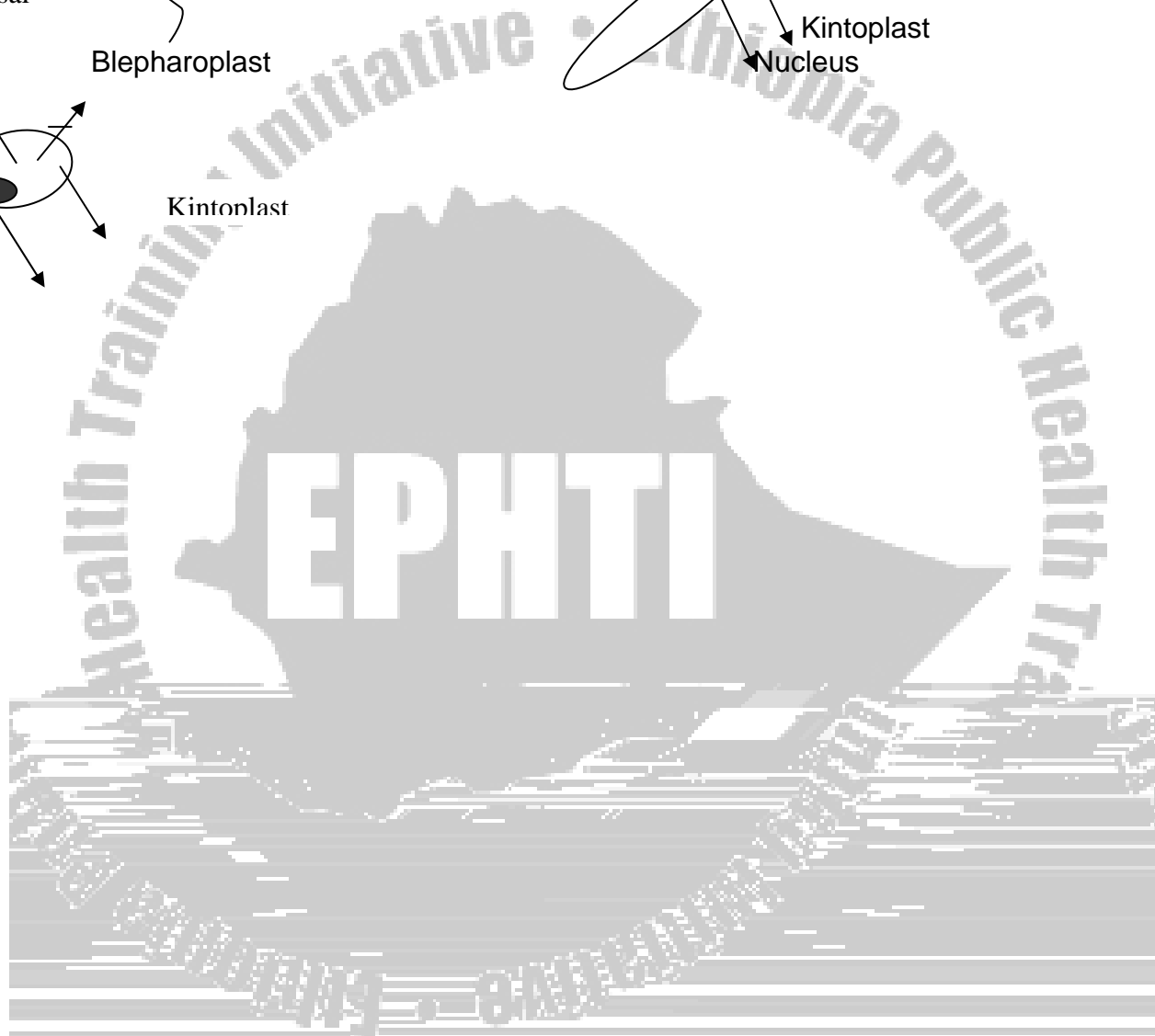
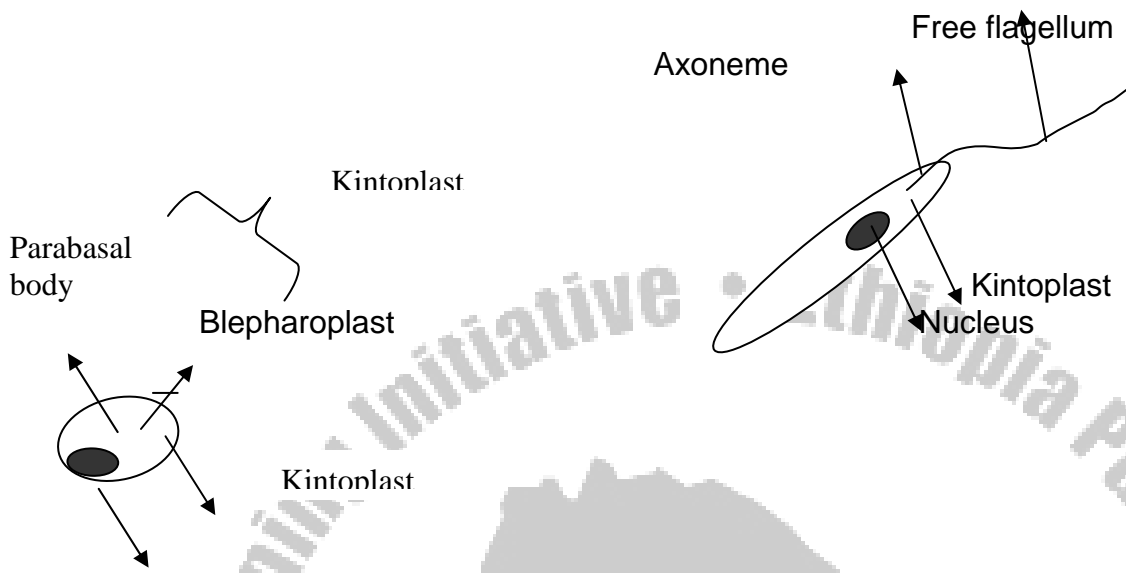
-A negative reaction may be found in some 15% patients with uncomplicated cutaneous leishmaniasis, especially in patients infected with *L. aethiopia*.

-The test is usually negative in active visceral leishmaniasis and diffuse cutaneous leishmaniasis.

-There are no significant cross- reactions with other disease.

3.3.5. Stages of Leishmania Parasite



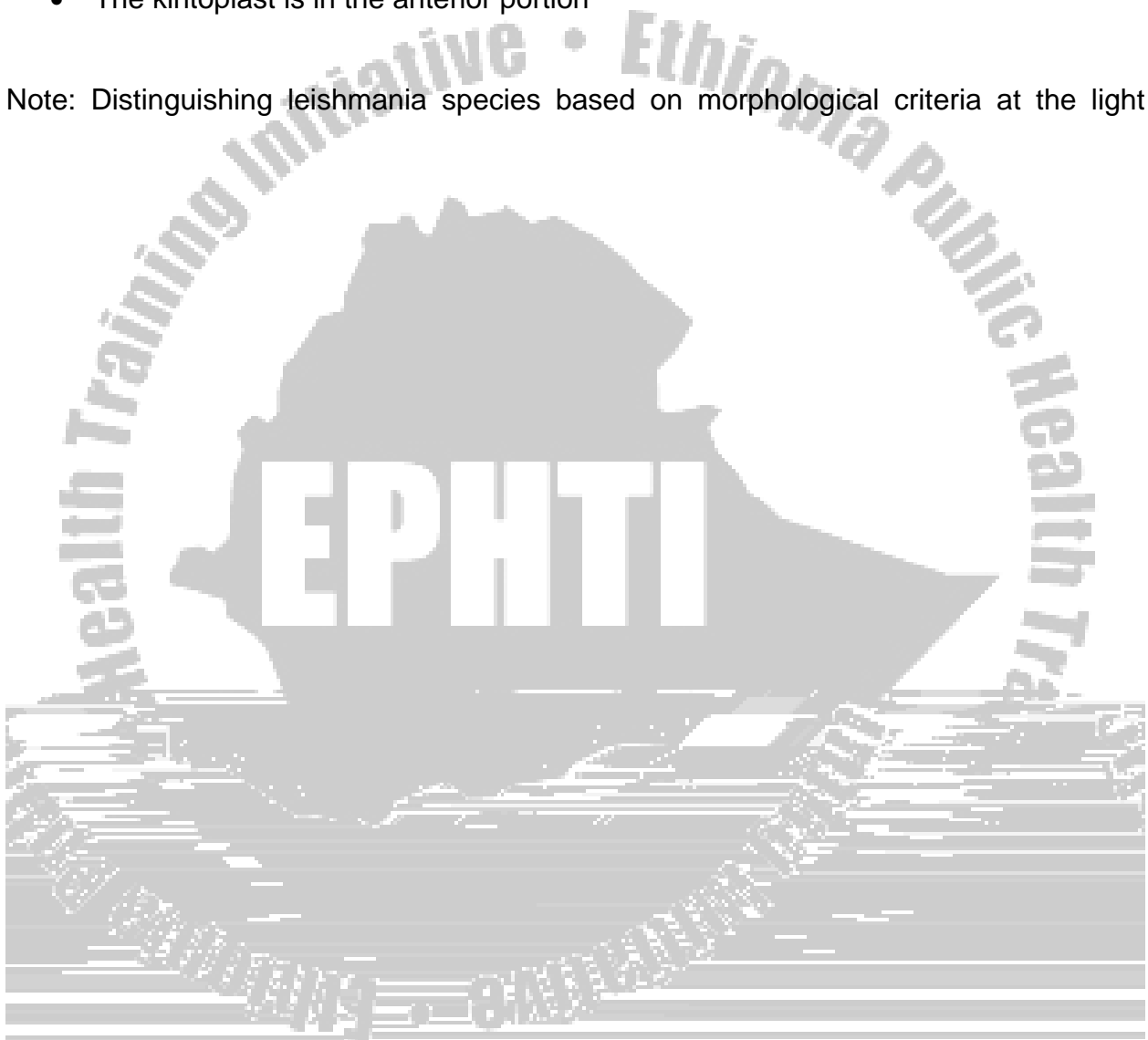


Picture showing promastigote and amastigote stages of Leishmania parasite.

Promastigote stage

- Elongated in form
- Has single free flagellum
- Has no undulating membrane
- Nucleus is near the middle
- The kintoplast is in the anterior portion

Note: Distinguishing leishmania species based on morphological criteria at the light



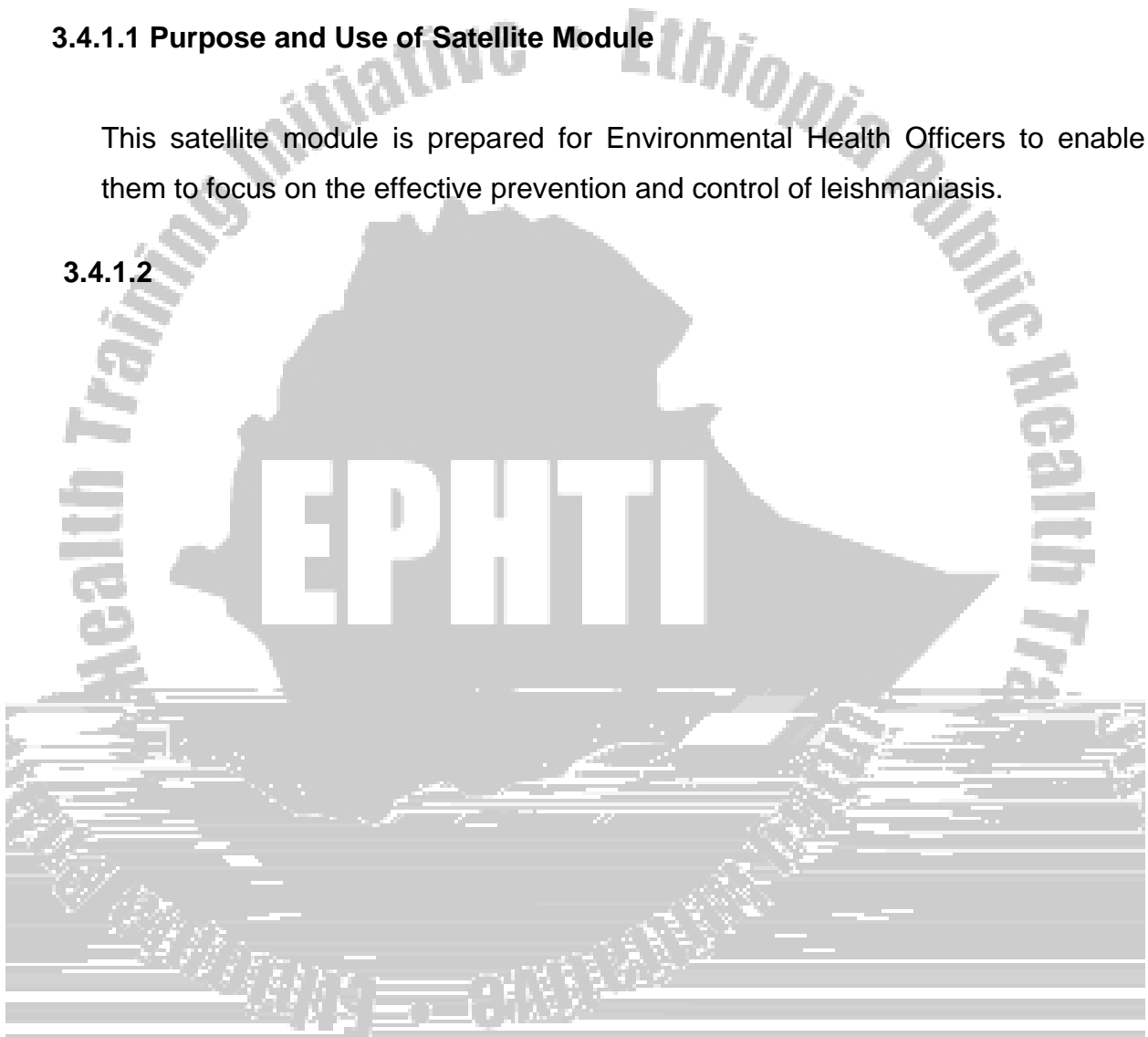
3.4 SATELLITE MODULE FOR ENVIRONMENTAL HEALTH OFFICERS ON LEISHMANIASIS

3.4.1. Introduction

3.4.1.1 Purpose and Use of Satellite Module

This satellite module is prepared for Environmental Health Officers to enable them to focus on the effective prevention and control of leishmaniasis.

3.4.1.2



3.4.3 Pretest

Instruction – choose the best answer

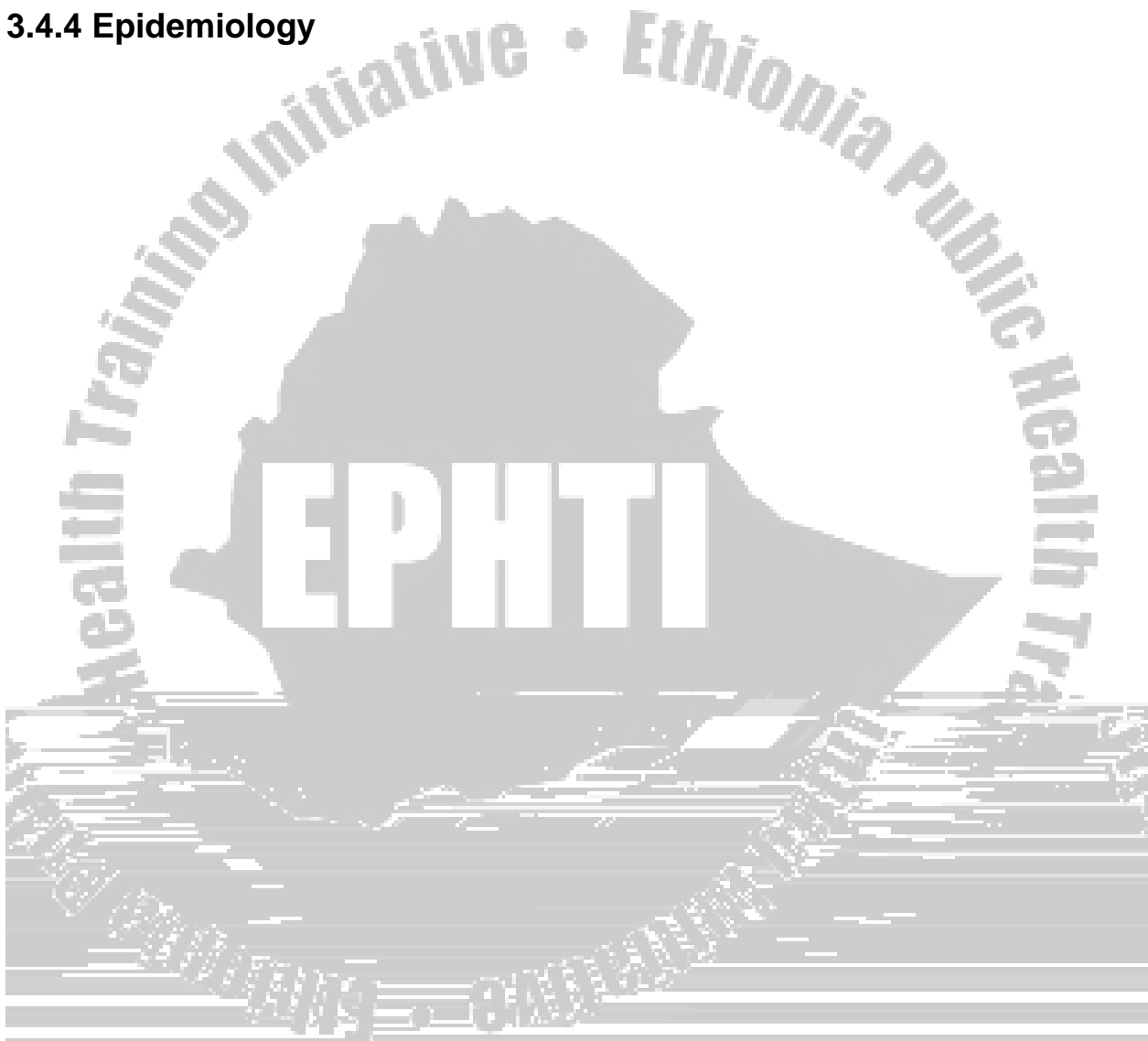
- 13) Why insecticidal control of sand fly larvae remains impossible?
- The breeding sites of most species are unknown or secretive
 - Even when the breeding sites are identified, they are too diverse and impractical to reduce larval number
 - Their larvae float on water surface and hide themselves
 - A and B
- 14) Which of the following **is not** true about the external morphology of phlebotomus sandflies
- The palps are as long as the proboscis
 - Hairy appearance
 - Have long and stilt like legs
 - Their wing held erect over
- 15) The eggs of sand fly are deposited:
- On surface water
 - On cracks and holes in the ground
 - On floating substance of water
 - All
- 16) Maturation of larva of phlebotomine sand fly depends on the following **except**
- Temperature
 - Food supply
 - Water flow
 - Species
- 17) Phlebotomine sand fly have a relatively short flight range, so that it is easy to control by-----
- Insecticidal spraying
 - Protective clothes
 - Impregnated bed net
 - Repellants

- 18) Under which of the following methods phlebotomine sand fly can be effectively prevented?
- By destroying reservoir
 - By forest clearance
 - By applying insecticides
 - All
- 19) Which of the following is impractical method of prevention of leishmaniasis?
- Environmental management
 - Destroy the reservoirs
 - Personal protection
 - Applying insecticide
- 20) Which of the following **is not** a characteristics of phlebotomine sand fly
- Active during night and dusk
 - Rest in dark moist areas
 - Active only during the day
 - endophilic and exophilic
- 21) Which of the following is a protective method against leishmaniasis at individual level?
- Reducing breeding sites
 - Applying insecticides
 - Using repellants
 - Forest clearance
- 22) The epidemiology of leishmaniasis is largely determined by:
- The species of sand flies, their ecology and behavior
 - The availability of the wide range of hosts
 - The species and strains of leishmania parasites
 - All
- 23) "Forest – free- belt" means:
- Afforestation
 - Forest clearance
 - Kill wild reservoirs
 - Filling cracks or burrows

24) Old World leishmaniasis is transmitted by:

- a. Phlebotomus species
- b. Lutzomia species
- c. Anopheles species
- d. Culex species

3.4.4 Epidemiology



livestock, wild rodents, snakes, lizards and birds. Each sand fly species has specific preferences for its source of blood, but the availability of hosts is an important factor. The saliva of sandflies can enhance the virulence of inoculated *Leishmania*. Sandfly species are only important as vectors of leishmaniasis if they feed regularly on humans.

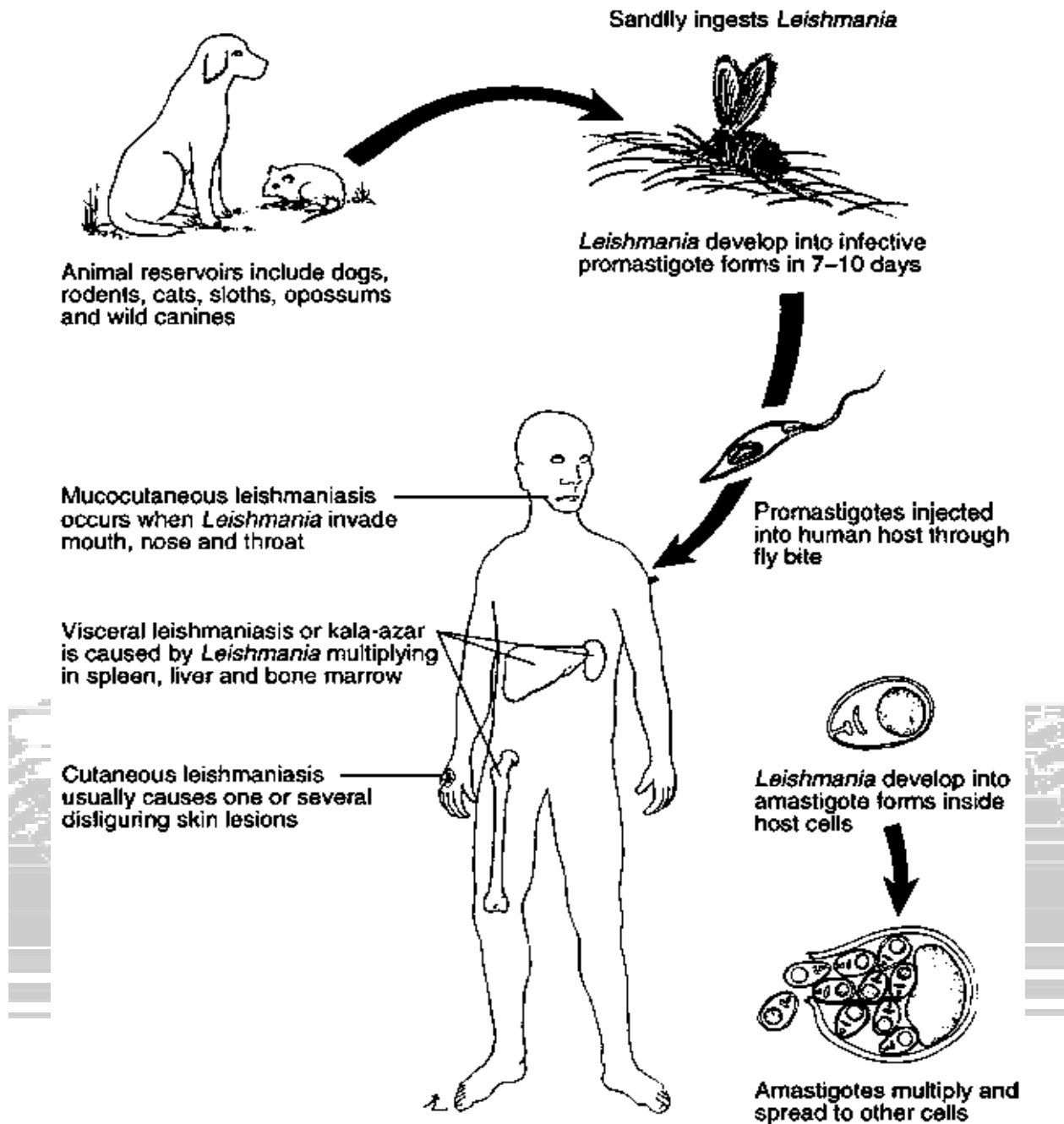


Fig. 1. Life cycle of leishmaniasis

3.4.5.1 External morphology of adult phlebotomine sand flies

⇒ Adult phlebotomine sand fly can readily be recognized by their:

- minute size (2-4mm in length)
- hairy appearance on the body (i.e the head, thorax, abdomen and wings are densely covered with long hairs)
- relatively long and stilt like legs
- relatively large black eyes
- wings to be held erect over the body even when the fly is at rest
- short and inconspicuous mouth parts
- short, hopping flight style

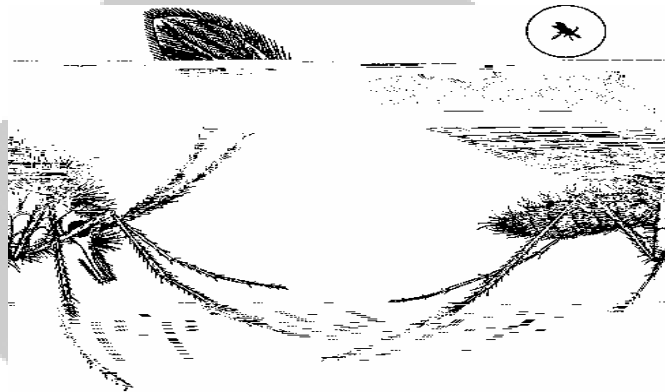


Fig.2. External morphology of phlebotomus sandfly

3.4.5.2 Stages of sandfly development

- **The egg stage:** The eggs are deposited in small cracks and holes in the ground, at the base of termite mound, cracks in masonry, on stable floors, in poultry houses, among leaf litter on the floor.

Although eggs are not laid in water they require a moist microhabitat with a high humidity. They are unable to withstand desiccation and hatch after 6-17 days under optimal conditions but may be prolonged in cooler weather.

- **The larval stage:** The larvae are mainly scavengers, feeding on organic matter such as animal feces, fungi, insect debris, decaying plant materials. Larval development is completed within 19-60 days depending on species, temperature and availability of food.
 - **The pupa stage:** Prior to pupation the larva assumes an erect position in the habitat, the skin then splits open and the pupa wriggles out. The larva skin is not completely attached to the pupa.
 - **The adult stage:** The adult emerge from the pupa after about 14 days then flies.
- The life cycle may last from 1 to 4 months, depending of species and temperature, although it usually lasts less than 45 days.

3.4.6 Prevention and Control Measures

1. At patient level

- Active case detection
- early treatment of cases

2. Basic sanitation

- Waste management /garbage clearance/ and house improvement /by cementing and plastering/
- Reducing breeding sites/places/ by filling any cracks, holes or burrows in the ground.
- Forest clearance, bushes around houses 300-400 meters in width.

3. Control animal reservoir hosts

Focus on destroying wild and domestic reservoir animals.

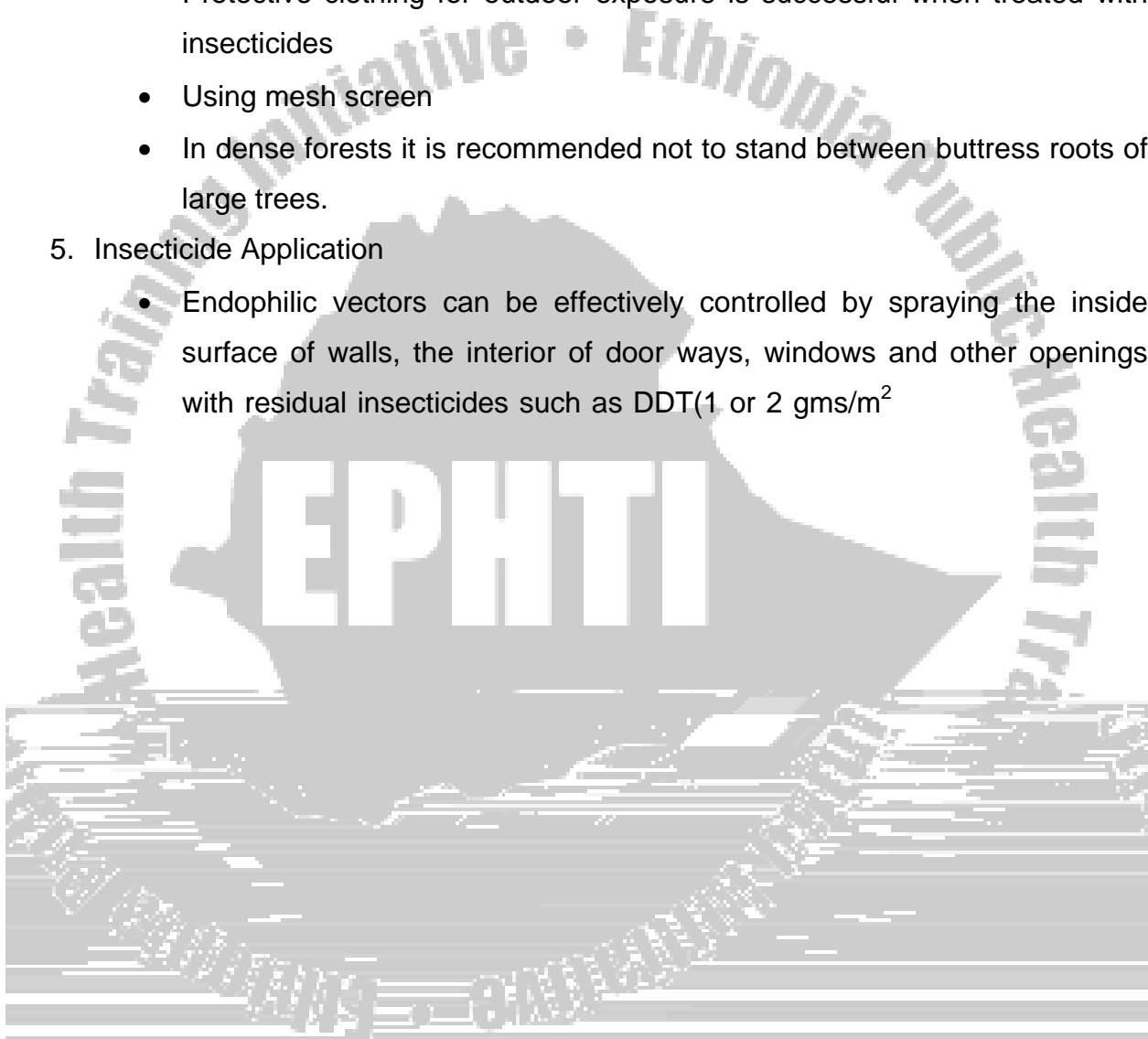
- Dogs are reservoirs for many species of leishmania, control by destroying infected dogs.
- Eliminating rock hyrax which is a wild animal reservoir in Ethiopia.
- Destroy rodent reservoirs like the great gerbil

4. Personal Protection

- Using fin-mesh bed nets or impregnated bed nets with various insecticides, including pyrethroid permethrin ($300\text{mg}/\text{m}^3$) or deltamethrin ($15\text{-}25\text{mg}/\text{m}^3$)
- Using chemical repellents like trimethyl pentadiol
- Protective clothing for outdoor exposure is successful when treated with insecticides
- Using mesh screen
- In dense forests it is recommended not to stand between buttress roots of large trees.

5. Insecticide Application

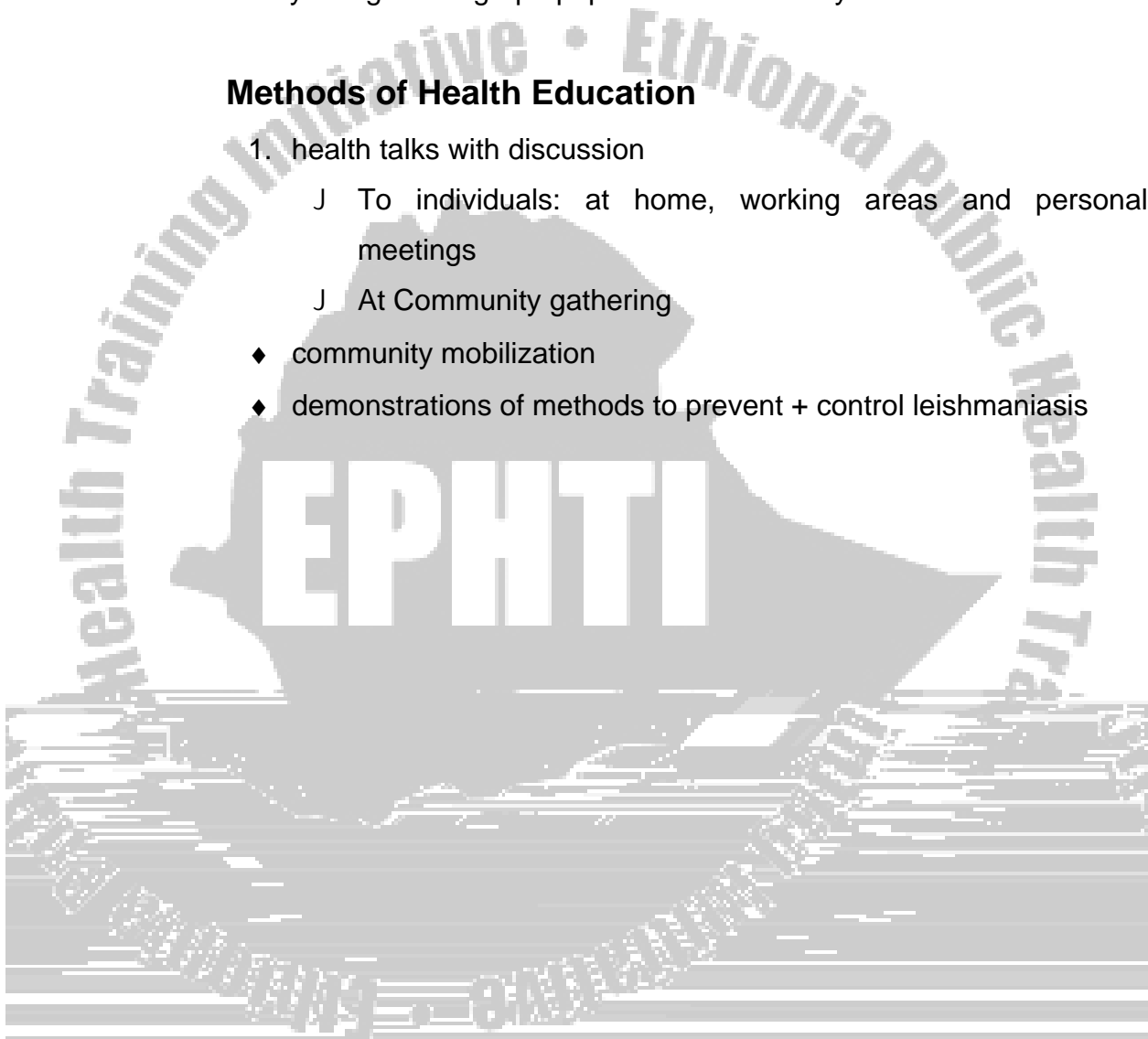
- Endophilic vectors can be effectively controlled by spraying the inside surface of walls, the interior of door ways, windows and other openings with residual insecticides such as DDT (1 or $2\text{ gms}/\text{m}^2$)



- destroy animal reservoirs (dogs, rodents)
- ∅ Community mobilization for environmental protection
 - Eg. -forest clearance around houses
 - destroy animal reservoir and its burrows
- Demonstration
 - ∅ By using board/graph papers draw the life cycle of the vector.

Methods of Health Education

1. health talks with discussion
 - J To individuals: at home, working areas and personal meetings
 - J At Community gathering
 - ◆ community mobilization
 - ◆ demonstrations of methods to prevent + control leishmaniasis



3.5 SATELLITE MODULE FOR HEALTH SERVICE EXTENSION WORKERS

Introduction

Purpose and uses of the module

This satellite module, which is an extension of the core module on leishmaniasis, is intended to consider important issues that can help the community health workers (CHWs), especially in the prevention and control of leishmaniasis.

Leishmaniasis is communicable disease that affects a considerable proportion of our society in different parts of the country. Prevention and control mechanisms have to be strengthened at the community level to decrease illness and death.

As a health agent of the community, your knowledge on leishmaniasis will help to control the disease and save lives. That is why this short and precise satellite module is prepared for you to teach and work with community in the control and prevention of leishmaniasis.

Direction for using the satellite module

- 3 Try to study and answer all the questions in the pretest
- 3 Read and understand the learning activity (case study) and answer the questions that follow
- 3 Read and understand the satellite module
- 3 Compare your results using the keys after finishing the module

Pretest

1-Leishmaniasis is caused by:

- a. Hereditary problem
- b. Germs
- c. Evil eye
- d. Bad water

2-Leishmaniasis is transmitted by:

- a. Fleas
- b. Lice
- c. Sand flies
- d. Dirty water

3-A person with leishmaniasis can have

- a. Skin problems
- b. Abdominal swelling
- c. Fever
- d. All of the above

4. What preventive measures can you take, in a community where you live, to protect the society from acquiring leishmaniasis?

5. What will you do if you get a person with a skin lesion, which is long standing, and non- healing?

6. If you are living in leishmania endemic area what will you teach the society in your health education?

Learning objectives

After completing this satellite module the CHW is expected to:

- Identify the causes of the disease the transmitting vector and reservoir hosts
- Identify individuals suffering from Leishmaniasis
- Describe the contributions of CHWs in the prevention and control of the disease at community level

Case study; Learning activity

Derege is an eleven-year-old boy who lives in Humera with his family. He, one day, became febrile and weak. He complained about his current feelings to his mother and was reassured. In the following days he continued to have same



Short notes

1 Definition

Leishmaniasis is a parasitic disease transmitted by a bite of an insect vector, a type of



Symptoms and signs

Leishmaniasis is a disease that can appear in two forms in our country. These forms of the disease are known as Visceral, and Cutaneous. The signs and the symptoms seen in these special forms are different.

3 Visceral Leishmaniasis

The illness starts 2-6 months after the sand fly bit, which transmits the disease. It starts gradually with fever, which loss of appetite and with progressive weight loss. The patient will develop significant weight loss and anemia associated with progressive increment in the size of abdomen, which is due to enlargement of abdominal organs, which are liver and spleen. He can also have diarrhea and dry cough and even bleeding from nose or mouth. Due to the commonly prevailing problem patients usually develop pale and grayish facial complexion.

Cutaneous Leishmaniasis

The bite of the sand fly can cause localized irritation and as a result the individual can have skin lesions, which are small, red swellings at exposed parts of our body like face, hands, forearms and lower limbs. They can be ulcerative or dry with nodules covered by scales. These lesions can be localized at a single part or can be disseminated to several parts of the skin. They are not usually self-healing and the individual only complains of their disfiguring results.

Out come of the disease

Out come depends on the type of the disease. Cutaneous leishmaniasis usually results in sine damage and disfigurement otherwise it doesn't cause death. Visceral leishmaniasis unless it is treated on time it will complicate and results in death of a significant percentage of such patients.

Diagnosis

Knowing the symptoms of leishmaniasis is important for diagnosis of both forms of the disease. Final diagnosis needs laboratory confirmation. In visceral leishmaniasis aspirated fluid from the spleen or bone marrow is important to visualize the parasites

.for cutaneous leishmaniasis also we need to take tissue from the lesion site and look for the parasites.

Role of the health extension package agent

Referral

A patient with suspected leishmaniasis showing the symptoms described above should be referred to a near by Health centre for further investigation and management. So the agent is required to assess the patient and make sure the patient is referred and gets better medical attention.

Prevention and control

Prevention

Strategies

- Early diagnosis and treatment
- Prevent intrusion of people in to natural zoonotic foci
- Protect against infective bites of sand flies
- Health education
- Community participation

Individual prevention

- Avoiding risk of Exposure: Avoid vicinity of sand fly development or resting sites
- Mechanical means: self protection form sand fly bite by wearing clothes, bed nets
- Chemical means: repellants applied to the skin

Collective measures

- Forest clearance: establishment of forest free zone of about 400 meter around human settlements
- Indoor residual spraying

Control

Aim of control

- interrupt life cycle of parasite
- limit or eradicate the disease

Targets are the vector and the reservoir

Strategies

- Wild reservoir control: when reservoir are rodents , not applicable to other mammals
- Sandfly control
 - § Destruction of breeding sites
 - § Insecticide spraying
- mobilize community health workers, community leaders , women, other sector personnel such as in agriculture education , religious leaders etc
- Train selected community members on Leishmaniasis

Topics for Health Education

1. Under taking Environmental control

- forest clearance
- Destroying rodent sites
- Identifying sand fly breeding sites and destruction of those sites

2. Reduction of contact between people and sand flies

- Selection of settlement sites , should be at least 400mts away from breeding and shading sites
- Clearing trees and vegetation around living , working areas
- Increase use of insecticide impregnated bed nets
- Use of screen on windows
- Wearing protective clotting
- Applying insect repellants on the skin

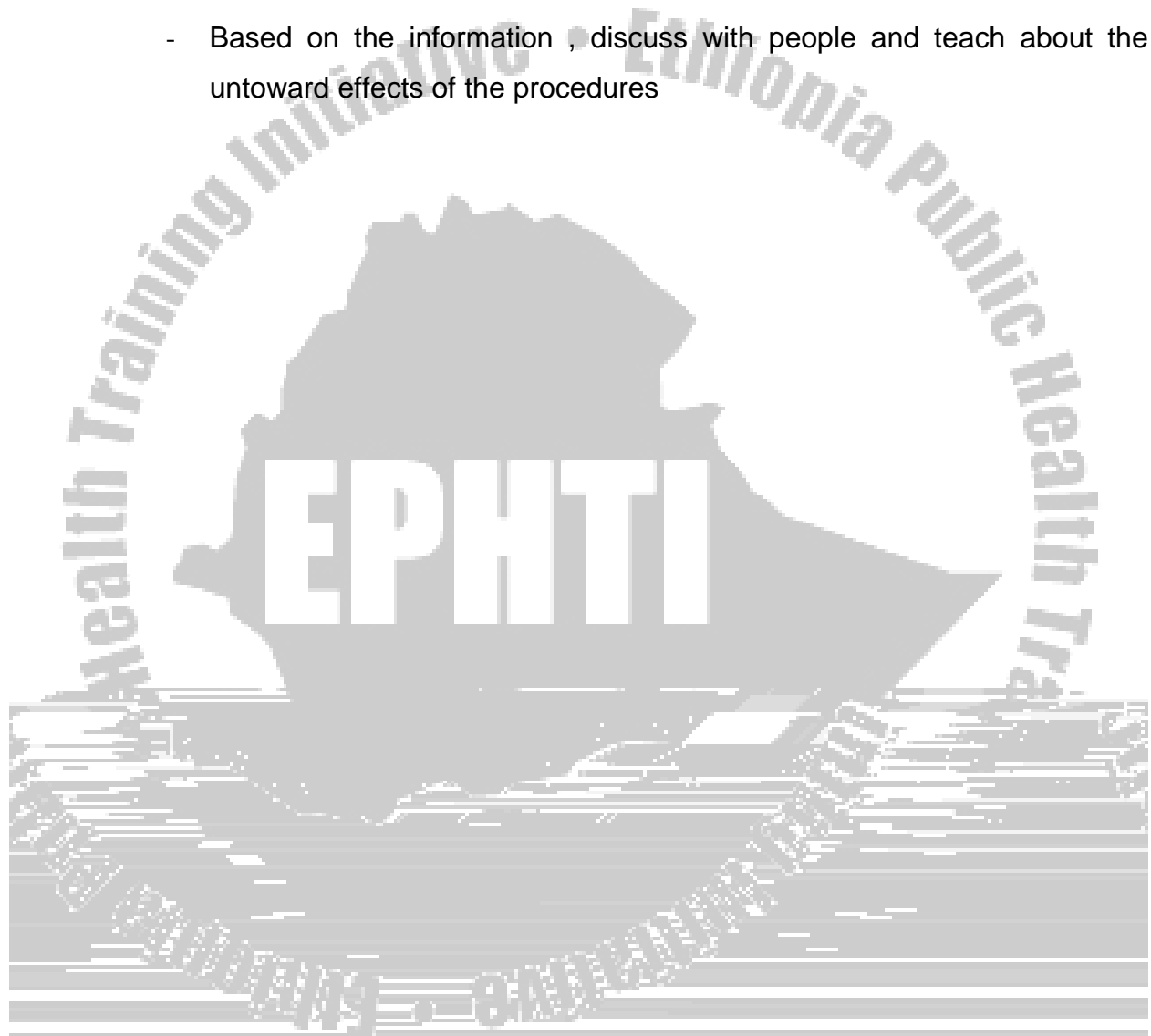
3. Early reporting to nearest health institution

4. Community participation

- Importance of community participation and
- Inter-sectoral collaboration

5. Traditional malpractice

- Study the traditional treatment & patient care procedures of Leishmaniasis
- Based on the information , discuss with people and teach about the untoward effects of the procedures



UNIT FOUR

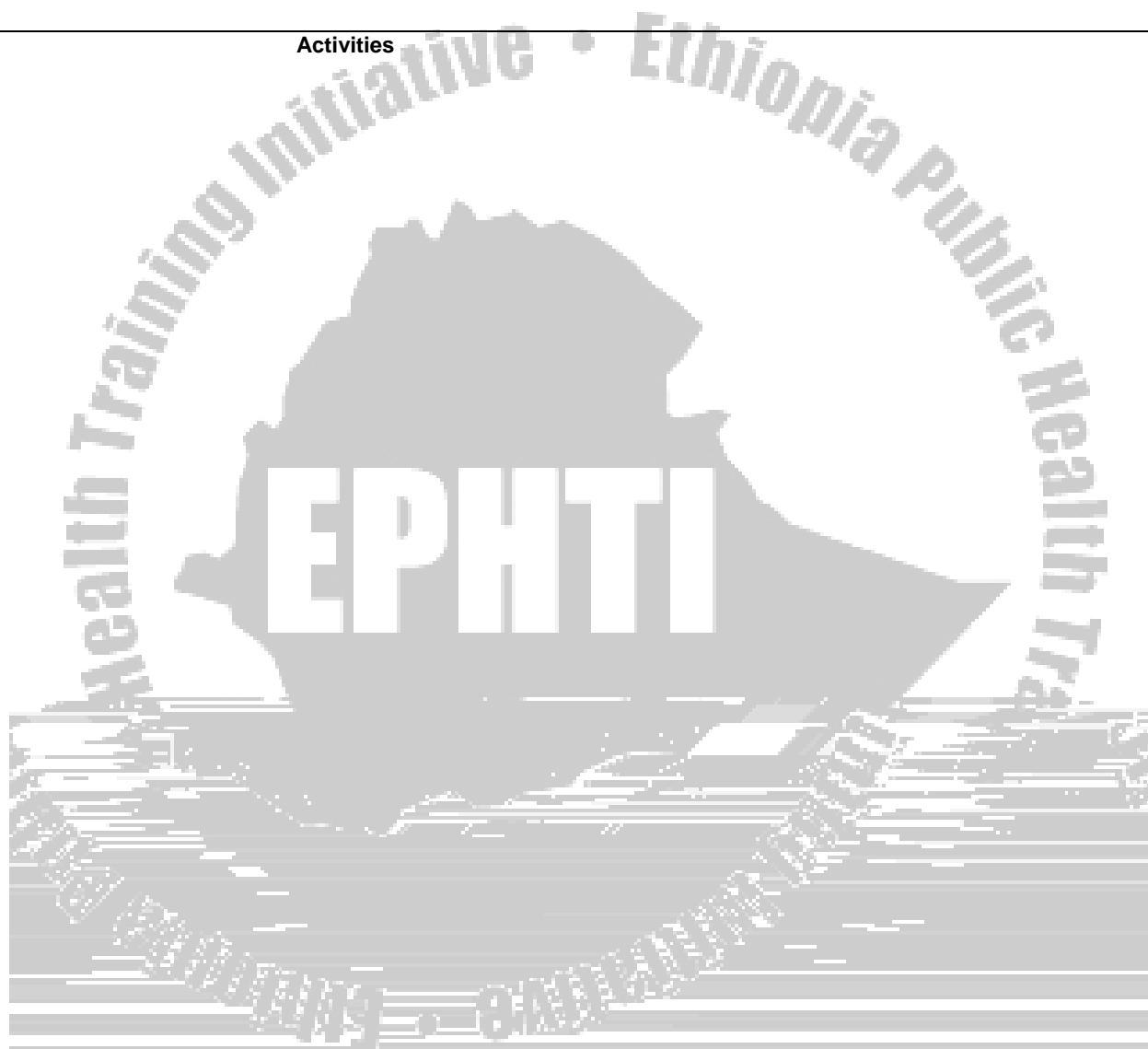
ROLE AND TASK ANALYSIS

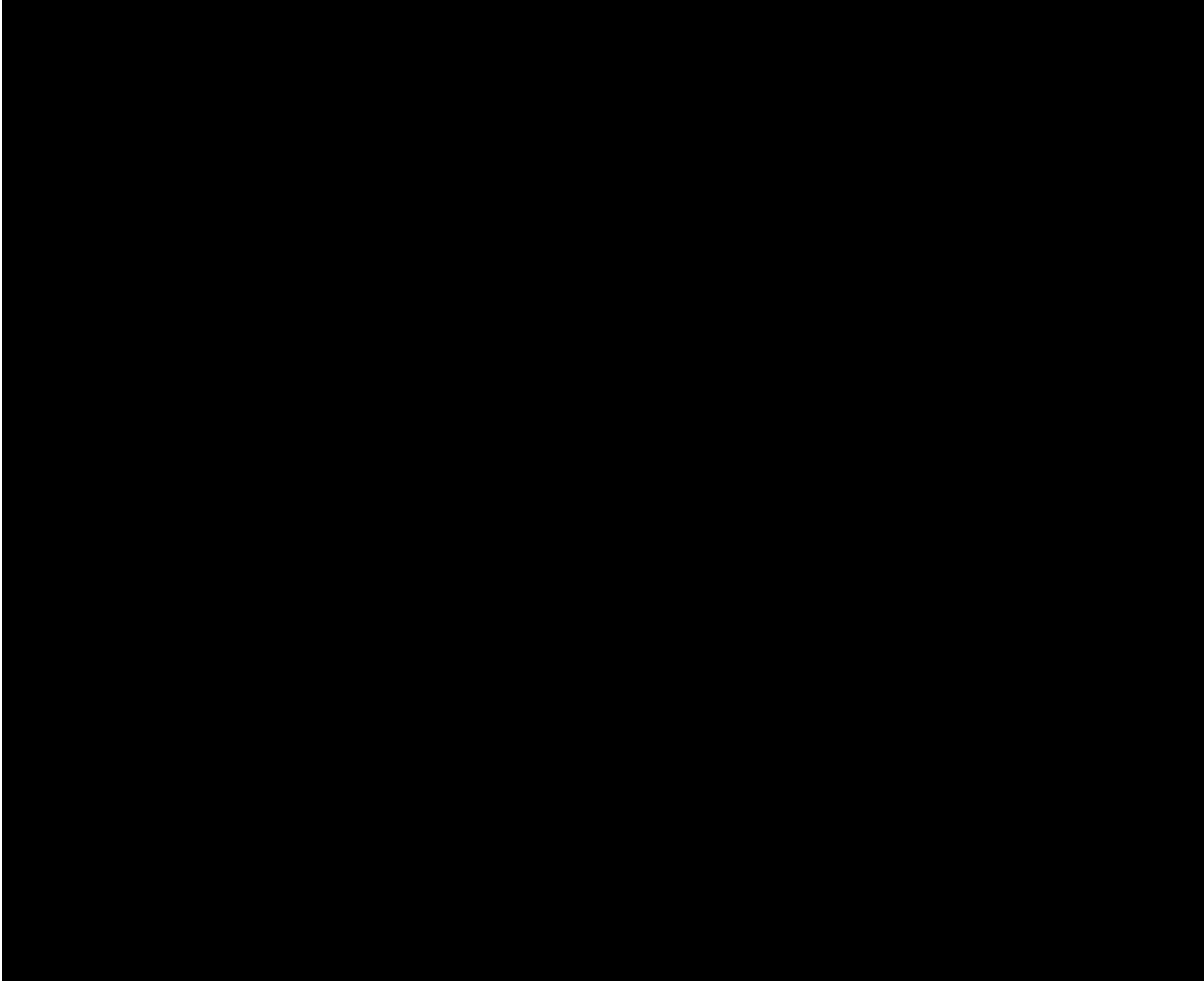
Table 1 Knowledge – Objectives and Activities by Category of Student

Learning Objective	Activities			
	H.O	BSc Nurses.	EHO	MLT
Describe the causes of Leishmaniasis	Study the causes of Leishmaniasis	Study the causes of Leishmaniasis	Study the causes of Leishmaniasis	Study the causes of Leishmaniasis
Describe the modes of transmission of Leishmaniasis	Study the modes of transmission	Study the modes of transmissions	Study the modes of transmission	Study the modes of transmission
Describe the life cycle of Leishmaniasis	Study the life cycle in definitive and intermediate hosts	Study the life cycle in definitive and intermediate hosts	Study the life cycle in definitive and intermediate hosts	Study the life cycle in definitive and intermediate hosts
State the diagnostic approach	Study the epidemiological pattern, the clinical features and laboratory methods of investigations	Study the epidemiological pattern, the clinical features & laboratory methods of investigations	Study the epidemiological pattern Environmental factors	Study the laboratory procedures and interpretation of results
Describe the recommended treatment protocol	Study the type, dose and routes of administration of r			

Table 2 Attitude – Objectives and Activities by category of Students

Activities





UNIT FIVE

GLOSSARY

Amastigote: oval, nonflagellated morphological form found in some of the hemoflagellate life cycle

Axoneme: - intracellular portion of the flagellum

Blepharoplast: - Basal body structure in hemoflagellates from which the axoneme arises

Definitive host: - host in which the adult and/ or sexual phase of a parasite occurs

Flagella- Tail- like extensions of the cytoplasm which provide a means of motility

Intermediate host: Host in which the larval or sexual phase of a parasite occurs

Promastigotes: long, slender hemoflagellate morphologic form containing a free flagellum

Undulating membrane: - finlike structure that is connected to the outer edge of some flagellates

Erythrocyte sedimentation rate: - The length of fall of erythrocyte when anticoagulated blood is stand erected for 1 hour

Kintoplast: -

UNIT SIX

ABBREVIATIONS

- CL - cutaneous leishmaniasis
- VL - Visceral Leishmaniasis
- MCL - Mucocutaneous leishmaniasis
- PKDL - Post kala azar dermal Leishmaniasis
- EDTA - Ethylene Di- potassium diamine tetra acetic acid
- NNN media - Novy- Nicolle -McNeal
- LD Bodies-Leishman Donovan Bodies
- IgG - immunoglobulin G
- IgM - Immuno globulin M
- DAT - direct agglutination test
- HIV - Human Immuno deficiency virus
- MCL - Mucocutaneous leishmaniasis

UNIT SEVEN

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8.1.3 For Medical Laboratory

1. B
2. B
3. C
4. A
5. B
6. A
7. D
8. B
9. D
10. D
11. C

8.1.4 For Environmental Health Science

- | | |
|------|-------|
| 1. D | 7. B |
| 2. A | 8. C |
| 3. B | 9. C |
| 4. C | 10. D |
| 5. A | 11. B |
| 6. C | 12. A |