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UNIT ONE

INTRODUCTION

1.2. Directions for Using Modules

The following steps will take you through the core module:

- Read the introduction
- Attempt to answer all pre- test questions.
- Read the core module and case study thoroughly
- Answer the post- test questions.
- Compare your answers of the pre- test with those of the post- test.

***** Go through the specialized satellite modules based on the instructions given for each category.

UNIT TWO

CORE MODULE

2.1. Pretest

Choose the correct answer and write the letter of your choice on separate answer sheet

1. Which of the following are not features of intestinal schistosomiasis?
    A. Bloody diarrhea
    B. Ascites
    C. Hematemesis
    D. Hematuria
2. The most prevalent schistosoma species in Ethiopia include
    A. S.mansoni
    B. S.haematobium
    C. S.japonicum
    D. A and B
3. The intermediate host for *S. haematobium* belongs to the genus
    A. Biomphalaria
    B. Bulinus
    C. Oncomalania
    D. All of the above
4. The infective stage of schistosoma species to human is
    A. Egg
    B. Miracidium
    C. Cercaria
    D. A and C
5. Select wrong combination
    A. *S.mansoni* _Esophageal varices
    B. *S. japonicum* _ Ascites
    C. *S. haematobium* – Vesical caliculi
    D. *S. makongi* – Bladder cancer

B. S. haematobium

C. S .japonicum

D. S. mekongi

12. In *S. haematobium*, eggs can be recovered in the urine after infection in about

A. 2 weeks

B. 12 weeks

C. 5 months

D. 1 year

13. The prevalence of *S.mansoni* in Ethiopia is about

A. 5%

B. 25%

C. 50%

D. 80%

14. Schistosoma infection is more common in

A. Rural

B. Urban

C. Displaced

D. A and C

15. In chronic Schistosomiasis diagnosis can be made by

A. Serum antibody tests

B. Serum antigen tests

C. Rectal biopsy

D. All

2.2. Significance and Brief Description of the Problem

Schistosomiasis is one of the most widely spread parasitic infections. It occurs in most countries of tropical Africa, Middle East, Central and South America, the Caribbean and the Far East. An estimated 200 million people in the world are infected with the parasite. The human schistosomes are distributed through some of the countries of the world at the lower end of the economic cycle or at least the parasites are found in relatively poor rural people. Many countries of tropic and sub-tropical Africa that already have severe economic problems are further handicapped by wide spread infection among their farmers. In some part of South America, 12% of the deaths in hospitals were due to the consequences of schistosomiasis. In Tanzania, 20% of persons in some areas have serious damage to the urinary system and can be expected to live only a few years. In Tanzania, Zanzibar, Nigeria and Egypt the pathological changes in children are likely to have their most serious effect in adolescence and early adulthood, just when these young people are likely to have completed schooling and are ready to become productive members of society. (10, 11)

Ethiopia is one of the endemic countries for both *S.mansoni* and *S.haematobium*. Human infection caused by *S.mansoni* has a wide geographical distribution in Ethiopia. The prevalence of schistosomiasis in Ethiopia, as in other developing tropical countries, is increasing due to water related projects and population movements. The transmission of the disease is closely linked with the personal habits and livelihood requiring daily and frequent contact with contaminated water. Increasing population movements in recent decades and deteriorating living conditions have increased the spread of schistosomiasis to areas where it was previously absent. Although the right snail hosts have been collected at higher altitudes, no transmission has been known to have occurred. It is believed that at this altitude the temperature is too low for development of schistosome larvae. Today, schistosomiasis causes greater morbid

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The patient was sent home with four tablets of praziquantel and advised to him to inform the sick workers to seek medical follow up and to avoid contact with canal water. Later, a team of professionals was deployed from health center to visit the patient's village. The team was comprised of environmentalist, health officer and laboratory technicians.

After the team arrived in the village, members shared tasks among themselves. The public health officer tried to search for sick people and found many individuals with hematuria. He advised them to seek medical care at Adama Health Center. The Environmentalist observed that there is open field defecation & urination, no latrines or clean water supply in the village, and the villagers have the habit of regular washing after urination. On further investigation, he found snails close to the canal. The laboratory technician collected urine samples from the sick individuals and the team returned to the health center.

After returning to the health center, the team reported to the health center and medical director of Adama Hospital to arrange a meeting to discuss the findings. The team members agreed that the situation was series and needs as immediate solution. Therefore, it was decided to deploy another team after a week for detailed investigation in the village.

Exercise

1. What are Abdi's health problems?
2. What conditions predisposes Abdi to this problem?
3. What measures should be taken by the community?

2.5. Schistosomiasis

The term schistosome or schistosoma means split body and refers to the fact that the males have a ventral groove called gynocophoric canal in which the cylindrical female resides in. They are members of the Platyhelmenthes and are generally flat, flat leaf shaped worms. Members of the family show morphological and physiological

peculiarities, which distinguish them from all other trematodes. They are dioecious and and live in the blood stream of warm-blooded hosts, typically in venules around the intestine or bladder, depending on the species. Although 18 species of the genus schistosoma are currently recognized, the majority are parasites of animals other than humans. Most infections in humans can be accounted for by *Schistosoma haematobium, S.japomicum* and *S.mansoni*, together with a minor contribution from *S.intercalcatum* and *S.mekongi*. Ethiopia is one of the endemic countries for both *S.mansoni and S.haematobium.*

2.5.1. Schistosoma mansoni

S.mansoni causes intestinal schistosomiasis.

Epidemiology

S.mansoni is widely spread in many African countries including Sudan, Kenya, Madagascar, South America, Middle East, Brazil, and India. In Ethiopia, it is found at 2000m above sea level mainly in the south-waste and western part of the country, but it was reported from all administrative regions. The major sites are small streams and fresh water lakes. The infection is more common in rural than urban communities and it is more important in developing countries, as are nearly all other parasitic diseases, not solely because of greater dependence on agricultural products produced mostly by irrigation and the fact that most people are engaged in agricultural practices. The survey on schistosomiasis carried by the Institute of Pathobiology, Addis Ababa University, in all 14 administrative regions between 1978 and1982 indicates 15 % of the population were infected with *S .mansoni*. The national schistosomiasis survey of 1988-89 reported an overall prevalence of 25%. (1)

Life Cycle

S.mansoni is transmitted by cercariae penetrating the skin when a person is bathing, washing clothes, fishing, or engaged in agricultural work or other activities involving contact with water that has been fecally contaminated and contains the snail hosts of the parasite. The snail hosts of *S.mansoni* belong to the genes B*iomphalaria*.

Important snail intermediate hosts in Ethiopia are:

- *B.pfeifferi* –prefers a small streams and irrigation canals; the most common snail host.
- *B.sudanica*- prefers a small streams and irrigation canals

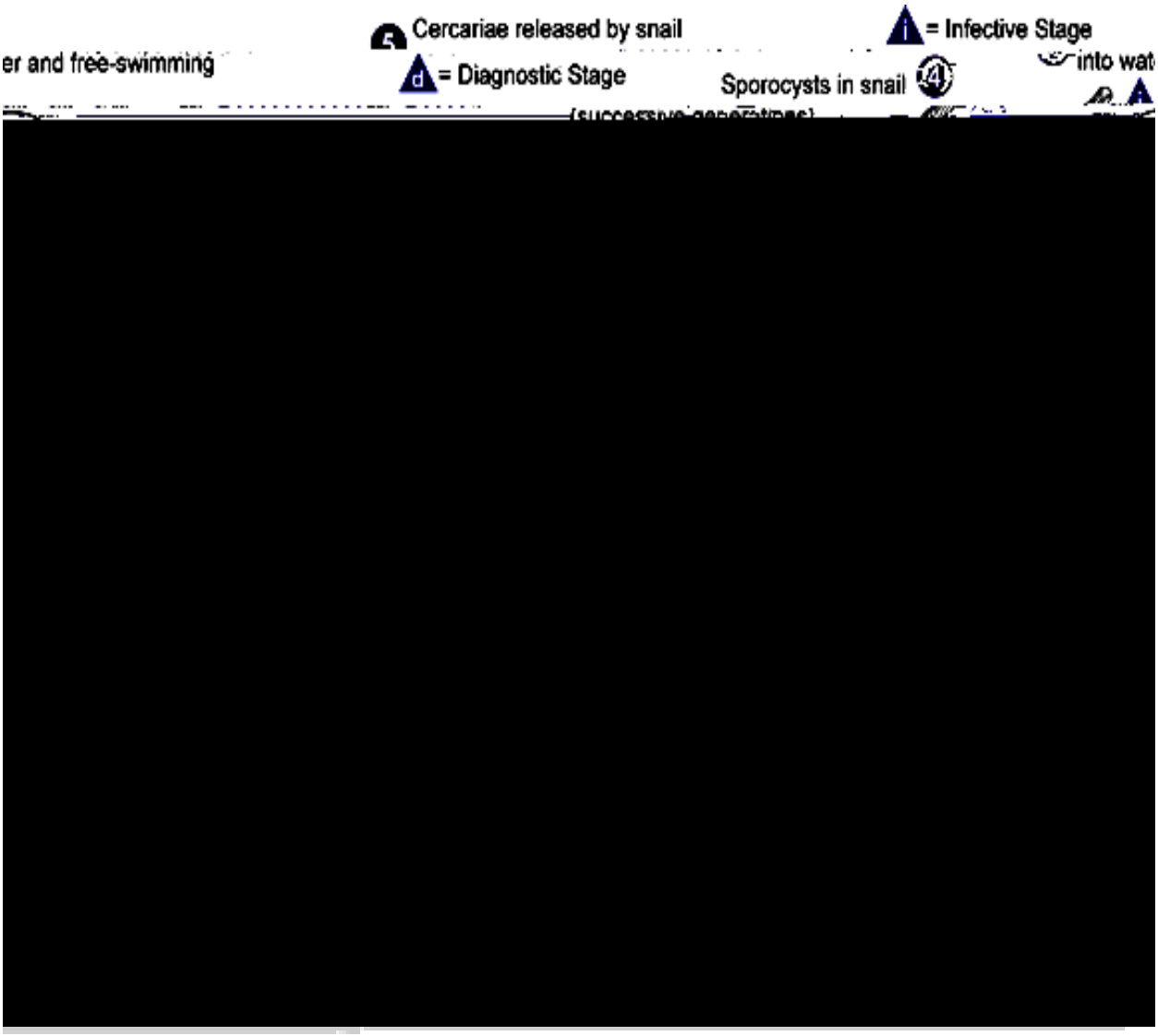

Fig.2.1 General life cycle of Schistosoma Species

Source: DPDx Laboratory Identification of Parasites of Public Health Concern, CDC, National Center

for Infectious Diseases Division of Parasitic Diseases, USA, 2003.

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The hepatosplenic phase of disease manifests early (during the first year of infection, particularly in children) with enlargement of liver due to parasite induced granulomatus lesion, which is seen in about 15-20 % of infected individuals. Moreover, portal hypertension may lead to esophageal varice, splenomegally and ascites. Bleeding from esophageal varices may, however, be the first clinical manifestation of this phase. (5)

Diagnosis

Diagnosis of infection with members of the genus *Schistosoma* is based on the following:

1. Clinical signs and symptoms.
2. History of living in an endemic area.
3. Serological tests detecting anti-bodies or parasitic antigens.
4. Finding the characteristic eggs.

Serological tests are useful during acute phase of infection and in chronic cases in which eggs cannot be found. Serum antibody tests have a limited application because they do not differentiate between active and previous infection or re-infection. Active infection can be diagnosed by detecting circulating Schistosome antigen using a monoclonal antibody reagent.

The most common and conclusive means of diagnosing intestinal schistosomiasis is finding the characteristic eggs with lateral spine in the stool. For *S.mansoni*, fecal samples are examined by sedimentation methods designed to remove the greater portion of the fecal debris by sieving. In long standing infections, eggs may not be seen in the feces; the method then used is rectal biopsy. One or two snips of rectal mucosa are taken (the procedure is painless if properly done) and the tissue is examined microscopically while pressed between two slides. Testing viability of eggs is important in determining the stage of infection. In some long standing infections, dead eggs may be found in feces. Viability may be determined by direct examination of the eggs or inducing the eggs to hatch. (12)

2.5.2. Schistosoma haematobium (Urinary Schistosomiasis)

S.haematobium causes urinary/vesical schistosomiasis. The species contain several strains.

Epidemiology

S.haematobium is endemic in 54 countries, mainly in Africa, and eastern Mediterranean. It is also found in several Indian Ocean islands and small islands of the coast of east and West Africa. In some areas the distribution of *S.haematobium* overlaps with *S.mansoni* causing double infections.

The development of irrigation schemes and dams for hydroelectric power and flood control have greatly increased the prevalence of *S.haematobium* infections in several countries In Ethiopia the distribution of *Schistosoma haematobium* is focal. It occurs in low land areas at altitude below 800 meters above see level. *S.haematobium* is endemic in Awash valley, Kumruk (Western

The life cycle of *S.haematobium* is similar to the life cycle of *S.mansoni* with few exceptions. *S.haematobium* flukes pair in the blood vessels of the liver and then migrate to the veins surrounding the bladder (vesical plexus). Mature flukes can also be found in the vein of the liver and rectum. The female adult worm lays eggs in the venules of the bladder. The estimated egg out put of an individual infected with *S. haematobium* is 200 up to 2000 eggs per day.

Many of the eggs penetrate through the mucosa in to the lumen of the bladder and are passed in the urine. Eggs can be found in the urine from about 12 weeks after infection. About 20% of the eggs remain in the wall of the bladder and become calcified. The eggs can also be found in the ureters, rectal mucosa, reproductive organs and liver.

Pathogenesis

With in 24 hours of infection an intense irritation and skin rash, referred to as "Swimmer's itch", may occur at the site of cercarial penetration. Acute schistosomiasis (Katayama fever), primarily an allergic response to developing schistosomes, rarely occurs with *S.haematobium*. When the eggs penetrate through the wall of the bladder, there will be bleeding which can be found in the urine (haematuria). Eggs trapped in the wall of the bladder and in surrounding tissues cause inflammatory reactions with the formation of granulomata. Many of the eggs die and become calcified eventually producing what are known as *"Sandy patches"* in the bladder. Following prolonged untreated infection and a marked cellular immune response, the ureter may become obstructed and the bladder wall thickened leading to abnormal bladder function, urinary tract infection and eventually obstructive renal disease with kidney damage. (2, 5)

Clinical Features

It is the eggs of *S.heamatobium* in the tissues not the adult flukes that stimulate host inflammatory response that result in damage to the bladder and ureters characterizing urinary shistosomiasis. *S.haematobium* infection is more commonly

similar to, but often more severe than, those of *S.mansoni* infection. The egg output off *S.japonicum* is higher compared to infections with other species (about 500-3500 eggs per day). Enlargement of liver and spleen is common in all age groups. *S.japonicum* infects a wide range of animals including water buffaloes, dogs, cats, cattle, pigs, sheep, goats and wild rodents. Laboratory diagnosis is based on finding characteristic eggs in the feces and rectal biopsy. The eggs are ovoid in shape and has one minute lateral spine.

2.5.4. Schistosoma intercalatum

S.intercalatum is the rarest and least pathogenic schistosome that matures in man. It causes intestinal schistosomiasis. It is

excreted. Alternatives include oxaminoquine for *S.mansoni* & metrifonate for *S.haematobium.* However, metrifonate has been lately withdrawn from the market. (2)

Prevention and Control Methods

1. Avoiding contact with water known to contain cercariae by:
    - Providing safe water supply to the community.
    - Construct footbridges across infested rivers and streams.
    - Providing safe recreational bathing sites
2. Preventing water becoming contaminated with eggs by:
    - Health information on safe excreta disposal
    - Treating infected persons
    - Providing sanitary facilities
    - Protecting water supplies from fecal pollution by animal reservoir hosts (for *S. japonicum*)
3. Minimizing the risk of infection from new water conservation, irrigation schemes and hydroelectric development by:
    - Mass or selective treatment of labour migrants.
    - Setting settlements away from canal drains and irrigation canals and providing latrines and sufficient safe water for domestic use.
    - Lining canals with cement and keeping them free from silt and vegetation in which snails can breed
    - Filling in formerly used irrigation ditches with clean soil to bury snail hosts.
    - Varying the water levels in the system.
4. Destroying snail intermediate hosts, mainly by:
    - Using molluscides where this is affordable, feasible and will not harm important animal and plant life.
    - Removing vegetation from locally used water places, draining swamps and other measures to eradicate snail habitats.
    - Taking environmental measures to prevent seasonal flooding which results in an increase in snail numbers in transmission.

- Biological means by introducing predators like fish and insects that eat snails and *Marisa cornuarieties* snail that competes with *Biomphalaria glabrata*

5. Treating water supplies by:

- Using a chlorine disinfectant where possible
- Storing water for 48 hours to allow time for any cercariae to die.
- Using filter systems at water inputs to prevent cercariae from entering. (2,4).

6. Mass or Selective Chemotherapy

In areas with high morbidity and intensity of infection, chemotherapy can be given by health center staff in the community /school to reduce morbidity. The prevalence and intensity of infection is high in children and selective chemotherapy can be administered in schools. Prevalence and intensity of infection, drug tolerance, and impact of treatment should be monitored substequently. Health extension workers can play key role in community mobilization and evaluation of treatment. With the introduction of new dugs such as praziquantel and existing metrifonate mass treatment has been possible in Ethiopia.

2.6. Learning Activity- 2

Mesfin Kebede is a 19-year-old freshman student at Alemaya University. A week after his arrival to the university, he visited the university clinic with complaints of colicky abdominal pain, bloody diarrhea and generalized body weakness. He was seen at the emergency outpatient department and the nurse on duty sent him with metronidazole and co-trimoxazole. He returned back to the clinic after a week with no improvement of his illness. He gave additional history that he had fever & skin rash two months back for which he visited Zeway Health Center where he was treated for malaria with three tablets with out blood exam

regularly after returning from school. He is the eldest in the family and is responsible for many activities at home including washing clothes of all family members. He usually washes clothes besides the lake.

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Chronic intestinal manifestations may manifest as colicky abdominal pain with bloody diarrhea, fatigue, and growth retardation in children. Other components of chronic intestinal schistosomiasis related to its complications are discussed below.

1. Portal hypertension

This occurs after about 10-15 years of exposure and infection. It is due to the development of periportal fibrosis. The liver may be enlarged, although in many cases it is small, firm, nodular, and the left lobe is characteristically prominent. It manifests with ascites, esophageal varices with or without bleeding, and an enlarged spleen. Patients may not have schistosoma eggs in the feces because of previous treatment and/ or attrition of adult worms without subsequent reinfection. (5)

2. Fissure, Fistula in ano and piles

Fissure in ano and piles due to *Schistosoma mansoni* infection and rectal and anal egg deposit have been observed. Fistulas frequently develop into the ischiorectal fossa, the perineum, the buttocks, or the urinary bladder.

3. Pulmonary hypertension

This is due to obliteration of pulmonary arterioles by granulomatous inflammation induced by embolized eggs lodged in the small arterioles. In the lungs, this may cause pulmonary hypertension and cor pulmonale. This clinical entity is an uncommon presentation in chronic schistosomiasis.

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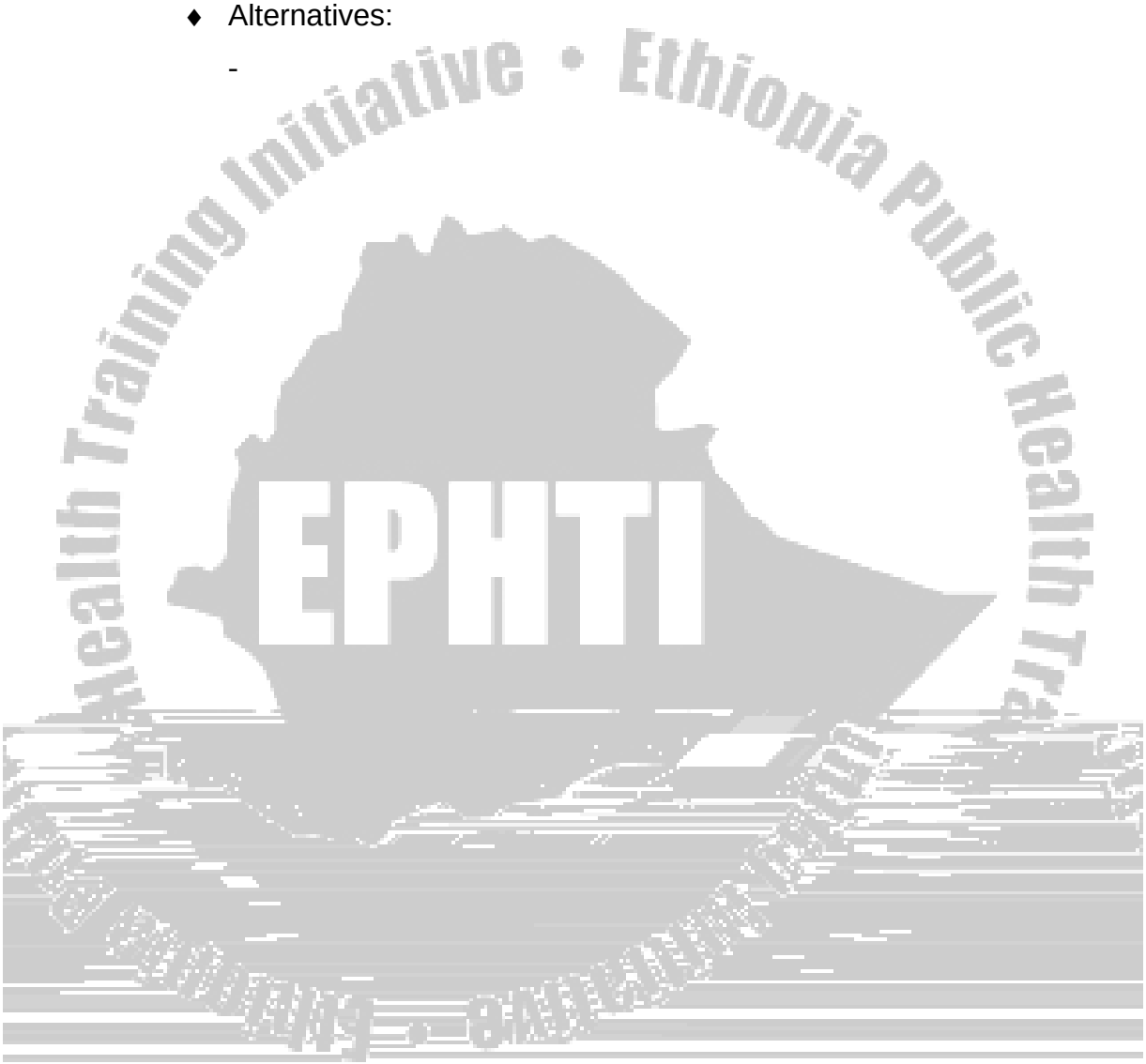
Ultrasound can also detect the presence of ascites & splenomegaly. Ascitic fluid analysis should also be made which has transudative feature in ascites secondary to portal hypertension.

3.5. Schistosoma

2. For severe acute schistosomiasis or Katayama fever systemic glucocorticosteroid can be considered.
3. Antischistosomal chemotherapy
    - Drug of choice: Praziquantel 40-60mg/kg as a single oral dose or divided in to two or three doses is sufficient.
    - Alternatives:
        -



UNIT FOUR

SATELLITE MODULE FOR NURSES

4.1. Introduction

Schistosomiasis is one of the most common public health problems. It is also highly endemic parasitic disease in Ethiopia as well as many other African, Asian and South American countries. Nurses' responsibilities include prevention of the disease and promotion of health so that the community will lead a better and healthier life. It is therefore necessary that nursing students to be equipped with basic knowledge about schistosomiasis, its management and method of prevention and control. Nurses can effectively contribute in controlling schistosomiasis by utilizing various strategies of community mobilization techniques and diagnostic and management skills that their training can afford them.

4.1.1. Purpose and Use of This Module

This satellite module is an easy reference developed for nursing students and graduate nurses in the service sectors. It was developed with the aim of providing them with knowledge and skill specific to the profession regarding management, prevention, and control of schistosomiasis. This module should enable them to identify and tackle individual problems and those of the community at large. The module is also designed to provide a uniform and easy to understand reference that can help and solve the shortage of such reference materials in remote parts of this country.

4.1.2. Directions for Using the Module

- First complete the pre-test before reading this satellite module to check your existing knowledge
- Read the learning objectives
- Read the information on case management and prevention and control
- Refer to the core module when necessary

- Do the posttest to evaluate yourself

B. Normal bowel / bladder function

C. Normal body weight

D. Normal skin integrity

E. None

4.3 Learning Objectives

After reading the satellite module the learner will be able to:

- Assess patients with schistosomiasis
- List at least four nursing diagnosis for patients with schistosomiasis.
- Describe five nursing interventions for a patient with schistosomiasis.
- Discuses the goals or outcome criteria of nursing intervention for patients with schistosomiasis.
- Manage patients with schistosomiasis
- Mention the preventive and control measures.

4.4. Case Management

- Frequency
- Colour

8. Other Symptoms
    - Fatigue
    - Fever
    - Itching sensation
    - Abdominal pain (colicky abdominal cramp)
    - Vomiting that contain blood
    - Diarrhea associated with blood

B. Objective Data

1. Assess the skin for**:**
    - Maculopapular rash
    - Cercarial dermatitis
    - Conjuctiva (pale or pink)
2. Assess the abdomen for:
    - Hepatospleenomegally
    - Abdominal distention
    - Ascites
    - Tenderness
3. Assess the general body parts for:
    - Generalized Lymphadenopathy
    - Emaciation of upper trunk and upper limbs.
    - Edema of lower limbs

4.4.2. Nursing Diagnosis

Based on the assessment data the patient's major nursing diagnosis may include:

- Abdominal pain related to intestinal inflammatory process
- Alteration in comfort related to itching

- Diarrhea related to irritation of intestinal mucosa
- Potential for alteration of nutrition less than body requirement related to diarrhea; hepatic fibrosis
- Activity intolerance related to fatigue
- Altered body temperature related to disease process
- High risk for skin integrity related to edema
- High risk for squamous cell carcinoma of the bladder related to chronic infection of long duration.
- High risk for infection transmission related to contagious agents

4.4.3. Nursing Goal/ Plan

- Abdominal pain should be relieved
- Patient should feel comfortable
- Maintenance of skin integrity
- The patient should fully engage in his or her daily activity
- Patents normal body temperature should be maintained
- Patient's nutritional status should return to normal
- Health Information about cause of the disease and its preventive methods should be given to the patient.
- The patient should regain normal bowel / bladder function

4.4.4. Implementing Interventions

- Asses vital sign
- Collect stool or/and urine specimen properly including the following information:
    - Type
    - Time of sample (for urine during early after noon)
    - Volume or amount
    - Sample number
- Inform patient regarding his/ her disease and treatment

- Administer medication as prescribed
- Monitor food and fluid intake
- Keep the skin clean and dry (Skin care)
- Monitor the patient's response to therapy
- Monitor for complications
- Monitor fecal and urine out put (frequency, amount and color)
- Give information for the patient about medications, their dosage and side effects
    - Á Some drugs cause occasional drowsiness and dizziness and
      E.g. Oxamniquine
    - Á Some drugs cause mild gastrointestinal upsets, giddiness, and drowsiness. E.g. Praziquantel
    - Á Overdose causes organophosphate poisoning E.g. Metrifonate
- Provide health information on prevention of schistosome infections such as
    - Á Seeking treatment when there is suspicion of infection
    - Á Mobilize the community so that people in the community understand and get motivated to act together and prevent the disease
    - Á Identify risk group of the community living in the endemic areas and eligible for stool/ urine examination.
    - Á Take time to discuss with the patients' living conditions and advise them accordingly
    - Á Make an appointment for a follow up visit
    - Á Using safe water supply
    - Á Avoiding contact with contaminated water
    - Á Prevention of water from contamination with feces

4.4.5. Evaluation

Use the following criteria to evaluate the achievement of nursing goals

- The patient has maintained normal bowel and urinary function
- Abdominal pain is relieved
- The patient verbalize that he/ she is comfortable
- The patient has regained normal body temperature
- The patient has gained normal body weight
- The spread and recurrence of infection is prevented
- The patient accurately describes measures to prevent the spread of the infectious agents.

5.3. Pre-test

I. Choose the best answer from the alternatives given for each question and write your answers on a separate sheet of paper.

1. The following techniques are used to diagnose intestinal schistosomiasis except
   A. Rectal biopsy examination
   B. Zinc sulphate floatation technique
   C. Formol ether concentration technique
   D. Direct examination of feces
2. Laboratory findings in urinary schistosomiasis does not include
   A. Glucosuria C. Eosinophilia
   B. Haematuria D. Bacteriuria
3. Pick out the false statement about *S.haematobium*.
   A. The eggs can be detected rarely in feces.
   B. Rectal biopsy examination is used in case of chronic infections.
   C. Collecting last few drops of urine is very important for diagnosis.
   D. By examining a single urine specimen we cannot exclude *S.haematobium* infection.
4. What is the clearing reagent used in Kato-Katz thick smear?
   A. Malachite green C. Trypan blue
   B. Methylene blue D. Glycerine
5. Which of the following schistosoma species has lateral spine?
   A. S. haematobium C. S. intercalatum
   B. S. japonicum D. S. mansoni
6. All are true about Formol Ether concentration technique except
   A. Risk of laboratory acquired infection from fecal pathogens is minimized.
   B. The technique is rapid.
   C. Fecal pathogens are killed by the formalin
   D. None

II. Give short answers for the following questions.

1. What is the characteristic feature of *S.haematobium* eggs that differentiates them from eggs of *S.mansoni*?
2. What is the material that is used

Collection of Faecal Specimen

- A fresh faecal specimen is required.
- The specimen should not be contaminated with urine.
- A large teaspoon amount of feces is adequate or about 10 ml of a fluid specimen.
- The container should be clean, dry, leak-proof, and free from traces of antiseptics and antibiotics and have suitable size.
- Avoid using containers made from leaves, papers, or cardboard

- Dropping bottles containing physiological saline (0.85 %w/v)

Procedure

1. Place a drop of fresh physiological saline on a slide.

   ¶Don't use too large a drop of saline in order to avoid contaminating the fingers and stage of the microscope.

2. Using a wire loop or piece of stick, mix a small amount of specimen, about 2 mg (Match stick head amount) with the saline. Make smooth thin preparations and cover it with a cover glass by holding the cover glass at an angle of 30^0 touching the edge of the suspension and gently lowering the cover glass on to the slide so that no air bubbles are introduced.

   To make sure the preparation is thin (not too thick) place the slide on a newspaper. If you can see and not read the paper print, it is a good preparation.

   If the specimen is dysenteric and unformed, no need of using physiological

Very many ……..Over 40 per preparation (7, 15)

Fig.5.1 Egg of *S.mansoni* with lateral spine (Arrow)

Source: DPDx Laboratory Identification of Parasites of Public Health Concern, CDC, National Center

for Infectious Diseases Division of Parasitic Diseases, USA, 2003.

II. Concentration Techniques

When eggs are not found in direct preparations concentration methods should be performed. Even in moderate to severe

- Diethylether or ethylacetate
- Sieve (strainer) with small holes or two layers of gauze

  The small inexpensive nylon tea or coffee strainer available in most countries is suitable.
- Beaker
- Microscope slide
- Cover slip
- Conical (centrifuge tube)
- Stopper
- Applicator stick
- Centrifuge.
- Microscope

Procedure

1. Using a rod or stick, emulsify an estimated 1g (pea-size) of feces in about 4 ml of 10% formol water contained in a screw-cap bottle or tube.
2. Add a further 3-4 ml of 10% v/v formol water, cap the bottle, and mix well by shaking,
3. Sieve the emulsified feces, collecting the sieved suspension in a beaker.
4. Transfer the suspension to a conical (centrifuge) tube and add 3-4ml of diethyl ether or ethyl acetate.

   ***Caution**: Ether is highly flammable and ethyl acetate is flammable, therefore use well away from an open flame. Ether vapour is anaesthetic, therefore make sure the laboratory is well-ventilated.*
5. Stopper* the tube and mix for 1 minute. If using a vortex mixer, leave the tube unstoppered and mix for about 15 seconds.

   **Do not use a rubber bung or a cap with a rubber liner because ether attacks rubber.*
6. With a tissue or piece of cloth wrapped around the top of the tube, loosen the stopper (considerable pressure will have built up inside the tube).
7. Centrifuge immediately at 3000 rpm for 1 minute.

8. Using a stick or the stem of a plastic bulb pipette, loosen the layer of faecal debris from the side of the tube and invert the tube to discard the ether, faecal debris, and formol water. The sediment will remain.
9. Return the tube to its upright position and allow the fluid from the side of the tube to drain to the bottom. Tap the bottom of the tube to resuspend and mix the sediment.

   Transfer the sediment to a slide, and cover with a cover glass.
10. Examine the preparation microscopically using the 10x objective with the condenser iris closed sufficiently to give good contrast. Use the 40x objective to examine the eggs.
11. Count the number of schistosome eggs in the entire preparation. This will give the approximate number per gram of feces.(4)

B. Kato-Katz technique

This technique is recommended by the World Health Organization (WHO) for the diagnosis of *S.mansoni, S.intercalatum* and *S.japonicum*.

Thousands of villages in Ethiopia have been screened for *S.mansoni* using this technique (by Institute of Pathobiology, Addis Ababa University). The technique is feasible for mass screening as the collected specimen can be examined at leisure

Principle:

It is based on the clearing of a thick faecal smear with glycerine in the presence of a background stain, usually malachite green. The eggs appear unstained although miracidia are not visible.

Materials and reagents needed

- Spatulas
- Filter paper or scrap paper
- Screen (stainless steel or plastic sieve)
- Template (stainless steel, plastic or cardboard)

  Note: Templates of different sizes are known to exist.

  A template with -9mm hole and 1mm thickness deliver 50 mg of feces

  -6mm hole and 1.5mm thickness will deliver 41.7 mg of feces

  -6.5mm hole and 1.5mm thickness will deliver 20 mg of feces.
- Water wettable (hydrophilic) cellophane strips, 25x30 or 25x35 mm in size.
- Microscope slide
- Flat bottom jar with lid
- Forceps
- Toilet paper or absorbent tissue
- Microscope
- Glycerol + malachite green or glycerol methylene blue solution.

  [Add 1 ml of 3 % aqueous malachite green or 3% methylene blue to 100 ml glycerol and 100ml distilled water mixture. Mix well. Then pour this solution on to the cellophane strips in a jar and left for at least 24 hrs prior to use.]

Procedure

1. Mesh a portion of feces, either by pressing the sieve down on feces placed on filter paper or scrap paper, or by pushing the sample through the sieve with a spatula, to remove fiber and other coarse debris.
2. Scrap the flat-sided spatula across the upper surface of the screen to collect the sieved feces.

- Microscope slide
- Microscope
-

Fig.5.2. Uncalcified and calcified (black) eggs of *S.mansoni* in rectal biopsy.

Source: Cheesbrough M. District Laboratory Practice in Tropical Countries, Part 1, Cambridge University Press, 1998.

IV. Serological Diagnosis

This is based on the detection of antibodies produced against the schistosomes/eggs or antigens of the schistosomes/eggs.

i. **Antibody detecting tests**: - do not differentiate present and past infection or reinfection because the antibodies persist in the serum for a long time after the infection has cleared. So, these tests have a limited appl.00is isa.

before passing urine nor collecting terminal

In urinary schistosomiasis the urine will usually contain blood and appear red or red- brown and cloudy. If blood is not seen, test the specimen chemically for blood and protein using dipsticks.

3. Transfer 10 ml of well-mixed urine to a conical tube and centrifuge at RCF 500-

Fig.5.4. Ciliated miracidium of *S.haematobium* in urine.

Source:

***Note**: If more than 50 eggs are present (considered as a heavy infection) there is no need to continue counting. Report the count as "More than 50 eggs/10ml". (4)*

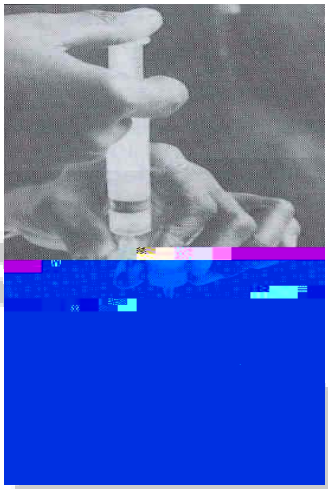


Fig.5.5. Filtration concentration technique for detection of *S.haematobium* eggs.

Source: Cheesbrough M. District Laboratory Practice in Tropical Countries, Part 1, Cambridge University Press, 1998.

Differentiating Non-Viable From Viable Schistosome Eggs on a Filter

In assessing active infection or in judging whether treatment has been successful, it is helpful to know whether the schistosome eggs detected are viable or non-viable.

Although it is often possible to see flame cell movement in viable eggs, a more reliable way of differentiating is to examine a preparation stained with 1 w/v trypan blue in physiological saline. A drop of stain is added and the preparation is left for 30 minutes at room temperature (in a damp chamber to prevent drying out).

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

1. Read the task analysis of the different categories of the health center team
2. Do the questions of pre-test as a post-test.
   Note*:* Use a separate answer sheet.
3. Compare your answers of the pre and posttests with the answer keys given in Annex 1.

UNIT SIX

SATELLITE MODULE FOR

permanently in the ventral groove (gynecophoric canal) of the shorter, stouter males. The eggs which do leave an infected person in urine or feces hatch on contact with fresh water and the emergent miracidia infect a range of aquatic and amphibious snails in which infective cercariae are produced.

6.1.2. Directions for Using the Satellite Module

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

6. 2. Pretest

Choose the best answer and write the letter of your choice on the separate sheet

1. Schitosomiasis is mainly prevented and controlled by
   A. Treating all patients.
   B. Giving health information.
   C. Eradicating or control of intermediate host snails
   D. None
2. Humans are being infected by
   A. Miracidium
   B. Cercariae
   C. Egg of schistosoma
   D. The larvae of snail species
3. Which factors are favorable for snails to survive?
   A. Fast flowing water
   B. Muddy channels
   C. 40^0c temperature of the environment
   D. During rainy season
4. The predators of the intermediate host snails are
   A. Fishes
   B. Other large snails
   C. Ducks
   D. A and C

5. Which chemical is more important in the control of snails?

A. DDT

B. $CuSO_4$

C. $NaCO_3$

D. Malathion

6. How many species of schistosoma are important human parasites?

A. One

B. Four

C. Two

D. Unknown

7. Which type of species of human schistosoma has widespread distribution in Ethiopia?

A. S. intercalatum

B. S. monsoni

C. S. haematobium

D. B and C

Write 'true' if the statement is correct and 'false' if the statement is incorrect

8. Schistosoma infection has great association with population migration.

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S.mansoni and *Bulinus* species for *S.intercalatum*). They are found on vegetation in

6.5. Transmission Factors

There are basically two types of factors that determine its transmission. These are

1. Factors with respect to the intermediate host snails
2. Factors related to cercariae and infection of susceptible host

A. Factors with respect to the intermediate host snails

1. Composition of the fresh water

- There should be fresh water
- There must be abundant aquatic vegetation in the water to feed on and to deposit eggs. Algae are the main food.
- There must be calcium for their eggs
- Alkaline environment is conducive for the snails

2. Temperature

- 22-23c^{o} is conducive; if the temperature reaches 39^{0}c the snail will die.
- Fast flowing water and heavily shaded are unfavorable for snails.

3. Habitat

- Muddy canals and slow flowing water is favorable for snails
- Drains leading from main canal create good condition for snails.

4. Season

- The season that is favorable for snails is during the month after rainfall.

5. Predators

- Ducks and large snails (non-vectors eat intermediate host snail)

6. Feet of birds

- Some water birds feet carry the egg mass of the snail and infect the water bodies.

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UNIT SEVEN

SATELLITE MODULE FOR HEALTH EXTENSION WORKERS

7.1. Introduction

7.1.1. Purpose and use of this module

This satellite module on schistosomiasis is prepared for community health workers. It emphasizes on the role of community health workers in the detection and early referral of schitosomiais cases and prevention and control of the disease. Moreover, it will help in their active participation and dissemination of information about schistosomiasis to the public. However, in order to be easily understandable this module should be translated to the local language. Meanwhile, the Community health worker should take the responsibility of

A. House fly

B. Mosquito

C. Fresh water fish

D. Snails

3. Which of the following is an important symptom in patients with schistosomiasis?

A. Itching of the skin

B. Bloody diarrhea

C. Bloody urine

D. Fever

E. All of the above

4. Which of the following is wrong about the preventive and control aspect of schistosomiasis?

A. Proper construction and use of latrine.

B. Boiling water for drinking.

C. Cleaning the canal where snails breed

D. Educating the public to avoid contact with water bodies that have cercariae and to use latrine.

7.3. Learning Objectives

After reading this satellite module, you will be able to:

- Define schistosomiasis
- List causes of schistosomiasis
- Identify probable cases of schistosomiasis
- Describe the mode of transmission of schistosomiasis
- Describe the management of schistosomiasis
- Discuss the prevention and control methods of schistosomiasis

7.4. Significance and Brief Description of the Problem

Ethiopia is one of the endemic countries for both *S.mansoni* and *S.haematobium*. The human infection caused by *S.mansoni* has a wide geographical distribution in Ethiopia. The severity of schistosomiasis in

projects and population movements. Today, schistosomiasis causes greater morbidity and mortality than all other worm infestations. The disease is increasing in prevalence affecting about 10% of the world's population and ranking second to malaria as a cause of disability and death.

Since schistosomiasis is a socio-economic problem, the control and prevention program showed be integrated with the rural development programs, particularly in small scale agricultural and water development activities.

7.5. Definition, Life Cycle, Disease Development, and Patient Presentation

Definition

Schistosomiasis is a trematode disease caused by several species of schistosoma. There are two types of schistosomiasis of public health importance in Ethiopia. Intestinal schistosomiasis caused by S. mansoni affects the intestine and liver while urinary schistosomiasis caused by S. heamatium affects bladder, ureters and kidneys.

Life cycle

Human infection is by skin penetration of the cercariae stage while swimming or washing in fresh water body containing the cercariae stages. Cercariae migrate from skin to blood vessels (veins) around the intestine and bladder where they develop into adult stages. The adult worms, mate and the female worm produces eggs. The eggs penetrate into the intestinal vessels of humans and excreted in feces. The eggs develop into a stage called miracidium. The miracidium penetrates an intermediate host snail where it develops into cercariae and is released into the water. The cercariae again infect man while swimming or contact with water.

Disease development

The disease is produced as a result of damage of tissues caused by reaction of the body to schistosomula, adult worms, and mainly deposited eggs in the intestinal or

bladder wall. The tissue damage is caused by host's immunological response and mechanical damage to tissues caused by eggs wherever they are deposited, i.e. intestinal or bladder wall, liver, brain, spinal cord, etc.

Patient Presentation

Patients with schistosomiasis may present with the following signs and symptoms:

- Itching of the skin at the point of cercariae penetration
- Fever and chills
- Diarrhea, abdominal cramps and tenderness
- Burning urination, bloody urine and frequent urination
- In the long run may develop abdominal swelling.

Patients are either in endemic area or travel to areas known for schistosoma and have contact with water bodies suspected to have infected snails.

7.6. Management

Early treatment is essential in patients with schistosomiasis before it damages vital body organs like the liver & kidney. Once there is damage to these organs, it is difficult to cure the patient. Therefore, community health workers should encourage

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D. Snails

3. Which of the following is an important symptom in patients with schistosomiasis?
   A. Itching of the skin
   B. Bloody diarrhea
   C. Bloody urine
   D. Fever
   F. All of the above
4. Which of the following is wrong concerning the preventive and control aspect of schistosomiasis?
   A. Proper construction and use of latrine.
   B. Boiling water for siu67T TDne.

UNIT EIGHT

TAKE HOME MESSAGES FOR CARE GIVERS/SELF CARE

So far, we have discussed in detail about schistosomiasis.

What do you know about scistosomiasis?

Schistosomiasis is a disease caused by blood and intestinal flukes which are generally flat, flashy flat leaf shaped worms in which the adult worms are adapted to life with in blood vessels of intestinal wall and bladder. The male is actually flat, but its sides of the body rolled ventrally forms a gynecophoric canal bearing the long flat body of the female.

UNIT NINE

ROLE AND TASK ANALYSIS

N.B: The scope and level of involvement in the different tasks may vary on the basis of level of training of health professionals.

9.1 Knowledge, Objectives and Learning Activities

No	Learning objectives	Learning activities			
		HO	**Nurse/PHN**	**ENHS/EHT**	**MLT**
1	To define schistosomiasis	Define schistosomiasis	Define schistosomiasis	Define schistosomiasis	Define schistosomiasis
2	To identify the etiology and pathogenesis of schistosomiasis	-Identify the etiologies of schistosomiasis -Study the pathogenesis of schistosomiasis	-Identify the etiologies of schistosomiasis -Study the pathogenesis of schistosomiasis	-Identify the etiologies of schistosomiasis -Study the pathogenesis of schistosomiasis	-Identify the etiologies of schistosomiasis -Study the pathogenesis of schistosomiasis
3	To describe the epidemiology of schistosomiasis	Study the prevalence of *S.mansoni* and *S. haematobium*	Study the prevalence of S.*mansoni* and *S. haematobium*	Study the prevalence of S.*mansoni* and S. *haematobium*	Study the prevalence of S.*mansoni* and *S. haematobium*
4	Explain the public health significance of schistosomiasis	Recognize the morbidity and mortality of schistosomiasis	Recognize the morbidity and mortality of schistosomiasis	Recognize the morbidity and mortality of schistosomiasis	Recognize the morbidity and mortality of schistosomiasis
5	To identify the clinical features of schistosomiasis	Describe the sign and symptoms of schistosomiasis	Describe the subjective and objective features manifested by schistosomiasis	Learn the signs and symptoms of schistosomiasis	Learn the signs and symptoms of schistosomiasis
6	To enumerate the methods of diagnosing schistosomiasis	-Know the techniques of history taking and physical	**-**Recognize the subjective and objective features for the diagnosis of	**-**Recognize the different approaches to detect	**-**Study the steps in diagnosing schistosomiasis -Study the

examination to diagnose schistosomiasis

-Know the laboratory

	management, prevention and control of Study the preventive and control measures of schistosomiasis				

9.2 Attitude, objectives and learning activities

4	To recognize the signs and symptoms of schistosomiasis.	-Appreciate the need to detecting schistosomiasis early. -Focus on the important clinical features and complications.	-Focus on the important clinical featureo

9.3 Practice, Objectives and Learning Activities

No	Learning Objectives	Learning Activities			
		HO	NURSE/PHN	ENHS/EHT	MLT
1	To perform appropriate diagnostic measures of schistosomiasis	Take appropriate history, perform proper physical examination.	Apply the nursing process to diagnose the patients' illness	Give health information on the sign and symptoms.	Conduct appropriate laboratory investigations.
2	To detect the different etiologic agents of schistosomiasis	Take appropriate history, perform proper physical examination. n--1..00c.d Ta2(gations	Asses the patient properly for the possible causative agents.	Give health information on the root causes and the need for medical check up. to)Tj0 -1.7186]TJ0522.40treat020	-Carry out the different laboratory investigations to identify etiologic agents/species. -Record and report the result
3	To apply proper management of schistosomiasis --1.	-Prescribe appropriate anti-schistosomal chemotherapy. -Refer severe/ complicated cases. 32phicated cases.	Carry out the appropriate nursing management and patient support principles.	Teach on personal and environmental management	- Play an active role in laboratory confirmation of cure.
4	To conduct86 TD0.0017 Tc0 Tw[(.56 ref48)403.56 ref188.76 327.66 0.c-0 Tc46				

ANNEXES

Annex-1

Answer keys to pre and post tests

Part I: Core module

1. D
2. D
3. B
4. C
5. D
6. C
7. E
8. A
9. C
10. A
11. B
12. B
13. B
14. D
15. D

Part II

A. For Health officers

1.

No.	***Intestinal Schistosomiasis***	***Urinary schistosomiasis***
1	Cercarial dermatitis, so called "*swimmer's itch" m*ost often occurs	Cercarial dermatitis, so called "*swimmer's itch"* occurs but less commonly
2	C*olicky* abdominal pain, bloody diarrhea, fatigue and growth retardation in children	Burning sensation on urination, bloody urine, and frequency of urination
3	Portal hypertension which may lead to ascites, splenomegaly, and esophageal varices	Obstruction of the lower end of the ureter which may result in hydroureter and hydronephrosis
4	Presence of periportal fibrosis on ultrasound	Presence of typical *sandy patches* visible on cystoscopy
5	No association with malignancy	An association with squamous cell carcinoma of the bladder

2.

The basis for pathogenesis of schistosomiasis is an inflammatory response both humoral and cell mediated against cercaria in early infection and more importantly to eggs deposited in several tissues. The granulomatous response around these ova is cell mediated and is regulated both negatively and positively by a cascade of cytokines, cellular and humoral response.

3.

Eggs are eliminated with feces or urine. Under optimal conditions the eggs hatch and release miracidia, which swim and penetrate specific snail intermediate hosts. Miracidia develop into cercariae in the snail. Upon release from the snail, the infective cercariae swim; penetrate the skin of the human host which migrates through several tissues and stages to their residence in the veins. Adult worms in humans reside in

the mesenteric venules in various locations; mesenteric veins for *S. mansoni* and venous plexus of bladder for *S.haematobium.* The females deposit eggs in the small venules of the portal and perivesical syst

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5. The use of ether in Formol Ether concentration technique is to dissolve the fat in the feces

D. **For Environmental Health Officers**

Choose the best answer

1. D
2. B
3. B
4. D
5. B
6. B
7. D

Annex- 2

Abbreviations

HO = Health Officer

ENHO = Environmental Health Officer

MLT = Medical Laboratory Technologist

PHN = Public health nurse

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the portal vein in the abdomen. These vessels often form open sores and bleed. This is often a

complication of cirrhosis of the liver.

Fissure: 1.A crack like break in the skin, as an anal fissure.

2. A split or a groove on the surface of an organ. It often marks the division of the organ into parts, as the lobes of the lung. A fissure is usually deeper than a sulcus, but *fissure* and *sulcus* are often used as if they were the same thing.

Fistula: an abnormal passage from an internal organ to the body surface or

Proteinuria: also called albuminuria, having large amounts of protein in the urine, as albumin proteinuria is often a sign of kidney disease or kidney problems brought on by another disease. However, proteinuria can also be caused by heavy exercise or fever.

Pyuria: white blood cells in the urine. It is a sign of infection of the urinary tract. Pyuria occurs in inflammation of t infection 1.3ver.