MODULE

Schistosomiasis

Diploma Program
For the Ethiopian Health Center Team

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UNIT ONE

INTRODUCTION

1.1 Purpose and Use of This Modules

The scarcity of relevant teaching or learning materials in the higher training institutions of Ethiopia has been one of the major problems which hinder effective and efficient task oriented problem solving training. Preparation of teaching materials that fill such a gap should be given a high priority.This module is therefore, designed to arm students of the health profession of the four disciplines all over the country with the basic knowledge, practical skill, and attitude through interactive and participatory learning.

This module will help the health center team comprised of, Public health Nurses (PHN) Medical Laboratory Technicians (MLT) and Environmental Health Technicians (EHT) to correctly identify cases of Schistosomiasis and manage them effectively as team members. Thus separate satellite modules are prepared for each professional category of the health center team based on the tasks expected from them.

The module can also be used for in-service training of the health center team and for basic training of other health professionals, health extension workers and caregivers. However, the module is not intended to replace standard textbooks or other reference materials.

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 on the pre- test to 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 species of schistosoma 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 the wrong combination
   A. *S.mansoni* _Esophageal varices
   B. *S. japonicum* _ Ascites
   C. *S. haematobium* – Vesical caliculi
   D. *S. makongi* – Bladder cancer

11. Species of schistosoma associated with bladder stone and bladder carcinoma is

A.

At the Health Post, he was given pain relievers and advised to visit higher centers. He then visited Adama Health Center where he was seen by a health officer. The patient gave similar history at the health center and, additional information that many of the workers in the Plantation Farm experience similar problem. On physical examination the health officer found only mild tenderness over the suprapubic region and in the right flank. Microscopic urinary examination was requested and revealed ova of *S. hematobium*. The patient was sent home with four tablets of praziquantel and advised to inform the sick workers to seek medical attention and to avoid bathing at the canal. 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 tap water 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 their findings to the health center staff and to the medical director of Adama Hospital so that a meeting will be arranged to discuss the findings. The team members agreed that the situation was serious and needed immediate solution. It was decided to deploy another team after a week for detailed investigation of conditions in the village.

Exercise

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

S. mansoni is widely distributed in Ethiopia. Out of 365 communities surveyed between 1961and 1986 for *S. mansoni*, cases were reported from 225 (62%) and 85 (23%) and the prevalence ranged from 10 – 92% (19). Transmission occurs mainly in streams, irrigation schemes, and lakes. The intensity of infection, correlates with severity of infection, varies from locality to locality in Ethiopia. The intens

Figure-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.

Eggs are eliminated with feces or urine (1). Under optimal conditions the eggs hatch and release miracidia (2), which swim and penetrate specific snail intermediate hosts (3). The stages in the snail include 2 generations of sporocysts (4) and the production of cercariae (5). Upon release from the snail, the infective cercariae swim, penetrate the skin of the human host (6) , and shed their forked tail, becoming schistosomulae (7) . The schistosomulae migrate through several tissues and stages to their residence in the veins (8,9). Adult worms in humans reside in the mesenteric venules in various

about 15-20 % of, infected individuals. Mor


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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

The clinical presentation in the invasive and acute stages of *S. heamatobium* infection is similar to *S.mansoni* infection. In the established stage 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 that stimulate host inflammatory response that damages to the bladder and ureters. Up to 80% of children infected with *S.heamatobium* have dysuria, frequency of urination and haematuria. Along with the local effects of granuloma formation in the urinary bladder, obstruction of the lower end of the ureter results in hydrourether and hydronephrosis which can be seen in 25-50% of infected children. As infection progresses, bladder granuloma undergoes fibrosis which results in typical *sandy patches* visible on cystoscopy. In many endemic areas, an association between squamous cell carcinoma of the bladder and *S.haematobium* infection can be observed. (2, 5)

Diagnosis

Diagnosis of *S.haematobium* infection is based on:

A. Clinical signs and symptoms
B. History of living in an endemic area
C. Serological tests
D. Finding the characteristic eggs.

During the acute stage and in chronic cases in which eggs cannot be found, serological tests are very useful. Serological tests that are applied for diagnosis of *S.mansoni* infection can be used for diagnosis


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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 power development by:

    Constructing settlement camps 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 intermediate host of schistosomiasis.

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 subsequently. 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 (8, 9).

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 without blood examination and his fever subsided.

Family history revealed the following information. He is from Zeway town from poor family who cannot support his schooling. Therefore, he had to engage in fishing regularly after returning from school. He is the eldest in the family and he is responsible for many activities at home including washing clothes of all family members. He usually washes clothes besides the lake.

Then the patient was then examined and laboratory tests including blood, urine and

Exercise 2

Answer the following questions

1. What is Mesfin's health problem?
2. What is the predisposing factor for the illness?
3. What should have seen done of the patient at the first visit to the health center?
4. What public health problem exists in Zeway town & what measures should be taken?

2.7. Post-Test

Do the pretest as the posttest. Use a separate sheet of paper and compare your result

UNIT THREE

SATELLITE MOUDLE FOR PUBLIC HEALTH OFFICERS

3.4. Schistosoma mansoni

Pathogenesis

During the invasive stage, cercaria-associated dermatitis reflects both humoral and cell mediated dermal and subdermal inflammatory response. As the parasite approach sexual maturity and commencement of oviposition, acute schistosomiasis or Katayama fever may occur. In chronic schistosomiasis, most disease manifestations are due to cellular and humeral inflammatory response to eggs retained in the host tissue. This result in granuloma formation around parasite eggs. The granulomatous lesions may have a big size, thus inducing organomegally and obstruction. Subsequent to granulomatous response, fibrosis sets in, resulting in more permanent disease sequelae. Accumulation of antigen antibody complexes results in deposits in renal glomeruli and may cause significant kidney disease.

Ova that are carried by portal blood to the liver lodge at the presinusoidal sites where granulomas are formed, contributing to liver enlargement. After granuloma formation, periportal fibrosis (Symmers' clay pipe stem fibrosis) may occur. Presinusoidal portal blockage causes several hemodynamic changes, including portal hypertension, ascitis and esophageal varices which may result in hematemesis. (5)

Clinical Features

In general, disease manifestations of intestinal schistosomiasis occur in three stages: swimmers' itch, Katayama fever, and chronic schistosomiasis. Swimmers' itch is a form of dermatitis which starts manifesting 2 or 3 days after invation with cercaria larvae. It appears as itchy maculopapular rash on the affected areas of the skin. It is a self-limiting clinical entity. Four to eight weeks after skin invasion acute schistosomiasis (Katayama fever) may develop. This is a serum sickness-like syndrome with fever, generalized lymphadenopathy, cough, colicky abdominal pain and diarrhea. Hepatosplenimegaly could also develop.

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.

4. Glomerulonephritis

This may manifest with proteinuria and/or renal failure. (2, 5)

Diagnosis

Diagnosis of schistosomiasis is based on clinical signs and symptoms, history of living in or travel to endemic area, serologic tests & finding the characteristic eggs in stool. In chronic cases other diagnostic procedures can be used. Ultrasound of the liver can detect periportal fibrosis which is a very sensitive & specific diagnostic tool. 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 haematobium

Pathogenesis

Similar processes that occur in intestinal schistosomiasis occur in urinary schistosomiasis. Granuloma formation in ureters obstructs urinary flow, with subsequent development of hydroureter, hydronephrosis and retrograde urinary tract infection. Similar lesions in the urinary bladder cause the protrusions of papillomatous structures in to its cavity; these may ulcerate and/or bleed. The chronic stage of infection is associated with scarring & depositions of calcium in the bladder wall. It can also predispose to aquamous cell carcinoma of the bladder. (5)

Clinical Features

Clinical manifestations of *S.haematobium*

Alternatives:

- Oxaminoquine 15mg/kg single dose for *S.mansoni*
- Metrifonet 5-15mg/kg, 3 doses given at two weeks interval for *S.haematobium.* (2, 5)
- Artemisisinin compounds used in malaria treatment are being evaluated for schistosomiasis.

Prevention and Control

1. Health education on:

   proper excreta disposal.

   avoiding contact with infected water bodies like lakes, rivers, ponds and canals.

2. Snail control:

   Physical methods

   - Periodic clearance of canals from vegetations
   - Manual removal of snails & their destruction

   Biological methods

   - Use of natural enemies to the snails as *Marisa*

   Chemical methods

   - Molluscides are applied in the canals to kill the snails. (2)

3.4. Post-test Questions

Do the pretest as a posttest. Use separate sheet of paper.

UNIT FOUR

SATELLITE MODULE FOR PUBLIC HEALTH NURSES

4.1 Purpose and Uses of This Module

This satellite module is a reference material developed for nurse students and public health nurses in service sectors, with the aim of delivering knowledge and skills necessary and specific to the profession regarding to prevention, management and control of schistosomiasis. The module is intended to enable students and staff nurses to assess and diagnose the burden of the schistosomiasis in the community and to develop intervention measures at the individual and community level. It is also designed in such a way it can provide uniform and easy to understand information that help to solve shortage of such reference materials in remote part of working areas of our country.

4.2 Directions for Using This Satellite Module

First complete the pretest under this section before reading core module and satellite module

Reading learning objectives

Read information on case management

Then study satellite module

Refer the core module

Complete the post test and compare your answer of pretest and post test with the key given at the back to evaluate yourself

4.3 Pre-Test

Choose the best answer and write your choice on a separate answer sheet

1. ‘Swimmer itch’ of the skin is caused by
    A. Cercarial penetration
    B. Autoimmune reaction to the presence of egg at the site
    C. The bite of miracidium
    D. Contact of skin with water
    E. All of the above.
2. The following are complication of schistosomiasis ***except***
    A. Sqamous cell carcinoma of bladder
    B. Colonic and rectal polypse
    C. Esophageal varices
    D. Portal hypertension
    E. None of the above
3. The nursing care for patients with schistosomiasis include all ***except***
    A. Administering analgesics to relieve pain
    B. Collection of urine and stool specimen
    C. Restriction of food intake in patients with diarrhea
    D. Administering intravenous fluid to maintain fluid volume.
    E. None of the above
4. One of the following is ***not*** recommended in the prevention of schistosomiasis
    A. How to avoid contact with water known to have cercaria
    B. Avoid use of irrigation project to prevent infection
    C. Protection of water source from contamination with feces.
    D. Storing water at least for 48 hours before use to allow cercaria to die.
    E. None of the above
5. Skin care for a patient admitted for schistosomiasis include
    A. Inspection of skin for irritation
    B. Frequent change of position to avoid bedsore
    C. Dry and smooth bedding
    D. Keeping skin clean and dry

E. All of the above

6. Which one of the following sentence is ***not*** true?
   A. *S.mansoni* and *S.haematubium* are the most endemic species in Ethiopia.
   B. Small intestine is the most common site affected by *S.haematubium*.
   C. Both *S.mansoni* and *S.haematubium* can affect gastro –intestinal and urinary tract function.
   D. Inflammatory reaction in schistosomiasis is caused by the presence of schistosoma egg in host tissue.
7. Conclusive diagnosis of the schistosomiasis is made by
   A. Clinical sign and symptoms
   B. History of living in schistosoma endemic area
   C. Serological test for antibody presence
   D. Presence of characteristics ova in specimens
   E. None of the above
8. Health education for a patient with schistosomiasis includes all ***except***
   A. Importance of taking medc0Lrtatlith oite af Health education schists 8. Healt5 Serol

4.5 Case Management

4.5.1 Nursing Assessment

Subjective data

Pati

Abdominal distension

Ascites

Assess the general body part for;

Generalized lymphadenopathy

Emaciation of upper trunk and upper limbs

Edema of lower limbs

4.5.2 Nursing Diagnosis

Based on the history and physical examination of disease condition, the major nursing diagnosis may include:

Abdominal pain related to intestinal inflammatory process and increased peristalsis

Diarrhoea related to intestinal inflammatory process

Fluid and electrolyte deficit related to diarrhoea

Alteration of nutrition, less than body requirement related to mal absorption

Activity in tolerance related to fatigue

High risk for skin integration related to edema, diarrhoea and mal nutrition.

High risk for squamous cell carcinoma related to chronic irritation

Potential for infection transmission related to contagious agents

Knowledge deficit concerning the disease process and management

4.5.3 Nursing Goal

Major goals of patient may include

Relief of abdominal pain and cramp

Attainment of normal bowel and bladder elimination

Maintenance of fluid volume and electrolyte balance

Maintenance of optimal nutrition and weight

Avoidance of fatigue

Prevention of skin break down

Absence of complications

4.5.4 Nursing Intervention

Relief of pain by

- Administering ordered analgesics or anticholinergics
- Local application of heat
- Position change

Maintaining normal elimination pattern

- Bed rest to encourage decrease peristalsis
- Administration of anti

Prevention of schistosomiasis including early seeking of treatment when there is suspicion of infection.

Mobilization of community on preventive measures

Identify risk group of community who are eligible for screening.

Proper human excreta disposal

Prevention of water contamination with feces and provision of safe water supply.

4.5.5 Nursing Evaluation

The following evaluation criteria can be used to measure the out come of nursing intervention

Patient is relieved of abdominal pain

Normal bowel and bladder elimination is attained

Fluid volume balance is maintained

Obtained optimal nutrition pattern, patient tolerates small frequent food with out diarrhea

Avoid episodes of fatigue, patient rests and adheres to activities advised

The skin integrity is maintained

Acquires an understanding of the disease process

4.6 Post -Test

Do the posttest as the pre test and assess your progress.

UNIT FIVE

SATELLITE MODULE FOR MEDICAL LABORATORY TECHNICIANS

5.4. Techniques for laboratory diagnosis of schistosomiasis

5.4.1. Laboratory diagnosis of *Schistosoma mansoni*

General Considerations

The eggs of *S.mansoni* can be detected in feces and rarely in urine. Absence of eggs in a single fecal specimen does not necessarily imply absence of active infection; three to five tests on feces passed in different days may be needed.

The laboratory diagnosis can be done by

- Finding schistosome eggs in feces by direct examination or more commonly by using a concentration technique. The specimen will often contain blood and mucus.

  Other findings

  There may be eosinophilia, raised erythrocyte sedimentation rate and low hemoglobin values (anemia)

x

x x

Reporting the appearance of faecal specimens

The following issues should be reported

Color of the specimen.

Consistency i.e. whether formed, semi-formed, unformed, watery

Presence of blood, mucus, and/or pus

Whether the specimen contains other parasitic worms, e.g. tape worm, thread worm etc.

Microscopic examination

Materials and solutions needed

Microscope

Microscope slide

Cover glass

Wire loop or wooden applicator

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 news paper. 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 saline.

Just place a small amount of specimen including the blood and mucous using a wire loop or piece of stick. Cover with a cover glass and using a tissue, press gently on the cover glass to make a thin preparation.

3. Examine systematically the entire saline preparation for schistosome eggs. Use the 10x objective with the condenser iris closed sufficiently to give good contrast and use also the 40x objective to assist in the detection and identification of the eggs. The eggs are pale yellow-brown, large, and oval, measuring about 150x60µm. They have a characteristic lateral spine and fully developed miracidium.
4. Report the number of eggs found in the entire saline preparation as follows:

   Scanty ……1-3 per preparation

   Few ……..4-10 per preparation

   Moderate number ……..11-20 per preparation

   Many ……..21-40 per preparation

   Very many …… Over 40 per preparation

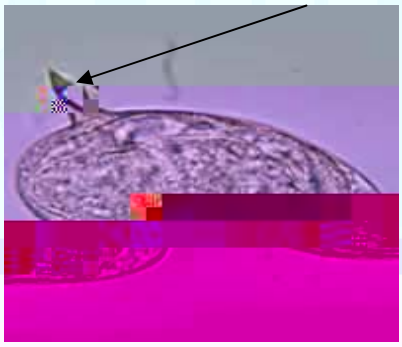

Fig. 4.1 Egg of *S.mansoni* with lateral spine (Arrow)

Source: DPDx Laboratory Identification of Parasites of Public Health Concern, CDC, National Center for Infectious Diseases Division of Parasitic Diseases, USA, 2003.

B. Concentration Techniques

When eggs are not found in direct preparations concentration methods should be performed. Even in moderate to severe symptomatic infections concentration technique may be required to detect eggs.

I. Formol ether concentration technique

This technique is rapid and risk of laboratory-acquired infection from fecal pathogens is minimized because organisms are killed by the formalin solution. The technique, however, requires the use of highly flammable ether or less flammable ethyl acetate.

Principle:

Feces are emulsified in formol water; the suspension is strained to remove large fecal particles, ether or ethyl acetate is added, and the mixed suspension is centrifuged. The eggs are fixed and sedimented and the fecal debris is separated in a layer between the ether and the formal water. Fecal fat is dissolved in the ether.

Materials and solutions needed.

Formol water, 10%v/v
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 vapor is anesthetic, 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 open 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 fecal debris from the side of the tube and invert the tube to discard the ether, fecal 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.

II. Kato-Katz technique

The technique is recommended by the World Health Organization (WHO) for the diagnosis of

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

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.
3. Place template in the middle of a clean microscope slide and fill with meshed feces from the spatula so that ly filled. Using the side of the spatula remove excess feces from the edge of the 15...
4. Carefully remove template and place a presoaked cellophane strip over

orbent surface (e.g. toilet paper) on a bench top to spread the feces under the cellophane strip.

6. Position slide with smear uppermost to facilitate clearing of specimen and leave for 1- 24 hours.
7. Examine the smear systematically with in 24 hours an d count and report the number of *S.mansoni* ova.

To calculate the total number of eggs per gram of feces, multiply the number of *S.mansoni* eggs in the smear by an appropriate factor. Selection of a factor depends on the template us

For example, if a 50mg template is used, the factor will be 20.

NOTE: Compare with other field technique for detecting and quantifying schistosome eggs in feces, the Kato-Katz technique is less sen unsuitable for fluid or hard specimens, can alter the morp15.ogical appea eggs, and the technique is less safe and hygienic. Alternative field te

have been suggested such as formol detergent gravity technique described below.

III. Formol detergent field technique

It is reproducible, inexpensive, simple, safe and hygienic to perform (formalin kills fecal pathogens) and gives good preservation of schistosome eggs. It is more sensitive than the Kato-Katz technique because more feces is used.

Materials and reagents required

Universal container with a conical base and measuring spoon.

Sieve (strainer) with small holes. The small nylon tea strainer is suitable.

Beaker

Plastic bulb pipette or Pasteur pipette

Microscope slide

Microscope

Formol detergent solution

[To make this solution add 10 ml of detergent solution (e.g. Lipsol, Decon, Teepol or other washing up detergents) to 480 ml of clean water. Then add 10 ml of concentrated formaldehyde solution to the mixture of detergent solution and water.]

Procedure

1. Dispense about 10 ml of the formol detergent solution in to a universal container.
2. Using the spoon attached to the cap of the containers, transfer a level spoonful of feces to the container (approx.300 mg feces), and mix well in the solution to break up the feces. Tighten the cap and shake for about 30 seconds.
3. Sieve the emulsified feces, collecting the sieved suspension in a beaker. Return the sieved suspension to the conical based Universal container.
4. Stand the container upright in a rack for 1 hour (do not centrifuge)


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small lateral spine at one end and contain a fully developed miracidium.

5. Count the number of eggs in the preparation and report the number/10ml of urine. If more than 50 eggs are present, there is no need to continue counting. Report the count as “More than 50 eggs/10ml”. Such counts indicate a heavy infection.

Fig.4.2. Egg of *S.haematobium* with terminal spine (Arrow)

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

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

Miracidia in urine: - If the urine is dilute or has been left to stand for several hours in the light, the miracidia will hatch from the eggs. The ciliated miracidia are motile.

Fig.4.3. Ciliated miracidium of *S.haematobium* in urine.

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

C. Examination of Total Volume of Urine Collected Between 10.00h and 14.00h

In light infections to increase the possibility of finding *S.haematobium* eggs, the total volume of urine excreted between 10.00h and 14.00h can be examined. The examination involves testing of the urine for protein and blood, preserving the eggs by adding 0.1ml of 10% formol saline to 50-100 ml of urine, allowing the

eggs to sediment (for 2 hours), discarding all but the last approximate 15 ml of urine, centrifuging the last 15ml urine and examining the sediment for *S.haematobium* eggs.

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 ENVIRONMENTAL HEALTH TECHNICIANS

6.1 Introduction

6. 1.1 Purpose and Brief Description of the Satellite module

The purpose of this satellite module is to equip environmental health professionals with basic knowledge and skill about the preventive and controlling measures for schistosomiasis particularly those species prevalent in Ethiopia. The module also intendes to help other health professionals by providing relevant informative on schistosomiasis.

Four species of the genus Schistosoma are important human parasites. Of these *S.mansoni, S.haematobium ,S,intercalatum* and *S.japonicum* have widespread distribution. The adult male and female worms live in the blood veins and intestine of the host (human) for many years. As an adaptation for these unusual microhabitats, the

6.2 Learning Objectives

After going through the principles and concepts in this module about schistosomiasis; the learner will be able to:

6.4 Schistosomiasis

6.4.1 Mode of Transmission and Life cycle

The infection is not communicable from person to person. Infection is acquired from

latrines that will not contaminate water are the primary intervention measures expected from health professionals in general and environmental health workers in particular. These strategic interventions can keep water safe for human health including making water free from intermediate hosts and reach of animal wastes. Providing adequate and safe water both for consumption and recreation reduces the contact of snails with bodies of water that carry the infectious agent (cercariae).

Providing the community with adequate health information and educating the public about the cause, the mode of transmission and prevention of infection has great importance in reducing the prevalence of schistosomiasis. Public health information is also used to promote proper excretal disposal to stop transmission and to promote the use of health services before irreversible damage and complications occur.

Making the bodies of water shallow, exposed to the sun or making the water run more quickly will make the snail's environment unfavorable. This process of environmental management for the prevention of the infections requires a multisectoral approach. This emanates from the fact that bodies of water are used for irrigation purpose, power generation, and other economic purpose that necessitate the building of dams, canals, ponds, etc. If some of these constructions are not assessed and planned with health considerations, they can enhance the breeding of snail intermediate hosts. This in turn will increase the incidence and prevalence of the infections especially in endemic areas.

Although the basic preventive and control measures are described above, the following points should be taken into consideration by environmental health professionals.

1. Avoiding contact with water known to contain cercariae by:
   Providing safe water supply to the community.
   Providing proper excreta and urine disposal facilities.

2. Preventing water from becoming contaminated with schistosome eggs by:
   Giving health information based on target and high-risk group.

Mobilizing community members to have their own sanitary waste disposal facilities.

Identifying the infected person and giving treatment.

Protecting water sources from fecal pollution by animal reservoir host for *S.japonicum*.

3. Minimizing the risk of infection from new water construction and irrigation schemes.

6.5 Post -Test

Do the pretest as a posttest and determine your progress.

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 conveying the message of the module.

7.1.2. Direction for using the module

Start by attempting all the pre-test questions; write your answers on separate sheet of papers.

Read the whole text of this satellite module in accordance with its sequence including the task analysis.

Do the post-test on the separate sheet and compare your answer with the key provided.

7.2. Pre-test

Choose the correct answer and write your choice on a separate sheet.

1. Which of the following is the most important factor for schistosomiasis infection?
    A. Ingesting water and food contaminated with schistosoma eggs.
    B. Insect bite
    C. Swimming in water containing cercariae
    D. Ingesting fish infected with cercariae
2. What is an intermediate host for the transmission of schistosomiasis?
    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 Ethiopia is increasing due to water related 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 re

7.7. Post-test questions for community health workers

Choose the correct answer and write your choice on a separate answer sheet.

1. Which of the following is the most important factor for the infection of schistosomiasis?
   A. Ingesting water and food contaminated with schistosome eggs.
   B. Insect bite
   C. Swimming in water containing cercariae
   D. Ingesting fish infected with cercariae
2. What is an intermediate host for the transmission of schistosomiasis?
   A. House flies
   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
   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 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.

Task Analysis for health extension workers

The community health worker is expected to under take the following activities:

1. Establish the presence of schistosomiasis in the community.
2. Conduct home visit to monitor drug reaction and advise defaulters.

3. Giving health information to the community about the causes, treatment and prevention methods.
4. Mobilizing the community to construct and use latrines.
5. Reporting to the nearest health institution about all activities done on this disease.
6. Mobilizing the community to protect springs and wells.

Management of schistosomiasis

Any person showing the above signs and symptoms should go to a health institution for examination and appropriate treatment.

Prevention of schistosomiasis

Infection of schistosomiasis can be prevented by:

- Construction of foot bridges across infected rivers
- Prevention of water contamination by providing health information and sanitary facilities
- Early treatment of infected persons
- Providing health information to use latrines, and sufficient and safe water supply
- Protecting water supplies from fecal pollution by animal reservoir hosts
- Minimizing the risk of infection from new water conservation, irrigation schemes and hydroelectric power development
- Destroying snail intermediate hosts by removing vegetation at water contact points and draining of swamps.
- Draining and clearing swamps.

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					

6	To enumerate the methods of diagnosing schistosomiasis	-Know the techniques of history taking and physical examination to diagnose schistosomiasis -Know the laboratory techniques used to diagnose schistosomiasis	-Recognize the subjective and objective features for the diagnosis of schistosomiasis - Be familiar with the basic diagnostic methods	-Recognize the different laboratory methods to detect schistosomiasis	-Study the steps in diagnosing schistosomiasis -Study the different laboratory techniques to detect schistosomiasis
7	To describe the management of schistosomiasis	-Understand the need for early detection and treatment of schistosomiasis -Study the management of complications of schistosomiasis -Enumerate the drugs used and complications	-Understand the pharmacological management of		

9	To recognize the interdisciplinary roles of the different health center team members in the management, prevention and control measures of schistosomiasis	-Recognize the roles of other team members.	-Recognize the roles of other team members.	-Recognize the roles of other team members.	-Recognize the roles of other team members.

9.2 Attitude, objectives and learning activities

No.	Learning objectives	Learning activities			
		HO	**Nurse/PHN**	**ENHS/EHT**	**MLT**
1	To recognize schistosomiasis is a significant public health problem in Ethiopia	Realize that schistosomiasis is a major health problem of Ethiopia	Realize that schistosomiasis is a major health problem of Ethiopia	Realize that schistosomiasis is a major health problem of Ethiopia	Realize that schistosomiasis is a major health problem of Ethiopia
2	To appreciate the different etiologies of schistosomiasis	Give emphasis to *S.mansoni* and *S.haematobium* species.	Give emphasis to *S.mansoni* and *S.haematobium* species.	Give emphasis to *S.mansoni* and *S.haematobium* species.	Give emphasis to *S.mansoni* and *S.haematobium* species.
3	To appreciate the life cycle of schistosomiasis	Recognize the need of intermediate host and fresh water bodies for the life cycle of schistosomiasis.	Recognize the need of intermediate host and fresh water bodies for the life cycle of schistosomiasis.	Recognize the need of intermediate host and fresh water bodies for the life cycle of schistosomiasis.	Recognize the need of intermediate host and fresh water bodies for the life cycle of schistosomiasis.


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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 principles to diagnose the illness in the patient	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.	Asses the patient properly for the possible causative agents.	Give health information on the root causes and the need for medical check up.	-Carry out the different laboratory investigations to identify etiologic agents/species. -Record and report the result
3	To apply proper management of schistosomiasis	-Prescribe appropriate anti-schistosomal chemotherapy. -Refer severe/complicated cases.	Carry out the appropriate nursing management and patient support principles.	Teach on personal and environmental management	- Play an active role in laboratory

ANNEXES

Annex 1:

Answer keys to pre and posttests

Part I: Core module

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

Part II

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 systems; the eggs are moved progressively toward the lumen of the intestine (*S. mansoni* and *S. japonicum*) and of the bladder and ureters (*S. haematobium*), and are eliminated with feces or urine, respectively.

4.

Avoiding contact with water known to contain cercariae by providing safe water supply to the community for washing and bathing sites and Health information for the community

Preventing water from contamination with eggs by providing sanitation facilities, health information and treating infected persons.

Minimizing the risk of infection from new water conservation, irrigation schemes and hydroelectric development by treating workers when necessary and making settlements away from canal drains and irrigation canals

Destroying snail intermediate hosts by removing vegetation from canals and using molluscides

5.

Complications of intestinal schistosomiasis.

1. ***Portal hypertension:*** is due to the development of periportal fibrosis due to granulomatous inflammation induced by embolized eggs to the liver that are lodged in the presinusoidal sites. It manifests with ascites, esophageal varices with or without bleeding, and an enlarged spleen.
2. ***Glomerulonephritis:*** is due to antigin-antibody complexes deposited in the renal glomeruli. This may manifest with proteinuria and/or renal failure.

3. Fissure in ano, Fistula in ano and piles

Fissure in ano and piles due to schistosoma mansoni infection have been observed. Fistulas frequently develop into the ischiorectal fossa, the perineum, the buttocks, or the urinary bladder.

Complications of urinary schistosomiasis

1. ***Hydroureter and hydronephrosis:*** occur due to granuloma formation in the ureters obstructing urinary flow.
2. ***Bladder stone:*** may form due to scarring and depositions of calcium around the eggs as nuclei in chronic stages of infection.

C. For Medical Laboratory Technicians

Multiple-choice items.

1. D
2. A
3. C
4. D
5. A
6. D

Short answer items.

1. S*.haematobium* eggs have terminal spine.
2. Cellophane strips soaked in glycerine/malachite green or glycerine/methylene blue solution
3. The appropriate time is between 10.00h and 14.00h because the excretion of *S.haematobium* eggs in urine is highest at this time.
4. The use of ether in Formol Ether Concentration Technique is to dissolve the fat in the feces

D. Answers for Diploma Environmental health workers

Multiple choice items

1. B
2. D

True or false

3. True
4. True

Short Answers

6. The eggs of schistosoma in an infected person open on contact with water and release miracidium. The miracidium is motile in water and tries to find fresh water snail. Once it enters the snail the miracidium divides producing thousands of new parasites called cercariae. The cercariae are then excreted by the snail in to the surrounding water. The cercariae penetrate the skin, when cercariae enter skin they loose their tails and become schistosomule. The schistosomule mature and become adult male and females. The adult females lay eggs and the eggs are excreted with feces and urine into the environment and repeat the cycle.

7. The major snail control measures are
   - Biological control
   - Chemical control
   - Ecological control

Annex 2:

Abbreviations

EHTTw( )3.8TwEnvironm

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GLOSSARY

Ascites, an abnormal pooling of fluid in the abdominal cavity; the fluid contains large amounts of protein and other cells. Ascites is usually noticed when more than 1pint (500 ml) of fluid has collected.

Bacteriuria, the presence of bacteria in the urine. More than 100,000 bacteria per ml of urine usually mean urinary tract infection is present.

Biopsy, **1**. ***Removing*** a small piece of living tissue from an organ or other part of the body for microscopic examination to establish a diagnosis or follow the course of a disease.

2. The ***tissue*** removed for examination.

3. (*Informal***)** to remove tissue for examination. Kinds of biopsy include aspiration biopsy, needle biopsy, punch biopsy, surface biopsy.

Cercaria, *pl*. **cercariae**, a tiny, wormlike form of the class Trematoda. It develops in a freshwater snail. It is released into the water and swims toward the sun, rising to the surface of the water in the warmest part of the day.

Cystoscopy, the direct examination of the urinary tract with a special device (cystoscope) placed in the urethra. Before the test, the patient either is given a tranquilizer or is put to sleep. For the test, the bladder is filled with air or water and the cystoscope is put into place. In addition to testing, cystoscopy is used for taking samples of tumors or other growths and for removing growths polyps).

Dermatitis, an inflammation of the skin marked by redness, pain, or itching. The condition may be long-term or sudden.

Dysuria, painful urination, usually the result of a bacterial infection or blockage in the urinary tract. Dysuria is a symptom of such conditions as inflammation of the urinary bladder (cystitis), swelling of the urethra (urethritis), swelling of the prostate (prostatitis), urinary tract tumors, and some gynecological disorders.

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** cracklike 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 between two internal organs. Fistulas may occur in many sites from the mouth to the anus and may be made for treatment follow the course of a disease.

Fossa, *pl*. **fossae**, a hollow or pouch, especially on the surface of the end of a bone

Hematemesis, vomiting of bright red blood, indicating rapid bleeding of the upper digestive tract. It is often linked to enlarged veins in the esophagus or peptic ulcer.

Hematuria, abnormal presence of blood in the urine. Many kidney diseases and disorders of the genital and urinary systems can cause hematuria.

Hydronephrosis, swelling of the pelvis by urine that cannot flow past a blockage in a ureter.

Ureteral obstruction may be caused by a tumor, a stone lodged in the ureter, inflammation of the prostate gland, or a urinary-tract infection. The person may have pain in the flank. Surgery to remove the blockage may be needed. Prolonged

hydronephrosis will result in eventual loss of kidney function.

Hydroureter swelling of the ureter by urine that cannot flow past a blockage in the lower ureter, bladder or urethra.

Miracidium, the larval stages of aquatic invertebrates (**e.g. Flukes**) that lead sedentary, or attached, lives in the adult stage are typically motile and free-swimming. Such larvae are found in sponges, sessile mollusks, and many rotifers and worms. These larvae serve to increase the distribution of the adults.

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 the bladder, kidney, or urethra, and tuberculosis of the kidney. Pyuria may be caused by an infection from viruses. Miliary pyuria causes blood, pus, and tissue cells, as well as bacteria, in the urine.