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Intestinal parasites and knowledge, attitude and practices (KAPs) among individuals who have river water contact with special emphasis on *Schistosoma mansoni* in Addiremets town, Western Tigray, Ethiopia.

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A RESEARCH THESIS SUBMITTED TO THE DEPARTMENT OF MEDICAL LABORATORY SCIENCE, SCHOOL OF ALLIED HEALTH SCIENCES, COLLEGE OF HEALTH SCIENCE, ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN CLINICAL LABORATORY SCIENCE (DIAGNOSTIC AND PUBLIC HEALTH MICROBIOLOGY SPECIALTY TRACK).

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This is to certify that the thesis prepared by Alganesh Gebreyohanns entitled “*Intestinal parasites and Knowledge, attitude and practices (KAPs) among individuals who have river water contact with special emphasis on Schistosoma mansoni in Addiremets town, Western Tigray, Ethiopia*” submitted in partial fulfillment of the requirements for the Degree of Masters of Sciences in Clinical Laboratory Sciences (diagnostic and public health microbiology) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Abbreviations

CDC.....	Centers for Disease Control
CSA.....	Central Statistical Agency
Epg.....	Egg per gram
KAP.....	Knowledge, Attitude, Practice
PCR.....	Polymerase Chain Reaction
SOP.....	Standard Operating Procedure
SPSS.....	Statistical package for social science
WHO.....	World Health Organization
STH.....	Soil-transmitted helminthes
YLDs.....	Years lived with disability
SAF.....	Sodium acetate acetic acid formalin

Operational definitions

River water contact: individuals who have contact with the river during activities such as washing clothes, bathing, swimming, irrigation working or during crossing.

Good knowledge: individuals who answered $\geq 50\%$ of the knowledge questions.

Poor knowledge: individuals who answered $< 50\%$ of the knowledge questions.

Positive attitude: individuals who answered $\geq 50\%$ of the attitude questions.

Negative attitude: individuals who answered $< 50\%$ of the attitude questions.

Good practice: individuals who answered $\geq 50\%$ of the practice questions (whose answer was 'no').

Bad practice: individuals who answered $< 50\%$ of the practice questions (whose answer was 'yes').

Abstract

Background: Intestinal parasitic infections are major public health and socio-economic concerns that adversely affect the well-being of millions of peoples worldwide, mainly the poor in developing countries. The most prevalent helminthes in developing countries are *Schistosoma mansoni*, *Ascaris lumbricoides*, *Trichuris trichiura*, hookworms and *Hymenolepis species*. Intestinal Schistosomiasis is a serious public health problem mainly in tropical and subtropical parts of the world.

Objective: To determine prevalence of intestinal parasites and knowledge, attitude and practices (KAPs) among individuals who have river water contact with special emphasis on *Schistosoma mansoni* in Addiremets, Western Tigray, Ethiopia.

Methodology: A cross sectional study was conducted from February to April 2017. A total of 411 study participants were included in this study. Socio demography, associated risk factors and knowledge, attitude and practice (KAPs) of individuals regarding intestinal parasitosis mainly to intestinal schistosomiasis were collected using preformed structured questioners. From all study participants, stool samples were collected and laboratory investigations were performed using direct microscopy, Formol-Ether concentration and Kato- Katz techniques. Malacology study was assessed by collecting snails from the river in the study area. Data was entered into excel sheet, cleaned and exported and analyzed using SPSS version 20. Bi-variant logistic regression and multiple logistic regressions were used for correlation analysis.

Result: The overall prevalence of intestinal parasites was 51.3%. The most frequent parasites encountered were *S. mansoni* and *H.worm*. The prevalence was slightly higher among males 54.1% (131/242) than females 47.3% (80/169). The highest proportion of parasites was reported among the age group of 5-9 years old subjects (70.6%). The prevalence of *S. mansoni* was found to be 26.3 % with mean of intensity infection 218 egg per gram (Range: 24 to 1728). Of all study participants 94.4% had good knowledge while 35.9% of them had poor practices towards intestinal parasitosis and intestinal schistosomiasis.

Conclusion: High prevalence of intestinal parasitic infection was observed in Addiremets town in which *S. mansoni* and *H. worm* were the most common parasites. Majority of the participants had good knowledge and positive attitude towards intestinal parasites and intestinal schistosomiasis.

Key words: Intestinal parasites, Schistosomiasis, KAP, Addiremets, Western Tigray, Ethiopia.

1. Introduction

1.1. Background

Intestinal parasites, including protozoan and helminthes, are found and affect gastrointestinal tract of human and other animals, causing intestinal parasitosis [1]. Intestinal parasitic infections are the major public health and socio-economic concerns that adversely affect the well-being of millions of peoples worldwide, mainly the poor in developing countries [2]. Major ethiologic agents of intestinal parastosis are *Entamoeba histolytica*, *Giardia lamblia*, *Ascaris lumbricoides*, *Trichuris trichiura*, hookworms, *Hymenolepis species*, *Taenia species*, and *Schistosoma mansoni* [1]. Majority of intestinal parasites are transmitted by the fecal-oral route while others transmitted through skin penetration [3].

Schistosoma mansoni is a causative agent of intestinal schistosomiasis which is a serious public health problem in tropical and subtropical parts of the world especially in poor communities without access to safe drinking water and adequate sanitation [4]. The 2016 World health organization fact sheet estimates show that at least 258 million people required preventive treatment for Schistosomiasis worldwide. It is estimated that at least 90% of those requiring treatment for schistosomiasis live in Africa [5]. In Ethiopia, both intestinal schistosomiasis and urinary schistosomiasis are posing considerable public health problems. Moreover, *S. mansoni*, when compared to *S.hematobium*, is widely distributed and covering large parts of Ethiopia, and prevalent in 1300-2200m above sea levels (asl). On the other hand, the distribution of *S. haematobium* is restricted to some lowlands below 800 m asl, in Awash, Kurmuk (near the Sudan border) and Wabe Shebele areas [6].

Schistosoma mansoni have a complex life cycle in which free-living cercariae, penetrate healthy human skin during water exposure. The cercaria transforms into schistosomulum then enters the venous circulation and eventually migrates to the lungs. They then travel through the circulatory system to the hepato circulation where they mature in to adult worms and mate. *S. mansoni* migrate to intestine where the females begin egg production [7].

These eggs are attached to the wall of the lumen and penetrate the wall of the lumen. They are then expelled in the feces. River waters can be contaminated with human feces which contain

schistosome eggs and upon water body contact the miracidium, liberated from the egg, seek out snail hosts to continue the life cycle [7].

River waters can be contaminated with human feces which contain schistosome eggs and the miracidium is released to the water. Activities such as collecting water from the river, wash clothes, bathing, swimming in the river can exposes humans for *S. mansoni* infection. Farmers and irrigation workers whose occupation exposes them to contaminated water can acquire the infection during river water contact. Therefore farmers, irrigation workers, women who collect water, wash clothes, dishes and cooking utensils and children considered as high-risk group [8]

Schistosomiasis can be acute or chronic parasitic disease. The incubation period for patients with acute schistosomiasis is usually 14-84 days; however, many people are asymptomatic and have subclinical disease during both acute and chronic stages of infection. Persons with acute infection (also known as katayama syndrome) may present with rash, fever, headache, myalgia, and respiratory symptoms. Clinical manifestations of chronic disease result from host immune responses to schistosome eggs. *S. mansoni* eggs most commonly lodge in the blood vessels of the liver or intestine and can cause diarrhea, constipation, and blood in the stool [7].

Laboratory methods used to diagnose intestinal parasitosis including *S. mansoni* are PCR, Kato-Katz technique, serological tests, Formal-ether concentration technique, and direct microscopic examination. In developing countries, microscopic identification of eggs in stool or urine is the most practical method for diagnosis [9].

Praziquantel is the recommended treatment against all forms of schistosomiasis. It is effective, safe and low-cost [5]. Community awareness and involvement are considered as one of the important tools for the success and sustainability of any disease control programme. Assessing knowledge, attitude and practice of individuals regarding schistosoma risk factors, transmission, intermediate host (snail) in the community have a great importance for identifying, designing and implementing effective community-based control interventions [10]. In Ethiopia, *Biomphalaria sudanica* (*B. sudanica*) and *Biomphalaria pfeifferi* (*B. pfeifferi*) are the main snail intermediate hosts for *S. mansoni*. *B. sudanica* is distributed in few water bodies in southern part of the country whereas *B. pfeifferi* has a wider geographical distribution in Ethiopia [11].

1.2. Statement of the problem

Intestinal Parasitic Infections (IPIs) constitute the greatest single worldwide cause of illness and disease. 3.5 billion Individuals have been infected with intestinal parasites; of these 450 million individuals developed diseases [12]. Globally, an estimated 438.9 million people were infected with *H. worm* in 2010, 819.0 million with *A. lumbricoides* and 464.6 million with *T. trichiura*. Of the 4.98 million years lived with disability (YLDs) attributable to STH, 65% were attributable to *H. worm*, 22% to *A. lumbricoides* and the remaining 13% to *T. trichiura* [13].

Schistosomiasis (also known as Bilharziasis) is the disease caused by a blood fluke (trematode) of the genus *Schistosoma* [14]. It is a major cause of morbidity and mortality for developing countries in Africa, South America, the Caribbean, the Middle East, and Asia [15]. Schistosomiasis is the second leading parasitic disease after malaria in terms of public health importance. Globally, 232 million people in 78 countries require annual treatment for schistosomiasis; of which 88% of the infections occur in sub-Saharan Africa. [16,17]. Approximately 280,000 people worldwide die of schistosomiasis-related complications every year. The disease largely affects poor rural communities with limited access to basic sanitation and clean water [17].

The schistosoma egg-laying in the tissues, mainly in the liver, leads to a granulomatous inflammatory process that changes the hepatic microenvironment (hypertension and periportal fibrosis). This may, in some patients, result in severe or hepatosplenic forms of the disease, which is potentially lethal because of the bleeding caused by disruption of the esophageal varices [18].

The economic and health effects of schistosomiasis are considerable and the disease disables more than it kills. In children, schistosomiasis can cause anaemia, stunting and a reduced ability to learn, although the effects are usually reversible with treatment. Chronic schistosomiasis may affect people's ability to work and in some cases can result in death [5]. According to a 2009 Zambia Bilharzia Control Program (ZBCP) report, approximately 15.4% (2 million) of people in Zambia have schistosomiasis [18].

Cases of intestinal parasitosis are highly abundant in Ethiopia. It is estimated that one third of Ethiopians are infected with *A. lumbricoides*, one quarter is infected with *T. trichiura* and one in eight lives with *H. worm*. As a result, Ethiopia has the second highest burden of ascariasis, the

third highest burden of hookworm, and the fourth highest burden of trichuriasis in Sub-Saharan Africa [19]. Inadequate knowledge, attitude/perception and improper practice in relation to intestinal parasitosis including intestinal schistosomiasis contribute to the high level of prevalence. Moreover, if people do not have adequate knowledge, attitude and practice regarding the disease it is difficult to control or to eradicate [20].

Studies conducted among different study groups in different localities of Ethiopia showed highest prevalence of intestinal parasites including *S.mansoni*. [11, 21, 22]. However, limited studies were done among individuals who have river water contact and whose residence is around the river in different parts of Ethiopia. Moreover, there is no documented study conducted yet in Addis Ababa about the prevalence of intestinal parasites including *S. mansoni* and KAPs of individuals towards intestinal parasitosis and intestinal schistosomiasis. Hence the aim of this study was to determine the prevalence of intestinal parasites and knowledge, attitude and practices (KAPs) among individuals who have river water contact with special emphasis on *S. mansoni* in Addis Ababa, Western Tigray, Ethiopia.

1.3. Significance of the study

Knowing prevalence of intestinal schistosomiasis and knowledge, attitude and practices (KAPs) of individuals is important for intervention and control programs. This study was planned to assess prevalence of intestinal parasites and KAPs of individuals with special emphasis to *S. mansoni* infection among peoples living in Addiremets. This study:

- Provides information on the prevalence of intestinal parasites and *S. mansoni* on the study sites.
- Also provides information on knowledge, attitude and practices of the individuals who have river water contact.
- Findings of this study could help local concerned bodies for appropriate intervention programs.
- Moreover, the information obtained from this study could help policy makers to develop prevention and control strategies.

2. Literature Review

Globally, an estimated 438.9 million people were infected with *H. worm* in 2010, 819.0 million with *A. lumbricoides* and 464.6 million with *T. trichiura*. Of the 4.98 million years lived with disability (YLDs) attributable to STH, 65% were attributable to *H. worm*, 22% to *A. lumbricoides* and the remaining 13% to *T. trichiura* [13].

From a study done by Dashes N, et al., in United Arab Emirates in 2009 on Prevalence of intestinal parasitic infections, the prevalence of protozoan parasites were 92.2%) in which prevalence of *Entamoeba histolytica* was 71.8% and prevalence of *Giardia lamblia* was 17.5%. The prevalence of helminths was 7.8%. Among the helminths, *Ancylostoma duodenale* and *Ascaris lumbricoides* were the common ones [23].

A study conducted in Yemen in 2012 by Sady H, et al., on knowledge, attitude, and practices towards schistosomiasis among rural population shows that the prevalence of *S. mansoni* was 8.0% [10]. In another study conducted in Tanzania in 2009 by Mazigo H, et al., on intestinal schistosomiasis: prevalence, knowledge, attitude and practices among school children; the prevalence of *S. mansoni* was 64.3%. In this study 92.4% of the respondents had heard about schistosomiasis, 49.8%, 68.0 % and 47.2% had knowledge concerning the transmission, signs and symptoms, and prevention, respectively and 77.1% considered schistosomiasis as harmful while 48.5% believed that schistosomiasis could be prevented [24].

In a study conduct in Nigeria by Dawaki S, et al., in 2013 on Knowledge, Attitude, and Practices regarding Schistosomiasis among Rural Communities in Kano State, 74.5% of the participants had prior knowledge about schistosomiasis with 67.0% of them how it is transmitted and 63.8% having no idea about the preventive measures and 34.7% of them seeking treatment from clinics/hospitals [25].

Another study conducted in Kano state, Nigeria in 2013 by Dawaki S, et al., on prevalence and risk factors of schistosomiasis the prevalence of *S. mansoni* was 8.9% [26]. Another study conducted in Nigeria In 2014 by Singh K, et al on Epidemiology of schistosomiasis in school aged children in some riverine areas of Sokoto. In this study the prevalence of *S. mansoni* was 2.92% (11 positive in 375 samples). According to this study prevalence of *S. mansoni* is higher in males than females. It was also prevalent in the age group of 9 to 12 years old [27].

A study conducted in Nigeria in 2015 by Gimba, U.N on epidemiological status of intestinal parasitic infection rates in children attending gwagwalada township clinic, fct-abuja, the overall prevalence of intestinal parasites were 28.0% in which the prevalence of *A. lumbricoides* was 42.9%, the prevalence of *E. histolytica* was 38.1%) while *S. Starcolaris* was 19.0%. The prevalence of intestinal parasites was higher in females than males [28].

According to a study conducted in Khartoum by Balola H, *et al* in 2011 on Assessment of knowledge and attitude regarding Schistosomiasis shows 57.1% of the population had poor knowledge about the symptoms of intestinal Schistosomiasis, 69.6% had poor knowledge about complications of intestinal Schistosomiasis [29]

According to a study conducted in 2008, by Mengistu M on prevalence of *S. mansoni* and other intestinal parasites among individuals living nearby three rivers of Jimma town and the risk factors involved showed that, of 517 individuals with age range of 9 months to 80 years old the prevalence of *S. mansoni* was 26.3%. In this study the prevalence of *S. mansoni* was higher in males than females and highly affected age group was 10-14 years old [30].

A study conducted by Dufera M, *et al.*, in Finchaa Sugar Estate, western Ethiopia in 2013 on *S. mansoni* infection shows that the prevalence of *S. mansoni* was 37.5% in which the prevalence is high in males and in the age group of 11-20 years old [6].

A cross sectional study was conducted in 2013 by Jejaw A, *et al.*, in Mizan-Aman town, southwest Ethiopia on high prevalence of *S. mansoni* and other intestinal parasites among elementary school children. In this study the prevalence of *S. mansoni* was 44.8% [22]. Another study conducted by Tulu B, *et al.*, in Bale Zone in 2013 on Prevalence and its associated risk factors of intestinal parasitic infections among Yadot primary school children of South Eastern Ethiopia. In this study the overall prevalence of intestinal parasites was 26.2%. Poly-parasitism was detected in 6.2% of the students. Students, who were infected with single, double, triple and quadruple parasites were 20%, 4.7%, 1.2% and 0.3% respectively. The prevalence of *S. mansoni* was 12.6%, the prevalence of *E. histolytica/dispar* was 5%, the prevalence of *A. lumbricoides* was 4.7%, and the prevalence of *H. nana* was 4.4% [31].

In the study conducted in Umolante district, South Ethiopia in 2014 by Alemu M, *et al.*, on Prevalence of intestinal schistosomiasis and soil transmitted helminthiasis among primary school

children shows that the prevalence of *S. mansoni* was 12.6% in which the overall prevalence was slightly higher among boys than girls [32].

A study conducted by Ayalew A, *et al.*, in North Gondar in 2010 on Prevalence and risk factors of intestinal parasites among Delgi school children, the overall prevalence of intestinal parasites were 79.8% . In this study the most prevalent intestinal parasites identified were *A. lumbricoides* (48%), *G. lamblia* (41.9%), *E. histolytica/dispar* (27.3%), *S. mansoni* (15.9%) and *H. worm* (11.5%). Of the total positive stool samples 13.6% were single infection and 66.2% were mixed infection [33].

Alebie G, *et al.*, conducts a study in Sanja area, Amhara region in 2013 on Epidemiological study on *S. mansoni* infection. In this study the prevalence of *S. mansoni* was 82.8%. The prevalence of *S. mansoni* was slightly higher among males than females but the difference was not statistically significant ($p > 0.05$) [34].

A study conducted in Mekelle city, Northern Ethiopia in 2010 by Asefa A, *et al.*, on infection prevalence of *S. mansoni* and associated risk factors shows that the prevalence of *S. mansoni* was 23.9 % . In this study the prevalence is higher in males and in the age group of 10 - 14 years [4]. Kidane E, *et al.*, conduct a study in Eastern Tigray in 2012 on Prevalence of intestinal parasitic infections and their associations with anthropometric measurements of school children in selected primary schools, Wukro Town. In this study the overall prevalence of intestinal parasitic infection was 60.7% in which multiple infections with two and above parasites were found in 7.5% of the positive stool samples. The prevalence of *E. histolytica*, *G. lamblia* and *I. beli* was 23.2%, 16.9% and 4.4%, respectively and the prevalence of *A. lumbricoides*, *H. worm*, *T. trichiura*, *S. mansoni*, *E. vermicularis*, *H. nana* and *Teania saginata*. Was 5.7%, 3.9%, 3.1%, 3.1%, 1.3%, 1% and 0.8%, respectively [1].

Another study conducted by Desta H, *et al.*, in Ethiopia in 2014 to determine the Current Status of *S. mansoni* Infection among School Children around Hizaty Wedicheber Microdam in Merebmieti showed that the overall prevalence of *S. mansoni* was 42.4%. In this study the prevalence and intensity of infection was higher in males and the highest prevalence was in the 10-14 year age group [21].

3. Objectives

3.1. General objective

- To determine the prevalence of intestinal parasites and knowledge, attitude and practices (KAPs) among individuals who have river water contact with special emphasis on *Schistosoma mansoni* in Addiremets, Western Tigray, Ethiopia.

3.2. Specific objectives

- To determine the prevalence of *S. mansoni* and other intestinal parasites.
- To assess knowledge, attitude and practices of individuals towards intestinal parasitosis with more emphasis to intestinal schistosomiasis.
- To assess the phenotypical distribution of snail species across the river.
- To assess exposure of people with river water.

4. Materials and methods

4.1. Study area

The study was conducted in Addiremets, the administrative center of Wolqayt which is located in western Tigray. Addiremets is located 1074.6 km far apart from Addis Ababa. It is found between 13°45'N latitude, 37°19' E longitude and Elevation 1,870 m (6,140 ft) meters above sea level. Based on the 2007 census conducted by the Central Statistical Agency of Ethiopia (CSA), wolqayt woreda has a total population of 138,926, of whom 70,504 are men and 68,422 women; 10,758 or 7.74% are urban inhabitants. Based on the 2007 Census conducted by the CSA, Addiremets has a total population of 5,203, of whom 2,446 are men and 2,757 women [35]. Mytsaeda river is found in Addiremets where the study was conducted.

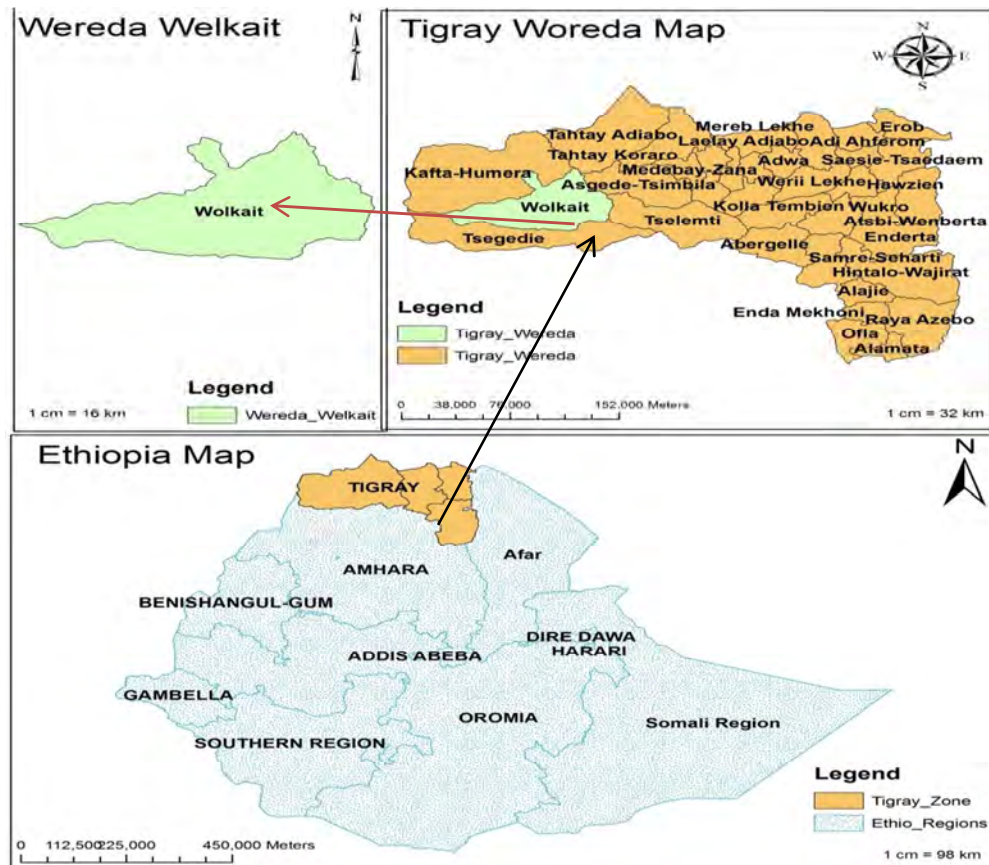


Figure 1. Map of the study area (Adindan zone 37 degree), Addiremets town, 2017.

4.2. Study design and period

A cross sectional study was conducted in Addiremets from February 2017 to April 2017.

4.3. Population

4.3.1. Source population

All individuals whose residence was Addiremets were taken as the source population.

4.3.2. Study population

All individuals who had contact with the river water at the study site.

4.3.3. Inclusion criteria

- Individuals whose residence was in Addiremets at least for six months.
- Individuals who had contacts with the river.

4.3.4. Exclusion criteria

- Individuals who took medication for *S. mansoni* and other intestinal parasites within the last three months.
- Patients who were not willing to participate in the study.

4.4. Study Variables

4.4.1. Dependent variables

- Prevalence of intestinal parasites
- Phenotypic distribution of snails

4.4.2. Independent variables

- Age
- Sex
- Religion
- Educational status
- Water contact
- KAPs and associated factors

4.5. Measurement and data collection

4.5.1. Sample size determination

The minimum number of study subjects was calculated by using single population proportion sample size determination technique [4].

$$n = Z^2_{\alpha/2} P (1- P)/ d^2$$

Where:

- “n” is minimum number of sample size,
- “Z” is standard value which is Z=1.96
- “d” is marginal error. At 95% confidence interval, marginal error is 5%(0.05)
- “P” is the prevalence value = 42.4%(0.42) according to a study conducted by Desta H, et al in Hizaty Wedicheber microdam in Merebmieti , Northern Ethiopia in 2014 [21].

$$N = \frac{1.96^2 \times 0.42(0.58)}{0.05^2}$$
$$N = 374$$

The sample size was 374. By considering 10% non-respondent rate add 37 and the final sample size was 411.

4.5.2. Sampling method

Systematic random sampling method was applied to select households from all households in the town. Based on the 2007 Census conducted by the CSA, this town has 1,432 households and the average family size was 3.51. So that 411 individuals were selected from (411/3.51) 118 households. The first house hold was selected randomly by lottery method and the remaining households was selected every 12th houses (1,432/118) “K” value was 12. If the 12th house was inconvenient, the household next to it was sampled. In each household, 4 individuals were selected conveniently. Then 4 individuals in the selected households were recruited to the study. If number of household members were less than 4, the remains were taken from the next household.

4.5.3. Data collection Procedure

Socio demographic data, associated risk factors and knowledge, attitude and practices (KAPs) of the study participants regarding to intestinal parastosis and intestinal shichtosomiasis were gathered by using pretested structured questionnaire. Each study participant was provided with dry, clean and labeled stool cup and was instructed to bring adequate amount of fresh stool. The first portion of the collected stool samples were prepared for direct microscopy and kato-katz technique. Then the remainind portion was preserved in sodium acetate acetic acid formalin (SAF) solution. The shells of the snail, intermediate hosts of *S. mansoni* were collected from the shores of the river where at the site of human-water contact by using forceps.

4.5.4. Laboratory analysis

Each collected stool samples were processed and examined using direct microscopy, formal-ether concentration and Kato-Kaz techniques.

A. Direct microscopic examination

Direct microscopy was performed at the site of collection (primary hospital) for possible detections of motile parasitic stages such as the larvae of *S. stercoralis*, trophozoites of *E. histolytica/dispar* and *G. lamblia*, and parallel to helminth eggs, cysts and oocysts of intestinal protozoa. Wet mount was prepared by taking approximately 5g of stool adding a drop of physiological saline on a sild [36].

B. Formal-ether concentration Technique

For formal-ether concentration technique, after emulsifying faeces in formol water the suspension was strained to remove large faecal particles. Thenafter, ether or ethyl acetate was added and the mixed suspension was centrifuged. After discarding the supernatant, the sediment was examined undermicroscope for Cysts, Oocysts, eggs and larvae of parasites [36].

C. Kato-Katz Technique

Kato- Katz technique was used to prepare stool smears on slides for microscopic examination of intestinal helments. In this technique 41.7 grams of stool was taken to determine intensity of the infection in terms of egg per gram of stool (epg) in each slide [36].

4.6. Quality control and Data Quality Assurance

The questionnaires were pretested using 5% of study participants whether the necessary information was properly filled. The amount of the stool and absence of contamination with urine was supervised by the principal investigator during sample collection. All the reagents used for laboratory analysis were checked by positive and negative control samples. Standard operating procedure (SOP) was strictly followed during the course of sample collection, preservation, transportation, processing, recording, examination of Kato thick smears, formal-ether concentration technique and wet mount technique.

4.7. Data analysis and interpretation

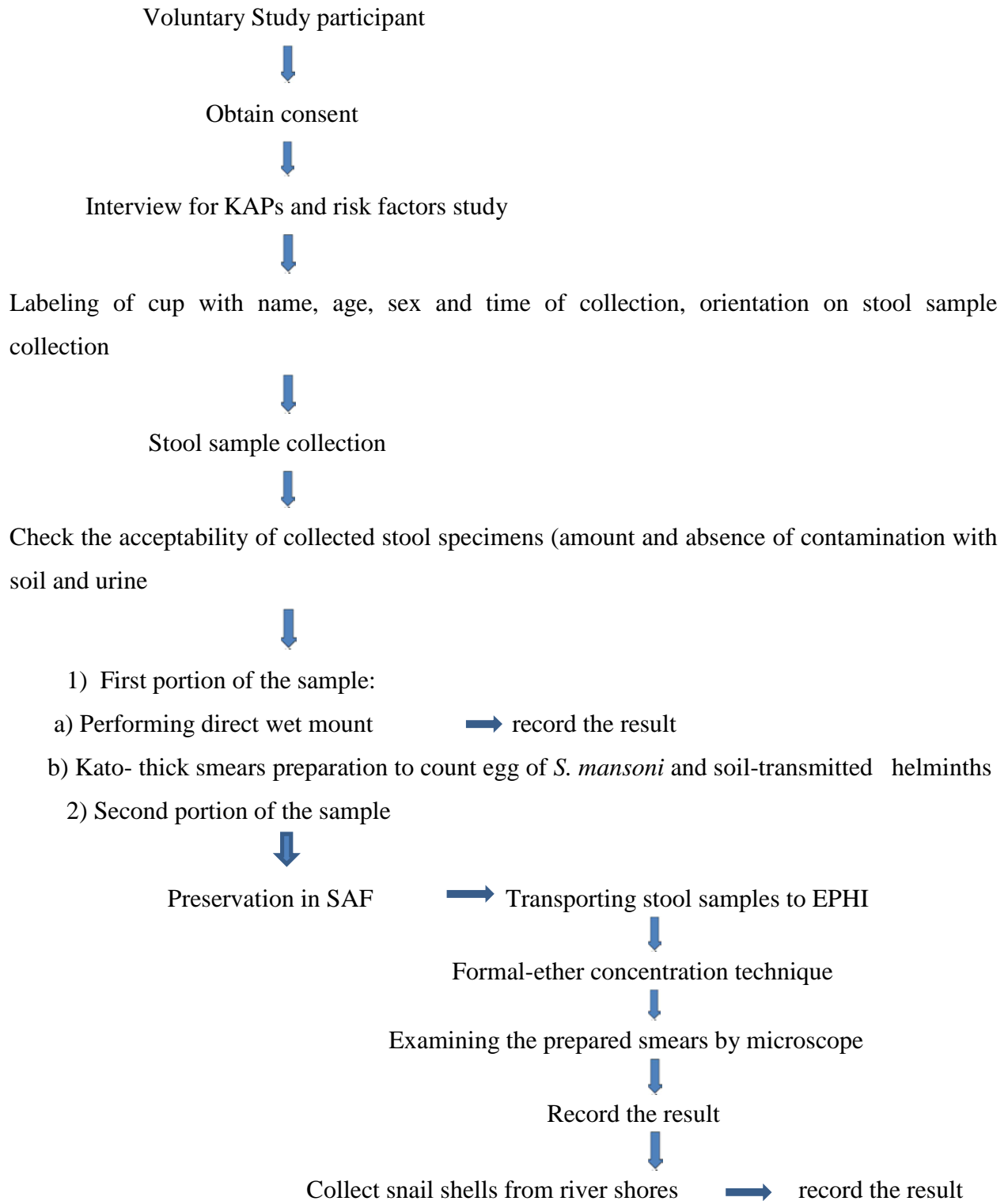
Data was entered, cleaned and analyzed using SPSS version 20 software. The descriptive statistics (mean \pm SD, median (or range), percentages or frequency) were calculated. The bi-variant logistic regression analysis was used to assess the relation between dependent variables and independent variables and those variables which showed association (p-value < 0.05) were analyzed using multiple logistic regressions. Finally, the results were presented in text, charts, graphs and tables.

4.8. Ethical considerations

Ethical clearance was obtained from Department of Research and Ethical Review Committee (DRERC) of Medical laboratory Science, School of Allied Health Science, College of Health Science, Addis Ababa University. Permission letter was obtained from local health bureau. The aim of the study, benefits and rights were explained to study participants/ relatives and informed consent was obtained. Stool samples were taken from those individuals who were volunteers and signed on consent form. Any information that was obtained during the study was kept confidential. Persons who were found positive for intestinal parasites including *S. mansoni* were treated accordingly.

5. Work flow

The study was conducted as follows:



6. Result

6.1. Socio-demographic findings

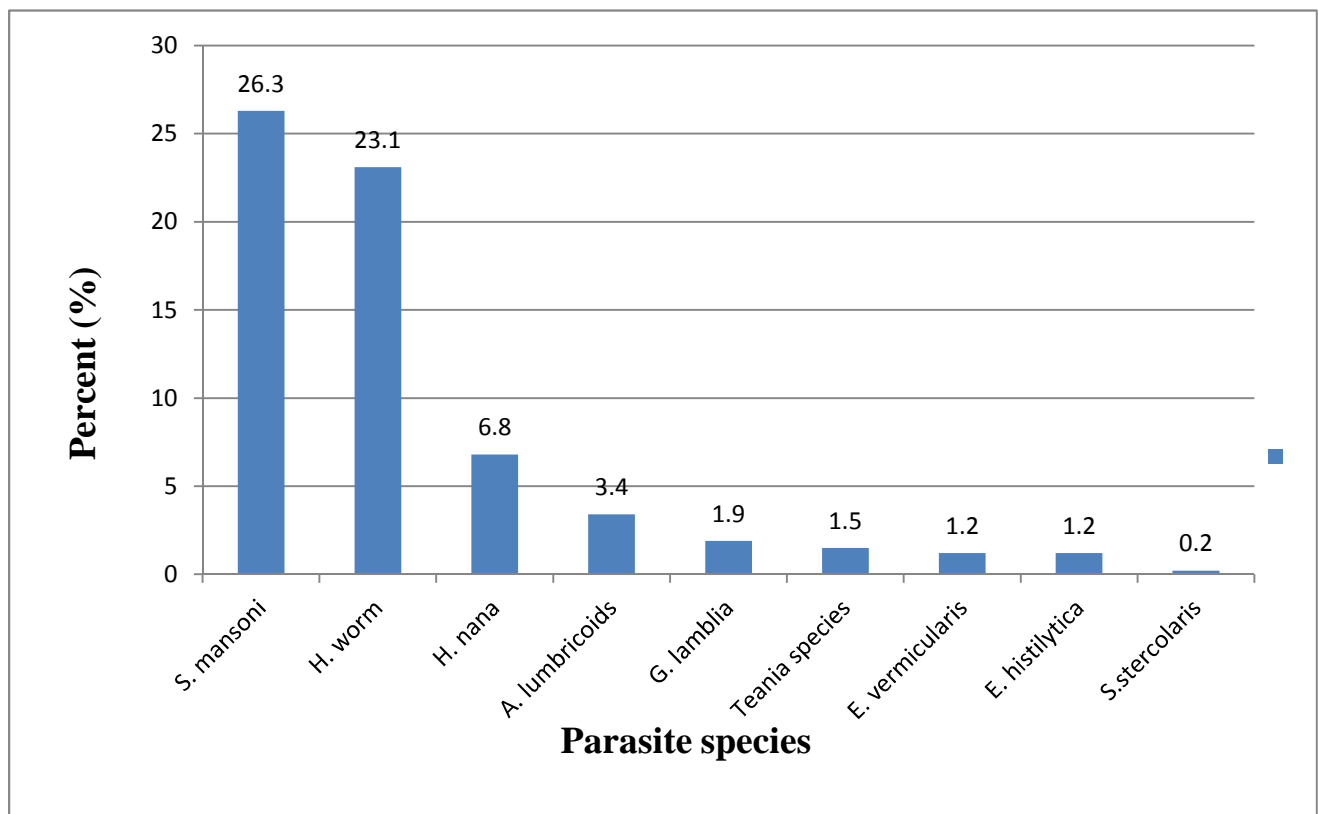
A total of 411 individuals with age range of 5 to 70 years (mean SD 21.72 ±11.15) were included in this study. Out of this, 58.9% (242/411) were males and 41.1% (169/411) were females. Majority 21.7% (89/411) of the study participants fall within the age category of 15-19 years followed by 19.2% (79/411) falling in the age group of 20-24 years. Of included study participants, 89.3% (367/411) of them were Orthodox Christian followers while the remaining 10.7% (44/411) were Muslims. Regarding their occupation, majority 64.7% (267/411) of the participants were students followed by 12.7% (52/411) house wife. Majority 41.1% (169/411) were grade 1-8 students (primary). (Table 1)

Table 1: Socio-demographic data of study participants, Addiremets town, 2017.

Socio-demography		No. of study participants	Percent
Sex	Male	242	58.9
	Female	169	41.1
Age group	5-9	51	12.4
	10-14	59	14.4
	15-19	89	21.7
	20-24	79	19.2
	25-29	43	10.5
	30-34	36	8.8
	35-39	22	5.4
	40-44	12	2.9
	45-49	10	2.4
	≥50	10	2.4
Religion	Orthodox	367	89.3
	Muslim	44	10.7
Occupation	Employed	25	6.1
	Student	267	64.7
	Farmer	42	10.4
	House wife	52	12.7
	Merchant	25	6.1
Education Status	Illiterate	70	17.0
	Primary	169	41.1
	Secondary	99	24.1
	Tertiary	22	5.4
	Collage	47	11.4
	University	4	1.0

6.2. Prevalence of intestinal parasites

The overall prevalence of intestinal parasites was 51.3% (211/411). A total of 20.4% (43/211) co-infections were found. From the total co-infections, co-infection of *S. mansoni* with other intestinal parasites was: *S. mansoni* and *H. worm* co-infection was 34.9% (15/43), *S. mansoni* and *H. nana* co-infection was 32.6% (14/43), *S. mansoni* and *A. lumbricoids* co-infection was 7% (3/43), *S. mansoni* and *Teania species* co-infection was 4.7% (2/43) (Figure 3). Nine species of intestinal parasites were identified and of them, *S. mansoni* was the most common intestinal parasite detected 26.3% (108/411). The over all prevalence of Soil-transmitted helminthes was 26.5% (109/411) in which *H. worm* accounts 23.1% (95/411) and *A. lumbricoid* accounts 3.4% (14/411). Prevalence of each intestinal parasite is demonstrated in Figure 2.



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Figure 2: Species distribution of intestinal parasites detected, Addiremet town, 2017

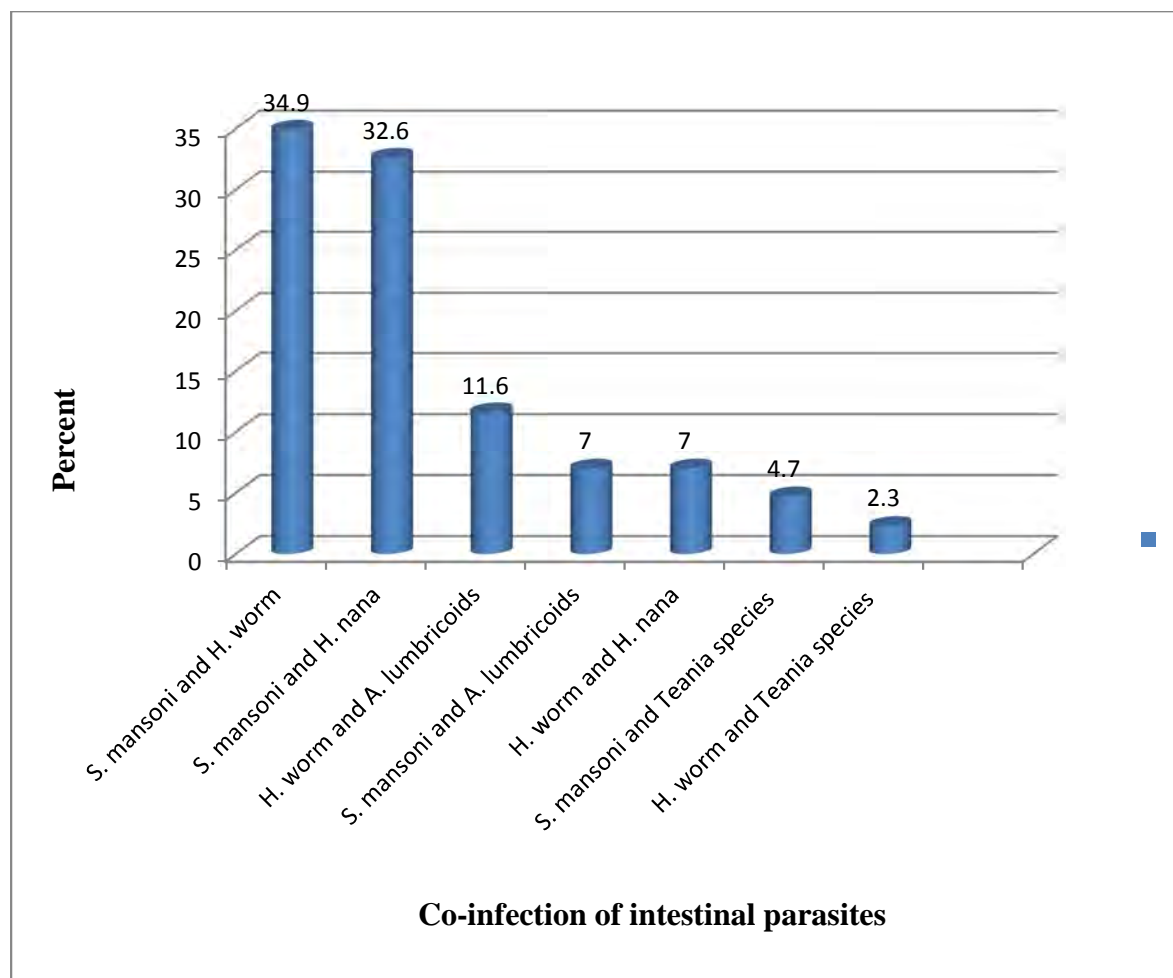


Figure 3: Co-infection of intestinal parasites, Addiremet town, 2017.

The overall intestinal parasite prevalence was slightly higher among males 54.1% (131/242) compared to females 47.3% (80/169). The highest proportion of intestinal parasites showed among the age group of 5-9 years old study subjects 70.6% (36/51) followed by the age groups 10-14 years with infection rates of 66.1% (39/59). Intestinal parasitic infection was significantly associated with age group of 5-9 years, 10-14 years and 15-19 years [(AOR10.302; 95% CI 1.482-71.621, P = 0.018), (AOR 8.370; 95% CI 1.227-57.113, P=0.030), (AOR 6.582; 95% CI 1.008-42.993, P=0.049)] respectively. However; gender, occupation and educational status didn't show stastically significant association. (Table 2)

Table 2: Distribution and association of intestinal parasites infection by socio demographic data, Addiremets town, 2017.

Socio-demographic		total	No(%) of positive for intestinal parasites	COR95% CI	p-value	AOR 95% CI	p-value
Sex	Male	242	131(54.1)	1.313(0.886-1.947)	0.175		
	female	169	80(47.3)	1	1		
Age group	5-9	51	36(70.6)	9.600(1.821-50.613)	0.008*	10.302(1.482-71.621)	0.018*
	10-14	59	39(66.1)	7.800(1.512-40.233)	0.014*	8.370(1.227-57.113)	0.030*
	15-19	89	54(60.7)	6.171(1.238-30.776)	0.026*	6.582(1.008-42.993)	0.049*
	20-24	79	41(51.9)	4.316(0.862-21.615)	0.075		
	25-29	43	15(34.9)	2.143(0.403-11.401)	0.372		
	30-34	36	15(41.7)	2.857(0.530-15.410)	0.222		
	35-39	22	3(13.6)	0.632(0.088-4.532)	0.648		
	40-44	12	2(16.7)	0.800(0.091-7.002)	0.840		
	45-49	10	4(40)	2.667(0.361-19.712)	0.337		
	>50	10	2(20)	1	1		
Occupation	Employed	25	7(28)	1.231(0.347-4.371)	0.747		
	Student	267	163(61)	4.963(1.919-12.836)	0.001*	1.421(0.392-5.157)	0.593
	Farmer	42	16(38.1)	1.705(0.554-5.250)	0.352		
	Housewife	52	19(36.5)	1.880(0.639-5.532)	0.252		
	merchant	25	6(24)	1	1		
Educational status	Illiterate	70	24(34.3)	0.522(0.069-3.938)	0.528		
	Primary	169	98(58)	1.380(0.190-10.033)	0.750		
	Secondary	99	51(51.5)	1.062(0.144-7.845)	0.953		
	Tertiary	22	11(50)	1.000(0.119-8.421)	1.000		
	Higher level	51	27(53)	1	1		

(Note: COR: crude odd ratio; CI: confidence interval; AOR: adjusted odd ratio)

6.2.1. Infection intensity of *S. mansoni*, *H. worm* and *A. lumbricois*

The intensity of each parasite infection was checked by counting the eggs and expressed in terms of egg per gram (epg). The mean egg per gram (epg) of *S. mansoni*, *H.worm* and *A. lumbricois* infection observed were 218 epg (Range: 24 to 1728), 563 epg (Range: 24 to 3360) and 5292epg (Range: 672 to 14,400), respectively. For *S.mansoni* from the 108 individuals who were positive; the egg count were performed for 72 study subjects because the remaining study subjects were positive either in direct microscopy or in fomal-ether concentration technique or in both but not in kato-katz technique. Therefore; from the 72 individuals 35(48.6%) had light infection, 25(34.7%) had moderate infection and 12(16.7%) had heavy infection. For *H. worm* from 95 postive for 87 were performed the reason was the same. Seventy seven (88.5%) had light infection, 9(10.3%) had moderate infection) and 1(1.2%) had heavy infection. For *A. lumbricois* 8(66.7%) had light infection and 4(33.3%) had moderate infection [32]. (Table 3)

Table 3: Infection intensity of *S. mansoni*, *H. worm* and *A. lumbricois*, addiremets town, 2017.

Socio-demography		Infection intensity								
		<i>S.mansoni</i> n (%)			<i>H.worm</i> n (%)			<i>A. lumbricois</i> n (%)		
		1-99	100-399	>399	1-1999	2000-3999	>3999	1-4999	5000-49,999	>49,999
Sex	Male	13(50.0)	10(38.5)	3(11.5)	22(28.6)	3(33)	1(100)	4(50)	2(50)	0
	Female	22(47.8)	15(32.6)	9(19.6)	55(71.4)	6(66.7)	0	4(50%)	2(50)	0
Age group	5-9	8(22.9)	7(28.0)	4(33.3)	3(3.9)	0	0	0	2(50)	0
	10-14	8(22.9)	9(36.0)	6(50.0)	2(2.6)	1(11.1)	0	0	1(25)	0
	15-19	11(31.4)	3(12.0)	2(16.7)	28(36.4)	3(33.3)	0	3(37.0)	1(25)	0
	20-24	6(17.1)	3(12.0)	0	23(29.9)	3(33.3)	0	1(12.5)	0	0
	25-29	1(2.9)	0	0	11(14.3)	0	0	0	0	0
	30-34	0	1(4.0)	0	8(10.4)	1(11.1)	0	1(12.5)	0	0
	35-39	0	0	0	1(1.3)	1(11.1)	0	1(12.5)	0	0
	40-44	1(2.9)	0	0	0	0	0	0	0	0
	45-49	0	1(4.0)	0	1(1.3)	0	1(100)	2(25.0)	0	0
	≥50	0	1(4.0)	0	0	0	0	0	0	0

6.2.2. Prevalence of *S.mansoni*

The prevalence of *S. mansoni* in this study was found to be 26.3% (108/411). Among 242 male and 169 female participants 27.7% (67/242) & 24.3% (41/169) were positive for *S. mansoni* respectively. The distribution of *S. mansoni* infection with age groups showed that age group of 10-14 years old (61%) and 5-9 age groups (54.9%) were highly affected with *S. mansoni* infection. With regard to occupation students were highly affected with *S.mansoni* with infection rate of 36.7%.(Table 4)

Table 4: Distribution of *S. mansoni* infection by socio demographic data, Addiremets town, 2017.

Socio-demography		Group total	No. of positive for <i>S. mansoni</i>	Percent
Sex	Male	242	67	27.7
	Female	169	41	24.3
Age group	5-9	51	28	54.9
	10-14	59	36	61
	15-19	89	22	24.7
	20-24	79	14	17.7
	25-29	43	1	2.3
	30-34	36	3	8.3
	35-39	22	0	0
	40-44	12	2	16.7
	45-49	10	1	10
	≥50	10	1	10
Occupation	Employed	25	1	4
	Student	267	98	36.7
	Farmer	42	4	9.5
	House wife	52	3	5.8
	Merchant	25	2	8
Education Status	Illiterate	70	4	5.7
	Primary	169	73	43.2
	Secondary	99	21	21.2
	Tertiary	22	2	9.1
	Higher level	51	8	15.7

Individuals who wear open shoe were more infected than who wear closed shoe (AOR 8.126; 95% CI 1.789-36.904, P = 0.007). Similarly, individuals who swim three or more times per week were more infected than who swims one times per week (AOR 2.506; 95% CI 1.096-5.730, P=0.029) On the other hand, individuals who stayed 1 hour in the river during swimming were more infected than who stayed ½ hour (AOR 2.001; 95% CI 1.012-3.956, P=0.046). (Table 5)

Table 5: Association of *S. mansoni* infection with risk factors and demographic factors of the study participants, Addiremets, 2017.

Risk factors		<i>S. mansoni</i>		COR (95.0% C.I.)	P-value	AOR (95.0% C.I.)	P-value
		negative	Positive				
Sex	male	175	67	0.837(0.533-1.313)	0.438		
	female	128	41	1	1		
Age group	5-9	23	28	10.957(1.291-92.970)	0.028*	4.434(0.260-75.535)	0.303
	10-14	23	36	14.087(1.672-118.682)	0.015*	5.640(0.332-95.860)	0.231
	15-19	67	22	2.955(.354-24.654)	0.317		
	20-24	65	14	1.938(.227-16.561)	0.545		
	25-29	42	1	0.214(0.012-3.756)	0.292		
	30-34	33	3	0.818(0.076-8.842)	0.869		
	35-39	22	0	0.000(.000)	0.998		
	40-44	10	2	1.800(.139-23.374)	0.653		
	45-49	9	1	1.000(.054-18.574)	1.000		
	≥50	9	1	1	1		

Continued...

Risk factors		<i>S. manson</i>		COR (95.0% C.I.)	P-value	AOR (95.0% C.I.)	P-value
		Negative	Positive				
Occupation	Employed	24	1	0.479(.041-5.652)	0.559		
	Student	169	98	6.669(1.539-28.893)	0.011*	1.478(0.161-13.584)	0.730
	Farmer	38	4	0.932(0.145-6.010)	0.941		
	House wife	49	3	0.719(0.112-4.603)	0.727		
	Merchant	23	2	1	1		
Swimming habit	yes	115	76	3.883(2.418-6.235)	0.00*	1.407(0.753-2.626)	0.284
	no	188	32				
Place of Bathing	Mytsaeda river	251	105	7.251(2.215-23.736)	0.01*	1.439(0.230-8.998)	0.697
	home	52	3	1	1		
Type of shoe	open	224	104	8.967(3.196-25.154)	0.001*	8.126(1.789-36.904)	0.007*
	closed	78	4	1	1		
Washing clothes in the river	yes	263	76	0.361(0.213-0.614)	0.00		
	no	40	32	1	1		
Frequency of swim per week	Three times	44	44	3.250(1.504-7.021)	0.003*	2.506(1.096-5.730)	0.029*
	Two times	32	20	2.031(0.864-4.775)	0.104		
	One times	39	12	1	1		
Duration of stay during swimming	1 hour	33	36	2.347(1.253-4.396)	0.008*	2.001(1.012-3.956)	0.046*
	2 hour	11	7	1.369(0.487-3.849)	0.551		
	½ hour	71	33	1	1		

(Note: COR: crude odd ratio; CI: confidence interval; AOR: adjusted odd ratio)

6.3. Knowledge, attitude and practice of study participants towards intestinal parasitosis and intestinal schistosomiasis.

6.3.1. Knowledge about intestinal parasites and intestinal schistosomiasis

From all study participants, 73.2% (301/411) study participants (older than 15 years) were interviewed for their knowledge, attitude and practices (KAPs) towards intestinal parasitosis and intestinal schistosomiasis. Of the 301, 94.4% (284/301) had good knowledge about the way of transmission, and prevention of intestinal parasitosis and intestinal schistosomiasis while the remaining 5.6% (17/301) had poor knowledge. (Table 6)

Table 6: Knowledge about intestinal parasitosis, schistosomiasis, symptoms, transmission and prevention among the study participants, Addis Ababa town, 2017.

n= 301

Knowledge variables	Yes n (%)	No n (%)	Total
Have you ever heard about intestinal parasites?	283(94)	18(6)	301
How did you know about intestinal parasites			
a. Radio	11(3.9)		
b. Health facility	123(43.4)		
c. Friends	82(29)		
d. School	67(23.7)		
Have you ever heard of schistosomiasis?	292(97)	9(3)	301
How is schistosoma transmitted?			
a. Swimming in infested river water	132(43.9)	169(56.1)	301
b. drinking dirty water	171(56.8)	130(43.2)	301
c. Playing in infested river water	43(14.3)	258(85.7)	301
d. snail	18(6)	283(94)	301
e. by flies	0	301(100)	301
f. eating contaminated raw food	35(11.6)	266(88.4)	301
g. Don't know	36(12)	265(88.0)	301
This is a question for those who answered snail for the transmission where does snail reside?			
a.in river	11(64.7)		
b.in soil	4(23.5)		
C.do not know	2(11.8)		
What are the main signs and symptoms of intestinal schistosomiasis?			
a. fever	61(20.3)	240(79.7)	301
b. headache	8(2.66)	293(97.3)	301
c. weakness	81(26.9)	220(73.1)	301
d. dry cough	1(0.3)	300(99.7)	301
e. abdominal pain / discomfort	155(51.5)	146(48.5)	301
f. diarrhea	102(33.9)	199(66.1)	301

Continued...

g. blood in stool	79(26.2)	222(73.8)	301
h.do not know	87(28.9)	214(71.1)	301
Is Schistosomiasis treatable?	293(97.3)	8(2.7)	301
Where do you prefer to seek treatment for Schistosomiasis?			
a. traditional healer	1(0.3)		
b. health facility	298(99)		
c. pharmacy (drug shop)	2(0.7)		
Is Schistosomiasis a preventable disease?	283(94)	18(6)	301
How do you prevent schistosomiasis?			
a. treatment with specific medicines	54(19.1)	229(80.9)	283
b. avoid bathing or swimming in stagnant water	128(45.2)	155(54.8)	283
c. use of toilets	64(22.6)	219(77.4)	283
d. provision of safe tap water	198(70)	85(30)	283
e. avoid defecating in lakes	13(4.6)	270(95.4)	283
f. personal hygiene	13(4.6)	270(95.4)	283
g. don't know	1(0.4)	282(99.6)	283
Overall Knowledge level			
Good knowledge	284(94.4)		
Poor knowledge	17(5.6)		
Total	301(100)		

6.3.2. Attitude

Of the 301, 96% (289/301) considered schistosomiasis as a serious disease. However; 31.9 % (96/301) of the respondents believed that playing on the soil can not be a cause for intestinal parasitosis. Majority of respondents 85.7% (258/301) believed that swimming/bathing in river water can cause Schistosomiasis. (Table 7)

Table 7: Attitude of study participants to wards intestinal parasitosis and intestinal schistosomiasis, Addis Ababa town, 2017.

n= 301

Attitude variable	Yes n (%)	No n (%)	Total
Do you think intestinal parasitosis is a serious disease?	283(94.0)	18(6.0)	301
Do you think to take a medication against intestinal parasitosis is important?	300(99.7)	1(0.3)	301
Do you think going to health facility is important when you feel abdominal discomfort?	301(100)	0	301
Do you think taking traditional medication is good to treat intestinal parasitosis?	27(9)	274(91)	301
Do you think playing in soil can cause intestinal parasitosis?	205(68.1)	96(31.9)	301
Do you think eating raw vegetables can cause intestinal parasitosis?	285(94.7)	16(5.3)	301
Do you think Schistosomiasis is a serious disease?	289(96)	12(4)	301
Do you think to take medication against Schistosomiasis is important?	300(99.7)	1(0.3)	301
Do you think swimming/bathing in river water can cause Schistosomiasis?	258(85.7)	43(14.3)	301
Do you think Schistosomiasis is treatable?	296(98.3)	5(1.7)	301
Overall Attitude level			
positive attitude	300(99.7)		
Negative attitude	1(0.3)		
Total	301(100)		

6.3.3. Practices

Regarding respondents practices 88.0% (265/301) of the respondents had practices of swimming or bathing in river water and 56.5% (170/301) defaecate around the river. And also, 92.7% (279/301) of respondents wash their clothes in river.

Table 8: practice of the study participants towards intestinal parasitosis and intestinal schistosomiasis, Addiremets town, 2017. n=301

Practice variable	Yes n (%)	No n (%)	Total
Do you eat raw meat/vegetable?	230(76.4)	71(23.6)	301
Do you wash your hand before meal?	301(100)	0	301
Do you go to health facility when you feel abdominal discomfort?	284(94.4)	17(5.6)	301
Do you take medications for intestinal parasitosis?	299(99.3)	2(0.7)	301
Do you wash your cloths in the river?	279(92.7)	22(7.3)	301
Do you swim/bathing in the river?	265(88.0)	36(12.0)	301
Do you defecate around the river?	170(56.5)	131(43.5)	301
Do you immediately dry your body after swimming?	9(3.0)	292(97.0)	301
Do you fetch river water for cooking/drinking?	29(9.6)	272(90.4)	301
Do you participate in mass drug treatment for intestinal parasitosis?	74(24.6)	227(75.4)	301
Overall practice level			
Good practice	193(64.1)		
Bad practice	108(35.9)		
Total	301(100)		

6.4. Malacological survey

Snails were surveyed in mytsaeda river water and were collected by handpicking with forceps and gloves. Morphologically, *Biomphalaria* types of snail shells were observed among different types of snail shells collected from the river. However, no live snail was found from the site during the study period, except shell. Identified molluscus were *Biomphalaria*, *Bulinus* and *Physa* species. (Figure 4).



Figure 4. Snails collected from Mytsaeda river, Addiremet town, 2017: Red pointers show *Biomphalaria* species types of morphology, black pointers show *Bulinus* species types of morphology and blue pointers show *Physa* species types of morphological characteristics upon observation. There were also other unnamed species observed.

Observations made on physical characteristics of the stream during snail survey showed that the water was highly turbid. In summer season it has high volume and speed but subsequently decreases its volume and speed and formed a stagnant pool. During the study period it was a stagnant pool (see figure 5a). In the surrounding dry place there was grass and the shell of the snails were there (see figure 5b). Eventhough it was a stagnant pool, people in the surrounding area were using the river for irrigation and to wash cloths as well as fetch water for other purposes (See figure 6).

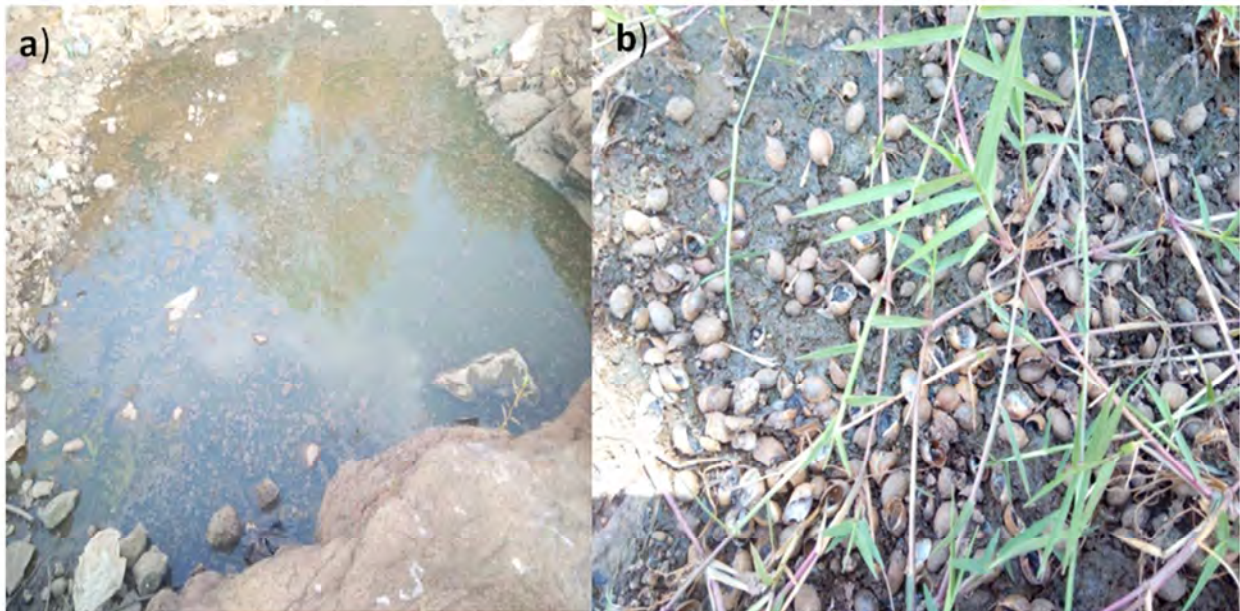


Figure 5. Snail habitat of Mytaeda river, Addiremets town, 2017.

a) Stagnant pool

b) Surrounding of the river



Figure 6. Activities of the residents (fetching water, taking water by pipe for irrigation), Addiremets town, 2017.

7. Discussion

The present study was aimed to assess the prevalence of intestinal parasites and knowledge, attitude and practices (KAPs) of individuals towards intestinal parasites especially *S. mansoni* in Addiremetse town. The overall prevalence of intestinal parasites was 51.3%. This was a comparable finding with some previous studies conducted in Ethiopia [37, 38]. The finding of this study was higher than reports from Nigeria and other part of Ethiopia (Bale zone), that revealed a prevalence of 26.2% and 28.0% respectively [28, 31]. This difference might be due to difference in age of the study participants and difference in sample size. However, it was a lower finding compared to other previous studies conducted in Tigray (wukro town), South west Ethiopia and Jimma town which showed an infection rate of 60.7%, 76.7% and 68.7% respectively [1, 22, 30]. The differences in findings among the studies can be explained by variations in geography, study subjects, socioeconomic and hygienic conditions of the population under consideration.

The most frequent intestinal parasite in the present study was *S. mansoni* 26.3% (108/411) that showed agreement with findings of a previous study conducted in Abaye Deneba [38]. In contrast, this result differs from other study findings conducted in Nigeria, Addis Abeba and Adigrat town where *A. lumbricoides* was the leading intestinal parasite [28, 39, 37]. This difference may be due to geographical variation and water contact activities of the study participants in our study.

In the present study the prevalence of intestinal parasites in male 131(54.1%) was slightly higher than females 80 (47.3 %). However, there was no statistical significant difference ($P>0.05$) in prevalence of intestinal parasites infections and gender. This finding agreed with the finding of a previous study conducted in Addis Ababa where the prevalence of intestinal infection was higher in male than female individuals but there was no statistical significant difference ($P>0.05$) in prevalence of intestinal parasites infections between gender [38]. To the contrary, the finding of this study disagreed with findings of previous studies conducted Uttarakhand hills (India), and Adigrat town, Ethiopia where the prevalence of intestinal parasitic infection was higher among females than males [36, 39]. This difference might be due to the fact that males are mostly participated in outdoor activities like irrigation activities, farming activities and high frequency of swimming/bathing in river water.

In this study, the highest proportion of parasites was reported among the age group of 5-9 years old subjects with prevalence rate of 70.6%. This indicated that younger children were more exposed than other age groups since they usually play on soil, swimming/bathing in river waters and eat food without washing hands. This showed agreement with previously conducted study in Addis Abeba [39] where, the higher prevalence of intestinal parasitic infection was seen in the age groups of 0-9 years. To the contrary, reports of other studies from Tigray (wukro town) showed that the prevalence of intestinal parasites was higher in the age group of 15-18 years old [1] and East gojam zone where the highest prevalence was in the age group of 10-14 years old [12]. This difference might be due to variations in family supervision, environmental conditions and personal hygiene.

In this study, the intensity of *H. worm* and *A. lumbricoides* infections were predominantly light. For *H. worm* 77 (88.5%) had light infection (1-1999), 9(10.3%) had moderate infection (2000-3999) and 1(1.2%) had heavy infection (>3999). This result showed disagreement with a study done in Kenya in which the intensity of the infection was light and there was no moderate and heavy infection [41]. The difference might be due to the difference in study subjects; the participants of the study in Kenya were preschool age children. For *A. lumbricoides*, 8(66.7%) had light infection (1-4999) and 4(33.3) had moderate infection (5000-49,999) and no heavy infection. This result differed from a study done from Kenya in which the intensity of infection were predominantly heavy [41].this difference could be due to difference in study subjects, microclimate, soil type.

The overall prevalence of *S. mansoni* in this study was 26.3% which showed similarity with the finding of a previous study conducted in Jimma (Ethiopia) in which the prevalence rate was 26.3%. Our result was a higher finding than the prevalence rates reported from Kano State (8.9%) [26], Sokoto, Nigeria (2.9%) [27], North Gondar (15.9%) [33], South Eastern Ethiopia (12.6%) [31] and Umolante district (12.6%) [32]. This difference might be due to difference in water contact activities of the study participants and ecological distribution snail. The result of the present study was lower than the previous studies conducted in North Western Tanzania, Finchaa Sugar Estate and Merebmieti which showed an infection rate of 64.3%, 37.5% and 42.2% respectively [6, 21,24]. The observed prevalence variation with previous studies from other localities might be due the difference in water contact, behavior of the study participants, environmental sanitation, ecological distribution of snails, local endemicity and sample size.

In the present study, the mean egg per gram (epg) of *S. mansoni* was 218 Epg. It was a higher finding than the result of a study conducted in Merebmeiti where the mean egg per gram was 86.7. This difference might be due to difference in treatment seeking behavior of the study participants [21].

Moreover, the finding of the current study showed that the prevalence of *S. mansoni* was slightly higher among male participants than that of female participants. However, there was no statistical significant difference ($P>0.05$) in prevalence of *S. mansoni* infections and gender. This result agreed with studies conducted from Nigeria and Ethiopia [27, 30, 21, 4]. The higher infection rate in males can be explained by the fact that males mostly participated in outdoor activities and stay most of the time outdoors, have high frequency swimming and take baths in cercaria-infected water body and more likely vulnerable to acquire infection.

In this study, the highest prevalence of *S. mansoni* infection was in the age group of 10-14 years (61%) followed by those with ages ranging from 5-9 years (54.9 %). This result agreed with the finding of a study conducted in Mekele [4]. This might be due to higher rate of water contact activities in the age groups of 10-14 and 5-9 years.

In the current study, 94.4% of study participants had good knowledge about the transmission, signs and symptoms, and prevention of intestinal parasitosis including intestinal schistosomiasis while the remaining 5.6% had poor knowledge. It was found that a majority of 292 (97 %) of the respondents had heard about schistosomiasis (locally known as Bilharzia). Moreover, the results further showed that 58.1% (175/301) of the respondents were able to mention at least one mode of transmission. This result differs from a result of a study conducted in Yemen in which 92.4 % of the respondents had heard about schistosomiasis and 49.8 % of the respondents were able to mention at least one mode of transmission [10]. This difference may be due to socio demographic variation of the study participants.

In this study, 96% of the study participants believed that Schistosomiasis is a serious disease. But in another study conducted in Yemen 77.1% of the respondents believed that Schistosomiasis is a serious disease. The difference might be due to difference in age of the study participants in which the study from Yemen was conducted in school children [10].

In the current study, 92.2% of the respondents had a practice of washing their cloths in the river. Moreover, 88% had a practice of swimming/bathing in the river.

A lower finding was reported from a study conducted in Yemen in which 74.3% of the study participants had a practice of washing clothes in river and 58.8% had a practice of swimming/bathing in in river [10]. This difference might be due to due to difference in availability of pipe water. In the site of current study there was no pipe water in individuals house hold.

8. Strength and limitation of the study

8.1. Strength

- Three methods were used for increasing the chance of identifying diagnosis of intestinal parasites.
- Snail species distribution was assessed.
- KAPs of the study participants were assessed.
- Intensity of infection (parasite load) was measured.

8.2. Limitation

- Modified ziehl-Neelsen (Zn) technique was not done for cryptosporidium.

9. Conclusion

In conclusion, high prevalence of intestinal parasitic infection was observed in Addiremets town. The most common parasites in the town were *S. mansoni* and *H. worm*. Age group of <20 years had significant association with intestinal parasitic infection ($P < 0.05$). Majority of the study participants had light infection intensity of Schistosomiasis, Ascariasis and hook worm infection.

Majority of the participants in the study area had good knowledge and positive attitude about intestinal parasitosis and intestinal schistosomiasis. In general, majority of the participants had good practices but they had also risky practices like bathing/ swimming and washing clothes in the contaminated river water and defecating around the river.

In the study site, shells of *Biomphalaria* species, *Bulinus* species and *Physa* species were collected from the river.

10. Recommendations

Based on the finding of the study, the following points were recommended. There is a need of:-

- Treating rivers with available molluscicides.
- Health education about the way of transmission and prevention methods of intestinal parasitosis and intestinal schistosomiasis.
- Creating awareness in the community towards latrine construction to reduce open field defecation.
- Periodic deworming including adults in the community and establishment of good personal hygiene and environmental sanitation.
- Further studies addressing some factors not addressed by this study.

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Annex

Annex I: Participant Information sheet (English, Amharic and Tigrigna version)

Hello my name is _____ . You are being asked to take part in research study on assessing the prevalence of intestinal parasitosis and Knowledge, attitude and practices (KAPs) among individuals who have river water contact with special emphasis on *Schistosoma mansoni*. The study has been approved by Addis Ababa University Medical Laboratory Science department research ethics committee. The study finding will give information about how many individuals have *Schistosoma mansoni* infection and other intestinal parasites; and the KAP regarding to Schistosomiasis who have river water contact and helps for intervention and control programs.

In this study, you will be asked to give 5 gm of stool sample, which will be used to determine the prevalence of *S. mansoni* and other intestinal parasites and I will also ask u some questions to know the KAP of individuals regarding to intestinal parasitosis including schistosomiasis. The sample collection procedures take about 25 minutes and the interview takes about 15 minutes total 40 minutes. You are selected to participate in this study because of your being voluntary to give stool sample and to answer the questions so, the tests for the stool sample you give will be performed free and if you have *S. mansoni* or other intestinal parasites you will get a medication free. I would like to assure you that all of the results and the answers you give will be kept confidential and for the study purpose only. You have full right to stop being participant of the research study at any time without explanation. Also you have right to have question about the study to be answered. I will be glad to answer your questions about this study at any time.

You may contact me at e-mail address alganesh5838@gmail.com or mobile +251 910115838

Department of Medical Laboratory Science research ethics office +251 11 275 5170

Participant information sheet (Amharic version)

ለተሳታፊዎች ስለ ጥናቱ መረጃ የሚሰጥ ቅጽ

ሰላም ስሜ----- ::የዚህ ጥናት ዓላማ ከወንዝ ጋር ንክኪ ካላቸው ሰዎች ምንም ዓይነት ጥያቄ አንጀትን የሚያጠቃ ብልሃርዝያ እና ሌሎች አንጀትን የሚያጠቁ ትላትሎች ያላቸው ፤ እንዲሁም ስለ አንጀትን የሚያጠቁ ትላትሎች በሽታ ያላቸው እውቀት፣ አመለካከት እና ልምድ ለማወቅ ነው። እርስዎ በዚህ የምርምር ሥራ ላይ እንዲሳተፉ በአክብሮት ተጋብዘዋል። ይህ የምርምር ሥራ ከአዲስ አበባ ዩኒቨርሲቲ የላቦራቶሪ ሳይንስ ትምህርት ቤት የምርምር ሥራ ሥነ-ምግባር ኮሚቴ ፈቃድ ያገኘ ሲሆን ከጥናቱ የሚገኘው ውጤት ምን ያህል ሰው ነው አንጀት የሚያጠቃ ብልሃርዝያ እና ሌሎች አንጀት የሚያጠቁ ትላትሎች ፤ እንዲሁም ስለ ብልሃርዝያ እና ሌሎች አንጀትን የሚያጠቁ ትላትሎች ያላቸውን እውቀት፣ አመለካከት እና ልምድ ለማወቅ ይጠቅማል። ይህም በሽታውን ለማጥፋት እና ለመቆጣጠር ይጠቅማል።

በዚህ የጥናት ሥራ ለመሳተፍ ፈቃደኛ ከሆኑ 5 ግራም(አንድ የሻይ ማንኪያ የሚሆን) የሰገራ ናሙና ይሰጣሉ። ይህ የሰገራ ናሙና አንጀትን የሚያጠቃ ብልሃርዝያ እና ሌሎች አንጀትን የሚያጠቁ ትላትሎች መጠን ለማወቅ ይጠቅማል። የተወሰኑ ጥያቄ ስለ ብልሃርዝያ እና ሌሎች አንጀትን የሚያጠቁ ትላትሎች ያላቸውን እውቀት፣ አመለካከት እና ልምድ ለማወቅ እጠይቅዎታለሁ ። የሰገራ ናሙና ለመውሰድ 25 ደቂቃ እና ለጥያቄ 15 ደቂቃ በድምር 40 ደቂቃ ያህል ይወስዳል። በዚህ ምርምር እንዲሳተፉ የተመረጡት የሰገራ ናሙና ለመስጠት እና ጥያቄዎቹን ለመመለስ ፍቃደኛ በመሆንዎ ሲሆን በዚህ ጥናት በመሳተፍዎ በሰጡት ናሙና ላይ የሚደረጉ ምርመራዎች በነፃ ይሰራልዎታል እና አንጀትን የሚያጠቃ ብልሃርዝያ ወይም ሌሎች አንጀትን የሚያጠቁ ትላትሎች ከተገኙበዎት መድሃኒት በነፃ ያገኛሉ። የምርመራ ውጤቶቹ እና የሰጡት መልስ ሙሉ በሙሉ ሚስጥራዊነቱ የተጠበቀ እንደሚሆን ለጥናቱ ዓላማ ብቻ እንደሚውል ላረጋግጥልዎ እወዳለሁ። በጥናቱ ላይ ያለምንም ማብራርያ ላለመሳተፍም ሆነ በመሀል ለማቋረጥ ሙሉ ሙብት አለዎት።

በዚህ ጥናት ላይ ያለዎትን ጥያቄ በማንኛውም ሰዓት ሊጠይቁና ምላሽ ሊያገኙ ይችላሉ።

በሚቀጥለው አድራሻ ሊያገኙን ይችላሉ
ስልክ:- 0910115838
Email:- alghanesh5838@gmail.com

ህክምና ላቦራቶሪ ትምህርት ክፍል የምርምር ሥነ ምግባር ቢሮ ስልክ ቁጥር +251 11 275 5170

Participant information sheet (Tigrigna version)

ስለ እቲ መፅናዕቲ ሓበሬታ ዝህብ ቅጥዒ

ስለም ሸመይ _____ ::ናይዚ ፅንዓት ዓላማ ምስ ወራዲ ሩባ ርክብ ካብዘለዎም ሰባት ከንደይ እዮም ንመዓንጣ ዘጥቅቦ ብልሃርዝያን ካልኣት ንመዓንጣ ዘጥቅቡ ሓሳኩን ዘለዎም፤ ብተወሳኺ ስለ ብልሃርዝያን ካልኣት ንመዓንጣ ዘጥቅቡ ሓሳኩን ዘለዎም ፍልጠት ፣ ኣመለኻኽቲን ልምዲን ንምፍላጥ እዩ። ንሶም/ሰን ኣብዚ ናይ ፅንዓት ስራሕ ንክሳተፉ ብክብሪ ተጋቢዞም ኣለዉ። እዚ ናይ ፅንዓት ስራሕ እዙይ ካብ ኣዲስ ኣበባ ዩኒቨርሲቲ ናይ ላቦራቶሪ ትምህርትቤት ናይ መጽናዕቲ ስራሕ ስነ-ምግባር ኮሚቴ ፍቓድ ዝረከበ እንትኸውን ካብዚ መጽናዕቲ እዙይ ዝርከብ ውጺኢት ንመዓንጣ ዘጥቅቦ ብልሃርዝያን ካልኣት ንመዓንጣ ዘጥቅቡ ሓሳኩን ዘለዎም፤ ብተወሳኺ ስለ ብልሃርዝያን ካልኣት ንመዓንጣ ዘጥቅቡ ሓሳኩን ዘለዎም ፍልጠት ፣ ኣመለኻኽቲን ልምዲን ምፍላጥ ይጠቅም። እዙይ ውን እቲ ሕግም ንምጥፋእን ከምኡውን ንምቁጽጻርን ይጠቅም።

ኣብዚ ናይ መጽናዕቲ ስራሕ ንምስታፍ ፍቓደኛ እንተኾይናም 5 ግራም(ሓደ ናይ ሻሂ ማንካ ዝኸውን) ናይ ፍታን ናሙና ክህቡ/ባ እዮም/የን። እዚ ናይ ፍታን ናሙና ንመዓንጣ ዘጥቅቦ ብልሃርዝያን ካልኣት ንመዓንጣ ዘጥቅቡ ሓሳኩን መጠን ንምፍላጥ ይጠቅም። ከምኡ ውን ዝተወሰኑ ሕቶታት ስለ-ብልሃርዝያን ካልኣት ንመዓንጣ ዘጥቅቡ ሓሳኩን ዘለዎም ፍልጠት ፣ኣመለኻኽቲን ልምዲን ንምፍላጥ ክሓቶም/ተን እዩ። ናይ ፍታን ናሙና ንምውሳድ 25 ደቂቓ ከምኡውን ንሕቶ መመለሲ ዝኸውን ግዜ 15 ደቂቓ ብጠቅላላ 40 ደቂቓ ዝኸውን ግዜ ይወስድ። ኣብዚ መጽናዕቲ እዚ ንክሳተፉ/ፋ ዝተመረጹ/ጸ ናይ ፍታን ናሙና ንምሃብን ሕቶታት ንምምላስን ፍቓደኛ ስለ ዝኮኑ/ና እንትኸውን ኣብዚ መጽናዕቲ ብምስታፎም/ፈን ኣብቲ ዝሃብዎ/ኦ ናሙና ዝግበር ምርመራታት ብነጻ ክስረሐሎም/ለን እዩ። ከምኡውን ንመዓንጣ ዘጥቅቦ ብልሃርዝያ ወይከዓ ካልኣት ንመዓንጣ ዘጥቅቡ ሓሳኩ እንተተረኪብዎም/ወን መድሓኒት ብነጻ ክወሃቦም/በን እዩ። እቲ ናይ ምርመራ ውጺኢትን ዝሃብዎ/ኦ መልስን ሙሉእ ብምሉእ ሚስጢሩ ዝተሓለወ ከም ዝኸውንን ነቲ መጽናዕቲ ዓላማ ጥራሕ ከምዝውዕልን ክረጋግጻልኩም/ክን ይፈቱ። ካብዚ መጽናዕቲ እዚ ብዘይ ምንም ሙብራህርሂ ዘይምስታፍ ወይከዓ ኣብ ማእከል ናይ ምቁራጽ መሰል ኣለዎም/ወን። ኣብዚ መጽናዕቲ እዙይ ዘለዎም/ወን ሕቶ ኣብ ዝኮነ ሰዓትን ግዜን ክሓቱን/ታን መልሲ ክረክቡን/ባን ይክእሉ/ላ እዮም/የን።

ብዝቅፅል ኣድራሻ ክረክቡ/ና/ባና ይክእሉ/ላ

ስልኪ:- 0910115838

Email:- alghanesh5838@gmail.com

ህክምና ላቦራቶሪ ትምህርቲ ክፍሊ ናይ ምርምር ሥነ ምግባር ቢሮ ስልኪ ቁፅሪ +251 11 275 5170

Annex II: Informed consent form (English, Amharic and Tigrigna version)

I undersigned to confirm that, as I give consent to participate after clear explanation of the objective and purpose of the study to me in the language I understand and a clear understanding of the objectives and purpose of the study & with recognition of my right to withdraw from the study if I change my mind. The questions I raise about the study have been answered satisfactory.

I _____ do interestingly give consent to Mrs. _____ to give the stool sample and to answer the questions.

Name of Participant: _____

Participant's signature: _____

Name of data collector: _____

Signature of data collector: _____

Date: _____

Informed consent form (Amharic version)

ተሳታፊው በጥናቱ ለመሳተፍ ሙሉ ፈቃደኛ መሆኑን የሚገልጽበት ቅጽ

የተሳታፊው ስም _____

ስለጥናቱ አስፈላጊ የሆኑትን መረጃዎች አንብቤ ወይም ተነባኝ እናም የጥናቱ ዐላማ እና አስፈላጊነት ተረድቻለሁ። በማንኛውም ሰዓት ከጥናቱ የመውጣት መብት እንዳለኝ ተነግሮኛል። ከጥናቱ ጋር የተያያዙ ጥያቄዎችንም ጠይቄ ማብራሪያዎች ተሰጥተዋል። እናም ፍቃደኛ መሆኔ ከታች በመፈረም አረጋግጣለሁ።

እኔ _____ የተባልኩ የተጠየቁትን ጥያቄ መልስ እና የሰገራ ናሙና

ለ _____ ለመስጠት ፈቃደኝነቴን ገልጫለሁ።

የተሳታፊው ፊርማ _____

ቀን _____

የተመራማሪው ፊርማ _____ ቀን _____

Informed consent form (Tigrigna version)

ተሳታፊዬ ኣብቲ ፅንዓት ንምስታፍ ፍቓደኛ ምዃኑ ዝገልፀሉ ቐጥዒ

ናይ ተሳታፊ ሽም _____

ሰለ እቲ ፅንዓት ኣድላይቲ ዝኾኑ ሓበሬታታት ኣንቢቦ ወይ ከዓ ተነቢቡለይ ናይቲ ፅንዓት ዓላማን ኣድላይነትን ተረዲኦ ኣለኹ። ኣብ ዝኾነ ሰዓት ካብቲ ፅንዓት ናይ ምውፃእ መሰል ከምዘለኒ ተነገሩኒ እዩ። ምስቲ ፅንዓት ሕቶታት ሓቲተ እኹል ዝኾነ መብራህርሂ ተዋሂቡኒ እዩ። ስለዚ ፍቓደኛ ምዃኒይ ኣብ ታሕቲ ብምፍራም የረጋግፅ።

ኣነ _____ ዝተብሃልኩ ንዝተሓተትኩዎ ሕቶ መልስን ናይ ሰገራ ናሙናን ን _____ ንምሃብ ፍቓደኛ ምዃኒይ ገሊፀ ኣለኹ።

ናይ ተሳታፊ ፊርማ _____

ዕለት _____

ናይ መፅናዓይ ፊርማ _____

ዕለት _____

Annex III: Questioner (English, Amharic and Tigrigna version)

ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCE SCHOOL OF ALLIED HEALTH SCIENCE DEPARTEMENT OF MEDICAL LABORATORY SCIENCE

Purpose of research: To determine the prevalence of Intestinal parasitosis and Knowledge, Attitude, practice in individuals who have river water contact with special emphasis on *S. mansoni* Addiremetse, North-western Ethiopia.

Part one: socio-demographic characteristic

Questioner number _____

Sex: 1. Male 2. Female

Age in years: _____

Religion: 1. Orthodox 2. Muslim 3. Protestant 4. Others specify _____

Occupation: 1. Employed 2. Unemployed 3. Student 4. Farmer
5. House wife 6. Merchant 7. Others Specify _____

Education Status: 1. Illiterate 2. Primary (grade1-8) 3. Secondary (grade9-10)
4. Tertiary (grade11-12) 5. Higher level 6. Read and write only

Duration of stay in Addiremetse _____

Residence before coming to Addiremetse _____

Part two: Water contact Activities

1. Do you have latrine? a. Yes b. No

2. If yes to No 1, do the whole families use it?

a. Yes b. No

3. If no to No 1 question, where do you defecate and dispose the fascas?

a. Near the river b. Away from the river

c. Using pits and dispose to the river

4. Do you bring water for cooking and drinking from Mytsaeda River?

a. Yes b. No

5. If yes to question No 4, how many times a day do you fetch water for household? -----

6. Do you swim in Mytsaeda River? a. Yes b. No

7. How many times per week do you swim in the river?
 a. Three times a week b. two times a week c. one times a week
8. How long (period of time) you swim the river?hours
9. In what time do you swim?
 a. 1:30-3:30 b. 3:30-5:30 c. 5:30-7:30 d. 7:30-9:30 e. 9:30-11:30
10. Do you dry your skin immediately after swimming by towel?
 a. yes b. No
11. Do you have contact to Mytsaeda River while you are crossing it?
 a. Yes b. No
12. Do you wash cloths in Mytsaeda River? a. Yes b. No
13. Where do you bath? a. Mytsaeda River b. home c. public bathroom
14. If the answer to question 13 is “b” from where do you obtain the water?
 a. Mytsaeda River b. Pipe
 c. Spring protected d. Well protected
15. Do you wear shoes? a. Yes b. No
16. If the answer to question 15 is “b” what type of shoe do you wear?
 a. Open shoe b. closed shoe c. butts

Part three: Knowledge, Attitude, Practice

A. Questions designed to assess respondents' knowledge about intestinal parasitosis and intestinal schistosomiasis.

1. Have you ever heard about intestinal parasites? a. Yes b. No

2. How did you know about intestinal parasites?
a. Radio c. Friends
b. Health facility d. others (specify)

3. If yes to question No1, can you mention some of the intestinal parasites?

4. Have you ever heard of schistosomiasis? a. yes b. no

5. How is schistosoma transmitted?
a. Swimming in infested river water b. drinking dirty water
c. Playing in infested river water d. snail
e. by flies f. eating contaminated raw food
g. Don't know

6. This is a question for those who answered "d" for Q.5 where does snail reside?
a. River b. Soil
c. Do not know

7. What are the main signs and symptoms of intestinal schistosomiasis? (More than one response is Possible)
a. Fever b. Headache
c. Weakness d. Dry cough
e. Abdominal pain / discomfort f. Diarrhea
g. Blood in stool g. don't know h. Others (specify)

8. Is Schistosomiasis treatable? a. Yes b. No

9. Where do you prefer to seek treatment for Schistosomiasis?

- a. Traditional healer
- b. Health facility
- c. Pharmacy (drug shop)
- d. Others (specify)

10. Is Schistosomiasis a preventable disease? a. Yes b. No

11. If yes to Q. 10, how do you prevent schistosomiasis?

- a. Treatment with specific medicines
- b. Avoid bathing or swimming in stagnant water
- c. Use of toilets
- d. Provision of safe tap water
- e. Avoid defecating in lakes
- f. others (specify)
- g. Personal hygiene
- h. Don't know

B. Questions designed to assess respondents' attitude towards intestinal parasitosis and intestinal schistosomiasis.

1. Do you think intestinal parasitosis is a serious disease? a. Yes b. No

2. Do you think to take a medication against intestinal parasitosis is important?

- a. Yes
- b. No

3. Do you think going to health facility is important when you feel abdominal discomfort?

- a. Yes
- b. No

4. Do you think taking traditional medication is good to treat intestinal parasitosis?

- a. Yes
- b. No

5. Do you think playing in soil can cause intestinal parasitosis?

- a. Yes
- b. No

6. Do you think eating raw vegetables can cause intestinal parasitosis?

- a. Yes
- b. No

7. Do you think Schistosomiasis is a serious disease?

- a. Yes
- b. No

ክፍል ሦስት፡ እውቀት፤ አመለካከት፤ ልምድ

ሀ. የጥናቱ ተሳታፊዎች ስለ ብልህርዝያ እና ሌሎች አንጀት የሚጠቁ ትላትሎች በሽታ ያላቸውን እውቀት ለመገምገም የተዘጋጀ መጠይቅ

1. አንጀትን ስለ የሚያጠቁ ትላትሎች ሰምተው ያውቃሉ? ሀ. አዎ ለ. አላቅም

2. አንጀትን ስለ የሚያጠቁ ትላትሎች እንዴት ነው ያወቁት?

- | | |
|---------|---------------|
| ሀ. ፊደሎች | ለ. ከጤና ተቋም |
| ሐ. ከጓደኛ | መ. ሌላ ካለ ይግለጹ |

3. ለጥያቄ ቁጥር 1 መልስዎ አዎ ከሆነ, የተወሰኑትን አንጀትን የሚያጠቁ ትላትሎች መጠቀስ የችላሉ?

4. አንጀትን ስለ የሚያጠቁ ብልህርዝያ ሰምተው ያውቃሉ? ሀ. አዎ ለ. አላቅም

5. ብልህርዝያ እንዴት ነው የሚተላለፈው?

- | | |
|---------------------------|-------------------|
| ሀ. በተበከለ ወንዝ ውሃ ውስጥ በመዋኘት | ለ. የተበከለ ውሃ በመጠጣት |
| ሐ. በተበከለ ወንዝ ውስጥ በመጫወት | መ. በቀንድ አውጣ |
| ሰ. በትንኝ | ረ. በተበከለ ምግብ |

6. ይህ ጥያቄ ለጥያቄ ቁጥር 5. መልስዎ 'መ' ከሆነ ቀንድ አውጣ የት ነው የሚኖረው?

- | | | |
|------------|------------|----------|
| ሀ. ወንዝ ውስጥ | ለ. አፈር ውስጥ | ሐ. አላውቅም |
|------------|------------|----------|

7. አንጀት የሚጠቃ የብልህርዝያ በሽታ ዋና ዋና ምልክቶቹ ምንድን ናቸው? (ከአንድ በላይ መልስ መመለስ ይቻላል)

- | | | |
|--------------------|-----------|---------------|
| ሀ. ትኩሳት | ለ. ራስ ምታት | |
| ሐ. ድካም | መ. ደረቅ ሳል | |
| ሰ. የሆድ ህመም | ረ. ተቅማጥ | |
| ሸ. በሰገራ ውስጥ ደም መኖር | ቀ. አላውቅም | በ. ሌላ ካለ ይግለጹ |

8. የብልህርዝያ በሽታ ሊታከም ይችላል?

- | | |
|-------|-----------|
| ሀ. አዎ | ለ. አይታከምም |
|-------|-----------|

9. የብልሃርዝያ በሽታ መድሀኒት ከየት ቢያገኙ ነው የሚመርጡት?

ሀ. ከባህላዊ ህክምና

ለ. ከጤና ተቋም

ሐ. ከመድሀኒት መደብር

መ. ሌላ ካለ ይግለጹ

10. የብልሃርዝያ በሽታ መከላከል ይቻላል?

ሀ. አዎ

ለ. አይቻልም

11. ለጥያቄ ቁጥር 10. መልስዎ አዎ ከሆነ የብልሃርዝያ በሽታ እንዴት ነው የሚከላከሉት?

ሀ. መድሀኒት በመውሰድ

ለ. በተበከለ የወንዝ ውሀ ውስጥ አለመታጠብ/አለመዋኘት

ሐ. መጻጃ ቤት መጠቀም

መ. ንፁ የቧንቧ ውሃ በመጠቀም

ሰ. ወንዝ ዳር አለመጸዳዳት

ረ. ሌላ ካለ ይግለጹ

ሠ. አላውቅም

ለ. የጥናቱ ተሳታፊዎች ስለ ብልሀርዝያ እና ሌሎች አንጀት የሚጠቁ ትላትሎች በሽታ ያላቸውን አመለካከት ለመገምገም የተዘጋጀ መጠይቅ

1. አንጀትን የሚያጠቁ ትላትሎች በሽታ አደገኛ በሽታ ነው ብለው ያምናሉ?

ሀ. አዎ

ለ. አላምንም

2. አንጀትን ለሚያጠቁ ትላትሎች በሽታ መድሀኒት መውሰድ አስፈላጊ ነው ብለው ያምናሉ?

ሀ. አዎ

ለ. አላምንም

3. ሆድዎ ስያምዎት ወደ ጤና ተቋም መሄድ አስፈላጊ ነው ብለው ያምናሉ?

ሀ. አዎ

ለ. አላምንም

4. አንጀትን ለሚያጠቁ ትላትሎች በሽታ የባህል መድሀኒት መውሰድ ጥሩ ነው ብለው ያምናሉ?

ሀ. አዎ

ለ. አላምንም

5. አፈር ላይ መጫወት አንጀትን የሚያጠቁ ትላትሎች በሽታ ያስከትላል ብለው ያምናሉ?

ሀ. አዎ

ለ. አላምንም

6. ያልበሰሉ አትክልቶች መብላት አንጀትን የሚያጠቁ ትላትሎች በሽታ ያስከትላል ብለው ያምናሉ?

ሀ. አዎ

ለ. አላምንም

7. የብልሃርዝያ በሽታ አደገኛ በሽታ ነው ብለው ያምናሉ?

ሀ. አዎ

ለ. አላምንም

8. ለብልሃርዝያ በሽታ መድሀኒት መውሰድ አስፈላጊ ነው ብለው ያምናሉ?

ሀ. አዎ

ለ. አላምንም

8. ኣብቲ ወሓዚ ማይ ውሽጢ ንክንደይ ዝእክል ሰዓት ይሕምሱ/ሳ?

9. ሰዓት ክንደይ እዮም ዝሕምሱ/ሳ?

ሀ. 1:30-3:30 ለ. 3:30-5:30 ሐ. 5:30-7:30 መ. 7:30-9:30 ሰ. 9:30-11:30

10. ድሕሪ ምሕማሶም ሰውነቶም ወድያው ብፎጣ የድርቆ/ቻ'ዶ?

ሀ. እወ ለ. ኣየድርቆን

11. ብማይግዕዳ ወሓዚ ማይ ክሓልፉ እንተለው ምስቲ ወሓዚ ማይ ይነኻኽኡ/ኣ'ዶ? ሀ. እወ ለ. ኣይነኻኽእን

12. ክዳኖም ኣብ ማይግዕዳ ወሓዚ ማይ ይሓፀቡ/ባ'ዶ? ሀ. እወ ለ. ኣይሓፀብን

13. ነብሶም ኣበይ ይሕፀቡ/ባ? ሀ. ኣብ ማይግዕዳ ወሓዚ ማይ ለ. ኣብ ገዛ ሐ. ኣብ ናይ ህዝቢ ሻወር

14. ንሕቶ ቁፅሪ 13 መልሶም/ሰን ኣብ ገዛ ውሽጢ እንተኾይኑ እቲ ማይ ካበይ ኢኹም እትረኽብዎ/ኦ?

ሀ. ካብ ማይግዕዳ ወሓዚ ማይ ለ. ካብ ቧንቧ ማይ
ሐ. ካብ ዝተሓፀረ ናይ ምንጩ ማይ መ. ካብ ዝተሓፀረ ናይ ጉድጓድ ማይ

ክፋል ሰለስተ፡ ፍልጠት፤ ኣመለኻኽታ፤ ልምዲ

ሀ. ናይቲ ፅንዓት ተሳተፍቲ ስለ ሕማም ብልህርዝያ ካልኣት መዓንጣ ዘጥቅዑ ሓሳኩን ዘለዎም ፍልጠት ንምግምጋም ዝተዘጋጀዎ መሕትት

1. ስለ መዓንጣ ዘጥቅዑ ሓሳኹ ሰሚዖም/ዐን ይፈልጡ/ጣ'ዶ? ሀ. እወ ለ. ኣይፈልጥን

2. ስለ መዓንጣ ዘጥቅዑ ሓሳኹ ብከመይ እዮም ፈሊጦም/ጠን?

ሀ. ሬድዮ ለ. ካብ ጥዲና ተቋም
ሐ. ካብ ዓርኪይ መ. ካለእ እንተሃልዩ ይግለፁ

3. ንሕቶ ቁፅሪ 1 መልሶም/ሰን እወ እንተኾይኑ ዝተወሰኑ ንመዓንጣ ዘጥቅዑ ሓሳኹ ክጠቅሱ/ሳ ይክእሉ/ላ'ዶ?

4. ስለ መዓንጣ ዘጥቅዕ ብልህርዝያ ሰሚዖም/ዐን ይፈልጡ/ጣ'ዶ? ሀ. እወ ለ. ኣይፈልጥን

5. ብልህርዝያ ብከመይ እዩ ዝመሓላለፍ?

ሀ. ኣብ ዝተበከለ ወሓዚ ማይ ውሽጢ ብምሕማስ ለ. ዝተበከለ ማይ ብምስታይ
ሐ. ኣብ ዝተበከለ ወሓዚ ማይ ውሽጢ ብምጭዋቕት መ. በቀንድ ኣውጣ
ሰ. ብጣንጡ ረ. ብዘተበከለ ምግብ

6. እዚ ሕቶ ንቁፅሪ 5 ብትኽክል ንዝመለሱ ሰባት እዩ፡፡ ቀንድ ኣውጣ ኣበይ እዩ ዝነብር?

ሀ. ኣብ ወሓዚ ማይ ውሽጢ ለ. ኣብ ሓመድ ውሽጢ ሐ. ኣይፈልጦን

ሀ. እወ ለ. አይአምንን

6. ዘይበሰሉ አሕምልቲ ምብላዕ ንመዓንጣ ዘጥቅዑ ሓሳኹ ሕማም ከስዕብ ይክእል እዩ ኢሎም ይአምኑ/ና?

ሀ. እወ ለ. አይአምንን

7. ሕማም ብልሃርዝያ ሓደገኛ ሕማም እዩ ኢሎም ይአምኑ/ና? ሀ. እወ ለ. አይአምንን

8. ንሕማም ብልሃርዝያ መድሓኒት ምውሳድ ኣድላይ እዩ ኢሎም ይአምኑ/ና?

ሀ. እወ ለ. አይአምንን

9. ኣብ ወሓዚ ማይ ምሕማስ/ነብስኻ ምሕፃብ ሕማም ብልሃርዝያ ከስዕብ ይክእል እዩ ኢሎም ይአምኑ/ና?

ሀ. እወ ለ. አይአምንን

10. ሕማም ብልሃርዝያ ክድሕን ዝክእል ሕማም እዩ ኢሎም ይአምኑ/ና?

ሀ. እወ ለ. አይአምንን

ሐ. ናይቲ ፅንዓት ተሳተፍቲ ስለ ሕማም ብልሃርዝያን ካልኣት መዓንጣ ዘጥቅዑ ሓሳኩን ዘለዎም ልምዲ ንምግምጋም ዝተዘጋጀዎ መሕትት

1. ጥረ ሰጋ/ አሕምልቲ ይበልዑ/ዳ'ዶ? ሀ. እወ ለ. አይበልዕን

2. ቅድሚ ምግብ ምብልዎም ኢዶም/ደን ይሕፀቡ/ባ'ዶ? ሀ. እወ ለ. አይሕፀብን

3. ከብዶም/ደን እንትሕሞም/መን ናብ ጥዲና ተቋም ይኸዱ/ዳ'ዶ?

ሀ. እወ ለ. አይኸይድን

4. ንመዓንጣ ዘጥቅዑ ሓሳኹ ሕማም መድሓኒት ይወስዱ/ዳ'ዶ?

ሀ.እወ ለ. አይወስድን

5. ክዳኖም ኣብ ወሓዚ ሩባ ይሓፀቡ/ባ'ዶ? ሀ. እወ ለ. አይሓፀብን

6. ኣብ ወሓዚ ሩባ ይሕምሱ (ይሕምሳ)/ነብሶም ይሕፀቡ (ይሕፀባ) 'ዶ?

ሀ. እወ ለ. አይሕምስን/አይሕፀብን

7. ኣብቲ ወሓዚ ሩባ ኣከባቢ ይፍትኑ/ና'ዶ? ሀ. እወ ለ. አይፍትንን

8. ከዋኹ በኋላ ወድያውኑ ገላዎን ያደርቃሉ? ሀ. አዎ ለ. አላደርቅም

9. ድሕሪ ምሕማሶም ሰውነቶም ወድያው ብፎጣ የድርቆ/ቻ'ዶ?

ሀ. እወ ለ. አየድርቆን

10. ንመዓንጣ ዘጥቅዑ ሓሳኹ ሕማም መድሓኒት ብሕብረት ክወሃብ ከሎ ተሳተፎም ይፈልጡ/ጣ'ዶ?

ሀ. እወ ለ. አይፈልጥን

Annex IV: Check list

Table 9. Laboratory findings

A. Macroscopic examinations

Consistency of the stool	Hard _____ Loose _____ Watery _____ Soft _____ Formed _____
Appearance of stool	Bloody _____ Mucoid _____ Normal _____
Color of stool	Clay _____ Yellow _____ Black _____ Green _____ Red _____

B. Microscopic examinations

Direct microscopy	<ul style="list-style-type: none"> • No ova/cyst/troph of Parasite • Ova of <i>S. mansoni</i> • Ova of other intestinal parasites
Formal ether concentration technique	<ul style="list-style-type: none"> • No ova/cyst/troph of parasite • Ova of <i>S. mansoni</i> • Ova of other intestinal parasites
Kato thick method	<ul style="list-style-type: none"> • No ova/cyst/troph of Parasite • Ova of <i>S. mansoni</i> & report the number of egg per gram of faeces • Ova of other intestinal parasites

Annex V: Standard Operating Procedures

A. Direct Microscopic Examination

Used to diagnose motile parasites such as the larvae of *S. stercoralis* and trophozoites of *E.histolytica*, *G. lamblia*, and more rarely, *B. coli*, helminth eggs, cysts and oocysts of intestinal protozoa.

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

To avoid contaminating the fingers and stage of the microscope, do not use too large a drop of saline.

2. Using a wire loop or piece of stick, mix a small amount of specimen, about 2 mg, (matchstick head amount) with the saline. Make smooth thin preparations. Cover each preparation with a Cover glass.

Do not use too much specimen otherwise the preparations will be too thick, making it difficult to detect and identify parasites.

3. Examine systematically the entire saline preparation for larvae, ciliates, helminth eggs, cysts, and oocysts. Use the 10x objective with the condenser iris closed sufficiently to give good contrast.

Use the 40x objective to assist in the detection and identification of eggs, cysts, and oocysts. Always examine several microscope fields with this objective before reporting 'No parasites found'.

4. Report the larvae, cysts, oocysts, ciliates and each species of egg found in the entire saline preparation.

B. Formol-ether Concentration technique

Principle

In the Ridley modified method, faeces are emulsified in formol water, the suspension is strained to remove large faecal particles, ether or ethyl acetate is added, and the mixed suspension is centrifuged. Cysts, oocysts, eggs, and larvae are fixed and sedimented and the faecal debris is separated in a layer between the ether and the formol water. Faecal fat is dissolved in the ether.

1. Using a rod or stick, emulsify an estimated 1 g (pea-size) of faeces 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 faeces, collecting the sieved suspension in a beaker.
4. Transfer the suspension to a conical (centrifuge) tube made of strong glass, copolymer, or Polypropylene. Add 3–4 ml of diethyl ether or ethyl acetate.
5. Stopper the tube and mix for 1 minute. If using a Vortex mixer, leave the tube unstoppered and mix for about 15 seconds (it is best to use a boiling tube).
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 750–1000 g (approx. 3000 rpm) for 1 minute.

After centrifuging, the parasites will have sedimented to the bottom of the tube and the faecal debris will have collected in a layer between the ether and formol water.

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 small cysts and eggs.

C. Kato-Katz Technique

1. Place a small amount of faecal material on scrap paper and press the small on top.
2. Scrap with flat-sided spatula across the upper surface of the screen to collect the sieved faeces.
3. Place template with 41.7mg hole size on the center of a microscope slide and add faeces from the spatula so that the hole is completely filled. Pass the side of the spatula over the template to remove the excess faeces from the edge of the hole
4. Remove the template carefully so that the cylinder of faeces is left over the slide.
5. Cover the faecal material with the pre-soaked cellophane strip.
6. Invert the microscope slide and firmly press the faecal sample against the cellophane strip on another microscope slide or smooth hard surface.
7. Carefully remove the slide by gently sliding it side ways to avoid separating the cellophane strip or lifting it off.
8. For all except hookworm eggs, keep the slide for one or more hours at ambient temperature to clear the faecal material prior to examination under the microscope.
9. Examine the smear systematically and count the number of eggs of each species of the parasite. Multiply the number of eggs a factor depending on size of the template to report egg per gram of stool.

D. Snail collection technique

1. Collect the snail by handpicking using forceps and gloves from the edge of the stream.

2. Examine the morphology of the species based on the figure below.

A) Shell of *Bulinus* spp

B) Shell of *Biomphalaria* species

C) Adult snail of *Bulinus* spp and *Biomphalaria* species

D) Adult snail of *Biomphalaria* spp

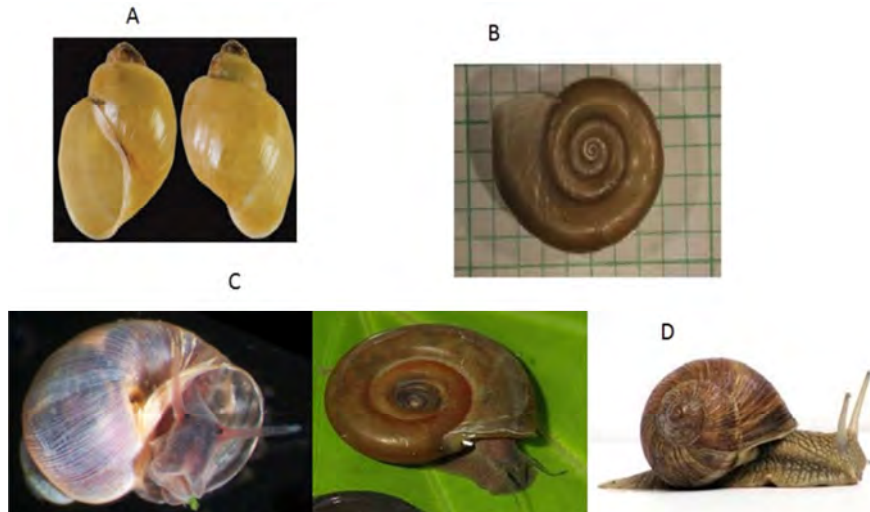


Figure 7. Morphology of snail species

Declaration

I, the under signed, declare that this MSc thesis is my original work and it has not been presented for a degree in any other University. All sources of materials used for this thesis and institutions who gave support have been duly acknowledged.

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