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The impact of mass chemotherapy on the status of intestinal *Schistosomiais* among Schoolchildren in Kemissie, North East Ethiopia

By

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Abstract

Schistosomiasis caused by Schistosoma mansoni is a major public health concern in the tropics and yet is a neglected disease. Globally, more than 207 million people are infected Today 120 million people are symptomatic for Schistosomiasis In Ethiopia, the condition is worsened due to very low latrine coverage and overall poor personal and environmental hygiene.This study, therefore, aimed to assess the prevalence of Schistosoma mansoni infection and associated risk factors in children of less than 15 year of age in Kemissie Town. A cross sectional school based study was carried out on sample of 300 students. A pre-tested structured questionnaire was used to collect data on socio demographic characteristics, water contact habit and toilet utilization. Fecal samples were collected and processed using the direct-smear method. Univariate and multivariate logistic regression models were used for data analysis. The overall prevalence of S. mansoni in the schoolchildren was 8 % (95% confidence interval (CI):1.96). Higher prevalence was detected in male children (8.5%) than in females (7.5%) . Sex, swimming habit & previous treatment for the parasite were significantly associated with the risk of Schistosomiasis (p-value <0.05). Specifically, Male sex is 3 times at increased risk of having Schistosomiasis than females (AOR: 3.255, 95% CI: 0.555-0.987, p: 000). Study subjects with frequently swimming habit were found to be 4 times at risk of Schistosomiasis than those have no swimming habit regularly or not at all (AOR: 4.487 95% CI: 0.278-0.854, p: 0.022). Study participants who have previous treatment history for Schistosomiasis were have 2 times at risk of developing Schistosomiasis than their counter parts(AOR: 2.760, 95% CI: 1.014-5.731, p: 0.031). The result showed that school age children are the vulnerable segment of the population. Therefore, prompt intervention strategies should be designed and implemented including provision of adequate safe water supply and health education on personal as well as environmental hygiene.

***Key words**: Schistosomiasis, prevalence, kemisse town*

1. Introduction

Schistosomiasismansoni is a parasitic disease caused by a species flukes (trematodes) of the genus *Schistosoma*. In terms of morbidity and mortality it is the next prevalent tropical disease to malaria in the world. It is found in developing counties of Africa, South America especially in Brazil, Venezuela, Surimana, Guyana, the Caribbean, the Middle East and Asia. (Fenwick , *et al.* 2009)

Schistosomiasis is one of the most widespread parasitic infections in developing countries (King, 2010). An estimated 779 million people are at risk, with 240million infected cases and more than 200,000 deaths occurring each year due to schistosomiasis worldwide (WHO, 2012). In Africa, over 90% of disease burden is found in sub-Saharan Africa (WHO, 2014), where S. mansoni and S. haematobium are the main causative species of schistosomiasis in the continent with an estimation of 54 and 112 million individuals infected, respectively, and the risk of infection for S. mansoni and S. haematobium was 393 and 436 million, respectively (WHO,2012).

Schistosomiasis is also one of the most common parasitic diseases and is widespread in many parts of Ethiopia, usually at an altitude between 1,200 and 2,000 meters above sea level. The result showed that the prevalence of Schistosomiasis mansoni was high among school children. As evidence from the studies made in small village Bushulo around Lake Hawassa73.3% (Terefe et al 2011), 43.2% in Zuway town and 31.6% in Fincha valley (Haile et al, 2012), 82.8% in Sanja town (Alebe et al., 2014) show prevalence cover in wide range(Mesfin et al., 2015).

The main determinants for the distribution, transmission and spreading of both Schistosoma species (S. mansoni and S. haematobium) in Ethiopia include water temperature, absence or presence of snail intermediate host, population movement, and water impoundment for irrigation and power(Ali, et al 2004). Besides factors such as socio-economic status, poor sanitation, inadequate medical care, and absence of safe drinking water supplies, it has also been reported that unsanitary sewage disposal, the habit of eating raw or semi-raw fish and the practice of allowing untreated infected sewage to drain in fresh water lakes are responsible for the establishment and maintenance of the parasites (Bethony , et al 2006). Environmental factors also play a role in the incidence of intestinal parasitic infection as hot and humid tropical climate favor increased parasite prevalence (Jemaneh , 2000).

School-aged children are the most affected group due to high exposure to infested water bodies. Growth retardation and poor school performance are adverse effects of the disease besides clinical manifestation and its complication (Kabatereine, 2004).

Some of the control and prevention methods including chemotherapy using praziquantil, sanitary disposal of faces to avoid pollution of water bodies, prevention of human contact to infected water bodies, elimination of the snail vector using mollucicides and creating awareness in the community.(MOE, 2001).

Schistosomiasis mansoni in Kemissie is widespread, "despite the effort made to reduce its incident through mass chemotherapy and indode application it is still on the increase. In 2014 the numbers of people infected by the parasites in Kemissie were 1940 and in 2015 it grew to 5890 (3145 males and 2745 females)"according to the data which is obtained from the kemissie health bureau, (2016). As the researcher realized that *S. mansoni* affects not only children but also people who live in Kemissie zone. Therefore, the aim of this study was to determine the prevalence of *S. mansoni* infection and associated determinant factors among primary school children of Kemisse Town, northeast Ethiopia. It is estimated that the outcome of the study will deal up-to-date information on the status of *Schistosomiasis* in the study area. It will help to know the prevalence and risk factors of the disease and thus form a basis for future assessments. In turn, this should enable relevant health policy makers and administrators to develop comprehensive and appropriate school-based health promotion strategies to encourage healthy lifestyles among primary school students.Detect cases early enough, and choolse appropriate intervention programs.

2. Objectives

2.1General objective

The general objective of the study was to assess the prevalenceof *Schist somamansoni*i infection and associated risk factors in childrenof less than 15 year of age in KemissieTown.

2.2Specific objective

- To determine the prevalence of *S.mansoni* inchildren of age 5-14 year.
- To identify the transmission sites for *S.mansoni* in the study area.
- To identify the risk factor for infection in the study area

3. Literature Review

3.1. Concept of *S.mansoni*

The S.mansoni group, *S.mansoni, S.rodbajni, S.edwardiense* and *S.hippopotami* comprises of many species identified by their lateral spine eggs and the fact they use pulmonate mollusks of genes Biomphalaria to complete their life cycles. The *heamatobium* group corresponds to the terminal spined egg species which develop mainly in snails of the genus Bulinus. It includes *Schistosoma heamatobium,S.S.bovis ,S.mathi, S.japonicum, S.meglorgi, marbrogrowi and S.malayensis , S.bovis, , S.quineensis, S.intercalatum*(Lambertucci *et al,* 2000)

The *Schistosome* species that infect humans are five:*S.mansoni, S.japonicum, Smekongi*, *S.intercalatum* and *S.heamatobium*. The first four species have well described associations with chronic hepatic and intestinal fibrosis as their attendant consequences. (Lambertucci *et al,* 2000)

*S.mansoni*occurs in much of sub Saharan Africa, North east Brazil, Surinam, Venezuela, the Caribbean, lower and middle Egypt and the Arabic Peninsula*S.mansoni* infects more than 83 million people in 54 countries mostly in tropical Africa causing intestinal *Schistomiasis* which results in pathology, morbidity and even death (Lambertucci *et al,* 2000). Based on estimate in sub-Saharan Africa, 54 million people are considered to be infected with *S.mansoni* resulting in blood mucoid stools, in 4.4 million hepatomegaly, in 8.5 million and an annual mortality of 13,000 (Wert et al., 2003). Adult *S. mansoni*worms live in hepatic portal vein, the vein that transports the final products of digestion to the liver. The female travels into the veins to get the intestine and eggsPassed with feces to continue the life cycle. Those produced in hepatic portal vein however are by and large are seeded into the liver where they are /lodge/ entrapped in the liver tissues and induced the granulomatous reactions and cause fibro obstructive disease in the liver and other organs and portal hypertension (Lambertucci et al, 2000).

3.2 Characteristics of Schistosomiasis (Pathology)

Schistosomiasis is due to immunologic reactions to Schistosoma eggs trapped in tissues. Antigens released from the egg stimulate a granulomatous reaction involving T- cells macrophages and eosinophils that results in clinical disease. Symptoms and signs depend on the number and location of eggs trapped in the tissues. Initially, the inflammatory reaction is readily reversible in the latter stages of the disease; the pathology is associated with collagen deposition and fibrosis resulting in organ damage that may be only partially reversible. (AppsMedscape medpulse News CME and Education, 2016).

Acute *Schistosomiasis (*Katayama Syndrome)

The symptoms of acute *Schistosomiasis* are mediated by the immune complex and usually begin with deposition of schistosome eggs into host tissues .Symptoms may includefever, fatigue, diarrhea ,non-productive cough with the presence of blood.(Ross ,et al,2007).

Chronic and advanced disease mature ,patent*Shistosom*e infections are inflammatory response to *Schistosome* eggs trapped in host tissue and liver fibrosis eggs of *S.mansoni*embolise to the liver ,where the granulomatatousinflammatory response induces periportal or clay-pipe-stem fibrosis (Ferrari,2004).

Diagnosis-Neuroschistosomiasis

The finding of eggs in the stool or positive serology provides supportive but not direct evidence of Schistosomal involvement in the central nervous system(Ferrari , 2004).

Population studies of the children have been shown that some infection can cause growth retardation and anaemia, as well as possible cognitive and memory impairment, which limits their potential (Manus and Gray, 2010). Treatment is randomized controlled trials have shown that praziquantel, a pyrazinoisoquinoline derivative, is a safe and effective oral drug that is active against all *Schistosome* species (Doenhoff and Cioli, 2003).

The challenge for researchers who aimto improve the diagnosis and management of *Schistosomiasis* will be find a way to respond to environmental change and to threat of praziquentel resistance. An integrated approach to the management of Schistosomiasis are

treatment to reduce transmission by snail control (focal mollusciciding), environmental modification ,improved sanitation ,health education and vaccination is the key to sustainable long term control of *Schistosomiaasis*(Gray ,et al ,2010).

3.3 Development

The life cycle of *S. mansoni*: Adults of *Schistosoma masoni* live in mesenteric and hepatic portal veins, which drain digestive end products to the liver of the host. The female generally moves through the smaller venules of the intestine and deposited its eggs in the digestive tract and come back to the blood vessels further continue the life cycle. The enclosed miracidia which goes out of the body is under-developed at the time it is oviposit. The egg must penetrate and transverse (traverse) multiple tissues and mucosal lining before entering the lumen of the gut escape to the environment. The passage of eggs from the blood stream to the lumen of the host is done by secretions of enzymes of its own. Once the eggs have reached the intestinal lumen, the egg exit out of the host with the feces (Bogitsh *et* al, 2005).

Upon reaching fresh water, the miracidia are activated to hatch, because they are no longer under the inhibitory of the host's body fluids. Hatching occurs by rupturing the egg shell along the suture line. Free-swimming miracidia must find suitable intermediate snail host quickly after hatching or else they will die. After a sail is penetrated, transformation into sporocysts occurs at the antennae of the head or on the foot in 7-10 days (Bogitsh *et.al* 2005).

The next stage; the generations of sporocysts is produced. Depending on the snail feed and external environment. These sporocysts that have migrated into the liver of the snail can undergo second and third sporocystsbefore it transforms itself to cercariae. The cercariae raptures the liver tissue facilitated by secretion coming from a pair of escape glands in cercaria and as released to the water bodies (Bogitsh *et.al* 2005)

Actively swimming cercariae possess distinctive forked tails and move in a figure-eight pattern. Secretions from the mammalian skin attract the cercariae. When it succeeds to reach the skin it penetrates the definitive host skin using enzymes from the glands two preacetabular glands located anterior to the ventral sucker, while three postacetabular glands lie behind the ventral suckers. Each gland has a duct that empties at the anterior region of the oral sucker. Cercariae adhere using both their muscular suckers and mucoid secretion to attach to the skin of a human

host. Because secretions from the preacetabular glands are highly enzymatic, they facilitated lysis of the host skin for penetration. Within the skin, cercariae burrow into the peripheral capillary bed or enter the lymphatic system, where the larva stay for 3 days transforming itself to the next larval stage called Schistosomulum and after 3 days the skin migrate through circulatory system move to the heart and then enter the lungs. Three significant morphological changes occur in cercariae during the penetration process loss of the tail, loss of the surface coat, and emptying of the contents of the penetration glands. The cercaria is referred to as a Schistomule following this transformation (Bogtish *et.al* 2005).

Schistomule reside under the skin for 3 days. On the fourth day; Juvenile parasite begins feeding on the host blood cells, which triggers a period of rapid growth and development. After 7to10 days Schistomules migrate through the pulmonary vein into the heart, and then into the systematic circulation. About three weeks later, the worms reach the hepatic portal veins, where sexual maturity is reached and mating is possible after 40 days. Males that contain females in their body grooves move to venue sat the definitive sites. (Bogitsh *et.al* 2005)

3.4 Factors for spread of disease

In Ethiopia the distribution of the disease can be interpreted from various factors, Including: Expansion of irrigation facilities in the 1960‘s used for drinking, washing and watering nomadic herds: building of the Kaka Dam on the Awash river and associated supply and drainage canals conducive to transmission and migratory movements of pastoral nomads and agricultural workers (WHO, Atlas 1987 Ethiopia).

Survey to measure the effect of irrigation construction on *Schistosomiasis* prevalence corroborates these assumptions before irrigation schemes began in the 1950’s in Awash valley *S.mansoni* was considered absent from the region by 1976 prevalence estimates reached 9.0%in the upper valley (Steinmann et.al, 2006)

3.5 Diagnosis and treatment of S.mansoni infection

Diagnosis and treatment of *Schistosomiasis* occurs mainly in hospitals in Ethiopia *S. mansoni* infection is a major cause of morbidity in outpatient cases in most of the country and intestinal parasites ranks second in number of outpatients cases (Jember ,2014).

3.6 Immune response to S.mansoni infection

Infection by *S.mansoni* in man induces multiple cellular and humoral immune responses to the parasite antigens that are believed to determine the outcome of disease .These responses have been shown to be correlated with the phase's acute vs chronic and the clinical form of the infection (Cheever et al, 1978).

several laboratories have been working on the identification of the immune mechanisms involved in the development of pathology and resistance to infection or re-infection among the most extensively studied immune factors are the anti –*Schistome* anti-bodies within the context ,idiotype /anti -idiotype interactions (Lima et al .1989) .

Several laboratories have been demonstrated that during the development of the disease significant change in cellular proliferative response occur. While the peripheral blood mononuclear cells (PBMC) from individuals with the acute phase (ACT) show significant in vitro proliferative responses to soluble egg antigen (SEA) and adult worm antigens, the PBMC response of patients with the chronic asymptomatic intestinal clinical form of disease to soluble egg antigens is significantly reduced .This decrease has been suggested to be due to the regulation of the immune response to the parasite eggs trapped in the tissue (Gazzinelli .etal 1987).

3.7 Transmission foci and distribution of S.mansoni infection in Ethiopia

Ethiopia has conducted *Schistosomiasis* and STH nation –wide mapping survey in all regions of the country by Ethiopia public Health Institute (EPHI).The intestinal form of *Schistosomiasis* caused by *S.mansoni* is widely distributed while the urogenital form caused by *S.haematobium* is more restricted in distribution .There are an estimated 37.3 million people living in *Schistosomiasis* endemic areas ,comprising 3.4 million pre-school children ,12.3 million school aged children ,and 21.6 million adults .In 2013 ,it was estimated that 35,775,100 cases of *Schistosomiasis* occurred in Ethiopia (EMH , :2016).

4. Materials and methods

4.1. Study area

The study was conducted on known, *S.mansoni* endemic area, Kemissie. Kemissie is a special Woreda of Oromia founded in Administrative Zone of Amhara Regional state. It is located approximately 305 km North East of Addis Ababa at $10^0$43'.30''N and $39^0$04'20''E at an altitude of the 1450m above sea level. Based on the 2014 National census conducted by the Central Statistical Agency of Ethiopia (CSA), this woreda had a total population of 19,420 whom 9,782 are men and 9,638 women(CSA ,2007). Most of the residents were farmers that are involved in agricultural and livestock production and also very familiar to irrigation practices in vegetables and chat cultivation. For determination and intensity of S.mansoniinfection, stool specimens werecollected in the villages of Cherete near the WorkieRiver in Kemissie. The prevalence was determined by collecting stools specimens and observing lateral spine eggs under the microscope (fig 1).

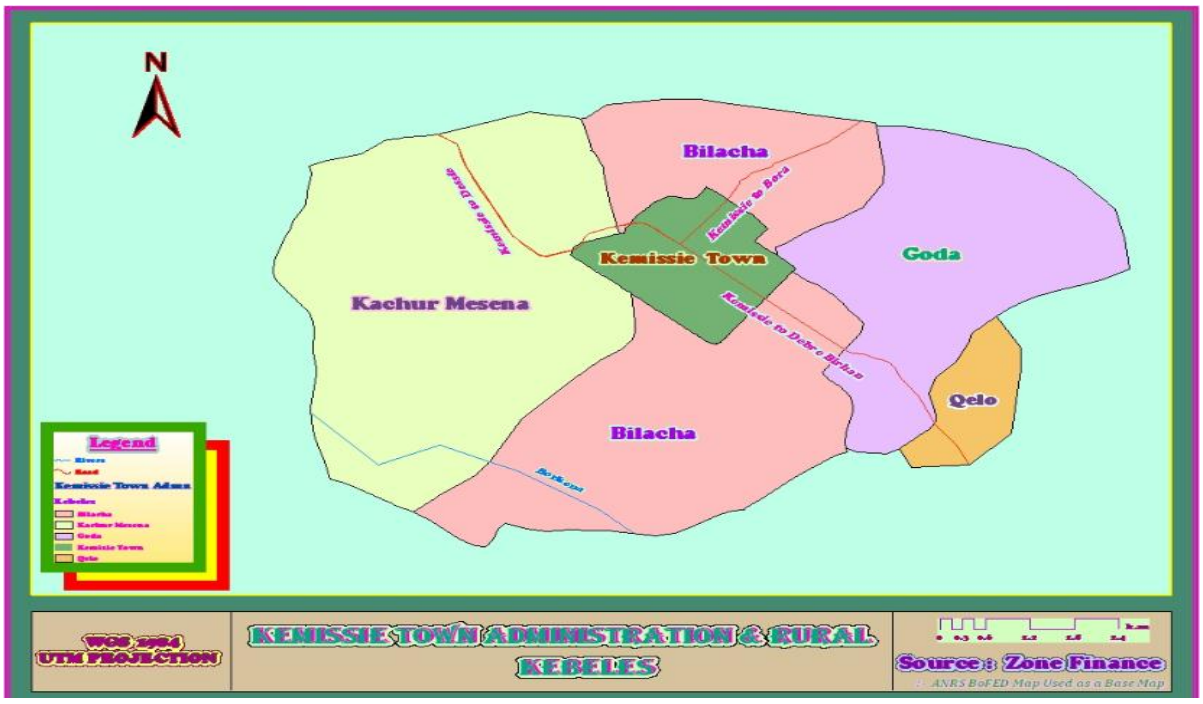

Figure 1. Map of study area (Source Kemissie Zone Finance)

4.2 Study design

A cross sectional study design was employed from December 2017to February 2018 which assessed the prevalence of Schistosoma mansoni infection among the primary school children in the selected schools which attending grade one to eight elementary school found in Kemisse.In which stool samples were collected to the laboratory for examination during the study period at Kemissie clinic and A.A.University parasitology laboratory.

4.3 Sample size

The sample size (n) was estimated using the statistical formula (Daniel, 1995],

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where „Z" is × standard normal distribution curve value for the 95% confidence interval (CI) having a value of 1.96 and „m" 4% margin of error (0.04). Since the overall prevalence rate (p) of *Schistosomiasis* was not known for the study area, p was taken to be 50%. For the calculation consider three schools study population a 95% confidence interval (z)and a 5% margin of error (d) were used. A sample size of 318 was determined considering a non-response rate of 10%.The calculated sample size was allocated to select Schools using proportional to population size, then from KachurSchool 157, Haromsa School 116 and Seadasa school 47 were selected for the study. The Kachur primary school and Haromsa school found near to disease transmission site Workie River.

4.4. Study population

A school-based cross-sectional study design was employed to assess Schistosoma mansoni Infection and Associated Risk Factors AmongPrimary School students whose age is 5-14 years in Kemissie area. Therefore, all students of the schools formed the sampling population.There are 6 primary schools in kemissie Town but researcher was focused on the ones nearby Workie River in Cherettei due to their setting. Three (3) schools were selected randomly by lottery system. They are Kachur, Haromsa and Hidar 29 Primary Schools. All interested and volunteer students were including in the study from each class and grade level.

4.5 Sampling Technique

From the students whowere registered during the study period, only 300 students were selected on a specified 6 days for sampling. They wereall 5-14 yearsold.From each of the 3 schools, 50 students were randomly selected per day for a period of 6 days. Each student was provided a stool with cup was labeled with number codes that were assigned during the time of the study.

4.6 Data quality control

To ensure reliable information:-before the data collection period, the questionnaire and laboratory materials was pretested in the random selected students on 2 % of the total sample size. Standard operating procedures were used for sample collection and processing for keeping a good quality study by professionals. The result of laboratory examination was recorded on well prepare format carefully and it was attached with questionnaire.Questionnaire originally prepared in English was translated into Amharic (participant language) for field work and back to English for checking language consistency.

4.7 Collection of Stool Sample

Single fresh fecal samples were collected with leak-proof and tightly cupped, labeled clean stool cups. The students were advised to provide the stool of the day. The stool samples were examined macroscopically for consistency (formed, soft, loose, pasty, watery or bloody), presence of adult worms or segments, and for any other physical abnormalities. The 2gm of stool samples were emulsified with 3-4 ml normal saline, then a drop of emulsified sample was placed on a glass slide, few drops of iodine were added, and all covered with a cover slip. The

preparation was first examined under objective lens 10x, then 40x for identification of parasites under low light intensity used for direct smear method and about 150 stool samples were collected by stool cups from the study area and transport to AAU Parasitology Laboratory for Kata –Katza test.

The technique of Kata –Katza smear materials were include : Malachite green chemical ,cellophane paper ,sieve, slide, cover slip, Microscope, and template. The template used to measure the quantity of stool in gm(1gm) .the sieve was important filtered raphage and smooth stool that required to examine .the cellophane paper flexible sock in malachite green cut and used it as slip of slide.

4.8. Survey of risk factors

Interview questionnaire were administered to the study subjects to identify risk. Factors associated with *S. mansoni*. The questionnaire was consisted variables including. Demographic information, socioeconomic status, previous history of *Schistosomiasis* treatment, sanitary facilities, frequency of water contact and reasons for water contact . The questionnaires were prepared by the mother tongue of the children that is, Amharic.

4.9 Data Analysis

Data was entered and statistical analysis performed using Statistical Package for Social Sciences (SPSS) version 21.0 software (IBM SPSS, Chicago). Questionnaire and KAP**.**Information were sorted out, verified and organized. Percentage S. mansoni infection was determined. Further, univariate and multivariate logistic regression models were used to test the association between various variables and S. mansoni-positivity. Crude odds ratio and adjusted odds ratio, were calculated with 95% confidence intervals (CI). $P \leq 0.05$ was considered statistically significant.

4.10Ethical consideration

Local and the study health center administrations were consulted and an approval was granted.Consent was obtained from each participant parents or gurdian. The confidentiality of collected information was ensured throughout the process. Collected fecal specimens were investigated with the laboratory technician. Participants found to be positive were counseled by the health professional who took the measurements.

5. Result

5.1 Socio-demographic characteristics of study participants

A total of 320 school children were participated in this study with a response rate 100%. But, only 300(153 males and 147 females) had analyzable data.Regarding socio-demographic characteristics; the ratio of female-to-male was 1.03 with 51% males and 49% female. Majority 155(51.7%) of the respondents were in the age group 11-14years from grade 1 to 6(Table 2, 3).

5.2 Prevalence and intensity of S. mansoni infection

From a total of 300 schoolchildren participated in the study 24 were found to be positive for *S.mansoni* infection, with an overall prevalence rate of 8% and other intestinal parasites and infection were identified from the Schoolchildren participated during investigation time like Ascaris ,Hook worm, Gardia and Entameoba histoletica.

Prevalence of *S. mansoni* infection among the study schools ranged from 2.5% - 9.3%. The highest prevalence of infection was in Kachur (9.3%), while the lowest prevalence was in Sadessa 29 primary school (2.5%). Infection prevalence of *S. mansoni* with respect to sex shows that slightly higher infection prevalence was in males (8.5%) than in females(7.5%) (Table 1).

Table 1. Prevalence of *S. mansoni* infection among schoolchildren in primary schools of Kemissie town , Northeast Ethiopia, with respect to sex n(300)

Schools	Number examined		Number (%) Microscopic Positive		Over all
	M	F	M	F	
Kachur	80	70	8(10)	6(8.6)	14(9.3)
Haromasa	60	50	5(8.3)	4(8)	9(8.2)
Sadessa 29	13	27	--------	1(3.7)	1(2.5)
Total	153	147	13(8.5)	11(7.5)	24(8)

Infection prevalence of S. mansoni with respect to age group revealed that the highest prevalence (13.4%) of S. mansoni infectionwas in children with ages ranging from 8-10 years followed by children with ages ranging from 5 - 7 and 11 - 14 years 10.4% and 3.9%, respectively. The prevalence was 10.98%(20/182) from grade level 1-4 and 3.4% (4/118) from grade level 5-6 primary school children(Table 2, 3).

5.3. Risk factors associated with S. mansoni infection

Gender, age, previous history of *Schistosomiasis* treatment, water source, frequency of water contact and reasons for water contact like swimming, working in irrigated agricultural field were significantly associated with *S. mansoni* infection .

A total of 24(8%) individuals were OIP positive for direct stool test and Kata-katza techniques were utilized, at 95% CI with 1.96. Although the absence of toilet access was found to be at higher risk of infection to *Schistosomiasis* among primary school age children compared to those having toilet access the relationship just below the statistical level of significance (COR 1.860, 95%CI 2.233-8.146, p=0.00). Participants who were having water treatment for drinking were less likely to have *Schistosomiasis* than those have no a chance of having protected water (COR 2.546, 95% CI 1.192-5.283, p=0.015). Those who have a grade level 1-4 were have a chance of developing *Schistosomiasi* two times than those their counterpart (COR 2.128, 95% CI 0.042-0.385, p<0.000)(Table 2).

Sex, swimming habite and previous treatment for *Schistosomiasis* were statically significant independent predictors of *Schistosomiasis*in the multivariate model (Table 3). Specifically, being a male was 3 times increased risk of developing *Shistosomiasis t*han being a female (AOR 3.255 95% CI 1.116-9.491, p=0.031). Study subjects with frequently swimming habit were found to be 4 times at risk of *Schistosomiasis* than those have no swimming habit regularly or not at all (AOR: 4.287 95% CI: 0.278-0.845, p: 0.000). Similarly, those Study participants who have previous treatment for *Schistosomiasis* were have 2 times at risk of developing *Schistosomiasis* than their counter parts(AOR: 2.760, 95% CI: 1.014-5.731, p: 0.031).(Table 3)

Table 2Univariate logistic regression analysis of Socio-demographic and other variables associated with S. mansoni infection inschool children of three primary school of kemissie town,northeast Ethiopia, November 2016-April 2017 (N=300)

Variabels	Alternatives	numbers	OIP +Ve n(%)	COR	95%C.I	P-value
Sex	M	153(51)	13(8.5)	0.941	0.941	0.041*
	F	147(49)	11(7.5)	1		
Age category	5-7	48(18.7)	5(10.4)	1		
	8-10	97(32.3)	13(13.4)	0.144	0.146-0.486	0.222
	11-14	155(51.7)	6(3.9)	0.249	0.430-0.876	0.257
Grade level	1-4	182(60.3)	20(12.4)	2.128	0.042-0.385	0.000*
category	5-6	118(39.7)	4(3.4)	1		
Toilet access	Yes	55(18.3)	3(5.5)	1		
	No	245(81.7)	21(8.6)	1.860	2.233-8.146	0.000*
water for	Protected	117(39)	4(3.4)	1		
drinking	river	183(61)	20(10.9)	0.307	0.018-5.098	0.410
Swimming	Never	34(11.3)	1(2.9)	1		
Habit	Sometimes	105(35)	7(6.7)	0.559	0.315-0.993	0.057
	Frequently	161(53.7)	16(9.9)	0.733	0.395-0.961	0.001*
Irrigation	Yes	186(62)	19(10.2)	1		
practice	No	114(38)	5(4.4)	0.4381	0.246-0.779	0.067
Water	Yes	37(12.3)	-	1		
treatment	No	263(87.7)	24(100)	2.546	1.192-5.283	0.015*
Previous	Yes	16(5.3)	8(50)	4.818	4.818	0.008*
treatment	No	284(94.7)	16(5.6)	1		

n: number of people, COR: crude odds ratio, CI: confidence interval, OIP: ova parasite *statistically significant, %: percentage

Table 3 Multivariate logistic regression analysis of Socio-demographic and other variables associated with S.mansoni infection in school children of three primary school of kemissie town,northeast Ethiopia, November 2016-April 2017 (N=300)

Variables	Alternatives	numbers	OIP +Ve n(%)	AOR	95%C.I	P-value
Sex	M	153(51)	13(8.5)	3.255	0.555-0.987	0.000*
	F	147(49)	11(7.5)			
Grade level	1-4	182(60.3)	20(12.4)			
category	5-6	118(39.7)	4(3.4)	0.566	0.042-0.385	0.078
Toilet access	Yes	55(18.3)	3(5.5)			
	No	245(81.7)	21(8.6)	0.438	0.246-0.779	0.067
Swimming	Never	34(11.3)	1(2.9)			
habit	Sometimes	105(35)	7(6.7)	0.678	0.280-1.116	0.099
	Frequently	161(53.7)	16(9.9)	4.487	0.278-0.854	0.022*
Water treatment	Yes	37(12.3)	-			
	No	263(87.7)	24(100)	0.147	0.086-0.251	0.058
Previous	Yes	16(5.3)	8(50)	2.41	1.014-5.731	0.031*
treatment	No	284(94.7)	16(5.6)			

n: number of people, AOR: adjusted odds ratio ,COR: crude odds ratio, CI: confidence interval,
OIP: ova parasite *statisticallysignificant, %: percentage

6. Discussion

This study was aimed at assessing prevalence of *Schistosomiasis* and associated factors among students in elementary schools around Kemissie town. The overall prevalence of *Schistosomiasis* was found to be 8%. Higher prevalence of S. mansoni was reported in our study area than the reports from different localities of Ethiopia including Jimma Zone, 2.1% (Yami ,2011), 5.95% from different water sources of Tigray region (Dejenie et al ,2010), 0.8% from Amibera District of Afar (Awoke et al,2013) and 1.3% from University of Gonder community school (Gelaw ,2013). This study showed a lower prevalence rate of *S. mansoni* compared to the research findings reported in other areas of Ethiopia, 85 % in Zarim, 67% Gorgora (Moges et al,2001) 67.6% in Finchaa valley (Haile et al, 2012) and 20.6% among schooled children in Gorgora (Essa et al, 2013). According to the Kemissie Town Health office report in 2016, the reduction is due to mass treatment praziquantel have been given before a month of the study for the school children grade 1-6 and also this difference may be due to difference in water contact habit and toilet utilization.

From the multivariate logistic regression analysis which was summarized in Table 3 sex, swimming activity and previous treatment for *Schistosomiasis* were statically significant predictors of *S.mansoni*.

The observed differences in prevalence and intensity of *Schistosomiasis* between the three schools (Kachur, Haromasa,Sadessa 29), higher in Kachur primary school than the two. This might be explained by distance of the schools from the Werkie river and Cheafa swampy where transmission is taking place. Kachur Primary School is in close proximity to the stream (about 500m), while Sadessa 29 is a bit far from the river and stream (about 2.5 km). Hence, the chance for school children of Kachur Primary School would be high to perform frequent water contact activities due to the proximity of the river crossing the town and water body close to the schools. And acquire heavy infection. Moreover, this observation reflects the focal nature of *Schistosome* infection and transmission (Gelaw et al ,2013).

The prevalence and intensity of as found to be higher in males than in females in the three schools studied. This observation*Schistosomiasis* w is similar to those reports from different localities of Ethiopia, Horro Guduru Wollega (Haile et al,2012) ,Wondo Genet (Erko et al

,2012), Different Water Source Users in Tigray, Northern Ethiopia (Dejenie et al ,2010)and Amibera District, Afar (Awoke et al ,2013). Systematic water contact studies were not conducted in the present investigation, higher infection rates in male children might be attributable to more frequent water contact patterns than in females. Generally, The higher infection rate in males can be explained by the fact that male children stay most of the time outdoors, playing with peers and more frequently swim and take baths in cercaria-infected water body and more likely vulnerable to acquire infection.

The prevalence and intensity of *Schistosomiasis* was found to be higher among those students who have more chance of water contact than the other. In this study those students who swim regularly have more chance of infection by *Schistosomiasis* than those students who can swim rarely or not at all. This might be due to the reason that individuals swim regularly are more likely to undertake risky water contact behavior, increase chance for cercaria to penetrate their skin and also increasing their exposure to infection.

In contrary to the other study, those students who took previous treatment were found to be higher intensity and infection of *Schistosomiasis* than their counter parts. This might be due to improper choice of the treatment for *Schistosomiasis.* However, despite successful treatment will improve the health of the people, *Schistosomiasis* treated person can become re-infected therefor prevention is still preferable to treatment.

The findings of this study also indicated that there was no significant association between age, grade level, water source for drinking and irrigation practice and prevalence of *S. mansoni* infection.

This study has certain limitations. It was a restricted population survey with a relatively small sample size (300) which could have inherent sampling bias making it difficult to generalize the findings for Kemissie town as a whole.

At the end, this study revealed low infection for *S. mansoni* infection compared to the previous majority reports in Ethiopia,Because praziquantel has been provided before the study for schoolchildren in the study area.

7. Conclusion

As elaborated in the previous sections the study result shows that *Schistosoma mansoni* prevalence in the three selected primary school of Kemissie town rate of infection slightly higher in malesthanin females , Lower infection for *Schistosoma mansoni* from the finding indicate that mass praziquantel treatment were given for schoolchildren before one month of the study. And still from the lower infection rate show that the spreading of *Schistosomiasis* has been continued.So prevention of the risk factors of *Schistosomiasisshould* be continued in the study area.

8. Recommendation

From the findings of the study, the following recommendations are suggested:Screening of high-risk primary school age children can be undertaken as a means of early intervention.A broader population-based survey is needed to adequately assess and burden of *S.mansoni* as well as explore the interactions of the various risk factors observed in this study. And also Strengthen health education and promotion using national and local TV and radio stations encourage civil societies to use social media for awareness creations and establish school and Non-school clubs who create awareness for behavioral change. Encourage donors, bilateral organization and international NGOs to work on interventions for prevention of risk factors of *Shistosomiasis.*

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10. Annex

Annex 1:

Medical diagnosis profile of the research participant (S) (Kemissie Town) in 2016 and 2017,**Stool-Sample in three primary Schools.**

Meaningof OIP = Ova Parasite

Code No	Sex	Age	School Name	Grade	Section	Result
01	F	7	Kachur	1	A	No,OIP Seen
02	M	7	Kachur	1	A	No,OIP Seen
03	F	7	Kachur	1	A	No,OIP Seen
04	M	8	Kachur	1	A	No,OIP Seen
05	F	7	Kachur	1	A	No,OIP Seen
06	M	7	Kachur	1	A	No,OIP Seen
07	M	7	Kachur	1	A	No,OIP Seen
08	F	7	Kachur	1	A	No,OIP Seen
09	F	7	Kachur	1	A	No,OIP Seen
10	M	7	Kachur	1	A	Yes,OIP Seen
11	M	6	Kachur	1	A	No,OIP Seen
12	M	7	Kachur	1	A	No,OIP Seen
13	M	7	Kachur	1	A	No,OIP Seen
14	M	7	Kachur	1	A	No,OIP Seen
15	F	5	Kachur	1	A	No,OIP Seen
16	F	7	Kachur	1	A	No,OIP Seen
17	F	6	Kachur	1	A	No,OIP Seen
18	M	6	Kachur	1	A	No,OIP Seen
19	F	6	Kachur	1	A	No,OIP Seen
20	M	7	Kachur	1	A	No,OIP Seen
21	F	8	Kachur	2	B	No,OIP Seen
22	F	12	Kachur	2	B	No,OIP Seen
23	F	11	Kachur	2	B	No,OIP Seen

24	F	9	Kachur	2	B	Yes, OIP Seen
25	F	7	Kachur	2	B	No,OIP Seen
26	M	6	Kachur	2	B	No,OIP Seen
27	M	8	Kachur	2	B	No,OIP Seen
28	M	9	Kachur	2	B	No,OIP Seen
29	M	7	Kachur	2	B	No,OIP Seen
30	F	9	Kachur	2	B	Yes,OIP Seen
31	F	9	Kachur	2	B	Yes ,OIP Seen
32	M	8	Kachur	2	B	No,OIP Seen
33	F	9	Kachur	2	B	No,OIP Seen
34	F	8	Kachur	2	B	No,OIP Seen
35	M	13	Kachur	2	A	No, OIP Seen
36	M	9	Kachur	2	A	Yes, OIP Seen
37	M	13	Kachur	2	A	No, OIP Seen
38	M	10	Kachur	2	A	No, OIP Seen
39	F	8	Kachur	2	A	No, OIP Seen
40	F	7	Kachur	2	A	No, OIP Seen
41	F	10	Kachur	3	A	No, OIP Seen
42	F	10	Kachur	3	A	No, OIP Seen
43	F	9	Kachur	3	A	Yes, OIP Seen
44	F	9	Kachur	3	A	No, OIP Seen
45	F	9	Kachur	3	A	No, OIP Seen
46	M	9	Kachur	3	A	No, OIP Seen
47	F	10	Kachur	3	A	No, OIP Seen
48	F	9	Kachur	3	A	No, OIP Seen
49	F	10	Kachur	3	A	No, OIP Seen
50	M	9	Kachur	3	A	No, OIP Seen
51	F	7	Haromsa(Worki)	1	A	Yes, OIP Seen
52	F	7	Haromsa(Worki)	1	A	No, OIP Seen

53	M	7	Haromsa(Worki)	1	A	No, OIP Seen
54	M	7	Haromsa(Worki)	1	A	No, OIP Seen
55	F	7	Haromsa(Worki)	1	A	No, OIP Seen
56	M	7	Haromsa(Worki)	1	A	No, OIP Seen
57	M	7	Haromsa(Worki)	1	A	No, OIP Seen
58	F	7	Haromsa(Worki)	1	A	No, OIP Seen
59	F	7	Haromsa(Worki)	1	A	No, OIP Seen
60	M	7	Haromsa(Worki)	1	A	Yes, OIP Seen
61	M	7	Haromsa(Worki)	1	B	No, OIP Seen
62	M	7	Haromsa(Worki)	1	B	No, OIP Seen
63	F	7	Haromsa(Worki)	1	B	No, OIP Seen
64	F	8	Haromsa(Worki)	1	B	No, OIP Seen
65	F	7	Haromsa(Worki)	1	B	No, OIP Seen
66	M	7	Haromsa(Worki)	1	C	No, OIP Seen
67	F	7	Haromsa(Worki)	1	C	No, OIP Seen
68	F	7	Haromsa(Worki)	1	C	No, OIP Seen
69	F	9	Haromsa(Worki)	1	C	No, OIP Seen
70	M	8	Haromsa(Worki)	1	C	No, OIP Seen
71	M	8	Haromsa(Worki)	2	A	No, OIP Seen
72	M	11	Haromsa(Worki)	2	A	No, OIP Seen
73	M	8	Haromsa(Worki)	2	A	No, OIP Seen
74	M	14	Haromsa(Worki)	2	A	No, OIP Seen
75	M	9	Haromsa(Worki)	2	A	No, OIP Seen
76	F	8	Haromsa(Worki)	2	A	No, OIP Seen
77	F	8	Haromsa(Worki)	2	A	No, OIP Seen
78	F	8	Haromsa(Worki)	2	A	No, OIP Seen
79	M	9	Haromsa(Worki)	2	A	No, OIP Seen
80	M	8	Haromsa(Worki)	2	A	No, OIP Seen
81	F	9	Haromsa(Worki)	2	B	No,OIP Seen
82	F	8	Haromsa(Worki)	2	B	No,OIP Seen

83	F	9	Haromsa(Worki)	2	B	No,OIP Seen
84	M	9	Haromsa(Worki)	2	B	No,OIP Seen
85	F	8	Haromsa(Worki)	2	B	No,OIP Seen
86	F	7	Haromsa(Worki)	2	B	No,OIP Seen
87	M	9	Haromsa(Worki)	2	B	No,OIP Seen
88	M	8	Haromsa(Worki)	2	B	No,OIP Seen
89	M	9	Haromsa(Worki)	2	B	No,OIP Seen
90	F	7	Haromsa(Worki)	2	B	No,OIP Seen
91	M	9	Haromsa(Worki)	3	A	No,OIP Seen
92	M	9	Haromsa(Worki)	3	A	Yes,OIP Seen
93	F	9	Haromsa(Worki)	3	A	Yes,OIP Seen
94	F	9	Haromsa(Worki)	3	A	No,OIP Seen
95	M	8	Haromsa(Worki)	3	A	No,OIP Seen
96	M	9	Haromsa(Worki)	3	A	No,OIP Seen
97	M	10	Haromsa(Worki)	3	A	No,OIP Seen
98	M	9	Haromsa(Worki)	3	A	No,OIP Seen
99	M	9	Haromsa(Worki)	3	A	No,OIP Seen
100	M	9	Haromsa(Worki)	3	A	No,OIP Seen
101	M	10	Kachur	3	B	No,OIP Seen
102	M	10	Kachur	3	B	No,OIP Seen
103	M	9	Kachur	3	B	Yes,OIP Seen
104	M	8	Kachur	3	B	No,OIP Seen
105	M	9	Kachur	3	B	Yes,OIP Seen
106	F	9	Kachur	3	B	No,OIP Seen
107	F	10	Kachur	3	B	No,OIP Seen
108	F	10	Kachur	3	B	No,OIP Seen
109	F	10	Kachur	3	B	No,OIP Seen
110	F	10	Kachur	3	B	No,OIP Seen
111	M	10	Kachur	4	A	No,OIP Seen
112	M	10	Kachur	4	A	No,OIP Seen

113	M	11	Kachur	4	A	No,OIP Seen
114	M	10	Kachur	4	A	No,OIP Seen
115	M	9	Kachur	4	A	Yes,OIP Seen
116	F	10	Kachur	4	A	No,OIP Seen
117	F	11	Kachur	4	A	No,OIP Seen
118	F	11	Kachur	4	A	No,OIP Seen
119	F	10	Kachur	4	A	No,OIP Seen
120	M	11	Kachur	4	A	No,OIP Seen
121	F	9	Kachur	4	B	No,OIP Seen
122	F	9	Kachur	4	B	No,OIP Seen
123	F	10	Kachur	4	B	No,OIP Seen
124	F	11	Kachur	4	B	No,OIP Seen
125	F	11	Kachur	4	B	No,OIP Seen
126	M	11	Kachur	4	B	No,OIP Seen
127	M	12	Kachur	4	B	No,OIP Seen
128	M	12	Kachur	4	B	Yes,OIP Seen
129	M	10	Kachur	4	B	No,OIP Seen
130	M	11	Kachur	4	B	No,OIP Seen
131	F	11	Kachur	5	A	No,OIP Seen
132	F	11	Kachur	5	A	No,OIP Seen
133	M	11	Kachur	5	A	No,OIP Seen
134	M	11	Kachur	5	A	No,OIP Seen
135	M	10	Kachur	5	A	No,OIP Seen
136	M	11	Kachur	5	B	No,OIP Seen
137	M	12	Kachur	5	B	No,OIP Seen
138	F	10	Kachur	5	B	No,OIP Seen
139	F	10	Kachur	5	B	No,OIP Seen
140	F	11	Kachur	5	B	No,OIP Seen
141	M	13	Kachur	6	A	No,OIP Seen
142	F	12	Kachur	6	A	No,OIP Seen

143	F	12	Kachur	6	A	No,OIP Seen
144	F	12	Kachur	6	A	No,OIP Seen
145	F	12	Kachur	6	A	No,OIP Seen
146	M	13	Kachur	6	B	Yes,OIP Seen
147	M	14	Kachur	6	B	No,OIP Seen
148	F	14	Kachur	6	B	Yes,OIP Seen
149	F	12	Kachur	6	B	No,OIP Seen
150	F	12	Kachur	6	B	No,OIP Seen

151	F	7	Kachur	1	B	No,OIP Seen
152	M	8	Kachur	2	A	No,OIP Seen
153	M	8	Kachur	2	B	No,OIP Seen
154	F	7	Kachur	1	A	No,OIP Seen
155	F	8	Kachur	2	B	No,OIP Seen
156	F	9	Kachur	3	A	Yes ,OIP Seen
157	F	12	Kachur	3	A	No,OIP Seen
158	M	11	Kachur	3	B	No,OIP Seen
159	M	10	Kachur	3	A	No,OIP Seen
160	F	10	Kachur	3	B	No,OIP Seen
161	M	10	Kachur	4	A	No,OIP Seen
162	M	8	Kachur	2	A	No,OIP Seen
163	F	10	Kachur	4	A	No,OIP Seen
164	F	10	Kachur	4	A	No,OIP Seen
165	F	10	Kachur	4	A	No,OIP Seen
166	F	12	Kachur	4	A	No,OIP Seen
167	F	13	Kachur	4	A	No,OIP Seen
168	M	12	Kachur	4	B	Yes, OIP Seen
169	M	11	Kachur	4	B	No,OIP Seen
170	M	12	Kachur	4	B	No,OIP Seen
171	M	11	Kachur	4	B	No,OIP Seen

172	M	12	Kachur	4	B	No,OIP Seen
173	M	12	Kachur	4	B	No,OIP Seen
174	F	12	Kachur	4	B	No,OIP Seen
175	M	11	Kachur	4	B	No,OIP Seen
176	F	11	Kachur	4	B	No,OIP Seen
177	M	10	Kachur	4	B	No,OIP Seen
178	F	10	Kachur	4	B	No,OIP Seen
179	M	11	Kachur	4	B	No,OIP Seen
180	F	11	Kachur	4	B	No,OIP Seen
181	F	10	Kachur	4	B	No,OIP Seen
182	F	10	Kachur	4	B	No,OIP Seen
183	F	10	Kachur	4	B	No,OIP Seen
184	F	10	Kachur	4	B	No,OIP Seen
185	F	11	Kachur	4	B	No,OIP Seen
186	F	12	Kachur	4	B	No,OIP Seen
187	M	13	Kachur	4	B	No,OIP Seen
188	M	12	Kachur	4	B	No,OIP Seen
189	M	12	Kachur	4	B	No,OIP Seen
190	F	12	Kachur	4	B	No,OIP Seen
191	M	12	Kachur	4	B	No,OIP Seen
192	M	12	Kachur	4	B	No,OIP Seen
193	F	11	Kachur	5	A	No,OIP Seen
194	F	11	Kachur	5	A	No,OIP Seen
195	M	12	Kachur	5	A	No,OIP Seen
196	M	12	Kachur	5	A	No,OIP Seen
197	M	12	Kachur	6	B	No,OIP Seen
198	M	12	Kachur	6	B	No,OIP Seen
199	M	14	Kachur	6	B	No,OIP Seen
200	M	14	Kachur	6	B	No,OIP Seen

201	F	13	Kachur	6	B	No,OIP Seen
202	F	12	Kachur	6	B	No,OIP Seen
203	M	7	Haromsa	1	A	Yes ,OIP Seen
204	M	7	Haromsa	1	A	Yes , OIP Seen
205	F	7	Haromsa	1	A	Yes , OIP Seen
206	M	9	Haromsa	3	B	Yes , OIP Seen
207	M	10	Haromsa	4	B	No,OIP Seen
208	M	10	Haromsa	4	B	No,OIP Seen
209	M	10	Haromsa	4	B	No,OIP Seen
210	M	10	Haromsa	4	B	No,OIP Seen
211	M	12	Haromsa	4	B	No,OIP Seen
212	M	12	Haromsa	5	C	No,OIP Seen
213	F	12	Haromsa	5	C	No,OIP Seen
214	M	13	Haromsa	5	C	No,OIP Seen
215	F	12	Haromsa	5	C	No,OIP Seen
216	M	12	Haromsa	5	C	No,OIP Seen
217	M	12	Haromsa	5	C	No,OIP Seen
218	F	12	Haromsa	5	C	No,OIP Seen
219	F	12	Haromsa	5	C	No,OIP Seen
220	M	12	Haromsa	5	C	No,OIP Seen
221	F	13	Haromsa	5	C	No,OIP Seen
222	M	11	Haromsa	5	C	No,OIP Seen
223	F	12	Haromsa	5	C	No,OIP Seen
224	F	12	Haromsa	5	C	No,OIP Seen
225	M	12	Haromsa	5	C	No,OIP Seen
226	M	12	Haromsa	5	C	No,OIP Seen
227	M	12	Haromsa	5	C	No,OIP Seen
228	M	13	Haromsa	5	C	No,OIP Seen
229	M	12	Haromsa	5	C	No,OIP Seen
230	M	12	Haromsa	5	C	No,OIP Seen

231	F	11	Haromsa	5	C	No,OIP Seen
232	M	12	Haromsa	5	C	No,OIP Seen
233	M	12	Haromsa	5	C	No,OIP Seen
234	M	12	Haromsa	5	B	No,OIP Seen
235	F	12	Haromsa	5	B	No,OIP Seen
236	F	12	Haromsa	5	B	No,OIP Seen
237	F	12	Haromsa	5	B	No,OIP Seen
238	F	12	Haromsa	5	B	No,OIP Seen
239	M	12	Haromsa	5	B	No,OIP Seen
240	M	13	Haromsa	5	B	Yes , OIP Seen
241	F	12	Haromsa	5	B	No,OIP Seen
242	F	12	Haromsa	5	B	No,OIP Seen
243	F	12	Haromsa	5	B	No,OIP Seen
244	F	13	Haromsa	5	B	No,OIP Seen
245	F	13	Haromsa	5	B	No,OIP Seen
246	F	13	Haromsa	5	B	No,OIP Seen
247	F	12	Haromsa	5	B	No,OIP Seen
248	F	12	Haromsa	5	B	No,OIP Seen
249	M	12	Haromsa	5	B	No,OIP Seen
250	F	12	Haromsa	5	B	No,OIP Seen
251	F	12	Haromsa	5	B	No,OIP Seen
252	M	12	Haromsa	5	B	No,OIP Seen
253	F	12	Haromsa	5	A	No,OIP Seen
254	F	13	Haromsa	5	A	No,OIP Seen
255	M	12	Haromsa	5	A	No,OIP Seen
256	M	12	Haromsa	5	A	No,OIP Seen
257	F	12	Haromsa	5	A	No,OIP Seen
258	F	12	Haromsa	5	A	No,OIP Seen
259	M	12	Haromsa	5	A	No,OIP Seen
260	M	13	Haromsa	5	A	No,OIP Seen

261	F	12	Haromsa	5	A	No,OIP Seen
262	F	12	Haromsa	5	A	No,OIP Seen
263	M	12	Haromsa	5	A	No,OIP Seen
264	F	13	Sedasa29	6	A	No,OIP Seen
265	F	14	Sedasa29	6	A	No,OIP Seen
266	F	13	Sedasa29	6	A	No,OIP Seen
267	F	13	Sedasa29	6	A	No,OIP Seen
268	F	13	Sedasa29	6	A	No,OIP Seen
269	F	13	Sedasa29	6	A	No,OIP Seen
270	F	14	Sedasa29	6	A	No,OIP Seen
271	F	14	Sedasa29	6	A	No,OIP Seen
272	F	14	Sedasa29	6	A	No,OIP Seen
273	F	13	Sedasa29	6	A	No,OIP Seen
274	F	13	Sedasa29	6	A	No,OIP Seen
275	F	12	Sedasa29	6	A	No,OIP Seen
276	F	13	Sedasa29	6	A	No,OIP Seen
277	F	11	Sedasa29	6	A	No,OIP Seen
278	F	14	Sedasa29	6	A	Yes , OIP Seen
279	M	13	Sedasa29	6	B	No,OIP Seen
280	M	14	Sedasa29	6	B	No,OIP Seen
281	F	13	Sedasa29	6	B	No,OIP Seen
282	F	13	Sedasa29	6	B	No,OIP Seen
283	F	13	Sedasa29	6	B	No,OIP Seen
284	M	13	Sedasa29	6	B	No,OIP Seen
285	F	12	Sedasa29	6	B	No,OIP Seen
286	M	13	Sedasa29	6	B	No,OIP Seen
287	M	13	Sedasa29	6	B	No,OIP Seen
288	F	12	Sedasa29	6	B	No,OIP Seen
289	M	13	Sedasa29	6	B	No,OIP Seen
290	M	12	Sedasa29	6	B	No,OIP Seen

291	F	12	Sedasa29	6	D	No,OIP Seen
292	F	12	Sedasa29	6	D	No,OIP Seen
293	F	13	Sedasa29	6	D	No,OIP Seen
294	F	12	Sedasa29	6	D	No,OIP Seen
295	F	13	Sedasa29	6	D	No,OIP Seen
296	M	12	Sedasa29	6	D	No,OIP Seen
297	M	14	Sedasa29	6	D	No,OIP Seen
298	M	12	Sedasa29	6	D	No,OIP Seen
299	M	12	Sedasa29	6	D	No,OIP Seen
300	M	12	Sedasa29	6	D	No,OIP Seen

Annex 2: Written consent form

Date:

Code of Study participant:

English version of participant's consent and Information sheet

Hello. My name is ———————— and I am here on behalf of Ahmed Mohammednur a post graduate student from AAU, I am here to collect information about the prevalence of Shistosoma mansoni infection among school children in kemisse twon, Northeast of Ethiopia. I am invited you to participate in the study which would you require your response to an interview on some related issue like water source, sanitary socio-demography characters.

All information given by you will be kept strictly confident. Your participation is purely voluntary and you are not obligate to answer.

Could I have your permission to continue?

If yes, continue the interview.

If no, pass to the next participant.

For any questions you have, you can contact the principal investigator by: 0914050675

Name (participant)_____ Signature _____Date_____

Name (Wittiness)_____Signature _____ Date_____

Name (Investigator)_____Signature _____Date _____

Annex 3 English Version of the Questionnaire

Date_____

Code No_____

This interview was about socio-demographic, water contact case(swimming, drinking, irrigation) It will help the researcher to find out participant

characteristics, knowledge, attitude and practice of the participant towards shistosomiasis. All information given in the interview will be handled confidentially. Please, circle the letter of participant choice, or write the figure Part.

socio demographic and economic characteristics of respondents

Name of town----------, Kebele----------S.N Socio-demographic information Response C0de

11 Sex A. Male

B. Female

12 Age ----------

13 previous History A. Yes

B. no

14.Grade level A. 1-4 B.5-6

15 Water source for drinking A. protected B. River(unsafe)

16. Swimming habit A. Never B. Frequently C. Sometimes

17. Irrigation practice A. Yes B. No

18. Toilet access A. Yes B. No

Annex 4: Questionnaire (Amharic version)

ቀን

የኮድቁጥር

የብልሃርዚያበሽታስርጭትእናአጋላጭደንቢዎችስማጥናትየተዘጋጀቃለመጠይቅየዚህቃለመጠይቅአላማበአሚሴከተማ ውስጥበሚገኙአንደኛደረጃት/ቤቶችያለአመለካከትልማድእናአጠቃላይየጤናደረጃንለመገንዘብእናለመግለጽታስቦየተዘጋጀነ ውየአንድተጥገኛ

- በሽታውንለመመርምርየሰገራናሙናከሰውነኂላስጥናቱተባባፊየሆኑትንታካሚዎችመጠይቁንእንድሞሉስጥኒውበትህ ትናደጠይቃልስለሆነምሁሉምየሚሏቸውመረጃዎችሚስጥራቸውየተጠበቀደሆናልመጠይቁንየሞሉትለመቃላይ

መረጃ

ወረዳቀበሌ

እድሜፃታወ------ሴየስራሁኔታስርሶስደርንጋዴየመንግስትተቀጣሪየቀንሰራተኛ-----

የቤትስራተኛየትምህርትሁኔታያልተማረማንበብእናመጻፍብቻየ-----ዓመትየተማረመጠይቅ

1. በትልየሚመጣበሽታደዞዎትውቃለሀ. አያውቅምለ. ያውቃል

2. የብልሀርዚያበሽታከሰውወደሰውየተላለፋልሀ. አዎለ. አደተላለፍም

3. የብልሀርዚያበሽታወደሰውየሚገባው?

ሀ. ቆዳንበመሰርሰርሐ. የቆሸሸውሳበመጠጣትለ. በዝንብንክሻመ.በእርግማንረ. ሀሳብየለንም

4. ወባናየአንጀትጥገኛተህዋስሲደዘዎትማንንያማክራሉሀ. የመንግስትጤናጣቢያለ. የግልክሊኒክሐ. ሙስቱንምመ. ባህላዊሳኪሞችንረ. አሳማክርምሸ. ሌላምካለደግለጹት

5. በእርሰዎሳሳብየብልሀርዚያበሽታንመቆጣጠርናመከላከልስራየሚሰራውማነው? ሀ. መንግስትለየግልድርጅትሐ. ህዝቡመ. ሁሉም

6. በጤናኬክስቴንሽንየሚሰጠውንየጤናትምህርትደተገብራሉ?ሀ. ሁልጊዜለ. አንዳዴሐ. ፈጽሞለለሰራም

7. የብልሀርዚያበሽታምንጭየሆነውሀ. ወንዝውሃለ. አፈርሐ. አየርመ. መልስየለም9. እራሰዎመጸዳጃቤትለሰዎት? ሀ. አዎለ.የለኝም10. የመጠጥውህስንዴትደጠቀማሉ? ሀ. በማፍላትለ. በማጥለልሐ. እንድሁመ. ሌላካለደዘርዝ

11. የሚጠቡትንውሃከየትደቀዳሉ? ሀ. ከምንጭለ. ከቧንቧውሃሐ. ከወንዝመ. ከሀደቅሠ. ከጉድጓድ

12. ሲንቀሳቀሱጫማደለብሳሉ?ሀ. አንዳንድጊዜለ. ሁልጊዜሐ. ለለብስም13. ከመመገብዎበፌትለጀዎንደታጠባሉ?ሀ. አንዳንድጊዜለ. ሁልጊዜሐ. ለልፎለልፎመ.ለለታጠብም14. የመስኖስራደሰራሉን?ሀለስራለሁለ.ለልሰራም

15. ወንዝወደምሃደቀደዋኛሉ? ሀ.ለልዋኝምለ. ለልፎለልፎሐ. ሁልጊዜመ. በጣምለልፎለልፎ

ሽንትቤትለመተሀ. አወለ. የለም

የጨሀምንጭወ

ሀ. ንፅህናውየተጠበቀለ. ንፅህናውያልተጠበቀ