

**RE-INFECTION RATES AND THE THERAPEUTIC EFFICACY OF  
PRAZIQUANTEL AGAINST *SCHISTOSOMA MANSONI* AMONG  
SELECTED PRIMARY SCHOOL CHILDREN IN JIMMA TOWN,  
SOUTHWEST ETHIOPIA**



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**A THESIS SUBMITTED TO JIMMA UNIVERSITY INSTITUTE OF HEALTH,  
FACULTY OF HEALTH SCIENCES, SCHOOL OF MEDICAL LABORATORY  
SCIENCES, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR  
THE DEGREE OF MASTERS OF SCIENCE IN MEDICAL PARASITOLOGY**

**MAY, 2022  
JIMMA, ETHIOPIA**

**JIMMA UNIVERSITY**  
**INSTITUTE OF HEALTH**  
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## **Abstract**

**Background:** Schistosomiasis is among neglected tropical parasitic diseases that result in major public health problem in the majority of developing tropical and sub-tropical countries including Ethiopia. Praziquantel (PZQ) is a first line drug of choice for the treatment of schistosomiasis even if low cure rate has been reported in different corner of the world. The re-infection rate of the parasite is common in areas where there is a water source containing infective larval forms (cercariae) of the parasite released by infected freshwater snails. Therefore, assessing the re-infection rate and determining the efficacy of PZQ in the study area is very crucial.

**Objective:** To assess the re-infection rate and therapeutic efficacy Praziquantel against *S. mansoni* infection among selected primary school children in Jimma Town.

**Method:** A school-based follow-up study was conducted from June 2021 to February 2022 among selected schools, Hamile 19, Seto Yido, Tuluma keneni, Abdi Gudina and Jimma primary schools in Jimma town, Southwest Ethiopia. Stool specimens were examined using single Kato-Katz thick smear method. School children who were tested positive for *Schistosoma mansoni* were involved in the drug efficacy and re-infection rate of the parasites and treated with 40 mg/kg of PZQ (BERMOXEL®). Cure and egg reduction rates were evaluated three weeks after treatment. The re-infection rate of those who were cured was evaluated after six months' post treatment period. Data was analyzed using Statistical Package for Social Science (SPSS) version 25. Bivariate and Multivariable analysis was done and variable with a p-value  $\leq 0.05$  was considered as statistically significant.

**Results:** A total of 521 school children participated in the study. At baseline, the overall prevalence of *S. mansoni* infection was 117(22.5%). Among positive for the infection, 92 were assessed for praziquantel efficacy study and three weeks of post treatment with 40mg/kg of praziquantel the children were re-examined. The egg reduction rate and cure rate of praziquantel among the study participant were 99.3% and 97.8% respectively (ERR=99.3 & CR=97.8) After six months of praziquantel treatment, 79 school children were traced for stool examination and 6.33% were re-infected by *S. mansoni*. The odds of *S. mansoni* infection was significant among males (AOR= 3.3; 95% CI= 2.0-5.3, P<0.01) and study participant who had the habit of crossing water bodies with barefoot (AOR=2.3; 95%CI=1.5-5; p<0.01)

**Conclusion and Recommendation:** The infection of *S. mansoni* is moderate relative to the WHO guideline and Re-infection rate of *S. mansoni* was low among five primary schools of Jimma town. Efficacy of praziquantel was satisfactory against *S. mansoni*. Being male & crossing River on bare foot were significantly associated with *S. mansoni* infection. Scheduled health education should be given to reduce the prevalence and transmission

**Key words:** Re-infection, *S. mansoni*, efficacy, Praziquantel, Jimma town

## **Acknowledgments**

I would like to thank Jimma University for funding this research and Jimma town Health Office for sponsoring me to attend the program.

I would also like to thank my advisors Mr. Mitiku B, Mr. Abebaw T and Mr. Mio A for their guidance and advice from topic selection to the development of this thesis.

I am also grateful to all of my study participants, their parents and schools' teachers for being voluntary to give information. Finally, I would like to thank my friends, classmates, and staff of Jimma University Neglected Tropical Diseases (NTD) laboratory for their unreserved precious support during data collection, supervision and supporting of materials needed for this study.

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## **Acronyms and Abbreviation**

<b>AOR:</b>	Adjusted Odds Ratio
<b>CR:</b>	Cure Rate
<b>ERR:</b>	Egg Reduction Rate
<b>EPG:</b>	Eggs per gram
<b>MDA:</b>	Mass Drug Administration
<b>NDCP:</b>	Non Communicable Disease Control Program
<b>NTD:</b>	Neglected Tropical Diseases
<b>OR:</b>	Odds Ratio
<b>PSAC:</b>	Pre -School Age Children
<b>PZQ:</b>	Praziquantel
<b>SC:</b>	School Children
<b>WHO:</b>	World Health Organization

# Chapter One

## Introduction

### 1.1. Background

Schistosomiasis is a chronic water-related parasitic disease caused by blood flukes of the genus *Schistosoma*(1). Human being is infected by six major species of shistosoma: *S. haematobium* which is responsible for causing urinary schistosomiasis while, *S. mansoni*, *S japonicum*, *S.mekongi*, *S.intercalatum* and *S. guineensis* are causing intestinal schistosomiasis(2).

The *Schistosoma* life cycle passes through succession of stages: Miracidia emerge from the eggs that hatch when they reach fresh water. Miracidia actively seek intermediate host snails of specific species.Each miracidium invades the soft tissues of the snail and develops into a mother sporocyst, after a period of multiplication of in the snail the cercariae emerge as a free-swimming larval stage capable of infecting humans. Cercariae can penetrate the skin of the definitive host and transform into schistosomula that migrate through the lungs to the liver where they reach maturity. Male and female worms may pair and move via the blood vessels to their final position, where they begin to produce eggs passed with feces or urine. (2)

Pathological changes in *Schistosoma* infections are predominantly caused by the deposition of eggs in various tissues and organs which is trapped by immune cells and result in the formation of granulomas or pseudo tubercles (3). Intestinal *Schistosomiasis* can cause abdominal pain, diarrhea, and blood in the stool. Liver enlargement is common in advanced cases, and is frequently associated with an accumulation of fluid in the peritoneal cavity and hypertension of the abdominal blood vessels which may result in splenomegally (3). *Schistosomiasis* is diagnosed by detection of parasites eggs in stool or urine specimens .Thick kato-katz technique is recommended for intestinal *shistosomiasis* as there is chance of missing the egg by wet mount in the case of low infection intensity as majority of the egg is trapped in the tissues or organs by immune cells (4).

Schistosomiasis mostly affects poor and rural communities, particularly agricultural and fishing populations. Lack of hygiene and certain play habits of school-aged children such as swimming or fishing in infested water make them especially vulnerable to infection (3)

*Schistosomiasis* primarily controlled through large-scale treatment of at-risk population, access to safe water, improved sanitation, hygiene education, and snail control. depending on the degree of endemicity is routine administration of single-dose oral PZQ (usually 40 mg/kg body weight) to whole populations or target groups is critical (5). The Primary control strategy for Schistosomiasis is School or community-based mass drug administration (MDA) with PZQ. The recommended treatment for all forms of Schistosomiasis is PZQ. Praziquantel widespread use may raise concerns about its efficacy, while some regions of the world report low cure rate(6). Therefore, there is a need for a regular monitoring of the drug under global pressure on its use. Moreover, re-infection has been reported rapidly after MDA (7).

## 1.2. Statement of the Problem

*Schistosomiasis* is one of the most common parasitic diseases, and it is common in tropical and subtropical areas, particularly in impoverished communities that lack access to safe water and adequate sanitation. It is one of the major NTD affecting over 240 million people worldwide and more than 700 million people live in endemic areas(3). It is estimated that at least 90% of those in need of *Schistosomiasis* treatment live in Africa, and the disease remains a major public health issue in many parts of the developing world. Particularly in Sub Saharan African countries such as Ethiopia(3), *Schistosomiasis* causes more than 200,000 deaths per year in Sub-Saharan African countries, according to the WHO (8).

In Ethiopia, like in other developing countries, *S. mansoni* infection is reported in different parts of the country(9) and there were an estimated 37.3 million people living in schistosomiasis endemic areas, encompassing 3.4 million pre-schoolchildren, 12.3 million school-aged children, and 21.6 million adults. From the country's 833 districts, 374 are uninfected for both intestinal and urogenital schistosomiasis, 190 have low, 153 moderate endemicity, and 69 high endemicity, the remaining districts are yet to be determined(10).

There are different higher reports on the prevalence of *S. mansoni* infection among school children in Ethiopia, 81.3%. from Demba Girara, Wolaita Zone (11) , (89.9%) from the study done in Sanja town, northwest Ethiopia (12), (83.3% from Sanja General Primary School (13) and there is a prevalence report of 28.7% among school children in the Jimma town, south west Ethiopia(14).

Praziquantel efficacy of the drug is considered as sufficient when the cure rate (CR) is 60–90 % and egg reduction rate (ERR) is > 90 %, while facilitating patients' compliance especially among children(5,15). Most of the time population treatment with PZQ produces CR of over 70 %(16).

PZQ's efficacy decreases with the incidence of infection prior to treatment, the number of pre-patent infections, diagnostic sensitivity, and the age of the patients (17) .

Furthermore, poor drug quality and patient compliance can have a negative impact on cure success(18). Effectiveness of the drug against *Schistosomiasis* has been tested in Egypt and *S. mansoni* isolates retrieved from Egyptian villages during the late 1990s showed resistance, or at least a decreased susceptibility to PZQ (19). In Kenya, also some *S. mansoni* infected patients that have been treated resume egg production after treatment, indicative of acquisition of new worms, or possibly reactivation of existing worms (20). There was also lower efficacy reported from Wondo Genet, Ethiopia, CR of 73.6% and ERR of 68.2%(21). There is a report of re-infection rate of 13.9% from Sanja, Ethiopia after 6 months of post treatment(22).

Even though lower efficacy of PZQ were reported from different part of the world, there is few reports on PZQ efficacy in Ethiopia and different studies conducted on prevalence and epidemiology of *S.mansoni* infection in our study area but there is very few or no data on re-infection rate and therapeutic efficacy of PZQ have not yet been evaluated in our study area.

Therefore, the aim of this study was to determine the re-infection rate of *S. mansoni* infection and evaluate the therapeutic efficacy of PZQ against *S. mansoni* among selected primary school children in Jimma town.

### **1.3. Significance of the Study**

This study provides important information to the regional & national health offices, policy makers and others stakeholders in the achievement of the following:

- It indicated current prevalence and re-infection rate of *S. mansoni* among primary school children.
- Determining epidemiology of *S. mansoni* to map the area for possible intervention
- To alert further investigator to determine the current efficacy of PZQ to encourage the MDA in the case of satisfactory and in case of reduced further action will be taken.
- Crucial for effective planning and sustainable strategies to control schistosomiasis transmission.
- Can be used as reference for further research and narrows the gap of the increasing demand for the literature in the topic under consideration.

## Chapter Two

### Literature Review

#### 2.1. Prevalence of *S. mansoni* among school children

A cross-sectional survey conducted in Tanzania reported prevalence of *S.mansoni* infection of 90.6%. Pre-adolescents ( $\leq 12$  years) were more infected with intestinal Schistosomiasis (93.2%) compared to adolescents ( $>12$  years). There was no significant difference in the prevalence of infection among male and female (23). A cross sectional study done in Cote d'ivore on prevalence of *S.mansoni* infection among school children, revealed that the prevalence of 6.1% and washing clothes in open freshwater bodies was significantly associated with *S. mansoni* infection(24).

A cross sectional study conducted among primary school students in Um-Asher area, Sudan reported the overall prevalence of *S. mansoni* infection of 2.95%. The males had higher prevalence of *S. mansoni* infection than females (40%). With regard to risk factors distance of residence from water source is associated with the infection(25).

In a school-based cross-sectional study conducted among selected primary schools around Lake Tana, the overall prevalence of *S. mansoni* infection was 34.9%. The majority of *S. mansoni* infections (61.4%) were low infection intensity. Among the different determinant factors being male, bathing habits and students attended primary schools were significant associated factors for *S.mansoni* infection (26).

According to a school based cross sectional study done on prevalence, intensity and associated factors of *S.mansoni* infection in northwest Ethiopia, the prevalence was 33.5%. Age of 8-11 years old are more affected is found to be risk factors for *S.mansoni* infection(27). A cross-sectional study conducted on Sanja Elementary Schools, northwest Ethiopia reported the prevalence of *S.mansoni* infection was 35%. Of the schoolchildren affected, 86.2% were mildly infected(22).

Another cross-sectional study conducted in Sanja General Primary School, Northwest of Ethiopia prevalence of *S. mansoni* infection was 83.3% with geometric mean egg count



of 357.8(13). There was also a study conducted in Demba Girara, Wolaita Zone, *S. mansoni* infection was 81.3%. Contact to stream was the most important factor for *S. mansoni* infection followed by herding cattle near the stream. Males were twice more likely to get the infection than females(11).

A study conducted among school children in Kemisse Town, Northeast Ethiopia reported the overall prevalence of *S. mansoni* infection of 52.1% with a mean intensity of 546 eggs per gram of stool. Majorities of the *S. mansoni* infections were moderate to heavy intensity, with only 5.0% light infections(28).

In similar cross-sectional study done in Manna district, Jimma zone, the prevalence of *S. mansoni* infection was 27.6%, which was 28.6% and 26.7% among men and women respectively. The majority of infection incidence was mild and predictors were bathing in river, washing clothes in open water and crossing rivers being bare foot(29).

In another study conducted on Prevalence and intensity of *S. mansoni* infection in Jimma town, Ethiopia, the prevalence was 8.4% in all schools, but the prevalence per school ranged from 1.7 to 26.7%. This variation in prevalence could be explained by the proximity of the schools to the river crossing the town (30).

In cross-sectional study among selected primary schools nearby rivers of Jimma town, the prevalence of *S. mansoni* infection was 28.7%. In this study sex, crossing rivers on barefoot, swimming/playing nearby river and distance of school from rivers, were significantly associated with *S. mansoni* infection (14).

## **2.2. Re-infection rates of *S. mansoni* among school children**

A study done in Brazil on successful treatment of PZQ among school children indicated there was reinfection rate of *S. mansoni*. Among re-infected children who had heavy infection at baseline, low socio-economic and lower level of education of the household head were highly related with reinfection rate(31).

A randomized controlled trial in Uganda reported 44.5% children that were egg negative at 1-month follow-up were tested egg positive for *S. mansoni* 8 months later. Re-infection was higher in boys than girls. Re-infection intensity at 8 months post treatment was 4.0 and 7.1 EPG for children who received a single and double dose, respectively. There was

a marked reduction in heavy infection after treatment but it rose again to half its original level 8 months later(32).

A study conducted in Niger indicated the re-infection rate among school age children with *S.mansoni* of 63.4% after 6 months of post treatment assessment(33).

According to a study conducted in the Blue Nile Valley of western Ethiopia during 1995 in selected schools previously hyper infected villages were examined for reinfection. In 1995 prevalence rates in the 5–19year age group had risen to 63%\_ 68%, which was very close to the 1985–1986 pre-control prevalence. The 1986 pre-control geometric mean of *S. mansoni* eggs per gram(EPG) of faeces in the 5–19 year age group was 73, after mass treatment in 1995 it was 27(34) which indicate there was re-infection.

In cross-sectional study conducted on Sanja Elementary Schools out of the students considered for the reinfection score, 13.9% were found to be re-infected after 6 months of post treatment. The reinfection rate showed a significant inverse association with age. Higher reinfection rate was observed in males than females(22).

### **2.3. PZQ Efficacy among school children**

As the study conducted on the efficacy and safety of PZQ among preschool-aged children in the Azaguie' district, south Co^ te d'Ivoire,high efficacy of PZQ against *S. mansoni* were reported ,CR of 88.6%; ERR 96.7%(35).

A study conducted to assess the efficacy and safety of PZQ among *S. mansoni*-infected children in north-western Tanzania indicated among children treated with a single-dose PZQ, the overall CR and ERR were 81.2% and 95.0%,respectively. There was no significant association between CR and pre-treatment infection intensity. There was lack of cure in about one-fifth of the infected children (36).

A cross sectional study in Niger to assess efficacy of PZQ on *S. mansoni*, reported only moderate CR and ERR (51.7–60.2%). Twelve months post-treatment prevalence rates approached pre-treatment levels, but infection intensities remained low (33).

In the multi-country study during 2014, the therapeutic efficacy of a single dose of PZQ against *S. mansoni* (Brazil, Cameroon, Ethiopia, Mali, Madagascar and Tanzania),

infections in school-aged children, was assessed. Overall, therapeutic efficacy, measured by ERR, which was 93.4%(37).

Another cross sectional study conducted among school children in Kemisse Town, Northeast Ethiopia reported CR of 91.7% and ERR of 86.8% (28).

In the cross sectional study done in Tumuga and Waja, north Ethiopia the cure rate of *S. mansoni* infection in the two study areas remains high and in Tumuga cure rate was 93.44% and in Waja 88.99% (38).

In a cross sectional study conducted in Wondo Genet, Ethiopia, the overall CR of 73.6% and ERR of 68.2% were reported. The CR showed significant association with age, the highest rate being observed in the 15-22 age group(21). A cross-sectional study conducted on Sanja Elementary Schools for the PZQ efficacy assessment reported the CR and ERR of 90% and 99.5%, respectively(22).

In study conducted in Sanja General Primary School, after 4 weeks of administration of PZQ the cure rate was 86.9% with egg reduction rate of 78.3%. Effectiveness of the drug was not statistically associated with sex, age group, and pre-treatment intensity of infection (13).

The study conducted among Finchaa Sholoko elementary school showed that the CR and ERR among the children who completed the study were 80.9 %and 99.51%, respectively. There was a substantial relationship between CR and pre-treatment infection intensity, but no significant relationship between CR and age ranges. (39). According to cross-sectional study done among school children in Manna district, Jimma zone Southwest Ethiopia,the therapeutic efficacy of PZQ was highly efficient, CR of 99.1 % and ERR of 99.9 %(29) was reported.

## 2.4. Conceptual framework

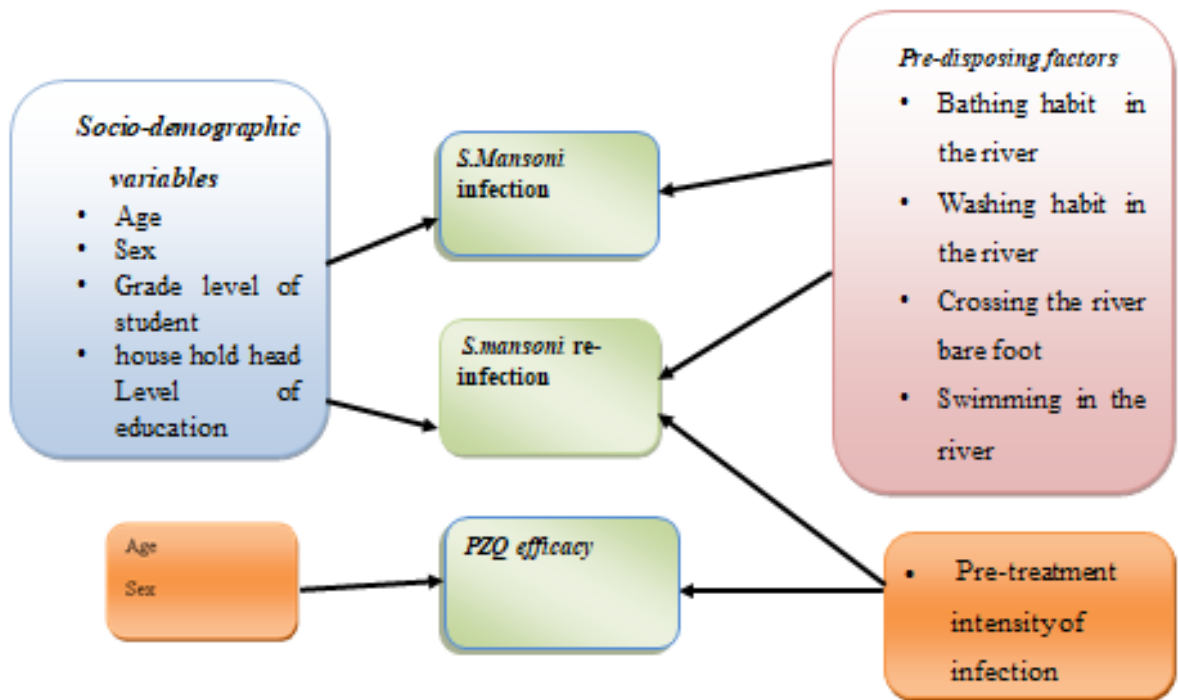


Figure 1: Conceptual framework showing the relationship between the independent and dependent variables adopted after reviewing of different literatures.

## Chapter Three

### Objectives

#### 3.1. General Objective

- To assess re-infection rate and therapeutic efficacy praziquantel against *S. mansoni* infection among selected primary school children in Jimma Town, South west Ethiopia, 2021.

#### 3.2. Specific Objectives

- To assess the re-infection rate of *S. mansoni* among selected primary school children in Jimma town
- To assess the therapeutic efficacy of PZQ against *S. mansoni* infection among selected primary school children in Jimma town
- To determine the prevalence of *S. mansoni* infection among selected primary school children in Jimma town
- To determine factors associated with *S. mansoni* infection among selected primary school children in Jimma town

## **Chapter Four**

### **Materials and Methods**

#### **4.1. Study area**

The study was conducted in Jimma town, which is approximately 350 km away to southwest of the capital city of the country, Addis Ababa, Ethiopia. It is located at a latitude of 7°39' 59.99'' N and longitude of 36°49'59.99''E and at 1720–2010 m above sea level. The area is characterized by a semi-arid type of climate with an average annual rainfall of 1500 mm. The mean daily temperature is 19°C, ranges from 12.7 to 26.2°C. According to the information obtained from Jimma town health office, Jimma town has 224,565 total populations, of which 112,911 are male and 111,654 females. There are two governmental hospitals, three private hospitals, four health centers, and forty-two private clinics in the town. Totally there are 48 primary schools of which 25 are governmental and 23 are non-governmental. There is Awetu River which crosses in the middle of Jimma town and the nearby communities of the town use this river for different domestic purposes as well near to some schools in the town. There are also other rivers such as Kito, Kaba, DMC pond and other small streams like Tulama keneni. These water sources may be sources of *S.mansoni* infections.

#### **4.2. Study period**

The study was conducted from June 2021 to February 2022 among selected primary school children in Jimma town.

#### **4.3. Study design**

A school based follow-up cross-sectional study was conducted to assess the re-infection rate and the therapeutic efficacy of PZQ against *S. mansoni* infection among selected primary school children in Jimma town, southwest Ethiopia.

#### **4.4. The study population**

##### **4.4.1. Source population**

All primary schools children in Jimma town during study period.

#### 4.4.2. Study population

All selected school children aged from 5 to 19 years attending selected primary schools in Jimma town during study period.

#### 4.5. Sample size determination and Sampling techniques

##### 4.5 .1 Sample size

The sample size was calculated based on WHO guide line to assess the efficacy of antihelminthic drugs (5), according to the guideline the sample of 100 children positive for parasite targeted for the study is sufficient to evaluate the efficacy of the drug. The number to be screened was estimated according to the prevalence in the study area which is 28.7 % (14), and with the compliance rate of 80% which gave us a total sample size of 436.

$$\text{No. of children to be screened} = \frac{\text{No of infected children}}{\text{Compliance rate} \times \text{Prevalence}}$$

Compliance rate = 80%

Prevalence = 28.7%

No. of infected children = 100

$$\text{No. of children to be screened} = \frac{100}{0.8 \times 0.287} = 436$$

By adding 10% for non-response the final sample size was 480

While collecting the data the numbers of children positive for *S. mansoni* infection were less than 100 at baseline, then we added 41 school children to evaluate the efficacy of PZQ with enough sample size and totally the final sample size was 521 school children.

### **4.5.2. Sampling techniques**

To select the study participants, five primary schools were purposively selected based on the prevalence of infection from previous data. Firstly, samples were proportionally distributed among selected primary schools. But, after data collection was started the prevalence of *S.mansoni* infection among Tulama Keneni and Seto Yido was higher than other selected schools. Since our objective was to get more positive, after collecting 60 participants from each school, we left collecting samples from schools with lower prevalence and distributed the rest number over the two schools (Tulama keneni & Seto yido). Grade and section were selected by lottery method and the participants were selected using simple random sampling technique from selected sections.

## **4.6. Eligibility Criteria**

### ***4.6.1. Inclusion criteria***

- School children aged 5-19 years old attending the selected primary schools and available during study period

### ***4.6.2. Exclusion criteria***

- Children in severe medical conditions, had liquid or diarrheal stool specimen
- Children vomited within 4 hours after drug administration
- Not received PZQ treatment for the last 6 months before data collection

## **4.7. Data collection procedure**

### ***4.7.1. Questionnaires Survey***

A semi structured questionnaire was used to obtain socio-demographic information and associated risk factors for *S. mansoni* infections. Questionnaire was translated to both Afan Oromo and Amharic languages. Data collectors were trained for half a day about the objectives of study and ways of data collection and assigned to each school to conduct the study under the supervision of the principal investigator. Explanation about the aim of the research was given to the children and their teachers at each spot before the interview.



#### **4.7.2. Baseline Parasitological Survey**

A single stool specimen of about 2g was collected from each school children participated in the study. A clean, dry, and leak proof container was used to collect a stool specimen, and the container for every child was labeled with a unique ID number and stool samples was transported to Jimma University NTD laboratory. Each stool specimen was examined using thick Kato-Katz preparations on a template holding 41.7 mg of stool. The slides were left for 24 hours to clear for easy visualization of *S. mansoni* eggs. After 24 hours, the smears were examined for eggs of *S. mansoni*. Results of the laboratory investigation were recorded on reporting sheets prepared for reporting the result. In addition, intensity of *S. mansoni* infection was calculated by multiplying the number of eggs counted by 24, which gives EPG of the stool.

#### **4.7.3. Drug Administration**

Each child was given a light snack (a biscuit with cup of tea) before the drug was administered and took the same batch, brand of PZQ (BERMOXEL<sup>®</sup>) stored properly and its expiry date was 03-2025. The nurses gave the tablets under direct observation, and each child was kept under observation for approximately 4 hours. The children were remained at school and continued their usual activities, and they were asked to rapidly report any side effect to a member of the investigation team(40).

#### **4.7.4. Follow-Up Survey**

Children who were tested positive for *S.mansoni* eggs and treated with PZQ at baseline were requested to provide a second stool sample between 14-21 days. Children who didn't attend school on the follow-up day or didn't bring a specimen were followed-up 1 or 2 days later. The laboratory method used in the baseline survey was used in the follow-up survey (40).

#### **4.7.5. Re-infection Assessment**

Children who were tested positive during the baseline survey and negative on follow up between 14 to 21 days of post treatment were tested at six months after post treatment to assess the re-infection rate.

#### **4.7.6. Praziquantel Efficacy**

Cure rate (CR) and egg reduction rate (ERR) were used to assess the drug efficacy.

CR=

$$\frac{\text{Number of negative children after treatment who were positive at baseline}}{\text{number of positive children before treatment}}$$

× 100

$$\text{ERR} = \left( 1 - \frac{\text{Arithmetic mean egg counts at followup}}{\text{Arithmetic mean egg counts at baseline}} \right) \times 100$$

## 4.8. Study variables

### 4.8.1. Dependent variables

- ✓ *S.mansoni* infection
- ✓ PZQ efficacy
- ✓ *S.mansoni* re-infection

### 4.8.2. Independent variables

#### ✓ Socio-demographic variables

- Age
- Sex
- Grade level of student
- House hold head level of education

#### ✓ practice related factors

- Bathing in the river
- washing in the river
- Swimming in the river
- Crossing the river bare foot

#### ✓ parasitic infection intensity at baseline

#### **4.9. Operational definitions**

**Cure rate:** a percentage of positive school children at pretreatment who become egg negative 21 days after treatment.

**Egg reduction rate:** reduction in the groups' Arithmetic mean fecal egg count for *S. mansoni* comparing before and after treatment.

#### **4.10. Data analysis**

Data were entered into Epi-data version 4.6 and exported to SPSS version 25.0 for analysis. The descriptive data were used for prevalence of *S. mansoni* infection, re-infection and PZQ efficacy. Binary logistic regression was employed to analysis associated factor to *S. mansoni* infection. Bivariate analysis was done and variables having a p-value less than 0.25 with the outcome variables were considered for multivariable analysis and a p-value  $\leq 0.05$  was considered as statistically significant.

#### **4.11. Data quality control**

The questionnaire was checked for completeness and consistency. All the slides for stool examination were labeled with the participant ID number specifically given for this purpose. And 10% of the positive and negative slides were read by another independent laboratory technologist. Data was checked for its completeness before entering for analysis.

#### **4.12. Ethical Consideration**

Ethical clearance was obtained from the institutional review board of Jimma University, Institute of Health with the reference number JHRPGD/325 written on 29/06/2021. Informed written consent was also sought from study participant's parent or guardian. An assent was also taken for the school children 5-19 years of old. All *S. mansoni* infected school children were treated with 40mg/kg PZQ other children who were positive for other helminthic infections were also treated with mebendazole 500 mg by Nurse Professionals.

## Chapter Five

### Results

#### 5.1. General characteristics of study participants

A total of 521 school children were participated from the five selected primary schools and the number of males was slightly higher (54.5%) than female participants. The mean age of school children was 10.19 (SD±2.06) the majority 317(60.8%) of study participants was selected between age group of 10 to 14 years old. Nearly one fourth (26.7%) of students were selected from grade 2 and (38.4%) students' house hold head was attended primary school education level. Tap water was family drinking water source for the majority (93.1%) of the study participants. Almost all (99.6%), students' family had own latrine and about 39 % of the students had habit of swimming, 41.9 % bathing and 41.1 % washing in the rivers. (Table 1).

**Table 1: Socio-demographic and associated factors among school children selected from five primary schools in Jimma town Ethiopia, 2021**

Variables	Categories	Number (%)
<b>Sex</b>	Male	284 (54.5)
	Female	237(45.5)
<b>Age</b>	5-9	193(37)
	10-14	317(60.8)
	15-19	11(2.11)
<b>Source of water</b>	Tap	485(93.1)
	River	21(4)
	Well	15(2.9)
<b>House hold head Level of education</b>	Illiterate	122(23.4)
	Primary	200(38.4)
	Secondary	156(29.9)
	College and above	43(8.3)

<b>Latrine availability</b>	Yes	519(99.6)
	No	2(0.4)
<b>School</b>	Seto yido	195(37.4)
	Hamle 19	60(11.5)
	Jimma	60(11.5)
	Abdi Gudina	60(11.54)
	Tulama keneni	146(28)
<b>Crossing river on bare foot</b>	Never	286(54.9)
	Sometimes	233(44.7)
	Always	2(0.4)
<b>Water contact</b>	Awetu	99(36.9)
	Kito	63(23.5)
	Seto	10(3.7)
	Tulama keneni	45(16.8)
	“Dmc”	37(13.8)
<b>Swimming</b>	Never	318(61.0)
	Sometimes	200(38.4)
	Always	3(0.6)
<b>Bathing</b>	Never	303(58.2)
	Sometimes	213(40.9)
	Always	5(1.0)
<b>Washing clothes</b>	Never	307(58.9)
	Sometimes	211(40.5)
	Always	3(0.6)

## 5.2. Prevalence and intensity of *S. mansoni* infection among school children

Out of the 521 screened schoolchildren in the selected five primary schools during the baseline survey, the prevalence of *S. mansoni* infection was 117 (22.5%), of which 90(76.9%) of them were males. From the infected school children 51(43.6%), 38(32.5%) and 28(23.9%) have light, moderate and heavy infections intensity respectively (Table 2).

**Table 2: Prevalence and infection intensity of *S. mansoni* among selected five primary school children in Jimma town, Southwest Ethiopia, 2021.**

Variables		Total participants	Positive	Infection intensity (egg), n (%)		
				Light (<100)	Moderate (101-400)	Heavy (>400)
<b>Sex</b>	M	284	90	40	30	20
	F	237	27	11	8	8
	Total	521	117	51	38	28
<b>Age</b>	5-9	193	32	14	11	7
	10-14	317	84	37	26	21
	15-19	11	1	0	1	0
	Total	521	117	51(43.6%)	38(32.5%)	28 (23.9%)

In addition to *S. mansoni* infection, other intestinal parasitic helminthes examined were *A.lumbricoides* (10.8%), *T. trichura* (9.8%), *H. nana* (2.5%), *E.vermicularis* (0.8%) and *Teania* species (0.4%). We examined the smear after 24 hour as our main objective is to identify *S.mansoni* infection and due to this we didn't examined hookworm egg (Table 3).

**Table 3: Prevalence of intestinal helminthic parasites among schoolchildren in Jimma town, Southwest Ethiopia, 2021**

Parasite	Number	Percent (%)
<i>S.mansoni</i>	117	22.5
<i>A.lumbericoides</i>	56	10.7
<i>T.trichiura</i>	51	9.8
<i>H.nana</i>	13	2.5
<i>E.vermicularis</i>	4	0.8
<b>Taenia species</b>	2	0.4

The prevalence of *S. mansoni* infection was higher in Tulama Keneni School. And the prevalence was higher among students that use DMC pond for bathing, washing and crossing it (Table 4).



**Table 4: *Shistosoma mansoni* prevalence by School attended and water contact among selected primary school children in Jimma town, Southwest Ethiopia, 2021.**

Variables	Category	<i>S.mansoni</i>		
		Positive (%)	Negative	Total
<b>School</b>	Seto yido	45(23.1)	150	195
	Hamle-19	6(10)	54	60
	Jimma	7(11.7)	53	60
	Abdi Gudina	11(18.3)	49	60
	Tulama keneni	48(32.9)	98	146
<b>Water contact</b>	Awetu	23(23.2)	76	99
	Kito	16(25.4)	47	63
	Seto	3(30)	7	10
	Keba	4(28.6)	10	14
	Tulama keneni	12(26.7)	33	45
	DMC	24(64.9)	13	37

### **5.3. Praziquantel efficacy against *S. mansoni* infection**

Out of 117 students who were positive for *S.mansoni* infection, only 102 children were treated with 40mg/kg of PZQ whereas, 15(12.8%) refused to take the treatment and later linked to health center. Six (5.9%) experienced vomiting after treatment then excluded from study and 4 (3.9%) students were not available during follow up even though they took drug properly. Ninety two school children were examined after 21 days of drug administration of PZQ for those who were infected with *S.mansoni*. Out of re-examined students, 90(97.8%) were cured and 2 (2.2%) were excreting *S. mansoni* eggs. In this study CR and ERR were 97.8% and 99.3% respectively. . From individuals that were not cured, their base line intensity was moderate 1(50%) and heavy 1(50%), whereas both were with light intensity after treatment.

$$CR = \frac{\text{Number of negative children after treatment who were positive at baseline}}{\text{number of positive children before treatment}} \times 100$$

$$= 90/92 \times 100 = 97.8\%$$

$$ERR = \left( 1 - \frac{\text{Arithmetic mean egg counts at followup}}{\text{Arithmetic mean egg counts at baseline}} \right) \times 100$$

$$= (1 - (1.8/275.2)) \times 100$$

$$= 99.3\%$$

**Table 5: Efficacy of Praziquantel against *S. mansoni* infection among selected primary school children in Jimma town, Southwest Ethiopia, 2021**

Variables	Category	Cured, n (%)	Uncured, n (%)	Total
<b>Sex</b>	Male	74(97.3)	2(2.63)	76
	Female	16(100)	0	16
	Total	90(97.8)	2(2.2)	92
<b>Age</b>	5-9	24 (96)	1 (4)	25
	10-14	65 (98.5)	1 (1.5)	66
	15-19	1 (100)	0 (0)	1
	Total	90 (97.8)	2 (2.2)	92

#### 5.4. Re-infection rate of *S. mansoni* among school children

Out of 90 school children who were negative for *S.mansoni* infection 21 days after treatment with single dose of 40 mg/kg of PZQ 11 students were not available during follow up 6 months of treatment. From 79 school children stool samples were re-examined for the presence of *S. mansoni* eggs to assess the re-infection rate. Among them 74 (93.6%) were negative for *S. mansoni* eggs, while the rest 5(6.3%) were positive for *S. mansoni*. All re-infected school children were males and had light infection intensity. (Table 6).

**Table 6: Re-infection rate of *S .mansoni* infection among five selected primary schoolchildren in Jimma town, Southwest Ethiopia, 2021**

	Variables	Category	Reinfection status	
			Yes (%)	No (%)
<b>1</b>	Sex	Male	5(7.8 %)	59(92.1 %)
		Female	0(0 %)	15( 0 %)
		Total	5(6.3 %)	74(93.6 %)
<b>2</b>	Age	5-9	1(5.26 %)	8(94.7 %)
		10-14	3(5.08 %)	56(94.92 %)
		15-19	1(100 %)	0(0 %)
		Total	5(6.3 %)	74( 93.6 %)

### 5.5. Factors associated with *S. mansoni* infection

Different variables were assessed to see as they are risk factors for *S. mansoni* infection including sex, house hold head educational status , swimming habits, bathing and washing clothes in fresh water bodies and crossing rivers on bare foots. Each variable were analyzed against *S.mansoni* infection using binary logistic regression and those variables with *p-value*< 0.25 were candidates for multivariable analysis. Variables with *p*< 0.05 were considered as statistically significant for *S. mansoni* infections. Contact with fresh water bodies (swimming bathing, washing clothes and crossing river on bare foot) had statistically significant association with *S. mansoni* infection during bivariate analysis. However, crossing river on bare foot was statistically significant during multivariable regression with AOR=2.3; 95% CI=1.5-3.5; *p*<0.01. Male school children were three times more likely to be infected with *S.mansoni* as compared to females with AOR=3.3; 95%CI = 2.0-5.3) *p*<0.01 (Table 7)

**Table 7 : Bivariate and multivariable analysis of predictors for *S. mansoni* among selected school children in Jimma town, Southwest Ethiopia, 2021**

Variables	Categories	Frequency	<i>S.mansoni</i>		Bivariate		Multivariable	
			Positive	Negative	COR(95%CI)	P	AOR (95%CI)	P
<b>Sex</b>	Male	284	90	194	3.6(2.3-5.8)	0.001	3.3(2-5.3)	0.001*
	Female	237	27	210	1		1	
<b>Age</b>	5-9	193	32	161	1.9(0.5-16.1)	0.520	1.7(0.2-14.5)	0.634
	10-14	317	84	233	3.60(0.5-28.6)	0.225	2.7(0.3-22.4)	0.371
	15-19	11	1	10	1		1	

<b>Level of education of house hold</b>	Illiterate	12	25	97	1.1(0.5-2.7)	0.790	-	
		2						
	Primary	20	46	154	1.3(0.6-3.1)	0.530	-	
		0						
	Secondary	15	38	118	1.4(0.6-3.3)	0.430	-	
		6						
	College	43	8	35	1			
<b>Swimming habit</b>	Never	31	53	265	1		1	
		8						
	Sometimes	20	62	138	2.2(1.5-3.4)	0.001	1.6(0.6-3.96)	0.333
		0						
	Always	3	2	1	10(0.9-112)	0.06	-	
<b>Bathing</b>	Never	30	53	250	1		1	
		3						
	Sometimes	21	61	152	1.9(1.2-2.9)	0.003	0.6(0.3-1.2)	0.142
		3						
	Always	5	3	2	7.1(1.15-43.4)	0.034	2.7(0.2-4)	0.448
<b>Washing in open water source</b>	Never	30	54	253	1		1	
		7						
	Sometimes	21	61	150	1.9(1.3-2.9)	0.003	1.2(0.5-2.5)	0.724
		1						
	Always	3	2	1	9.4(0.8-105.2)	0.07	-	-
<b>Crossing water bodies on bare foot</b>	Never	28	43	243	1		1	
		6						
	Sometimes	23	73	160	2.6(1.7-3.9)	0.001	2.3(1.5-3.5)	0.000*
		3						
	Always	2	1	1	5.65(0.34-92.1)	0.224	3.4(0.2-56.0)	0.389

**Key: \*significant at p < 0.05, 1=represents reference group**

## CHAPTER SIX

### DISCUSSION

In the present study the overall prevalence of *S. mansoni* infection among selected primary school children in Jimma town was 22.5% with majority of light infection intensity, while the efficacy of PZQ was satisfactory with CR of 97.8% and the ERR of 99.3%. The re-infection rate of *S. mansoni* was 6.33% after 6 months of post treatment with 40mg/kg of PZQ. Sex and crossing rivers with bare foot were independent predictors for *S. mansoni* infection.

The prevalence of *S.mansoni* infection of this study is lower than (89.9%) from the study done in Sanja town, northwest Ethiopia (12), (83.3% from Sanja General Primary School, North Gondar Zone (13), (37.9%) from Zarima town, northwest, Ethiopia(41), 34.9% from selected primary schools around Lake Tana (26)and kemisse town 52.1% (28). . The difference might be due to the difference between population habits, the geographical difference. And there was slightly higher report (28.7% ) in selected primary schools nearby rivers of Jimma town (14).

The present prevalence report is higher than the finding reported from Brazil 14.4% (42), 13.73% from Tigray (43) and 8.4% from Jimma town (30). The possible difference might be, in the current study in order to get adequate sample size to assess efficacy of PZQ purposively we selected schools that have high prevalence of *S. mansoni* infection, which might increase the prevalence of *S. mansoni* infection rate.

The present study finding is in line with the study done in Jimma zone with prevalence of 24.0% (29), Mekele city, 23.9% (44),Gorgora town, 20.6% (45) and 24% Manna District, Southwest Ethiopia (29).

From the *S.mansoni* infected school children nearly half (43.6%) of them have light intensity and this result is almost similar with study conducted around lake Tana (26) in which 61.4% of *S.mansoni* infected children have light intensity infection. Whereas in the study done among school children of Sanja elementary school (22) 86.2% and study done in Kemisse Town(28) also 95% *S.mansoni* infection had moderate intensity. The

difference might be the frequency of students' contact with water bodies infested with the infective stage.

From all the five selected primary school the prevalence of *S.masoni* infection was higher in Tulama Keneni primary School. The reason behind this might be students attending this school had contact with different rivers such as Tulama, Keba and DMC pond. And from all water source contact the prevalence was higher (64.9%) among students that had contact with DMC pond.

The indicator of PZQ efficacy is ERR and CR. According to WHO reference the ERR report in this finding (99.3%) is satisfactory. This finding is higher than the study finding conducted in Sanja primary school, north Gonder zone, 78.3%(13), and (68.2%) in Wondo Genet (21). However, it is in agreement with the finding in Sanja town (99.5%) (22), and Horro Guduru, Wollega Zone(99.51%)(39) and reported in Mana district, southwest Ethiopia(99.9%) (29).

In this study CR reported is higher than the report from Niger (51.7–60.2%) (33) ,Sanja town, 86.9% (22) and 90% in Sanja primary school (13,22),Tumuga,93.44%,Waja 88.99% (38),Horro Guduru (80.9%) (39),and Wondo genet (73.6%) (21). The possible explanation might be the studies with lower CR report re-examined stool specimen four to six weeks after treatment of single dose of PZQ which didn't avoid the risk that eggs identified in a specimen are from parasites that infected the individual after drug administration(5). This study finding is in line with the study finding conducted in Manna district, 99.1%(29).

The re-infection rate of *S. mansoni* was 6.33% after 6 months of post treatment with 40mg/kg of PZQ. After six months follow up of 79 participants, 74 (93.6%) remained negative, while 5(6.33 %) were re-infected. All re-infected school children had light infection intensity and all *S. mansoni* re- infection occurred in males. The current finding is lower than the finding reported in the Brazil (21.9%) (31). The possible explanation might be Brazil study follow up period was 12 months after single dose 40mg/kg PZQ treatments. And also might be difference in socio-demographic characteristics of study participants (64.9% of participants in study conducted in Brazil were from rural area) and difference in sample size (506 school age children were

participated or re-infection analysis). Slightly, similar magnitude of reinfection was reported in the study done in Sanja town, northwest, Ethiopia, 13.9%(22).

Factors such as age, swimming habits, bathing habits, washing clothes in open water sources and crossing rivers on bare feet were factors associated with *S. mansoni* infections. But, only sex and crossing rivers on barefoot were significant associated with *S.mansoni* infection. The sex distribution of *S. mansoni* in this study show a significant variation, males were more likely to get infected than female, and this might be due to difference in water contact behavior of males and females. This result is in line with study done in south Sudan(25).But, the study done in North-Western Tanzania shows there was no significant difference among male and female(23).



## CHAPTER SEVEN

### CONCLUSIONS AND RECOMMENDATION

#### 7.1. Conclusions

The present study finding indicated that the prevalence of *S.mansoni* infection is moderate relative to the WHO guideline. From five selected primary School the prevalence of *S.mansoni* infection was higher in Tulama Keneni primary school. The efficacy of single dose 40 mg/kg was satisfactory against *S. mansoni* infection. Re-infection rate of *S. mansoni* was low in the study area among selected school age children. Sex and crossing rivers on barefoot were independent predictors for *S.mansoni* infection.

#### 7.2. Recommendation

Scheduled health education should be given to reduce the prevalence and transmission and prevalence of *Schistosoma* spp. infection  $\geq 10\%$ , WHO recommends annual preventive chemotherapy with a single dose of praziquantel in all age groups from 2 years old, including adults, pregnant women after the first trimester and lactating women, to control *schistosomiasis* morbidity and advance towards eliminating the disease as a public health problem.

Exertion must be made to the strengthening of health systems by promoting health education, strengthening sanitation, and community participation by all stake holders which are vital components of disease control programs.

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## **Annex 1: Kato-Katz Technique**

### **Procedure**

1. Stool sample collected in plastic cup from each participant and labeled by their name/Identification number.
2. Mesh a portion of feces, pushing the sample through the sieve with a spatula, to remove fiber and other coarse debris.
3. Scrap the flat-sided spatula across the upper surface of the screen to collect the sieved feces.
4. Place template in the middle of a clean microscope slide and fill with meshed feces from the spatula so that the hole is completely filled.
5. Carefully remove template and place a presoaked cellophane strip over the cylinder of feces left on the slide.
6. Invert the slide and press on an absorbent surface on a bench top to spread the feces under the cellophane strip.
7. Position slide with smear uppermost to facilitate clearing of specimen and leave for 1- 24hrs.
8. Examine the smear and count and record the number of *S.mansoni* ova.

## **ANNEX: 2 Participant information sheet (English Version)**

**Title of the project:** re-infection rate and therapeutic efficacy of PZQ against *S. mansoni* infection among selected primary school children in Jimma Town, South west Ethiopia.

My name is **Hayat Jemal** and I am Msc student in Medical parasitology at Jimma University Institute of Health, Faculty of Health Sciences, School of Medical Laboratory Sciences, Medical Parasitology course team. I am doing a research on title stated above.

**Procedure:** We are inviting all children aged 5-19 years in this school to take part in this study. If you agree, we will obtain a small sample of stool from your child for examination of intestinal parasite especially *S. mansoni*. If your child is infected with any of intestinal parasite he/she will be provided with specific medication by health professional at health facility. With clinical observation and mother/guardian interview will be made post treatment any if there will be adverse effects of the drug. On 21 day of post treatment we will come back and take small stool sample to check response of the drug also on 6<sup>th</sup> month the re-infection rate will be assessed. Therefore, at the end of the study based on the result found all the necessary recommendations will be forwarded to all responsible bodies.

**Risks associated:** With this study there are no serious risks associated during study we will obtain a small sample of stool from your child for examination of intestinal parasite especially *S. mansoni*. If your child is infected with any of intestinal parasite he/she will be provided with specific medication in case some adverse drug effect could be happen after the drug was taken like Headache ,Nausea .Abdominal pain ,Bloody stool ,Drowsiness ,Vomiting ,Fever ,Fatigue, Diarrhoea Straining ,Dysuria ,Itching and in rare case referral cases may be occur and they can also referred to hospital and admitted accordingly.

**Participation:** I am asking you to participate voluntarily in this study; if you agree to participate you will be asked to sign a consent form and response to short questionnaire interview. The participation to the study is based on your willingness and the information from this study will help national Schistosomiasis control program in providing evidence



on responses of the medication against *S.mansoni* treatment in primary school children and to determine the need to include it in the preventive chemotherapy.

**Incentives and payment for participating in the study:** You will not be provided with any direct incentives for your participation in this study. But the cost of your medical examination and medication will be covered.

**Confidentiality:** All information you give and data obtained from laboratory analysis will be kept confidential and will be communicated only to responsible body. Formats containing data will be kept locked. Records are kept confidential; your name will not be mentioned. And your specimens are used only for the purpose this study.

**Right to refuse or withdraw:** You have the full right to withdraw from participating in the study at any time before and after consent without explaining the reason and not respond to some or all the questions. Your decision will not affect your right to get the health service you are supposed to get otherwise.

**Contact Address:**

If you have any questions or concerns, you can contact Hayat Jemal at any time using the following address:

Hayat Jemal, Medical Parasitology Msc student at Jimma University, Institute of Health, Faculty of Health Sciences, School of Medical Laboratory Sciences.

Tel: 09-17-80-10-52    *email: -hayatjemal262@gmail.com*

Jimma, Ethiopia

Thank you very much!!

### **Annex 3: Consent form (English version)**

I \_\_\_\_\_, here by giving my consent for me or my child to participate in the mentioned study. I understand that this study will be used to know the prevalence and re-infection rate of *S. mansoni* and response rate for treatment of *S. mansoni* at primary school children s among school age children. I also trust that at the end of study, the results will be shared with the concerned body, Jimma university institute of health science, Jimma town health office and to the school participated.

Your child's name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

Parent's name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

Name of data collector \_\_\_\_\_ signature \_\_\_\_\_ Date \_\_\_\_\_

**Thank you for your participation!**

**Annex 4: English version assent for child (<18 years of age of study participant)**

You are being asked to give a stool sample that will be examined for intestinal parasites. You do not have to do this if you do not want to do, but there is no danger in doing so.

Do you agree to give your stool sample for intestinal parasite examination?

Yes----- No-----

Do you agree to take medication given to according to your result?

Yes----- No-----

Child's name----- signature-----Date -----

Name of the person obtaining assent-----Signature ----- Date \_\_\_\_\_

Signature of the person obtaining assent----- Signature ----- Date \_\_\_\_\_

Witness name ----- Signature----- Date\_\_\_\_\_



አልፎአልፎራስንመሳትሊያጋጥምይችላልይህንንስጋትለማጥፋትመድኃኒቱበሰለጠነባለሙያእንዲሰጥይደረጋልበተቀሰውሰላታትውስጥልጆቹበባለሙያክትትልይደረግላቸዋልተኝተውመታከምአሰፈላጊሁኖከተገኝበሆስፒታልእኔዲታከሙይደረጋል።

**ተሳትፎ:**

በዚህምርምርጥናትላይበፍላጎቶችእኔዲሳተፍየተጠየቁሲሆንፍቃደኛበመሆኖከልብእናመሰግናለንም ክንያቱም *በብላርዚያበሽታመድኃኒት* /PQZ /  
የመፈወስብቃትእናበድጋሚየመያዝመጠንበት/ቤቶችአካባቢየሚታይቸግርገደሚቀርፍስለሆነእንዲሁምበሀገርአቀፍደረጃየቢላርዚያበሽታቁጥጥርስራላይግብዓትየሚሆኑመረጃዎችንበማድረስለቅድመመከላከልስራያግዘናልና።

**የክፍያሁኔታ:** በዚህጥናትውስጥበመሳተፎምንምአይነትየገንዘብክፍያየለውምነገርግንላልጆየሚደግሁሉምምርመራየሚሰጥመድኃኒትበነጻነው።

**ተአማኒነት:** የትኛውምአይነትየሰጡንመረጃለተመራማሪውናለህክምናሲያስፈልግለሚመለከተው ሃኪምብቻየሚቀርብሲሆንለማንኛውምሰውተላልፎአይሰጥምስምበኮድነውየሚመዘገበውቁልፍባለውኮንፒውተርውስጥተቆልፎይቀመጥል ።

**ማቃረጥ:**

በዚህጥናትውስጥገብተውእየተሳተፉበማንኛውምሰዓትናጊዘየምክንያቶችንለማንምሳያሰውቁየማቃረጥመብትአሎትለሚጠየቁትጥያቄበከፊልምሆነሙሉበሙሉአለመመስይችላሉበዚህውሳኔዎምንምአይነትየሚቃረጥበትየጤናአገልግሎትአይኖርም።

**አድራሻ :** በምርምርስራራውላይምንምአይነትጥያቄከሎትከዚህበታችባለአድራሻመጠየቅይችላሉ  
ስም:- ሃያትጀማል

የስልክቁጥር:- 0917801052      ኢሜል:-hayatjemal262@gmail.com

ጅማዩኒቨርሲቲጤናሳይንስኢኒስቲቱትበላብራቶሪዲፓርትመንትየፓራሳይቶሎጂትምህርትክፍል  
አመሰግናለሁ!!

**ለ/ የፍቃድኝነትመግለጫቅፅ**

እኔ \_\_\_\_\_

በልጅት/ቤትውስጥበሚደረገውየቢላርዚያበሽታመድሃኒት \_\_\_\_\_ /PZQ/

የመፈወስብቃትእናበድጋሚየመያዝመጠንምርመርስራመረጃበተነበበልኝመሰረትተረድቻለሁበተ  
ጨማሪምየምርምርውጤትለጅማዩኒቨርሲቲየህክምናሳይንስኢኒስቲቲውትለጅማከተማጤናቢሮእ  
ንዲሁምበሚማሩበትት/ቤትየሚሰራጭበመሆኑልጅየቢላርዚያበሽታበምርመራውጤትከተገኘበትየ  
ሚሰጠውንመድሃኒትእንዲወስድእናክትትልአንዲደረግለትፍቃድኛመሆኔንበፈርማዬአረጋግጣለሁ

የቤተሰብስም \_\_\_\_\_ ፊርማ \_\_\_\_\_ ቀን \_\_\_\_\_

የእማኝስም \_\_\_\_\_ ፊርማ \_\_\_\_\_ ቀን \_\_\_\_\_

የተመራማሪስም \_\_\_\_\_ ፊርማ \_\_\_\_\_ ቀን \_\_\_\_\_

**ሐ/ የስምምነትቅፅ**

የቢላርዚያበሽታመድሃኒት \_\_\_\_\_ / \_\_\_\_\_ PZQ \_\_\_\_\_ /

የመፈወስብቃትእናበድጋሚየመያዝመጠንምርመርእየሰራነውየሰገራምርመራለማድረግትፈልጋለ  
ክምርመራውምንምአይነትቼጌርእናጉዳትአያስከትልብክምበስጋትየምትሰራውአይለምካልፈለክግ  
ዳጅየለውምነገርግንበምርመራውጤትበሽታውከተገኘበትየሚሰጠውንመድሃኒትበነፃእናቀርብልካለ  
ንምርመራለማድረግፍቃድኛነክአዎ \_\_\_\_\_ አይደለሁም \_\_\_\_\_

በውጤትከመሰረትመድኃኒትለመውሰድፍቃድኛነክአዎ \_\_\_\_\_ አይደለሁም \_\_\_\_\_

የተማሪስም \_\_\_\_\_ ፊርማ \_\_\_\_\_ ቀን \_\_\_\_\_

ስምምነትያስፈፀመስም \_\_\_\_\_ ፊርማ \_\_\_\_\_ ቀን \_\_\_\_\_

የእማኝስም \_\_\_\_\_ ፊርማ \_\_\_\_\_ ቀን \_\_\_\_\_

## **ANNEX 6: Participant information sheet (Oromic Version)**

### **1. Ibsa odeeffannoo waa'ee qorannichaa maamiltootaaf (Afaan Oromootiin)**

Harka fuune! Akkam jirtu?

**Mataduree projektichaa:-**qorrannoo qorichii dhukkuba bilaarziyaa/praziqantal/ haala jabina fi irra debi'insa isaa jedhuun mana barumsaa filataman magaala jimmaa kessatti.

Maqaan koo **Hayaat Jamaal** jedhama. Yunivarsitii Jimmaatti barataa digrii lammaffaa muummee barnoota saayinsii fayyaatti kutaa qorannoo saayinsii fayyaa namaa fi maxxantootaati. Ani turtii yeroo ji'a lamaaf taasisu keessatti, qorannoo qorichii dhukkuba bilaarziyaa/praziqantal/ haala jabina fi irra debi'insa isaa jedhuun mana barumsaa jaraa kessatti gaggefamu irratti kan hojjatuudha.

**Adeemsa qorannichaa:** qorannicha manneen mana barumsaa filataman kessatti daa'imman umriin isaanii waggaa 5-19 ta'aniifi fedhii qaban hundaa hirmaachisaa. Ragaan bu'ura qoranochoo erga sasaabammee booda daa'imman samuda bolii guddaa kennuf fedhii qabaniif samudnii erga fudhamee booda haala firii qorannoo jaraatiin warren dhukkuba raammoo garaafii dhebee bilaarziyaa qaban martii filatamanii qorichii akka kennamuuf taasifamaa. Samuuda guyyaa 21 ffaa fudhamuun jabina qorichaa fayyisuu danda'uutuu madaalamaa itti anuudhaan samuda ji'a 3ffaa fi 6ffaa irratti godhamuun haala irra debi'anii qabamuu tuu ittiin baramaa. Bu'uruma kanaan firiin qoranochoo qaama ilaalu qufaaf raabsamaa.

**Miidhaa isaa:** Qorannichaan walqabatee miidhaan hamaan maamiltootarra dhufu tokkolleen hin jiru. Haata'u malee sa'a qorichii fudhatamu rakkoowan xixiiqoo fudhannaa qorichaa tiin kan dhufan kan akka dhukkubii mataa(bowwu), garaa Cinninnaa, ol ol jechisiisuu, jismii caccabsuu, boliin guddaa dhiga mullisu, qaama ho'isuufi darbee barbee of nama wallaalchisu mudachuu danda'a kana xiqqessuuf qoricha akka oggessaan kennamu taasifamaa hanga sa'a Afuriitiif hordofiin gahaan godhamaafii rakkon sanaa olii yoo mudatee hospitaalattii ergudhaan yaliin nii godhamaafii.

**Hirmaannaa maamiltootaa ilaalchisee:-**qorannoo kannarratti fedhii kessaniin hirmaannaa akka gotan gaafatamtuu hirmachuu kessaninis hojii dhukuba bilaarziyaa ballesuufii dhibamsiisu akka biyyollesaatti gaggefamu irratti waan hirmaataniif kabaja guddaa isiinif qabnaa.

**Haala kaffaltii:** - qaamnii qorannocha iraatti hirmaatu martuu kafaltiin qarshii kafalamu kan hinjirree dha. Haata'u malee baasiin wallaansaafi qorichaa martuu karaa qorataatiin kan baafamu ta'a.

**Iccitii odeeffannoo maamiltootaan wal-qabatee:** Odeeffannoon maamiltoonni kennaniis tahe kan gama laboratoriiin argamu, guutumaa guututti iccitiin isaa kan eegamuu fi qaama dhimmi kun ilaalu qofaaf kan gabaafamuudha. Kuniis kan tahu maqaan maamiltootaa osoo hin tuqamin karaa icciti taheen kan gabaafamuudha. Akkasumaas dhiigni isaan kennan kaayyoo qorannichaa kana qofaaf kan ooluudha.

**Addaan kutuu:-** filannocha fedhii kessaniin akka ittii hirmaattan ragaan isiin kennuu hin fenee yoo jiraatee dhibbaa tokko malee hirmaannaa kessan gutummaa guttuttis ta'e cinaadhaan addaan kuutu nidandessu. Kana rawachuu kessaniin tajaajilli fayyaa kamuu isiinirra hin cituu.

Yoo wanti gaaffii ykn ifa isiniif hin taa'in tokkolleen jiraate, yeroo barbaadanitti teessoo fi lakkoofsa bilbila keenya kan armaan gadii kanaan nu qunnamuu dandeessu.

Maqaa I/gaafatamaa qorannichaa: **Hayaat Jemaal**

**Teessoo:** Yunivarsitii Jimmaa Muummee saayinsii fayyaatti kutaa qorannoo saayinsii fayyaa namaa fi maxxantootaati.

**Lakkoofsa bilbilaa:** 0917801052    **Email:** *hayatjemaal262@gmail.com*

Galatomaa!!!



## 2. Guca Fedhii ibsuu (Hirmatota umirii waggaa18 gadita'aniif )

Ani obboo/Addee \_\_\_\_\_ qorrannoo qorichii dhukkuba bilaarziyaa/praziquantal/ haala jabina fi irra debi'insa isaa jedhuun mana barumsaa jaraa kessatti gaggefamu irrattii raga gahaa argadheeraa. Bu'aan qorannochaa qaama ilaaluu hundaaf, Dhaabata Fayyaa Universitii Jimmaa, Waajira Eguumsa Fayyaa magaala Jimmaatiif mana baruumsichaatiif akka dhihaatuu waan ammanuuf mucaan koo haala bu'aa qorannochaatiin quqoricha akka fudhatuu fi horddofiin barbaachisaan akka godhamuufi fedhii koo akka ta'e mallattoo kootiin ibsaa.

Maqaa Maatii \_\_\_\_\_ Mallattoo \_\_\_\_\_ Guyyaa \_\_\_\_\_

Maqaa Ragaa \_\_\_\_\_ Mallattoo \_\_\_\_\_ Guyyaa \_\_\_\_\_

Maqaa Qorataa \_\_\_\_\_ Mallattoo \_\_\_\_\_ Guyyaa \_\_\_\_\_

## 3. Guca waligaltee (Hirmatota umirii waggaa18 gadita'aniif )

Amma kan sigaafachaa jirru saamuda booli guddaa qorrannoo dhukkuba bilaarziyaa/praziquantal/ haala jabina fi irra debi'insa isaa qorachuuf nu gargaaru akka nu kenituuf. Kennus kennuu dhisuus nidandeessa garuu keennuukeetiin wantti midhamtu tokkoilleen hin jiru. Haala qorrannoo saamuda keetiin qorichaa siif kenninnu qabnaa.

Saamuda boolii guddaa nu kennuuf waligalteerta? Eeyyee \_\_\_\_\_ lakki \_\_\_\_\_

Haala qorrannoo samuuda ketiin qoricha siif kennamuu fudhachuuf waligalttetaa?

Eeyyee \_\_\_\_\_ lakki \_\_\_\_\_

Maqaa Da'ima \_\_\_\_\_ Mallattoo \_\_\_\_\_ Guyyaa \_\_\_\_\_

Maqaa Nama Gaafatee \_\_\_\_\_ Mallattoo \_\_\_\_\_ Guyyaa \_\_\_\_\_

Maqaa Ragaa \_\_\_\_\_ Mallattoo \_\_\_\_\_ Guyyaa \_\_\_\_\_

Galatoomaa!!!

## Annex: 7 English Questionnaires

Dear Sir/madam;

My name is Hayat Jemal, a Master's Degree student from Jimma University. Thus, this questionnaire is prepared to get appropriate information on to determine therapeutic efficacy of PZQ against *S. mansoni* and the reinfection rate among primary school children in Jimma town, south west Ethiopia. The information that I will obtain using this questionnaire will be used only for research purposes and also I need to assure you that confidentiality is our main quality.

Therefore; I respectfully request your cooperation to participate in this interview. You do have the right not to respond at all or to withdraw in the meantime, but your input has great value for the success of our objective.

Thank you for your cooperation!

Are you willing to participate? 1. Yes 2.No

Project identification No. \_\_\_\_\_ Date -----School Name \_\_\_\_\_

Sno.	Questions	Response	
	Socio-demographics factors		
101	Age	_____years	
102	Sex	1.Male 2.Female	
103	Grade level of student		
104	Level of education of house hold head	1. Illiterate 2. Primary school 3. Secondary school 4. Above Secondary school	
2	Risk factors related to <i>S. mansoni</i>		

201	Source of water for drinking	1.Tap 2.River 3.well 4. others__	
202	Do your family have own latrine	1. Yes 2. No	
203	Do you have habit of swimming in river?	1.Always 2. Sometimes 3. Never	
204	Do you have habit of bathing in river?	1.Always 2. Sometimes 3. Never	
205	Do you cross the river being bare foot?	1.Always 2. Sometimes 3. Never	
206	Do you wash clothes in the river?	1.Always 2. Sometimes 3. Never	
207	If you swim, wash clothes, bath and cross then which river	1. Awetu 2.Kitto 3. Setto 4. Keba 5. others	

**Laboratory data**

1. Date of Entry in the study: \_\_\_\_\_ Date of arrival after treatment for follow up: \_\_\_\_\_

Date of loss to follow up: \_\_\_\_\_

2. Stool examination: *S.mansoni* Positive:  Negative:

After treatment

Stool examination: *S. Mansoni*

Positive:                       negative

Comments \_\_\_\_\_

Name of Research Assistant: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Annex 8: Afaan Oromoo Questionnaire

Yuuniversiiti Jimmaatti

Inistitutii Saayinsii Fayyaa

Mummee Barnoota Laabraatorii Saayinsii fayyaa

Kabajamoo qooda fudhattoota qorannoo kanaa ani maqaan koo Hayaat Jamaal kanan jedhamu, barataa barumsa laabooraatorii digirii lammaffaa Yuunivarsiitii Jimmaati. Egaa gaafannoon kun kan qophaa'e odeeffannoo ga'aa fi qulqulluu ta'e raammoo garaa keessaa fi haala jabina qoricha isaa irratti qorannoo adeemsisuufi.

Odeeffannoon fudhadhu dhimma qorannoof qofa kan oolu yoo ta'u, iccitiin kamiyyuu kan eegame ta'uu isin nan hubachiisa. Kanaafuu qorannoo kana keessatti nu waliin akka taataniif kabajaan isin gaafadha. Qorannoo kana irratti hirmaachuu dhiisuus ta'e, yeroo barbaaddanitti keessaa ba'uuf mirga guutuu qabdu. Haa ta'u malee, hirmaannan keessan galma ga'iinsa qorannoo kanaaf bu'aa guddaa qaba.

Qorannichatti hirmaachuuf fedhii qabduu? A, Eyyee B, Lakki

Koodii. \_\_\_\_\_ Guyyaa ----- Maqaa mana barumsaa \_\_\_\_\_

Sno.	Questions	Response	
	Haala waliigalaa hirmaataa		
101	Umurii	_____	
102	Saala	1.Dhiira 2.Dhalaa	
103	Kutaa Barumsaa	_____	
104	Sadarkaa barumsaa dursaa maatii	1. hin baranne 2. sadarkaa jalqabaa 3. sadarkaa 2 <sup>ffaa</sup> 4. sadarkaa 2 <sup>ffaa</sup> oli	

2	Risk factors related to <i>S. mansoni</i>		
201	Madda bishaan dhugaatii	1.sarara dhuunfaa 2.Bishaan lagaa 3. bishaan bollaa 3.kan biraa_____	
202	Mana fincaanii qabduu?	1.Eyyee 2.lakki	
204	Bishaan lagaa nii daaktuu ?	1.wogguu hunda 2.yeroo tokko tokko 3.lakki hin qabuu	
203	Bishaan lagaattii qaama nii dhiqattaa	1.wogguu hunda 2.yeroo tokko tokko 3.lakki hin qabuu	
205	Miila duwwaa laga ni ceetuu?	1.wogguu hunda 2.yeroo tokko tokko 3.lakki hin qabuu	
206	Lagatti uffata ni miiccituu?	1.wogguu hunda 2.yeroo tokko tokko 3.lakki hin qabuu	
207	Yoo bishaan daaktuu, qaama dhiqattu, offata lagatti miccituufi miila duwwaa laga ceetuu taate laggichi isa kami?	1. Awetu 2.Kitto 3. Setto 4. Keba 5. kan biraa	

## **DECLARATION**

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

**Name:** Hayat Jemal

Signature: \_\_\_\_\_

**Name of the institution:** Jimma University

Date of submission: \_\_\_\_\_

This thesis has been submitted for examination with my approval as a University advisor

### **Name and Signature of the first advisor**

Name: Mitiku Bajiro (Msc, Ass. Professor) Date \_\_\_\_\_ Signature \_\_\_\_\_

### **Name and Signature of the second advisor**

Name: Abebaw T. (Bsc, Msc) Date \_\_\_\_\_ Signature \_\_\_\_\_

### **Name and Signature of the third advisor**

Name: Mio A. (Bsc, Msc) Date \_\_\_\_\_ Signature \_\_\_\_\_

### **Approval of examiners**

Name of internal-examiner: Mr. Daniel Dana Date \_\_\_\_\_ Signature \_\_\_\_\_

Name of external-examiner: Prof Berhanu E Date \_\_\_\_\_ Signature \_\_\_\_\_

### **Approval of school/department head**

Name of school/dept head: Dr. Teshome Degefa Date \_\_\_\_\_ Signature \_\_\_\_\_