MED

IDENTIFICATION OF HIGH RISK COMMUNITIES FOR INTESTINAL SCHISTOSOMIASIS USING QUESTIONNAIRES

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH

By:

Muluken Hailu, B.Sc.

May, 1993

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

IDENTIFICATION OF HIGH RISK COMMUNITIES FOR INTESTINAL SCHISTOSOMIASIS USING QUESTIONNAIRES

By

Muluken Hailu, B.Sc.

Department of Community Health
Faculty of Medicine, Addis Ababa University

Approved by the Examining Board

Dr. Derege Kebede
Chairman, Department Graduate Committee

Dr. Leikun Jemaneh
Advisor

Dr. Derege Kebede
Advisor

Dr. Pierre Duplessis
Examiner

Dr. Tesfaye Shiferaw
Examiner

Dr. Ahmed Ali
Examiner

ACKNOWLEDGEMENTS

It gives me great pleasure to thank Dr. Leykun Jemaneh and Dr. Derege Kebede for their keen interest and for their advise in doing this research project from the beginning to the end.

I am grateful to the International Development and Research Centre of Canada (IDRCC) for funding this thesis research, through McGill - Ethiopia Community Health Project.

My sincere thanks goes to the staffs of the district education offices, head teachers, teachers and students of Western Gojjam Region for their cooperation and participation in the distribution, completion and recovery of the questionnaires.

I extend my gratitude to Ato Berhanu Erko, Ato Sisay Desse, Ato Awagu Aizaz and Ato Yohannes Hailu who worked together during the field survey and for their microscopical examination of samples with utmost care.

I also thank the Institute of Pathobiology Addis Ababa University, for providing chemicals and materials necessary for this study.

My special thanks goes to Yemeserach Ashenafi and Solomon Berhanu for their careful typing of this manuscript. I am also greatful to Zemedenesh Mekonen and Abrehet Hagos for their extensive data entry and checkup.

Last but not least sincere thanks goes to those whose names is not mentioned but contributed for the fulfilment of this study.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	i
TABLE OF CONTENTS	ii
LIST OF TABLES	iv
LIST OF FIGURES	v
ABSTRACT	vi
CHAPTERS	
1. INTRODUCTION	1
2. LITERATURE REVIEW	5
2.1. The Biology of Schistosomes	5
2.2. World and Local Distribution of the Disease	6
2.3. Method of Diagnosis	9
2.4. The Value of Questionnaire in the Diagnosis of Schistosomiasis	11
2.5. Prevention and Control of Schistosomiasis	13
3. OBJECTIVE OF THE STUDY	16
4. MATERIALS AND METHODS	17
4.1. Description of the Study Area and Study Population	17
4.2. Target Population	18
4.3. Study Design	19

4.4. Questionnaire Design 21
4.5. Parasitological Validation 22
4.6. Focus Group Discussion 24
4.7. Cost Analysis 24
4.8. Data Analysis 25
5. RESULTS 26
5.1. Operational Results 26
5.2. Questionnaire Results 26
5.3. Biomedical Results 32
5.4. Relation between Questionnaire and Kato Results 37
5.5. Focus Group Discussion Results 38
5.6. Costs of the Different Approaches 39
6. DISCUSSION 46
7. CONCLUSION AND RECOMMENDATIONS 51
8. REFERENCES 53
9. APPENDICES 59

LIST OF TABLES

Page

1. Number of Children Interviewed by Sex 28
2. Number of Children Interviewed by Age 29
3. Number of Children Interviewed by Class 30
4. Prevalence of Positive Answers to Different Markers of S. mansoni in the Sixty-Eight Schools 31
5. Age Distribution of Children Tested Parasitologicaly 33
6. Sex Distribution of Children Tested Parasitologicaly 34
7. Prevalence of S.mansoni by Kato Thick Smear in Western Gojjam Region,1993 35
8. Prevalence of Positive Answers for Different Markers and Prevalence of S. mansoni in the 10 Schools Studied Biomedically 36
9. Costs of Different Approaches (in US Dollar) Analyzed at Regional Level 40
10. Overall Cost Comparison of the Two Approaches per Individual Basis (in US Dollars) and Screening Time 41

LIST OF FIGURES

Page

1. Scheme of the Study Design 20
2. Regression Analysis Between Prevalence of Schistosomiasis Determined by Questionnaire and Kato Thick Smear approaches 42
3. Regression Analysis Between Prevalence of Blood in Stool and Prevalence of Schistosomiasis Determined by Kato Thick Smear 43
4. Regression Analysis Between Prevalence of Distended Belly and Prevalence of Schistosomiasis Determined by Kato Thick Smear 44
5. Linear Regression Line between Teachers Rank As a Problem Versus Prevalence Schistosomiasis Determined by Kato Thick Smear 45
6. Map of the Study Region with Study Sites: Biomedicaly 64

ABSTRACT

Through the Educational Administration office, a total of 88 schools were screened in Western Gojjam Region using self administrated questionnaires. From 88 recovered questionnaires, based on the defined criteria, only 68 questionnaires were accepted as properly completed. A total of 3580 students were interviewed through their teachers in four weeks time.

From 3580 "indirectly" interviewed children, prevalences of 10.4%, 30.6% and 9.0% were found for the three markers; blood in stool, distended belly and schistosomiasis respectively. From 600 children screened parasitologicaly in 10 schools, over all 90 Schistosomiasis mansoni positives were found, yielding an estimated 15% prevalence rate for the region. A higher infection rate was found in males (17.5%) than females (12.9%) with an odds ratio of 1.64. A positive pearson's coefficient of correlation was found between the questionnaire and parasitological approaches in assessing the prevalence of intestinal schistosomiasis in ten schools. A coefficient of correlation of 0.89, 0.69, and 0.45 was found between the prevalence of schistosomiasis, prevalence of blood in the stool, and prevalence of distended belly respectively, and the parasitological screening.

The indirect interview approach is not only operationally feasible, it is also four times faster and thirty times less costly than the corresponding biomedical approach. The possible use of the questionnaire approach in the monitoring of S. mansoni infection is discussed.

1. INTRODUCTION

Schistosomiasis is a chronic and insidious disease, producing long-term effect on man. It is caused by parasitic worms belonging to the group trematodes or blood flukes. Schistosomiasis is endemic in 76 developing countries, and about 600 million people are exsposed for risk of infection and 200 million people are expected to be already infected (1). The three species of schistosome (Schistosoma mansoni, Schistosoma japonicum, and Schistosoma heamatobium) are found to be major causes of infection in man. The first two are causes of intestinal schistosomiasis, while the third causes urinary schistosomiasis.

Schistosomiasis is among the six major tropical diseases targeted for control while it comes second to malaria in many developing countries. The disease is found to be associated with other health problems such as infection with other parasites, malnutrition, deep rooted custom of indiscriminate defecation increase of population movement and intensification of irrigation based agricultural practices which are not well assessed on their environmental impact.

Schistosomiasis is transmitted focally and hence there is a great variation even within endemic area, particularly for S. mansoni and S. japonicum (1,2).

Altitude, human activity in relation to water contact and rain fall variations are found to make schistosomiasis setting-specific (1). The public health importance of schistosomiasis is related to the intensity of infection rather than the prevalence. The intensity of infection in turn is related to the length of water contact time which is mostly encountered during swimming and occupation. The former is mostly seen in boys than girls and the latter is seen among fisher men and farmers (3).

The history of transmission of schistosomiasis in Ethiopia is not well documented. But recently several studies (4-20) have indicated that Schistosoma mansoni and Schistosoma haematobium are endemic in Ethiopia. The former is more widely spread and focal in distribution while the later is found only in the rift-valley area and in western Ethiopia (8-11).

As the consequence of the final destination of adult schistosomes in the definitive host, half of the produced eggs will remain in the body deposited in the liver and kidney causing severe pathological effect. Morbidity due to S. mansoni infection is the result of worm burden in heavily infected children and fishermen. According to Lichtenberg (21) there is, a clear correlation between schistosome eggs in the stools and hepatosplenomegaly, such that the higher the mean egg count, the higher the prevalence of these organomegalies, and the risk of progression to severe disease.

The modified Kato-Katz thick smear technique is presently the most widely used diagnostic method but with limitations. The method is found to be unable to detect eggs when they are few in stool sample. The result is also influenced by the site of the sample taken and the randomness of eggs in the stool, in the early or chronic stages of infection and when there is low intensity of infection (21, 22). Other problems that face health planners at regional and district level are the financial constraints and shortage of trained technicians for large scale epidemiological surveys for such focal disease. The development of alternative questionnaire approach as first step to screen large area, followed by urine filtration technique on high risk communities is found to be rapid, simple, cost effective, sensitive and specific. This technique is found to be workable even through "indirect interview" approach through self administered questionnaires through the usual educational channels or community leaders in Ethiopia (23) and seven other African countries (23,24). Based on the findings of several morbidity studies a similar methodology was develop for S. mansoni in Zaire (Dr. Leykun Jemaneh: Personal Communication) and encouraging result was found. The importance of assessing community perception and priorities for schistosomiasis and other ill-effects have the following two advantages. First it initiates community based, decentralized information system. Second it involve the community in all stages of control programmes (24-27). The present study focuses on the diagnostic potential of the questionnaires approach based on different morbidity findings.

2. Literature Review

2.1. The Biology of Schistosomes

Since the discovery of schistosomes in 1852 by Theodor Bilharz, a total of 18 species of schistosomes have been found which parasitise man and his livestock (1). Of the five species of schistosomes which parasite man three species (Schistosoma mansoni, schistosoma japonicum, and schistosoma haematobium) are found to be major causes of infection in man and they are also widely distributed. The first two are the causes of intestinal schistosomiasis, while the third causes urinary schistosomiasis. Schistosoma intercalatum and Schistosoma mekongi are more restricted in their distribution.

The complex life cycle begins with the deposition of a large number of eggs (300-3,000 eggs per day per worm pair) (3) in to the blood vessels most of which leaves the body through faeces or urine. Eggs reaching suitable environment (mainly fresh water, warmth and light) will hatch to miracidia. The miracidia have a maximum of one day life span; within this short period they must find an appropriate snail intermediate host. The miracidia of S. mansoni, S. hematobium and S.japonicum, infect snails of the genus Biomphalaria, Bulinus and Oncomelamia respectively. The miracidia develop, multiply and shed as cercariae in to water. The cercariae infect the definitive host (man), within 48 hours. The various water contact habits of man (working in irrigation fields, fishing, swimming, washing, fetching water for domestic purposes and similar religions and other ritual practices) will lead people to the risk of infection by the overwhelming number of cercariae (3-5). The cercariae penetrate the skin by lytic action and eventually develop in to schistosomula. The schistosomula migrate in the tissues, blood vessels, the lungs and finally into the liver (where the schistosomula develop to adult schistosome). The female and male schistosome will get paired and migrate to mesenteric veins in the case of S. mansoni and S. japonicum or in to the veins of vesical plexus in the case of S. heamatobium. The adult female produce eggs and these eggs partly will leave the body through the faeces or the urine. The remaining half of the produced eggs will lodge in the liver and kidney causing severe pathological effect.

2.2. World and Local Distribution of the Disease

Schistosomiasis is one of the most worldwide distributed water based disease, ranking second to malaria in the tropical and subtropical world. Worldwide it is endemic in 76 developing countries. It has exposed about 600 million people for risk of infection and 200 million people are expected to be already infected (1,31). Schistosoma mansoni has been found in 53 countries in Africa, the Eastern mediterranean and South America. S. haematobium is found in 53 countries of Africa and Eastern Mediterranean. Whereas S. japonicum and S. intercaletum are more specific in their distribution the former is found in the South-East Asian countries, and the later is restricted only in six Central African countries (31). Of the five species of schistosomes which parasitises man only S. mansoni and S. haematobium are endemic in Ethiopia (4-20). The former is more widely spread and focal in distribution and the later is found in the lowlands of Awash, Wabishebele and in the Kurmuk town areas (8-11).

The existence of S. mansoni in Ethiopia has been recognised many decades ago when Ayad (12) reviewed the literature on schistosomiasis in Ethiopia during the period 1914 to 1952. He made epidemiological and malacological surveys, and determined the presence of transmission of S. mansoni in Harar, Jimma, Adwa, Bahir Dar and in Segenti (south of Asmara) (12,14,15). At different times a total of more than 500 communities have been studied (15). All the 14 previous administrative regions were studied and the four northern regions were noted to have high transmission. About 54 (48%) of 112 communities have prevalences greater than 10%. The lowest transmission is found in 51 communities in Bale, Illubabur and Sidamo where only 3 communities have prevalence higher than 10% (14,15).

Schistosomiasis transmission has been recognized in the altitude of 650 m in Mui National Park in southern Ethiopia (14) and in altitudes as high as 2480m (16). Most of the identified endemic areas are found in the attitudes between 1500 m and 2000 m. More than 18 million people are living in these risk communities and recently Kloos (15) estimated that about 10 million people are infected. This figure is based on the surveys that were done by the Institute of Pathobiology between 1978-1982 and between 1988-1989 and the projected population of the 1984 census population. The survey has estimated a national prevalence of 20% (15).

Western Gojjam administrative region is endemic for S. mansoni. Some epidemiological surveys (8,13,17) have been performed in twelve towns in this region; the results indicate that two-third of these towns were positive; one-third of them having a prevalence of more than 20%. But these studies were restricted only to those communities that are accessible to motorable roads, and most of the studies have been done long before and hence it is difficult to take the prevalences at present.

Biomphalaria pfeifferi is found to be the major intermediate host of S. mansoni in most endemic areas (8,14,16,18,19). Whereas Biomphalria sudanica is the intermediate host for S. mansoni in the rift valley area (14,19). From 22 water bodies that were studied in Gojjam for Biomphalaria pfeifferi, 17 were found to be positive (19). Recently Erko et al (13) and Teclehaimanot and Fletcher (32) have shown B. pfeifferi to be widespread in this area.

The availability of B. Pfeifferi in lakes, small streams and ponds, the indiscriminate habit of defecation, the use of streams and other natural water bodies for daily needs, and extensive population movement as well as the deteriorating living condition (15) have greatly contributed to the magnitude and impact of the schistosomiasis problem (the spread as well as the intensity).

2.3. Method of Diagnosis

The diagnosis of schistosomiasis is made from the detection of eggs from excreta or urine, depending on the particular species of schistosome. Biopsy material could also be used for detection of all schistosome infections. Different diagnostic methods have been developed for the detection of schistosomiasis, all of these have limitations either in terms of cost, rapidity, simplicity, replaceability or applicability for large scale surveys. The problems of "false positives" and "false negatives" are also noted in the diagnosis of schistosomiasis. The Direct faecal smears method includes both saline and iodine wet mount preparations. This method lacks sensitivity in the detection of schistosome eggs, unless the individual is heavily infected. The faecal concentration technique includes formalin ether concentration technique, merthiolate iodine formalin, concentration and gravity - sedimentation. These methods have high sensitivity that could detect even light infection, but are difficult to apply in field situation and are costly. Similarly the hatching test and serological methods are costly and not applicable for large scale epidemiological surveys. The serological methods mostly have higher "false positives" mostly as the result of other parasitic infection (20). Currently, the modified Kato-Katz thick smear method is recommended for the diagnosis of intestinal schistosomiasis. However the Kato-Katz method has limitations and is unable to detect eggs when they are few in the stools, the results are also influenced by the site of the sample taken and the randomness of eggs in the stool,in the early or chronic stages of infections and when there is low intensity of infection(20,22).

2.4. <u>The Value Questionnaire in the Diagnosis of Schistosomiasis</u>.

In view of the above problems, the World Health Organization currently gives great emphasis to schistosomiasis diagnosis. Identification of high risk communities rapidly and in a cost effective way through a self administered questionnaire approach was employed for <u>S</u>. <u>haematobium</u> in Tanzania (24-26). The approach was found to be less costly than the WHO recommended parasitological approach. This study was replicated on a multicountry basis (Cameroon, Congo, Ethiopia, Malawi, Tanzania, Zaire, Zimbabwe) and a similar finding was noted in that the applicability of the questionnaire approach in identifying high and moderate risk communities was cost effective and workable. Similar methodology has been employed for diagnosing intestinal schistosomiasis in Zaire and a positive correlation was observed between parasitological and questionnaire findings.

The focal nature of the disease, the inconvenience of the present diagnostic techniques (20), the lack of adequate resources for biomedical studies, the inaccessibility of about 75% of the country to all types of transport, (8) all have prompted a search for efficient and cost effective diagnostic techniques in the present concept of primary health care in Ethiopia for schistosomiasis as a whole and for intestinal schistosomiasis, in particular in which limited studies have been conducted elsewhere. The key informants questions used include experiencing bilharzia, blood in stool, and distended belly. Distended belly, for enlarged liver and spleen, has shown good correlation, particularly for children under 15 years of age (21,28-30). The association of blood in stool and S. mansoni infection has also been studied in different countries. On the other hand Hiatt (29) has studied the relation of morbidity to other parasitic infection in two high land communities in Ethiopia; where only S. mansoni was related to cramping abdominal pain and blood in stool. The WHO expert Committee on Schistosomiasis has briefly explained these relations as " Epidemiological studies in communities of different endemic areas with varying intensities of S.mansoni infection have clearly demonstrated a positive correlation between egg out put and prevalence of clinically diagnosed disease. Such studies have led to improved reproducibility and comparability of methods of measuring morbidity."(30).

Furthermore, detailed epidemiological knowledge is needed before any type of intervention can be considered. The focal nature of the disease shows that a given community may experience a high transmission resulting in a high prevalence rate, while the neighbouring village is virtually free of transmission (1,2). The disparities are even more marked if regions rather than communities are considered as units for intervention.

Screening campaigns are required before any insight into the disease situation can be made. A comprehensive parasitological screening would be a major undertaking, given the demographical and geographical constraints. Data gathered routinely through the health infrastructure are often incomplete or completely lacking, and hence offer little support.

However, a number of studies have shown that the disease perception of communities could be useful in assessing the importance of different health problems (27,33). Administrative systems with well organised infrastructure such the Ministry of Education and Party or Community Leaders are found to be the best for indirect interview approach in Ethiopia (23) and elsewhere (24-26). The main objectives of the present work are defined based on the elements mentioned above.

2.5. Prevention and control of schistosomiasis

Control of schistosomiasis can be directed in to one or any of the following combinations depending on the target required: control of schistosomiasis through breaking transmission or reduction of prevalence. The former is carried out by elimination of snails and reduction of host parasite contact. The later is achieved by chemotherapy.

The elimination of snails can be achieved either by one or any combination of the following: using synthetic or plant mulluscicides, biological agents or environmental modification. Synthetic molluscicides are found to be effective only after long term application. It needs high budgetary and also foreign currency (30,34) even all these complete the result is some times discouraging (30,35).

The use of plant mulluscicides such as endod does not need foreign currency, but their toxicology and cost effectiveness still needs study. Biological control method for the control of snail host is at its preliminary field trial stage. Environmental modification through increase in water flow, avoidance of weeds(in Lake Volta), and improvement in canals (in northern Puerto Rico) show reduction in transmission but discouraging result have been seen in southern Puerto Rico (30).

Reduction in host parasite contact is brought about by provision of water supplies and sanitary facilities and health education (30,36). These should be seen in the total community development, besides its reduction on schistosomiasis prevalence. Fruitful result have been observed in St. Lucia and Lake Volta in Ghana (30).

The third point of attack is directed against schistosomes in the human through the use of drugs. Unlike the other approaches the impact of chemotherapy on the incidence of schistosomiasis is controversial (34). The use of drugs are found to reduce the prevalence of infection with in short period of time and prevent disease in those infected individuals. Praziquantel is the newly developed drug which is effective for the three species of schistosomes. Although the drug is available in the market, the high cost reduces its utilisation.

In endemic areas the problem of reinfection led the integration of the above methodologies for long term control of schistosomiasis. The selection of the best method of combination depend on the particular community in focus. Currently the National Schistosomiasis Control programme focus on pilot project areas with integrated approach.

3. Objective of the Study

General Objectives:

-To replicate the "questionnaire approach" in the surveillance of intestinal schistosomiasis and to elucidate the operational feasibility of the indirect interview approach for the study of other ill-health conditions.

-To investigate alternative, cost effective ways of obtaining epidemiological data on intestinal schistosomiasis with the aim of identifying high risk villages for control measures.

Specific Objectives:

-To determine the applicability and efficiency of a specific questionnaire in identifying high risk communities for *S. mansoni*.

-To correlate the out come of the key informant questions with the results of parasitological examination.

-To compare the costs of the questionnaire approach with the costs of the standard parasitological approach.

4. Materials and Methods

4.1. Description of study area and study population.

The study was undertaken in western Gojjam Administrative region, about 600 km North-west of Addis Ababa (see figure 6). This region was selected for two main reasons:

- Available reports indicate relatively high and low risk areas.
- Study in this region is found to be economical both in material and financial expenses.

Western Gojjam Region is bounded on the north by Gondor Region and Lake Tana, in the west by Metekel and in the east by eastern Gojjam Administrative region. It covers a total area of 17,288.8 sq.km and has a population of approximately two million people. There are two rain seasons, autumn rain from February to April and the main rain season from June to September. The temperature is both the hot and the warm type that ranges from 15 to 25^{0}C. The altitude ranges from 1800 to 2200. The topography is hilly with several streams and tributaries of the Abay river. Lake Tana, which is found in the northern part of this region, has the potential of producing 10,000 tons of fish annually (37).

The population is static, mainly engaged in subsistence mixed agriculture. Teff is a stable food while oil seeds, cereals, cotton and pepper are main cash crops. In rural areas almost 94% of the rural population get their water from unprotected sources, whereas defecation is often in the field and in the ditches.

There are about 180 functional elementary schools in the region; but only 110 of these elementary schools have classes of 5 and 6 grades. About 30% of these elementary schools are assumed to be accessible with all weather roads.

4.2. Target Population

The study subjects were children attending the 110 elementary schools. Children in grade five and six are assumed to show the peak age infection rate. These age group is the most vulnerable and it will be easier and sensitive to indicate the situation of the disease in the area. Also conducting school surveys are preferred for the following reasons:

a. Schools surveys are cheap, accessible and rapidly conducted

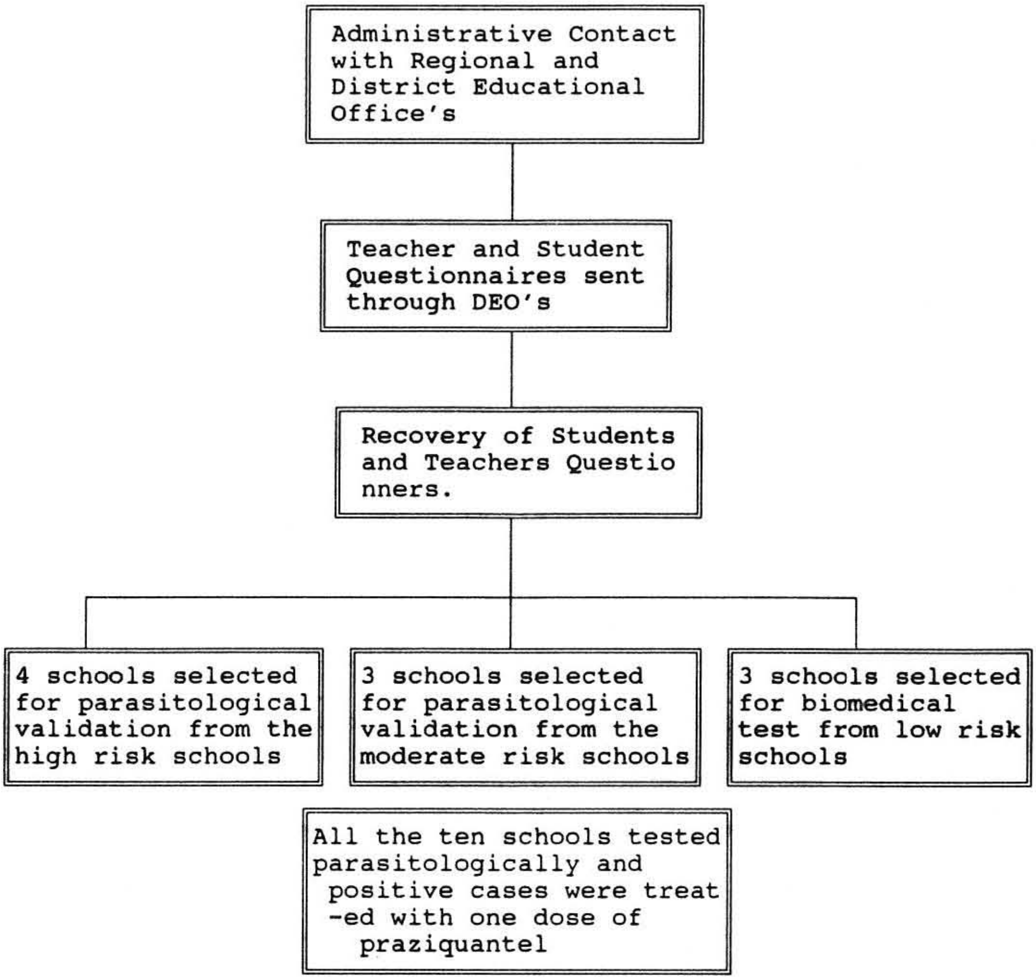
b. Members of the schools (head teachers, teachers and students) are likely to accept the inconvenience of providing stool samples and of other investigations.

4.3. Study Design

The pretesting the questionnare was performed in two elementary schools in Bahir Dar. Except for minor adjustments the questionnaires were similar to the ones set for S. haematobium in the multicountry study (23,25,26). The questionnaires were prepared in Amharic. The student questionnaires were distributed to every elementary schools through three District Educational Offices (DEO's) at Bahir Dar, Dagla, and Fenote-Selam in the Western Gojjam Administrative Region. The district educational officers were briefly informed on the general nature of the study. They were not briefed specifically on the objectives in order to avoid bias.

Through a letter the teachers were asked to complete the questionnaires during health or science programs, the nature questions are not aimed to measure their skills or relate his/her personal life and to initiate students to be participant for the study. The student questionnaires were filled by the teacher, through interviewing the child individually. They are also informed the possiblity to stop at any question(s) if they are discomforted. Each student is assumed to be interviewed with in 1 to 2 minutes.

Figure 1. Scheme of the Study Design



4.4. Questionnaire Design.

The questionnaires for teachers include the following main questions:-

a. The ranking of the diseases most prevalent among school children. The choices were: Malaria, Skin Diseases, Eye
Diseases, Schistosomiasis, Respiratory Infection, Measles, and Worms.

b. The ranking of signs and symptoms most prevalent among children. The choices that were given included the following; Itching, Coughing, Headache, Distended Belly, Blood in the Stool, Blood in the Urine, and Fever.

c. The ranking of priority diseases for control. The choices were similar to those listed in (a).

Questionnaires for school children were designed to compose three tables(appendix 2). The first table consisted of the socio-demographic characteristics (age, sex, nation, duration, religion) of 55 (fifty five) students. The second table composed of the signs and symptoms the child has experienced during the last 15 days and the third table asked of the disease(s) the child has had for the last fifteen days. Lists of seven symptoms and seven diseases were given and the answers were to be written as "yes" "no" or "don't know". The "don't know" answers were analyzed as "no".

4.5.Parasitological Validation.

Extensive parasitological validation was conducted in ten accessible elementary schools immediately after reception of the questionnaires . Five schools from high risk communities with a cut-off point for high risk taken as 15% and above for "yes" answer for experiencing schistosomiasis in the last 15 days. And another five schools were from low risk communities with a cut-off point 5% or below for the same question. A total of 600 children were chosen based on systematic random sampling in eight schools. In the remaining two schools the number of students were small and therefore all of the students were included. The sample size was determined based on the following formulas (38):-

$n = (Z \text{ alpha } /100P_1 - 100P_0)^2 \; P_0 \; (1-P_0)$

Alpha = 0.05 (chance of type I error)

Marginal error = 0.04 ($100P^1 - 100P^0$)

Estimated prevalence of schistosomiasis in the study area = 50 percent (this is inorder to get the maximum sample size).

Based on the above assumptions a total of 600 children were included in the parasitological survey. The school prevalence study was conducted by field laboratory team comprised of two senior and one assistant technicians, one secretary and one driver, lead by one project coordinator. After the necessary socio-demographic characteristics were recorded the students were provided with the corresponding numbered containers. There was 99% participation from randomly selected students that were asked to give stool samples. Students were asked to bring not less than 10g. of faeces. One school per day was studied, the specimens were collected early in the morning. The Kato-Katz (cellophane thick smear) procedure was used to study school prevalence rates.The methodology is briefly presented below:-

1. Wettable medium thickness cellophane cover slips were soaked for 24 hrs in glycerine and malachite green solution.
2. The stool samples were sieved through the screen to avoid unnecessary debris.
3. Through a spatula, small samples of faeces were taken from the screen and put on the template hole that can hold about 20 mg. of faecal sample.
4. The faecal material was covered with the cellophane and the slide was inverted and pressed against another slide for 45 minuets until the smeared clear and the writing in the paper under the slide is possible to be read.
5. Carefully the slide is removed from the cellophane stripe slide.

6. The smear examined under 40 x objectives for atleast one laterally spine egg in the field.

A double slide sample was collected and the positive cases were treated at the spot at a dose of 40mg/ per kg. body weight with praziquantel.

4.6. Focus Group Discussion

Focus group discussion was done in the same ten elementary schools concerning perception of the disease (schistosomiasis) during the field survey. This was done based on the method set for collecting social-science information for s.heamatobium in the multi-country study. Brief health education lesson was given at the end the survey in each school.

4.7. Cost Analysis

Cost analysis of the different approach was done after the necessary amount has been invested. These include: transportation, fuel, perdiem, and stationary. The costs of praziquantel is not included in the cost analysis since it is out of the diagnostic process. Costs are considered only at regional level since these kind of surveys can only be done at regional level. The working time for distributing, filling questionnaires and recovering the questionnaires were not considered, since this is part of their duties though it is narrowly defined as noted by the Ministry of Education.

4.8. Data Analysis

All data was entered, checked, and analyzed as to the WHO standard format. The data was processed in the Department of Community Health with EPI - INFO statistical package.

5. RESULTS

5.1. Operational Results

Through the usual administrative system in the Ministry of Education, a total of 110 student's and 220 teacher's questionnaires were distributed in 110 schools using the relay system that is being used at district level. The site of distribution and recovery of the questionnaires were selected to be the District Educational Office's (DEO's) in the three districts. The return time was specified to be four weeks. Within this time 88 schools returned the completed questionnaires to the DEO's; this resulted in 80% compliance rate. In 68 schools with a minimum of 12 students per school properly filling them out.

5.2. Questionnaire Results.

Table 1 and 2 show the sex and age distribution of children and table 4 depicts the number interviewed children by class. A total of 3580 children in grades five and six were interviewed; on the average 52.7 students per school. The mean age was 11.73 + 1.53, and male to female sex ratio was 1:0.77. Amhara ethnic and Orthodox Christians take the highest percentage with 96.4% and 92.5% respectively. The majority of students (98%) had lived for more than three years in the area where the interviews were performed.

The results of defined disease

markers for intestinal schistosomiasis were shown in table 4. The answers of children in the sixty eight schools for blood in stool, distended belly, and schistosomiasis were 10.4%, 30.6%, and 9.0% respectively.

Table 1. Number of Children Interviewed by Sex.

Sex	Frequency	Percent
Male	2020	56.4%
Female	1560	43.6%
Total	3580	100.0%

Table 2. Number of Children Interviewed by Age.

Age	Frequency	Percent
9	85	2.4%
10	778	21.7%
11	734	20.5%
12	1002	28.0%
13	537	15.0%
14	261	3.1%
15	111	1.1%
16	40	1.1%
17	8	0.2%
18	8	0.2%
19	1	0.0%
unspecified	15	0.5%
Total	3580	100.0%

Table 3. Number of Children Interviewed by Class.

Class	Frequency	Percent
5	1797	50.2%
6	1783	49.8%
Total	3580	100.0%

Table 4. Prevalence of Positive Answers to Different Markers of S.mansoni in 68 schools.

Markers	Frequency	Percent
Distended belly	1094.0	30.6%
Blood in stool	373.0	10.4%
Schistosomiasis	323.0	9.0%

5.3. Biomedical Results

Based on one of the marker, i.e., prevalence of schistosomiasis, a threshold level was defined inorder to identify those high risk and low risk schools with the answer "yes I had Schistosomiasis" of greater than 15% were considered to be high risk and correspondingly those showing lessthan 5% agrement to the same question as low risk. Extensive parasitological validation was made in schools from each group and the results are shown in Table 7. A total of 600 children were tested and 90 children were found to be positive giving a prevalence rate of 15% for intestinal schistosomiasis in the region.

The mean age of the children tested parasitologicaly was 11.35 + 1.25 years (range 9-19). The male to female sex ratio was 1:0.69, and a higher infection rate was found in males (17.5%) than females (11.0%), with an odds ratio of 1.64 (0.99< OR < 2.73)(see table 5 and 6).

Table 5. Age Distribution of Children Tested Parasitologicaly.

Age	Frequency	Percent
9	24	4.0%
10	141	23.5%
11	165	27.5%
12	188	31.3%
13	53	8.8%
14	15	2.5%
15	12	2.0%
16	2	0.3%
Total	600	100.0%

Table 6. Sex Distribution of Children Tested Parasitologicaly.

Sex	Frequency	Percent
Male	355	50.2%
Female	245	49.8%
Total	600	100.0%

Table 7. Prevalence of S.mansoni by Kato Thick Smear in Western Gojjam Region, 1993.

Test Result	Frequency	Percent
Positive	90	15.0%
Negative	510	85.0%
Total	600	100.0%

Table 8. Prevalence of Positive Answers for Different Markers and Prevalence of S.mansoni in the 10 schools Studied Biomedicaly.

Community	Prevblst[1]	Prevdis[2]	Prevsch[3]	PrevKat[4]	TeaRank
Dangla	2.2	13.3	0.0	0.0	7
Lay Birre	6.3	2.1	21.9	48.0	3
Durbete	0.0	4.8	0.0	0.0	7
Addiskidame	0.0	0.0	0.0	0.0	7
Merawi	12.2	10.2	17.3	35.0	3
Bure	0.0	0.0	0.0	0.0	7
Tis Abay	3.6	8.1	9.0	0.0	3
BahirDar(I)	10.6	6.0	10.0	4.0	7
Jiga	26.2	38.1	33.3	40.0	2
Bahirdar(II)	6.7	7.9	5.6	12.0	7

1 = Prevalence of Blood in Stool
2 = Prevalence of Distended Belly
3 = Prevalence of Schistosomiasis determined by Questionnaire
4 = Prevalence of Schistosomiasis Determined by Kato Smear
5 = Teachers Rank for priority to control

Table 8 shows prevalence of positive answers for the different morbidity markers of intestinal schistosomiasis in comparison to the result of the parasitological screening in ten schools.

The median rank of teacher's ranking for identifying schistosomiasis disease as a problem either in the 68 schools that were studied was found to be 7 (range 2 to 7).

5.4. <u>Relation between Questionnaire and Kato Results.</u>

Linear regression analysis between the questionnaire prevalence of the three key indicators and prevalence of schistosomiasis due to biomedical results was made. In all cases a positive correlation was found. A strong correlation was found for prevalence of schistosomiasis as determined by the questionnaire verses the biomedical findings. The Pearson's coefficient of correlation (r) was found to be 0.89, 0.69, and 0.45 for prevalence of schistosomiasis, blood in stool, and distended belly, respectively in relation to the parasitological result. (see figure 2, 3 and 4). Similarly a strong negative Pearson's coefficient of correlation (r) was found for the teachers rank of schistosomiasis as a problem in the community and that of school prevalence determined by KATO (see figure 5).

5.5. Focus Group Discussion Results

An informal qualitative investigation was carried out in those schools that were screened parasitolgicaly through group discussion with the head teachers, teachers, and students. The results indicate that:

1. Schistosomiasis is well perceived disease in the community. The knowledge is obtained through a) formally from health personnel in health institutions, mass media, and researchers; and b) informally from members of the village.
2. Some of the students concentrated on the diseases they had before irrespective of the present situation during the interview.
3. Some of the teachers commented to reduce either the number of symptoms and diseases or the number of children interviewed inorder to get better cooperation and not to share much of their time.
4. Their was no problem with the 15 days recall period.
5. The teachers and students were not discomforted to any of the questions, but they mentioned a problem in specifying the disease(s) though they could well tell the symptoms.
6. Benefits from such surveys in the past were not available to the community, thus some teachers tended to be uncooperative.

5.6. Costs of the Different Approaches.

Since such a study can be performed at the regional level the costs that were needed for personnel and transportation to and from the region was not included. Costs for the school questionnaire and biomedical survey is given below see (table 9 and 10). Costs such as treatment, vehicle, microscope, and other necessary kits were not included in the analysis.

Table 9. Costs of Different Approaches (in US dollars) Analyzed at the Regional Level.

Approaches	Transportation	Personnel	Supplies	Total
Questionnaire	180	100	60	340
Biomedical-survey	600	800	200	1600
Total	780	900	260	1940

Table 10. Overall Cost Comparisons of the Two Approaches per Individual Basis (in US dollars) and Screening Time.

	Questionnaire	Biomedical Survey
Total Costs	340	1600
No of School Screened	68	10
No of Children Screened	3580	600
Cost per School Screened	5	160
Cost per Child Screened	0.09	2.67
Adjusted to Questionnaire Approach	1	30
Screening Time(in weeks)	4	14

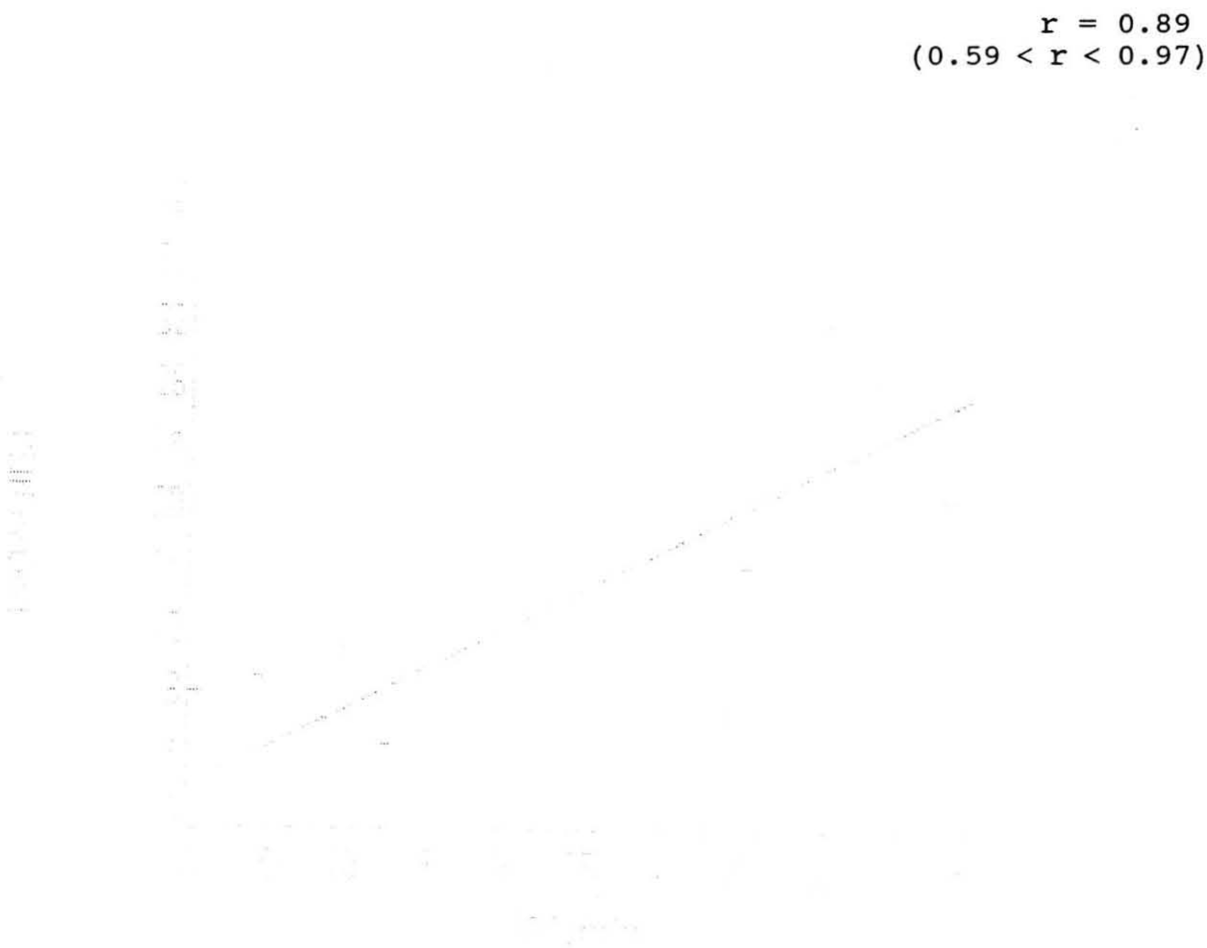


Figure 2. Regression Analysis between Prevalence of Schistosomiasis Determined by Questionnaire and Kato Thick Smear Approaches.

r = 0.69

(0.10 < r <0.92)

Figure 3. Regression Analysis between Prevalence of Blood in Stool and Prevalence Schistosomiasis Determined by Kato Thick Smear.

r = 0.45

(-0.26< r <0.84)

Figure 4. Regression Analysis between Prevalence of Distended Belly and Prevalence of Schistosomiasis Determined by Kato Thick Smear.

r = -0.78

(-0.95< r <-0.29)

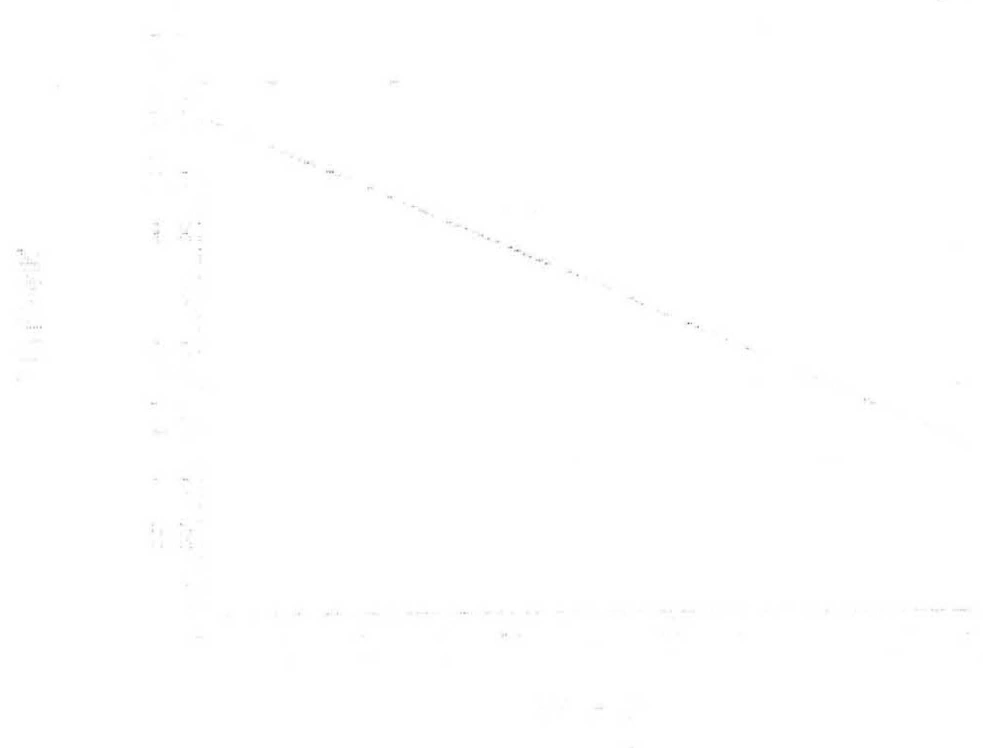


Figure 5. Linear Regression Line between Teachers Rank as a problem versus Prevalence of kato thick smear.

6. DISCUSSION

The main aspect of this study can be generalised in four components, as it has been described in the objective. These are operational feasibility, rapidity, cost effectiveness, and the diagnostic performance of the self administered questionnaire for the diagnosis of intestinal schistosomiasis.

Carefully designed and pretested questionnaires, based on the experience from similar studies in S. hematobium endemic(24-26) area were distributed to all elementary schools head teachers, teachers, and students of five and six grades in Western Gojjam, a region considered to be endemic for intestinal schistosomiasis. The study age group (majority of 10-14) are the most vulnerable of the study community and hence easily reflect the situation of the community they live in. About 80% of the targeted schools (88 schools) have completed the questionnaire and sent them to their respective district educational offices. From the operational feasibility of the educational systems, there was a reduction in school functionality and sharp decrease in school attendance rate in most rural areas. Therefore in this study 15 schools (17.0%) interviewed less than eight student per school and these were discarded from the study. In other four schools (4.5%)

the questionnaires were not properly filled, and only in one school the absence of participation was explained. All the teacher questionnaires were filled completely.

The usual educational system was selected for distribution and completion of the "indirect" questionnaires approach because of the fast relay system and communications they have between the district educational offices, the pedagogical centres and the elementary schools. The multiple interview approach in which the teachers interviewed children was also performed easily in this system. Besides the educational system is the most organized in its infrastructure and has the highest coverage particularly in remote rural areas.

The questionnaires were designed to look on general health problem instead of disease specific approach. The design has avoided overrating of the prevalence of key informants.

The diagnostic ability of each of the key informants was related to the standard parasitological diagnostic technique on the basis of pearson's coefficient of correlation. Experiencing schistosomiasis was the best indicator for infection than blood in stool or distended belly (see figures 2, 3, and 4). This result is similar to the Kilombero and Kilosa (in Tanzania) findings (25), where experiencing the disease was found to be the best indicator of infection than the symptoms. Blood in stool showed higher correlation with Kato Technique than distended belly. Earlier Haitt (29) and Von Lichentenberg (21) have indicated a similar association of bloody diarrhoea with s.mansoni infection as compared to other intestinal helminthic infections. It is obvious that bacterial & viral gastroentrits infection can cause bloody diarrhoea. However as these are water related infections and the time of this study was in the dry season it is highly unlikely that they have contributed to the increase the number to the answer "yes I had experienced blood is stool". In general experiencing bilharziasis and the presence of blood in stool are the most important indicators for S. mansoni infection.

In the present study there is only slight correlation between the kato result and distended belly. There was high prevalence of distended belly (30.6%) and the correlation to the prevalence of schistosomiasis as determined by Kato was insignificant. The high member of complaint rate for distended belly can best be explained by forces other than schistosomiasis like: consequences of malnutrition, and other intestinal infections, among others.

Moreover it was apparent from the group discussion that students tend to emphasis on the enlargement of abdomen for the seek of getting some treatment. The children associated helminthic infections with the usual rumbling sound made by the intestines and enlargement of the abdomen. These all reasons conform for the overestimated prevalence of 30% for distended belly for the region as a whole as compared to 10.4% and 9.0% for blood in stool and schistosomiasis.

In one school (Lay Birre) the increase in prevalence from previously documented prevalence of 4.6% to the present result of 48.0% was clearly revealed in the questionnaire diagnosis as 21.9%. The areas where the Kato technique revealed high prevalences, the prevalence of schistosomiasis by the questionnaires was also comparatively higher. This shows the potential of the questionnaire approach for the diagnosis of intestinal schistosomiasis.

Prevalence of schistosomiasis and teachers rank of schistosomiasis is found to be highly and negatively correlated (see figure 5). As the prevalence of schistosomiasis determined by Kato increased the teachers tend to give priority for the control of schistosomiasis in the village. Similar findings were noted in the works of Lengeler et al, Kilombero district in Tanzania where it was found out that higher ranking in priority was given by the teachers for control of schistosomiasis based on the higher prevalence rates for intestinal schistosomiasis in Namwalla village or urinary schistosomiasis in the rest of the villages(25). Thus it is useful to involve experienced individual from the village (such as teachers) before beginning any control activity.

In this study it was found out that a higher infection rate was found in males (17.5%) than females (12.9%) with odds ratio of getting the disease is higher about 1.64 times more for males than for females.

The other most important aspect of this study was cost comparison. A student can be diagnosed with questionnaire at a cost of 0.09 US dollar and with Kato smear 2.67 dollar. Therefore the present methodology is 30 times cost effective than the parasitological approach. In relation to time the questionnaire approach takes only four weeks. Extrapolation of the time taken for validation of the ten schools to include sixty eight schools indicate that the biomedical approach will take about fourteen weeks as compared to only one week for the questionnaires approach. It is the distribution, self administration and the multiple interview way of approach which makes the questionnaire methodology cost effective and rapid. Hence the present findings further strengthen the potential of the questionnaire approach for the monitoring of the disease.

CONCLUSION and RECOMMENDATIONS

Based on the present study the following conclusion and recommendations are made:

1. The distribution, completion (either in self-administered or multiple interview of teacher - student) and recovery of the questionnaires are operationally feasible through educational systems.
2. The use of questionnaires for the diagnosis of communities at high risk of intestinal schistosomiasis is cost-efficient about thirty times less than the recommended biomedical approach and it is also more than three times faster than biomedical approach.
3. "Bilharziasis" or "Yewaha-Til" (which means water-worm) is the word commonly used for schistosomiasis. Knowledge of the disease is very good in most areas that are identified as high risk. In low risk communities, the teachers have good knowledge of it, but it is less common among students.
4. Based on the questionnaire finding about 15% of the sixty eight schools are identified as high risk.
5. Among the key informants, experiencing schistosomiasis is found to be the best indicator of infection with strong positive parson's

coefficient of correlation with Kato.

Based on the present study the following recommendations are made:

- To emphasis on morbidity studies in relation to *S. mansoni* infection in the different communities.
- To involve individual from the village during all stages of control programmes.
- Based on this study the investigator recommend similar investigations for study of other diseases, water resource studies, and nutritional surveys.

References

1. Rollinson D J G Andrew Simpson The Biology Schistosomes: From Genes to Latrines,1987, Academic Press London .
2. WHO, Measurement of the Public Health Importance of Bilhariziasis, WHO Technical Report Series No 349
3. Warren K S. Selective Primary Care: Strategies for Control of Disease in the Developing world. I. Schistosomiasis. Review of Infectious Diseases 1982 4;3 715-726.
4. Kloos H Water Resources Development and Schistosomiasis Ecology in Awash Valley Ethiopia, soc sci med 1985; 20:609-625.
5. Kloos H Lemma A The epidemiology of Schistosoma mansoni infection in Tensae Berhan: human water contact patterns Ethiop Med J 1980 18(3) 91-98.
6. Kloos H. Lemma A Desole G Schistosoma mansoni distribution in Ethiopia: a study in Medical Geography. Ann Trop Med Parasitology 1978; 72:461-470.
7. Ayele T The Distribution of schistosomiasis in Ethiopia: Results of 1978-1987 Survey. Proceed Symp Human Schistosomiasis in Ethiopia 1982,(Ayele T. Lo C T eds.) Addis Ababa.
8. Tedla, Shebru H. Kloos and Getachew Tilahun (eds.). Schistosomiasis in Ethiopia Addis Ababa: Addis

Ababa University Press, 1989.

9. Kloos H Lemma A. Bilharziasis in the Awash Valley. III. Epidemiological studies in the Nura Era, Abadir,Melka Sedi and Amibara irrigation Schemes. Ethiop.Med J 1977; 15: 161-168.

10. Desole G Lemma A Mazengia B Schistosoma haematobium in the Wabishabelle valley of Ethiopia. Am J Trop Med Hyg 1978; 26 7:928_930.

11. **Ali A Lo C T Ayele T Schistosoma heamatobium in western Ethiopia. Ethiop Med J 1982; 24:13-18**

12. Ayad N Bilharziasis survey in British Somaliland, Eritrea, Ethiopia, Somalia, the Sudan, and Yemen. Bull. WHO 1956; 14:1-117.

13. Erko B Tedla S Petros B, Transmission of Intestinal Schistosomiasis in BahirDar, Northwest Ethiopia. Ethiop Med J 1991 29(4):199-211.

14. Lo C T Kloos H Birrie H Schistosomiasis: In Zein A Zein and Helmut Kloos eds.: The Ecology of Health and Disease in Ethiopia, MOH, 1988,Adiss Ababa.

15. Kloos, H Schistosomiasis.In: Helmut Kloos and Zein A. Zein (eds.). The Ecology of Health and Disease in Ethiopia. Pp 413-425 Westview Press USA, 1993.

16. Birrie, H. Survey of Schistosomiasis mansoni in the Borkena river Basin, Ethiopia. Ethiop. Med. J. 1986; 24:159-167.

17. Ayele T Tiruneh M The Incidence of Schistosomiasis mansoni in new comers around Lake Tana. Proceed Symposium on Human Schistosomiasis in Ethiopia. 1982 (in Ayele T Lo C T eds), Addis Ababa.

18. Woldemicheal T. Electrophoretic Studies on Enzyme of the Snail Intermediate Hosts of Schistosoma Mansoni From Ethiopia. Ethiop. J. Helth Development. 1990 4(1). pp 7-14.

19. Lo C T Redda A Gemeda N Malacological Studies of Human Schistosomiasis in Ethiopia. Proceeding Symposium on Human Schistosomiasis in Ethiopia. 1982 (Ayele T Lo C T eds.) Addis Ababa.

20. Jemaneh L. Comparison of Immunodiagnosis(ELISA) and Stool Examination (Kato Technique) in the Diagnosis of Schistosoma mansoni in Ethiopia. Ethiop Med J 1993, 31 37-49.

21. Von Lichentenberg F. Consequences of Infections with Schistosomiasis In: David Rollinson and Andrew J.G. Simpson (eds) The Biology of Schistosomes From Genes to Latrines. Academic Press, London, 1987, pp. 185-232.

22. Ali A A Review on Laboratory Diagnosis of Schistosomiasis. Proceed symp Human Schistosomiasis in Ethiopia.1982, (Ayele T Lo C T eds.) Addis Ababa.

23. Jemaneh, L. et al Identification of High Risk

Communities for Urinary Schistosomiasis: A Multi Country Study. (Final Report by the Team From Ethiopia). 1992, Addis Ababa Ethiopia.

24. Lengeler C et al. The value of questionnaires aimed at key informants, and distributed through an existing administrative system, for rapid and cost-effective health Assessment International Journal of Epidemiology 1991, 44(3): 150-159.

25. Lengeler C et al. Community-Based Questionnaires and health statistics as tools for the cost-efficient identification of communities at risk of urinary schistosomiasis. International Journal of Epidemiology, 20(2).

26. Lengler C et al. Rapid, low-cost, two step method to screen for urinary schistosomiasis at the district level: the Kilosa experience. Bulletin of the World Health Organisation, 1991 69(2):179-189.

27. Nichter M Project Community Diagnosis: Participatory research as a first step towards community involvement in Primary Health care. Soc sci med 1984, 19,273-252.

28. Arap Siogok TK, Mohmond AAF, Guna JH et al Morbidity in Schistosomiasis Mansoni : A Study of a Community in Machakos, Kenya. Am. J. Trop. Med. Hyg. 1976: 25, 273-285.

29. Hiatt R A Morbidity from Schistosoma mansoni

infection an epidemiological study based on quantitative analysis of egg excretion in two high land Ethiopian villages. Ann Trop Med Hyg 1976;25:808-812.

30. World Health Organization Epidemiology and Control of Schistosomiasis. WHO Technical Report Series No 643, 1980.

31. WHO The Control of Schistosomiasis: WHO Technical Series Report No 738 1985.

32. **Teclehaimanot A Fletcher M A Parasitological and** Malacological Survey of Schistosomiasis mansoni in the Beles Valley, Northwestern Ethiopia. The Journal of Tropical Medicine and Hygiene 1990,93(1):12-21.

33. Jackson L C Malaria in Liberian children and mothers: biocultural perceptions of illness versus clinical evidence of disease. Soc sci med 1985, 20:1281-1287.

34. Wolde Yohannes L. Synthetic and Plant Molluscicides in the Control of Schistosomiasis with Special Reference to the Agrobotanical Studies of Endod (Pytholacca Dodecandra) in Ethiopia. Schistosomiasis in Ethiopia, Proceedlings of symptom on Human Schitosomiasis in Ethiopia, 1982, (Ayle T. Lo C T eds.) Addis Ababa

35. Costa Lemae MFE, Rocha RS. Coura Filho P. Katzn. A 13 Year Followup of Treatment and Snail Control in an Area Endermic for Schistosoma Mansoni in Brazil, Incidence of Infection and Reinfection Bull WHO, 1993, 71(2): 197-205.

36. Gere-Egziabher E. Diagnosis Before Action:A Kap Survey as A Base Line for a Schistosomiasis Control Pilot Project in Kemise, Wello Administrative Region, Ethiopian J. hlth. Dev. 1987, 2(1) pp 1-10.

37. Hailu M Water Profile of the Northwestern Region, Ethiopia. 1993 (in press).

38. Colton T., Statistics in Medicine, Little, Brown and Company, Boston, 1974

ADDIS ABABA UNIVERSITY

MEDICAL FACULTY COMMUNITY HEALTH DEPARTMENT

Questionnaire Form No 1

Prepared for School Teachers

Date______

1.Address Administrative region __________

Awraja _________________ Woreda__________

Kebele/ village/peasant Association ______________

Name of school _________

School Number _______________

2. Identification: Age ____ Sex ___ Ethnicity :

Amhara______ Tigre___ Oromo_____ other___

Religion : Orthodox_____ Muslim____ protestant

other__

3. Educational level Grade 9 - 12 _____

Grade 12 complete _____ Grade 12+1 _____

Other _____

4. For how many years have you worked in the area, that you are working now: Less than a year _____

One to two years _____ More than two years ___

5. Which of the following diseases most prevalent among students. Rank and write them according to their importance.

The diseases are: Malaria, Skin diseases, Eye diseases, Respiratory infection, Schistosomiasis, Measles, Worms.

Rank 1 _____ Rank 4 ______

Rank 2 _____ Rank 5 ______

Rank 3 _____ Rank 6 ______

8. Which of the following symptoms most common among students. Write them in according to their importance.

The symptoms are: Coughing, Itching, Headache, Distended abdomen, Fever, Blood in urine, Blood in stool.

Rank 1 ______ Rank 4 ______

Rank 2 ______ Rank 5 ______

Rank 3 ______ Rank 6 ______

9. Among the diseases listed in No 7,which one you give priority for control measure. Write them in order of there importance.

Rank 1_______________ Rank 4_______________

Rank 2________________ Rank 5_______________

Rank 3______________ Rank 6_______________

10. Which of the following services need priority in your village. The services are : water, agricultural land, commodities, health, transport, education, housing.

Rank 1 ______ Rank 4 _______

Rank 2 ______ Rank 5 _______

Rank 3 ______ Rank 6 _______

11. Of the following listed water sources, rank and list six of the sources that are usually used by the community. Water sources are: pond, well-with hand pump, river, spring unprotected, spring/ well/ protected, /tap water, other.

Rank 1 ______ Rank 4 _______

Rank 2 ______ Rank 5 _______

Rank 3 ______ Rank 6 _______

Questionnaire N_ 1. Student Questionnaire

Awraja______ Wereda______ Name of the school______ Grade______

[illegible] write "X" for "Yes", "O" for "No", or "-" for "Don't know" answers.

Student No.	[illegible]
Age	
Sex	
Nation *	
Religion **	
Year of Stay***	

Question 1. Which of the following diseases does the child experienced for the last 15 days?

Malaria	
Skin Diseases	
Eye Diseases	
Schistosomiasis	
Respiratory Infec.	
Measles	
Worms	

Question 2. Which of the following symptoms does the child complain for the last 15 days.

[illegible]	
[illegible]	
Headache	
Distended Belly	
Blood in Stool	
Blood in Urine	
Fever	

Student No	[illegible]
Age	
Sex	
[illegible]	
Religion	
Year of Stay	

Malaria	
Skin Diseases	
Eye Diseases	
Schistosomiasis	
Respiratory Infec.	
Measles	
[illegible]	

[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	

* [illegible] = 1, [illegible] = 2, [illegible] = 3, Other = 4 ______

** [illegible] = 1, [illegible] = 2, Other = 3 ______

*** [illegible] ______

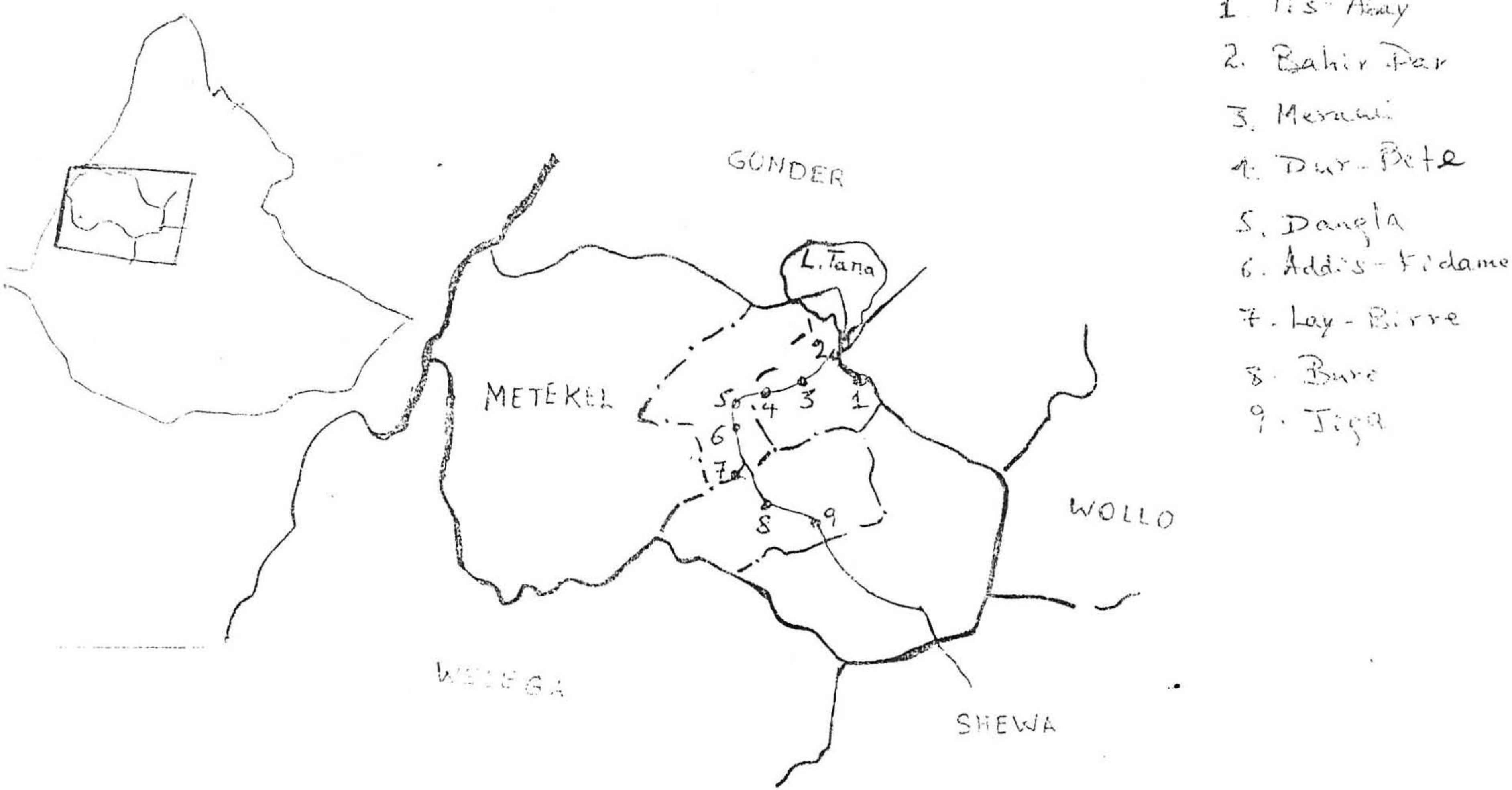


Figure - Map of the Study Region with Study Sites: Biomedicaly