

Prevalence of schistosomiasis and associated factors among students attending at elementary schools in Amibera District, Ethiopia*

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ABSTRACT

Introduction: Schistosomiasis is one of the most prevalent parasitic diseases and an important public health problem in many developing countries including Ethiopia. The study was aimed at assessing prevalence of schistosomiasis and associated factors among students attending at elementary schools in Amibera District, Ethiopia. **Methods:** A cross sectional school based study was carried out on sample of 840 students. First, all elementary schools around Amibera District were grouped in to strata based on their distance from the irrigation site as “Near” or “Far”. Then two schools were selected by simple random sampling method from each stratum. Finally, proportional allocation of the sample size was done according to the number of students in each stratum. From each grade level students were selected by simple random sampling techniques. A pre-tested structured questionnaire was used to collect data on socio demographic characteristics, water contact habit and toilet utilization. Stool and urine examination were done to determine prevalence. The analysis was carried out using SPSS version 16.0. **Result and Conclusions:** The overall prevalence of schistosomiasis in this study was 8.2%; among this

Schisosoma haematobium was 7.4% and *Schisosoma mansoni* was 0.8%. Education level (p-value = 0.047, OR = 1.834), swimming habit (p-value = 0.0001, OR = 4.979) and source of water for domestic consumption (p-value = 0.0001, OR = 0.334) had shown significant association with the occurrence of *S. haematobium* infection. **Conclusion and recommendations:** The prevalence of schistosomiasis was not what to be neglected. It was significantly associated with educational level, swimming habit of children and source of water for domestic consumption. Therefore, provision of safe water supply and health education at school level was recommended.

Keywords: Prevalence; Schistosomiasis; Amibera District; Ethiopia

1. INTRODUCTION

Schistosomiasis is one of the most prevalent parasitic diseases and an important public health problem in many developing countries. Globally, schistosomiasis ranks second among parasitic diseases of socio-economic and public health importance and is found in 48 African countries [1]. An estimated 779 million people are at risk of schistosomiasis, of whom 106 million (13.6%) live in irrigation schemes or in close proximity to large dam reservoirs and the majority of these infections occur in Sub-Saharan Africa [2,3].

The disease is mostly seen among the poor Sub-Saharan Africa. It was listed among the 13 diseases classified by World health organization as “Neglected Tropical diseases” [4]. It is prevalent in tropical and sub-tropical areas, especially in poor communities that had low access to

*Competing Interests: The authors declare that they have no competing interests.

Authors' contributions:

Worku Awoke was involved in proposal development, data cleaning, and data analysis and manuscript preparation.

Molalign Tarekegn was involved in proposal development, pre-testing the questionnaire, supervising the data collectors, data entry, analysis and manuscript preparation.

Melkamu Bedimo was involved in proposal development, data cleaning and data analysis and manuscript preparation.

safe drinking water and adequate sanitation. It is estimated that at least 90% of those requiring treatment for schistosomiasis live in Africa [5].

The three main species infecting humans are *Schistosoma haematobium* (*S. haematobium*), *Schistosoma japonicum* (*S. japonicum*), and *Schistosoma mansoni* (*S. mansoni*). Two other species, more localized geographically, are *Schistosoma mekongi* and *Schistosoma intercalatum*. Schistosomiasis in Africa is caused by an infection with *S. mansoni* and *S. haematobium* whose eggs may be found in feces or urine respectively [6].

School-age children who live in areas with poor sanitation are often most at risk because they tend to spend time swimming or bathing in water containing infectious cercariae [7].

In Ethiopia, the prevalence of schistosomiasis infection varies from localities. Previous studies showed that the prevalence of *S. mansoni* among school children was 85% in Zarim, 67% Gorgora [8], 5.95% among school children of different water source users in Tigray [9], 67.6% in Finchaa valley [10] and 20.6% among schooled children in Gorgora [11]. Hygiene and play habits make children especially vulnerable to infection [5].

This study was aimed at assessing prevalence of schistosomiasis and associated factors among students attending at elementary schools in Amibera Woreda, Ethiopia.

2. METHODS

2.1. Study Design and Study Area

A quantitative school based cross sectional study was carried out in Amibera District, Ethiopia. The district is found in Afar Regional State, located 270 km east of Addis Ababa. In the district there is one hospital, one health center and eight health stations. "Middle Awash irrigation Project" is also one irrigation project in the district. Concerning educational institutions there are 12 elementary, 3 high schools, and one technique school. There are 8670 number of students attending in 12 elementary schools. The total population of the study area is estimated to be 32,086 [12].

2.2. Sample Size Determination

The source population consisted of all students found in the 12 elementary schools. This study examined selected students from 4 elementary schools. The sample size was determined by using a single population proportion formula, which took the prevalence in the locality 54% with a margin of error of 0.05 at the 95% confidence interval (CI); then correction was made since the population was less than 10,000. Finally multiplying by a design effect of 2 and adding a 15% non-response rate, the final sample size was calculated to be 840 students.

2.3. Sampling Techniques

All elementary schools were stratified based on distance from the irrigation site, as "Near" or "Far". Then two schools were selected by simple random sampling method from each stratum. Proportional allocation of the sample size was done according to the number of students in each stratum and grade level. Students were selected by simple random sampling techniques using list of students as a sampling frame. A pre tested structured questionnaire was used to collect data on socio demographic, water contact habit and toilet utilization. Stool and urine examination were done to determine prevalence. The analysis was carried out using SPSS version 16.0.

Specimens (stool and urine) were collected by data collectors on-the-spot into separate dry, clean and labeled cup and the stool was preserved in 10% formalin. The 828 stool samples were transported by the data collectors to the laboratory at "National Hospital" found in Amibera district and processed using formal ether concentration technique for microscopic examination. In order to ensure quality of the data; proper training was given for data collectors, pre-testing was done on 5% of the sample size and smears were examined independently by two experienced laboratory technologist and finally checked by the supervisor.

2.4. Ethical Considerations

The research topic and methodology were approved by the ethical committee of Bahir Dar University and GAMBY College of Medical Sciences. Ethical clearance was obtained from the Ethical Committee of GAMBY College of medical sciences and Bahir Dar University. Permission to conduct the study was also obtained from school directors. During data collection, the purpose of the study was clearly explained to students and informed oral consent was obtained and for those positives treatment was given

2.5. Limitations

Data like water contract habit, source of water for drinking and toilet utilization were based on responses of students to the structured questionnaire. It would be more informative if it was done at the household level to identify the actual household practices.

3. RESULTS AND DISCUSSIONS

3.1. Socio-Demographic Characteristic of Study Subjects

A total of 828 of school children were participated in this study making the response rate of 98.3%. From this, 518 (62.6%) were male, 581 (70.2%) in the age group

between 10 to 14 and 357 (43.1%) were Muslims (**Table 1**).

3.2. Water Contact Habit and Toilet Utilization

In this study water contact habit and toilet utilization was assessed and the result shows that 294 (35.5%) of students have a habit for swimming, 311(37.6%) have a habit for washing clothes in the drainage, 243 (29.3%) have a habit for cutting grass near by the drainage, 296 (35.7%) have a habit of water contact during crossing and about 514 (62.1%) students reported that they use latrine facilities for urination and defecation (**Table 2**).

3.3. Prevalence of Schistosomiasis among Students

Laboratory analysis was done for 828 stool and urine samples. The result shows that 68 (8.2%) students were found to be infected by schistosomiasis. From the total positives, 61 (7.4%) and 7 (0.8%) of the students were infected by *S. haematobium* and *S. mansoni* respectively. Distribution of the parasite for both sexes showed that; *S. haematobium* was observed in 27 out of 310 females and 34 out of 518 males. The prevalence of *S. mansoni* was 5 (0.6%) and 2 (0.2 %) for males and females respectively. Of the total 828 students with *S. haematobium* infection, 5 (9.0%) students were in the age group 15 - 19 years, 49 (8.43%) in 10 - 14 years and 3.4% in 20 - 24 years. Moreover 9.7% and 4.5% of *S. haematobium* was observed among students attending within 1 - 4 and 5 - 8 grade

Table 1. Socio-demographic characteristics of students, Amibera district, Ethiopia March 2012 (n = 828).

Socio-demographic characteristics		N	%
Sex	Male	518	62.6
	Female	310	37.4
Age group in years	5 - 9	163	19.7
	10 - 14	581	70.2
	15 - 19	55	6.6
	20 - 24	29	3.5
Religion	Muslim	357	43.1
	Orthodox	224	27.1
	Protestant	175	21.1
	Catholic	65	7.9
	Others	7	0.8
Educational status	Grade 1 - 4	376	45.4
	Grade 5 - 8	452	54.6

Table 2. Water contact habit and toilet utilization among students attending at elementary schools in Amibera Woreda, Ethiopia March 2012.

Water contact habit and toilet utilization		N	%
Swimming habit	Yes	294	35.5
	No	534	64.5
	Total	828	100
Cutting grass	Yes	243	29.3
	No	585	70.7
	Total	828	100
Drainage contact While crossing	No	532	64.3
	Yes	296	35.7
	Total	828	100
Washing cloths in the drainage	Yes	311	37.6
	No	517	62.4
	Total	828	100
Source water for domestic use	Tap/protected well	707	85.4
	Drainage	121	14.6
	Total	828	100
Toilet utilization	Yes	514	62.1
	No	314	37.9
	Total	828	100

level respectively. The distribution of *S. haematobium* was also explored with regard to water contact habit and toilet utilization in detail. The result showed that 46 (75.4%) of infected students had a habit of swimming, 25 (40.9%) had a habit of washing their clothes in the drainage, 25 (40.9%) uses drainage as domestic water source, 61 (100%) had a habit of cutting grass in the nearby water sources, 29.5% crossing the drainage and 54.9% had a habit of open filled defecation (**Table 3**).

3.4. Factors Associated with the Occurrence of *S. haematobium*

Results from Bivariate Analysis

Bivariate analysis was carried out to examine factors associated with *S. haematobium* and p-value less than or equal to 0.2 was considered as cut off point for considering variables for entry in to multiple logistic regression. Accordingly, among the socio demographic factors Age (p-value = 0.187) and education level of students (p-value = 0.005) showed significant association with *S. haematobium*. However sex and religion were not significantly associated with occurrence of *S. haematobium* (**Table 4**).

Among water contact habit, swimming (p-value =

Table 3. Prevalence of *Schistosoma haematobium* with water contact habit and toilet utilization among students in Amibera District, Ethiopia March 2012.

Variables	Number of infected students with <i>S. haematobium</i>	Percent
Swimming habit		
Yes (294)	46	75.4
No (534)	15	24.6
Total (828)	61	100
Washing clothes		
Yes (311)	25	40.9
No (517)	36	59.1
Total (828)	61	100
Water source for domestic use		
Pipe/protected well (707)	36	59.0
Drainage (121)	25	61.0
Total (828)	61	100
Cutting grass		
Yes (243)	61	100
No (585)	0	0
Total (828)	61	100
Water contact during crossing the drainage		
Yes (296)	18	29.5
No (532)	43	30.5
Total (828)	61	100
Toilet utilization		
Yes (514)	28	45.9
No (318)	33	54.1
Total (828)	61	100

0.0001), source of water for house domestic purpose (p-value = 0.0001) and toilet utilization (p-value = 0.008) showed significant association with *S. haematobium*. Cutting grass, drainage water contact during crossing and washing clothes were not significantly associated with occurrence of *S. haematobium* (Table 5).

3.5. Results from Multivariate Analysis

By considering the independent variables that become significant on the bivariate analysis; multiple binary logistic regression analysis was carried out to assess the adjusted or net effect of the independent variables. Students from grade level 1 to 4 were 1.997 times (95% CI: 1.098, 3.633) more likely to be infected than those from grade level 5 to 8. Those students who had a habit for swimming were 4.74 times (95% CI: 2.524, 8.920) at a higher risk to be infected with *S. haematobium*. School children from households using pipe/protected water were

0.345 times (95% CI: 0.191, 0.625) less likely to be infected than those children from household using the drainage as a domestic water source. Age and toilet utilization were not significantly associated with *S. haematobium* in multivariate analysis (Table 6).

4. DISCUSSIONS

This study was aimed at assessing prevalence of schistosomiasis and associated factors among students in elementary schools around “Middle Awash Irrigation Project”. The overall prevalence of schistosomiasis was found to be 8.2%, the prevalence of *S. haematobium* and *S. mansoni* being 7.4% and 0.8% respectively. This study showed a lower prevalence rate of *S. mansoni* compared to the research findings reported in other areas of Ethiopia, 85 % in Zarim, 67% Gorgora [8], 67.6% in Finchaa valley [10] and 20.6% among schooled children in Gorgora [11]. This difference may be due to difference in water contact habit, toilet utilization and the low prevalence of vectors. The study area was known for its being low land and hot, however the snail responsible for the transmission of *S. mansoni* infection (*Biomphalaria pfeifferi*) is more prevalent in areas 2000 m above sea level and the optimal temperature for its development and survival is around 25°C. Above 30°C snail mortality increases, as a result this may contribute for the low prevalence of the disease [13].

In the present study, schistosomiasis did not show a significant variation with sex, which was consistent with a research finding reported from Nigeria [14], however it was inconsistent with a research finding reported by others [11]. This may be due to the difference in the division of labor in different regions of the country. In some places mostly males were more involved in field work activities than females and in others, females are involved more in field work activities. In the place where this study was conducted males and females might have similar exposure for water contact and other field work activities. Age, education level, swimming habit and domestic water source of the household were significantly associated with risk of *S. haematobium* among school children.

5. CONCLUSIONS

In conclusion, the present study showed that Schistosomiasis was spreading as a result of the irrigation project run in the area. *S. haematobium* infection was found to be significantly associated with educational level of the students, swimming habit and source of water for domestic purpose. Therefore, the prevalence of Schistosoma in this area was not what to be neglected. Provision of safe water supply and since the most affected group were low level class students, provision of health education on schistosomiasis transmission and its method of prevention is

Table 4. Distribution of *S. haematobium* infection with socio-demographic variables, among students attending at elementary schools in Amibera District, Ethiopia March 2012.

Variables	<i>S. haematobium</i>		Crude OR (95.0% C.I.)	p-value
	Positive	Negative		
Sex				
Male	34	484	0.736 (0.435, 1.246)	0.254
Female	27	283	1.00	
Age in years				
5 - 9	6	157	1.00	0.187
10 - 14	49	532	2.41 (1.014, 5.731)	0.047
15 - 19	5	50	2.61 (0.766, 8.941)	0.125
20 - 24	1	28	0.93 (0.108, 8.062)	0.951
Religion				
Orthodox	10	214	1.00	0.320
Muslim	24	333	1.542 (0.723, 3.289)	0.262
Protestant	17	158	2.303 (1.027, 5.164)	0.043
Catholic	3	62	1.035 (0.276, 3.879)	0.959
Others	7	0	3.45 (0.00)	0.999
Educational level				
1 - 4	44	408	2.27 (1.278, 4.057)	0.005
5 - 8	17	359	1.00	

Table 5. Association of *S. haematobium* with water contact habit and toilet utilization among students attending at elementary schools in Amibera District, Ethiopia March 2012.

Associated factors	<i>S. haematobium</i>		Crude OR (95.0% C.I.)	p-value	
	Positive	Negative			
Swimming habit	Yes	46	248	6.41 (3.515, 11.718)	0.0001
	No	15	519	1.00	
Water source	Tap	36	671	0.206 (0.118, 0.358)	0.0001
	Drainage	25	96	1.00	
Washing clothes	Yes	25	286	1.16 (0.87, 1.986)	0.567
	No	36	481	1.00	
Water contact during crossing	Yes	18	278	0.736 (0.417, 1.301)	0.292
	No	43	489	1.00	
Toilet utilization	Yes	28	486	0.491 (0.290, 0.829)	0.008
	No	33	281	1.00	

Table 6. Multivariate analysis of factors associated with *S. haematobium* among students attending at elementary schools in Amibera District, Ethiopia March 2012.

Associated factors	<i>S. haematobium</i>		Crude OR (95.0% C.I.)	Adjusted OR (95.0% C.I.)
	(+)	(-)		
Education level				
1 - 4	44	408	2.27 (1.278, 4.057)	1.997 (1.098, 3.633)
5 - 8	17	359	1.00	1.00
Swimming habit				
Yes	46	248	6.41 (3.515, 11.718)	4.745 (2.524, 8.920)
No	15	519	1.00	1.00
Water source				
Tap	36	671	0.206 (0.118, 0.358)	0.345 (0.191, 0.625)
Drainage	25	96	1.00	1.00

highly recommended at school level.

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LIST OF ABBREVIATIONS

AOR: Adjusted Odds Ratio

CI: Confidence Interval

OR: Odds Ratio

Km: Kilometers

SPSS: Statistical Package for Social Sciences