The Ethiopian Journal of Health Development

Original article

Schistosomiasis mansoni in school attenders and non-attenders in Northwest Ethiopia

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Abstact

Background: Information on epidemiology of schistosomiasis in school age children and particularly non school attenders are scanty in northwestern Ethiopia.

Objective: To assess the prevalence of *Schistosoma mansoni* in school attenders and non-attenders in Northwest Ethiopia.

Methods: A parasitological survey was carried out from June 1995 - July 1997 in selected communities and schools.

Results: Of the 199 community based school attenders in Zarima, 198 in Gorgora and 200 in Dek, 85%, 67% respectively were positive for *S. mansoni*. Of the non-attenders in Zarima, 60(50%) in Gorgora and 90(44%) in Dek were positive for *S. mansoni*. Among school attenders the intensity of infection (mean egg count) was fond to be 177 eggs per gram (epg), 139 epg, and 135 epg in Zarima, Gorgora and Dek respectively. Among non - attenders the intensity of infection was 166 epg, 100 epg, and 121 epg in Zarima, Gorgora, and Dek respectively. The study demonstrates that the infection rates and the intensities of infection of *S. mansoni* were higher in school attenders than in non-attenders. The difference in prevalence was statistically significant ($P<0.01$). The difference in intensity of infection was statistically significant only in Gorgora ($P<0.05$).

Conclusion: Focussing treatment intervention measures on school attenders would be an appropriate approach in Northwest Ethiopia. [*Ethiop. J. Health Dev.* 2001;15(2):117-123]

Introduction

Schistosomiasis has a focal distribution in Ethiopia (1). Temprature appears to be the major factor that affects the distribution of both human species in Ethiopia; S.mansoni and S. Haematobium. Schistosomiasis is mainly found at altitudes ranging mainly from about 1000 to 2200m and the disease is particularly prevalent in the northern and northwestern administrative regions of the country (1,2). The little information available on the morbidity of schistosomiasis (3,4) indicates that hepatic involvement and periportal fibrosis are not common in Ethiopian patients. In spite of the very limited reports on the morbidity, the disease is gradually becoming a public health problem especially in communities around irrigation farms (2,5,6).

In view of the meagre budget available for health and other major health problems of the country, the organization of an appropriate and cost-effective control program of schisto-somiasis may not be a priority. However, when the funds available are insufficient to justify a systematic control program,

alternative approaches such as organizing treatment targeted at school children would be easy and cheap, although missing the non-attenders may create a bias. Moreover, there is no information, on the infection rates and intensities of *S. mansoni* infection in non-attenders in Ethiopia. The purpose of this study was to report the comparison of infection rates and intensities of infection of *S. mansoni* in school attenders and non-attenders in the three communities of north west Ethiopia. The information generated by this study would also help to launch intervention program in the schools of the study areas.

Methods

This is a cross sectional study of the prevalence and intensity of S.manosni in school attending and non attending youth in north west Ethiopia. The study was carried out from June 1995 to July 1997 in three communities: Zarima, Gorgora and Dek (Fig 1). Zarima is a roadside town with a population of about 2700. It is located in a hot valley of the highlands at an altitude of 1260m, 140 Km north of Gondar town on the road to Asmara. There are two schools, one elementary and the other, a junior high school. Gorgora is a small roadside town on the seashore of Lake Tana (altitude 1800m), 65 km south of Gondar town. It has a population of about 2500. There are two schools, one elementary and the other secondary. Dek is the largest among the islands in Lake Tana (altitude 1800m) and about 120 Km south of Gondar town. It has a population of about 6000 and two elementary schools.

A complete census of each of these three communities was done. Children between 6 and 15 years of age were classified as "school attenders" or "non-attenders". Two different procedures (community based and school based) were followed to select children for the study. For the community based survey, 50 younger (6-10 years) and 50 older (11-15 years) boys and girls among school attenders and non-attenders were randomly selected. For the school based parasitological survey, about 600 school children were selected by cluster sampling. From each grade of a school, a section/ sections was / were randomly selected in each of the three communities. The student population in the schools of each community ranged from 800-1200.

School attendance

Figures for school attendance were based on the number of students enrolled at school according to the school administration and census of the study population. During the census the non-attenders were interviewed on the reason for not going to school. The findings of the interviews were checked during a number of group discussions with peer group of teachers, school administrators, health workers, community leaders and priests. Numbers for non-attenders were obtained by comparing the number of students enrolled at school with the total population of children between 6 and 15 years of age. Numbers on absenteeism and rates of dropping out from the schools were based on the schools records.

Parasitological methods

Stool specimens were collected in piece of plastic sheets distributed to each of the selected subjects. Within a matter of hours the specimens were processed for microscopic examination using Kato technique (7). A double slide was examined for each faecal specimen and egg counts were made. The average number of eggs of the two slides was used to calculate the geometric means of the counts.

Ethical Considerations

The objectives of the study were discussed with school directors and teachers and community leaders. Consent was obtained from school directors, parents and children selected for the study after explaining the purpose and the procedures of the study. Subjects who were found to harbour the parasite were treated with appropriate for the weight doses of praziquantel. Education and advice was given on how to protect oneself from being infected with S.mansoni for all study subjects. School directors and community leaders were informed about the results of the study and the means to prevent transmission of the parasite.

Data analysis

Chi-square test was used to compare proportions and the unpaired Student's t-test to compare mean egg counts. A logistic regression model was used to assess the effect of school attendance on the prevalence

of *S. mansoni* after adjustment for potential confounding by gender, age group or community. From this the odds ratio and 95% confidence interval (95% CI) was determined. A linear regression model, including only the *S. mansoni* positive individuals, was used to evaluate the effect of school attendance on the intensity of infection.

Discussion

Results

The proportion of children that attended school were high in Zarima and Gorgora (65.3% and 80.1% respectively) and much lower in Dek (36.3 %).

Table 1 summarises the reasons for not attending school. Financial problems were the foremost reasons mentioned (75.5%), followed by sickness (13.9%). Fifty three respondents There were no significant differences in rates of dropping out and absenteeism between girls and boys or between the younger and the older age groups. There was also no difference in absenteeism between children with S. mansoni infection and those with negative results. The percentage of dropouts was highest in Dek (26%) followed by Zarima (15%) and Gorgora (8%). However, average number of days of absence per student per year was highest for Gorgora (7.9 days). For Zarima and Dek it was 0.6 days each.

Table 2 shows schistosome infections determined in the two types of survey: in the community based survey among school attenders and non-attenders and in the school based survey. Of the 199 community based school attenders in Zarima, 198 in Gorgora and 200 in Dek, 85%, 67% and 69% respectively were positive for *S. mansoni*. Of the non-attenders, 119 (61%) in Zarima, 60(50%) in Gorgora and 90(44%) in Dek were positive for *S. mansoni.* The differences between school attenders and non-attenders were statistically significant($P<0.01$). Among school attenders the intensity of infection (mean egg count) was found to be 177 eggs per gram (epg), 139 epg, and 135 epg in Zarima, Gorgora and Dek respectively. Among non - attenders the intensity of infection was 166 epg, 109 epg, and 121 epg in Zarima, Gorgora, and Dek respectively.The difference in prevalence was statistically significant ($P<0.01$). The difference in intensity of infection was statistically significant only in Gorgora ($P<0.05$). The prevalence and intensity of infection in the community based school attenders appeared to

The prevalence of schistosome infection in attenders and non-attenders by gender and age, and in each of the three communities studied, were summarised in table 3. The table demonstrates that the difference in prevalence

holds true for boys and for girls, and for younger children and as well as for the older ones. This was the same in each of the three communities. Boys were significantly more infected than girls particularly in non-attenders ($p<0.05$) . In Gorgora and Dek the younger children were less infected than the older ones ($p<0.05$); such age-relation was not seen in Zarima.

Table 4 shows the association of school attendance with prevalence of *S. mansoni* adjusted for age and sex. The odds ratios and the lower confidence limits were generally greater than 1, indicating significant differences between school attenders and non-attenders. The difference between attenders and non-attenders was more pronounced in girls than in boys and it was greater in younger school children than in the older ages.

A linear regression model, with egg counts as the dependent variable and gender, community and school-attendance as the independent variables, showed also intensity of infection to be higher among school-attenders (Table 5).be the reflections of those parameters in the school-based study. Age and sex distribution showed no statistically significant differences between community and school based surveys, while the non-school attenders were signi-ficantly younger ($P=0.001$).

This study is the first of its kind in assessing the prevalence and intensity of *Schistosoma mansoni* infection in out of school children and comparing it with school attenders. Studies conducted among school children in different parts of the country reported *S. mansoni* infection rates ranging from 30% to 70% (8,9,10,11,12,13). The prevalence in school attenders in our study appears to be higher than most studies. This is in conformity with findings of previous studies that *S. mansoni* prevalence is highest in north and northwest parts of the country (2).

In contrast to the findings of Husein *et al* (14) in Egypt, the results of our study indicate that both the infection rates and the intensities of infection were higher in school-attenders than in non-attenders. This was true for each of the three communities studied. The difference was significant in monovariate analysis in boys and girls, in different age groups, and in different communities. In multivariate analysis, comparing the infection rates in school attenders and non-attenders, the difference was confirmed, and in regression analysis, comparing the intensities of infection, school attenders were also shown to be more heavily infected than non-attenders.

This difference in infection rate between school-attenders and non-attenders is difficult to explain. A possible explanation may be, that the school-attenders by virtue of their knowledge of hygiene, wash themselves more frequently than the non-attenders and thus, are more at risk of infection with *S. mansoni*. However, by the same token one would expect the school attenders to avoid exposure to infested water sources. Whether this part of the knowledge has been neglected or the absence of safe water sources is a major constraint or there are other explanations has to be explored further. Polderman (15) recorded unexpectedly increased prevalence of *S. mansoni* infection in school children of Chuahit town, 15 Km north of Gorgora. The high prevalence was attributed to the location of Chuahit school in the outskirts of the town, close to one of the infested streams. This explanation was not consistent with the present study, because all the three schools and the communities as a whole, were located at fairly short distances from the snail infested streams or shores. In a study carried out in Gojam administrative region (16) a high prevalence of *S. mansoni* in school children has also been noted but careful analysis of the distance travelled for collecting water and schistosome infection failed to explain the association.

Discussion with community members revealed that children from poor parents had no money to buy clothing, writing materials and even their daily food. Those from sick parents or who them selves were sick, were not able to attend school. Other children were needed at home to look after the cattle and to participate in household activities. Infection with S.mansoni or other parasitic diseases was not considered as an important cause of non- attendance, which is in agreement with the findings of our survey.

This study in Northwest Ethiopia indicates that a school intervention programme for schistosomiasis would target at the age group with the highest infection rates (7-15) and simultaneously at the group most exposed, the school children. Since attendance rates are high in present day Ethiopia and schools are well administered, intervention programmes could be managed. However, our results stress the need not only to increase awareness of hygiene at school, but at the same time to improve the quality of the water sources the students are going to be exposed to.

Acknowledgments

This research was financially supported by the Special Programme for Research and Training in Tropical Diseases (TDR) of the UNDP/World Bank/WHO. Apart from the collaboration of many technicians and villages whose help is gratefully acknowledged, the help of Mr Bitew Bayew and Mr Baye Gelaw, who did much of the microscopy, needs special mention. We also want to acknowledge the continuous support, interest and help of Dr David Evans at TDR.

Tables

Table 1: Reasons for school nonatendance in children agd 5-15 in Zarima, Gorgora and Dek, noth west Ethiopia, 1995-96

	n*	Financial reasons	Sickness	Needed at home
Zarima	189	69%	16%	15%
Gorgora	110	82%	10%	8%
Dek	199	78%	14%	8%
Total	498	75.5%	13.9%	10.7%

n* stands for the number of non-attenders interviewed. (10.7 %) answered that they were needed to carry out certain work activities at home.

Table 2: Comparison of the infection rates and intensities of infection of *S. mansomi* in the three types of survey among school age children in Zarima, Gorgora and Dek, north west Ethiopia, 1995-96

	Community based survey:								
	School attenders			non-attenders					
	n	%pos	Epg	n	%pos	Epg	n	School based survey	
		%pos	Epg						
Zarima	199	85	177	195	61	166	586	76	166
Gorgora	198	67	139	119	50	109	652	65	136
Dek	200	69	135	204	44	121	620	63	130

Table 3: Prevalence of *S. mansoni* infection in school-attenders and non-attenders by age and sex Zarima, Gorgora and Dek, north west Ethiopia, 1995-96

Boys					Girls					
		School-attenders		Non-attenders		School-attenders		Non-attenders		
		n	% pos	n	% pos	n	% pos	n	% pos	n
Zarima	Age 6-10	49	88	58	53	50	88	50	58	
	11-15	50	82	43	77	50	84	44	57	
	All	99	85	101	63	100	86	94	57	
Gorgora	6-10	50	64	39	44	50	60	32	41	
	11-15	48	67	29	69	50	76	19	53	
	All	98	65	68	54	100	68	51	45	
Dek	6-10	51	65	50	42	50	60	50	14	
	11-15	49	80	50	66	50	72	44	55	
	All	100	72	101	54	100	66	94	35	

Table 4: Odds ratios (with 95% confidence intervals) with school attendance as the independent variable and the prevalence of *S. mansoni* eggs as the outcome variable in Zarima, gorgora and Dek, north west Ethiopia, 1995-96

	Odds ratio (95% CI)		
Unadjusted	2.61 (2.03 - 3.36)		
Adjusted for age and sex	Zarima	3.42 (2.02 - 5.78)	
	Gorgora	1.62 (0.98 - 2.67)	
	Dek	2.54 (1.62 - 3.97)	
Adjusted for study community and age	Male	1.74 (1.18 - 2.57)	
	Female	3.06 (2.97 - 4.51)	
Adjusted for study community and sex	6 - 7 years	3.21 (1.63 - 6.31)	
	8 - 10 years	3.00 (1.85 - 4.88)	
	11 - 13 years	1.90 (1.14 - 3.15)	
	14 - 15 years	1.92 (1.02 -3.61)	
Adjusted for study community, age and sex		2.32 (1.77 - 3.05)	

Table 5: Linear regression results of a model with *S. mansoni* egg counts (log 10) as the dependent variable and sex, community and school attendance as the independent variables

Independent variable	**Coeff**		
Constant	2.11	0.02	<0.001
Sex (male=, female-1)	-0.08	0.02	1.001
Community (Lake-side=0, Zarima =1)	0.13	0.02	<0.001
School-attendance (no = 0, yes = 1)	0.06	0.02	0.016

N.B.: In the "Lake-side" communities, the results of Gorgora and Dek are combined

Figures

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