Prevalence and Distribution of Schistosomiasis in Afder and Gode Zone of Somali Region, Ethiopia

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ABSTRACT

Background: There is no recent information about the prevalence and distribution of schistosomiasis in the Somali national regional state of Ethiopia. Ethiopia launched the national integrated neglected tropical diseases (NTDs) Master Plan in June 2013. The Master Plan identified mapping NTDs as a prerequisite for launching control programs. Therefore it is important to understand the prevalence and distribution of schistosomiasis in respective regions. Materials and Methods: From February to March 2011, a cross-sectional survey was done in school-aged children from six districts of Afder Gode zone. Urine samples were collected and examined for ova of Schistosoma haematobium using the sedimentation technique and stool samples were collected and examined for S. mansoni using the Kato-Katz technique. A semistructured questionnaire was used to collect sociodemographic characteristics of the participants. Results: Of the 523 children, 513 (98%) of them participated in the study. The prevalence of S. haematobium was 16.0% (95% confidence interval (CI); 12.8-19.2). The rate of the disease was not uniform across the various six communities studied (χ² = 208.8, P < 0.0001). Musthail district had the highest prevalence with 64.2% (95% CI; 60.0-68.3) followed by Kelafo with 11.8% (95% CI; 9.0-14.6). No infections of S. mansoni were found in these settings. There was no difference in the prevalence of infection across age groups. Boys were more likely to be infected by S. haematobium than girls (odds ratio = 1.68; 95% CI: 1.1-2.7). Conclusion: S. haematobium infection is prevalent in the region with varying distribution across the districts. According to the World Health Organization, mass drug administration should be considered in some of the districts.

Key words: Schistosomiasis, S. haematobium, S. mansoni

INTRODUCTION

Schistosomiasis is a parasitic disease caused by blood flukes (trematodes) of the genus Schistosoma. An estimated 700 million people are at risk for infection, particularly agricultural work and domestic chores, in 76 endemic countries, and transmission is interrupted in some countries. More than 207 million people are infected with schistosomiasis worldwide and approximately; 85% live in Africa. After malaria and intestinal helminthiasis, schistosomiasis is the third most devastating tropical disease in the world.

Today, 120 million people are symptomatic with schistosomiasis and 20 million having severe clinical disease. More than 200,000 deaths per year are due to schistosomiasis in sub-Saharan Africa. Hygiene and playing in mud or water make children vulnerable to infection. Forty million women of childbearing age are infected. In endemic areas, the infection is usually acquired as a child. In particular, the risk of infection is highest among those who live near lakes or rivers.

Although Ethiopia is one of the countries with high burden of schistosomiasis, there is no control program

Access this article online

Quick Response Code:
Website: www.jgid.org
DOI: 10.4103/0974-777X.122007

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in the country. In addition, there is no up-to-date map of schistosomiasis in the country. The lack of information on the prevalence and distribution of schistosomiasis in Somali region is marked in comparison to other parts of the country. Therefore, the aim of this study was to describe the distribution and determinants of schistosomiasis in Afder and Gode zone of Somali region, Ethiopia.

MATERIALS AND METHODS

Study area and study population

Somali region is located in the eastern part of Ethiopia 635 km far from Addis Ababa. The region is divided to 52 districts and nine zones with a total population of 4,439,147.[6] Recently, all seven Wabi shebele river basin districts report cases of schistosomiasis. As a result a community-based cross-sectional study conducted from February 1 to March 28, 2011 in six (Hargele and Cheriti from Afder zone and Kelafo, Mustahil, Gode, and Adadile from Gode zone) of 15 districts of Afder and Gode zones. Due to security reason during the time of the survey, we excluded one of the river basin districts. Forty-two health centers and 55 health posts provide health services in these six districts.

Sample size calculation and data collection procedures

One school from each site was randomly identified; 523 school-aged children (5-15 years) were selected using a simple random sampling technique after obtaining the lists of students from school registration books. The sample size was estimated using a single proportion sample size formula by considering the following parameters: S. haematobium prevalence of 68%,[7] 95% confidence level, and 4% margin of error.

All urine and stool samples were collected between 10 and 14 h in the field, by a trained laboratory technician. From each subject, 10 mL of urine was collected in a properly labeled, clean, and sterile specimen container. Sedimentation techniques were employed to analyze the samples. A total of 10 mL urine was taken from the deposit of each specimen bottle after allowing it to sediment for about an hour. The deposit was examined microscopically using ×10 magnifications for schistosome egg characteristics.[8] Children were given labelled stool containers with tight covers bearing the serial numbers of the subjects and were asked to give approximately 5 g of stool. Stool samples were processed using the Kato-Katz smear technique.[8] These slides were examined under the microscope at ×10 magnifications. As a quality control measure, we sent all positive samples and 10% of negative samples to the Somali Regional Laboratory core process team, and all the samples reexamined for the presence of schistosomiasis by the regional expert.

Data analysis

Data were entered into SPSS version 17.0 statistical software. A univariate analysis was done to describe prevalence of S. haematobium and S. mansoni. A multivariate analysis was done to determine the presence of a statistically significant association between explanatory variables and the outcome variables (presence of schistosomiasis). Explanatory variables were considered associated with the outcome variable in the bivariate analysis at (P < 0.05). Odds ratios (ORs) and their 95% confidence intervals (CI) were calculated.

Ethical consideration

Ethical clearance was obtained from Somali Regional Health Bureau. Individual caregivers were asked to consent verbally for their school-aged children to participate in the study. Only those who provided consent were registered and requested to provide samples. To document verbal consent, the name of each individual who provided verbal consent was recorded, and their sample test results were subsequently recorded with these names. Individuals who tested positive for schistosomiasis infection were treated with praziquantel, according to World Health Organization guidelines. Parents/guardians provided consent on behalf of all participants.

RESULTS

Out of 513 samples examined, 82 (16.0%) were positive for S. haematobium (95% CI; 12.8-19.2). The prevalence rates of the disease were not uniform across the various six communities studied (χ² = 208.8, P < 0.0001). Mustahil district had the highest prevalence of 61 cases (64.2%, 95% CI; 60.0-68.3), followed by Kelafo 9 cases (11.8%, 95% CI; 9.0-14.6), Cheriti 7 cases (8.7%, 95% CI; 6.3-11.1) and Hargele 5 cases (6%, 95% CI; 3.9-8.0), while Gode and Adadile had no infected persons [Table 1].

Boys had high rate of prevalence with 40 cases (20.4%) than girls with 42 cases (13.2%) (P < 0.033) as shown in Table 1. Across age groups, the highest prevalence was recorded in the 14-16 year age cohort (19.7%), followed by the 8-10 and 5-7 age cohorts (18% and 16.1%, respectively), but there was no significant differences (P > 0.05) between these age groups. No infections of S. mansoni were found in the
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Prior to this study, information was obtained from the Somali Regional Health Bureau that schistosomiasis was observed in the area. However, recent published data were not available. Our study showed a prevalence rate of 16% of urinary schistosomiasis among the school-aged children in the defined area. The result is lower than the study done in two communities of southern Darfur which showed a prevalence of 56%. In 2002, a survey conducted in Gode zone (Kelafo and Mustahil districts) in Ethiopia reported a prevalence of 68%. Almost a decade before, a different study found a prevalence of 63.0% was recorded in the same districts. Currently in Ethiopia, there is no national schistosomiasis control program and the distribution of schistosomiasis is not yet mapped. Therefore, the findings of this study can guide interventions in these districts and contribute information for the national mapping initiative.

The prevalence rates of the disease were not uniform across the various six communities studied (χ² = 208.8, P < 0.0001), and this might be due to previous mass drug administration (3 years earlier) by Medecins Sans Frontieres in Cherti and Hargele districts.

There was no significant difference in age group in S. haematobium infection observed in our study (P > 0.05). The prevalence showed an increasing trend with increasing age and it peaked around 11-13 years and then started to decline. In older adults, no significant change is found in the prevalence of disease, but the parasite burden or the intensity decreases.

In our study, males had higher risk of S. haematobium infection compared with female (OR = 1.68, 95% C.I; 1.1-2.7). In contrast, a study in Ghana showed no statistical significant association between infection with S. haematobium and sex (P > 0.05). However, our findings were in agreement with a study done in Malawi. The difference in risk of infection with gender in our study could be attributed to pastoralist duties of males in Somali society, which leads to high frequency of water contact. There was no previous health facility report on S. mansoni infection and our study did not find a single case of S. mansoni.

The study has a number of limitations and its findings should be interpreted in the light of these limitations. First of all, we have not collected data on the environment and lifestyle characteristics of the participants which could act as cofounder and affect interpretation. Second, we did not measure the intensity of the infections.

### DISCUSSION

Prior to this study, information was obtained from the Somali Regional Health Bureau that schistosomiasis was observed in the area. However, recent published data were not available. Our study showed a prevalence rate of 16% of urinary schistosomiasis among the school-aged children in the defined area. The result is lower than the study done in two communities of southern Darfur which showed a prevalence of 56%. In 2002, a survey conducted in Gode zone (Kelafo and Mustahil districts) in Ethiopia reported a prevalence of 68%. Almost a decade before, a different study found a prevalence of 63.0% was recorded in the same districts. Currently in Ethiopia, there is no national schistosomiasis control program and the distribution of schistosomiasis is not yet mapped. Therefore, the findings of this study can guide interventions in these districts and contribute information for the national mapping initiative.

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### CONCLUSION

The findings of this study suggest that S. haematobium is endemic in the districts of Gode and Afder zones and that there is a high prevalence of infection among males as compared with females. The most important effects of schistosomiasis are the late complications that arise from chronic infection. Mustahil district is a high-risk community; therefore, treatment should be given once a year to all school-aged children (enrolled and not

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**Table 1: Distribution of Schistosoma haematobium by age, sex, and communities in Afder and Gode zone, Somali regional state**

| Variables       | Urine micro finding | P value | Odds ratio |
|-----------------|---------------------|---------|------------|
|                 | Positive | Negative |           |            |
| Age             |          |          |           |            |
| 5-7             | 16 (16.1%) | 83 (83.9%) | 0.78 |          |
| 8-10            | 36 (18%)  | 165 (82%) |          |            |
| 11-13           | 27 (12.4%) | 232 (88.6%) |          |            |
| 14-16           | 23 (13.7%) | 53 (80.3%) |          |            |
| Sex             |          |          | 0.033     | 1.00       |
| Female          | 42 (13.2%) | 275 (86.8%) |          |            |
| Male            | 40 (20.4%) | 156 (79.6%) | 1.68 (1.1-2.7) |          |
| Communities     |          |          | 0.0001    |            |
| Gode            | 0 (0.0%)  | 95 (100%) |          |            |
| Kelafo          | 9 (12.8%) | 77 (88.2%) |          |            |
| Mustahil        | 61 (64.2%) | 34 (35.8%) |          |            |
| Hargele         | 5 (6%)    | 77 (94%) |          |            |
| Cheriti         | 7 (8.7%) | 73 (91.3%) |          |            |
| Adadle          | 0 (0.0%)  | 85 (100%) |          |            |
| Total           | 82 (16.0%) | 431 (84.0%) |          |            |

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**Figure 1: Distribution of Schistosoma hematobium in six districts of Afder and Gode zones of Somali region, Ethiopia**
enrolled) and adults-at-risk (pregnant and lactating women; groups with occupations involving contact with infested water, such as fishermen, farmers, irrigation workers, or women in their domestic tasks), and to entire communities living in the area. Kelafo district is a moderate risk community; therefore, treatment should be given every 2 years to all school-aged children (enrolled and not enrolled) and adults at risk. Hargele and Cheriti districts are low-risk communities; therefore, treatment should be given twice during primary schooling age (e.g., once on entry and exit) to all school-aged children (enrolled and not enrolled) according to the World Health Organization guidelines on preventive chemotherapy on human helminthiasis.15

ACKNOWLEDGMENTS

We acknowledge the study participants and the community for the information provided.

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How to cite this article: Negussu N, Wali M, Ejigu M, Debebe F, Aden S, Abdi R, et al. Prevalence and distribution of schistosomiasis in Afder and Gode zone of Somali region, Ethiopia. J Global Infect Dis 2013;5:149-52.

Source of Support: The study was funded by World Health Organization Ethiopia Country Office. KD is supported by a Wellcome Trust Fellowship in Public Health and Tropical Medicine [099876]. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. Conflict of Interest: None declared.