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Epidemiology of intestinal schistosomiasis and soil transmitted helminthiasis among primary school children in Gorgora, Northwest Ethiopia

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PEER REVIEW

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Comments

The work is good, ringing the alarming bell for the school administrators, more personal hygiene sanitation work should be conducted among the school children in this area.

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ABSTRACT

Objective: To assess the prevalence and intensity of intestinal schistosomiasis and soil transmitted helminthiasis among primary school children in Gorgora, Northwest Ethiopia.

Methods: A cross-sectional epidemiological study was carried out in Gorgora primary school in Northwest Ethiopia from November to December 2010. Stool sample was collected from 326 children (170 male and 156 female) and examined by Kato-Katz technique for intestinal schistosomiasis and soil transmitted helminth infection. **Results:** A total of 120 children (56 males and 64 females) were positive for single or multiple parasitic infection. Four helminth parasite species were identified and the most prevalent was *Ascaris lumbricoides* (*A. lumbricoides*) (16.60%), followed by *Schistosoma mansoni* (*S. mansoni*) (10.10%), hookworm (5.50%) and *Trichuris trichiura* (*T. trichiura*) (4.60%). Furthermore, 1.84%, 2.76% and 2.45% of the study participants were co-infected with Hookworm & *A. lumbricoides*, *A. lumbricoides* & *S. mansoni* and *A. lumbricoides* & *T. trichiura*, respectively. **Conclusions:** The high prevalence of intestinal schistosomiasis and soil-transmitted helminthiasis observed in the study area shows the need of integrated control programme including periodic deworming, improving sanitation and access to clean water, appropriate health education and environmental measures to have a lasting impact on transmission.

KEY WORDS

Ethiopia, Intestinal schistosomiasis, Prevalence

1. Introduction

Intestinal schistosomiasis and soil transmitted helminthiasis are among the major public health problems in the world, especially in sub Saharan Africa^[1–3]. According to world health organization (WHO) report about 2 billion people are affected, and that 300 million are ill as a result of these infections, the majority being children^[2,3]. Despite the worldwide efforts at controlling intestinal schistosomiasis and soil transmitted helminthiasis, the number of infected persons is growing as well the number of deaths. Although there are several factors that increase mortality due to intestinal schistosomiasis and soil transmitted helminthiasis

in the world, lack of personal and environmental sanitation, limited access to clean water, overcrowding and low socio economic conditions are the major ones^[4].

In Ethiopia, intestinal schistosomiasis and soil transmitted helminthiasis are the major causes of mortality and morbidity^[5–9]. Poor personal, environmental sanitation, irrigation, overcrowding, resettlement, low altitudes are some of the factors suggested to be responsible for high prevalence of helminthiasis in Ethiopia^[10–12]. However, the status of helminthiasis was not illustrated in several localities particularly in the study area^[5–9].

Therefore, the scarcity of reports on the distribution and prevalence of intestinal schistosomiasis and soil transmitted

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helminthiasis in Ethiopia prompted investigation of the situation in Northwest Ethiopia. The research findings could provide baseline data on the distribution and prevalence of intestinal parasites and assist in proposing strategies to protect those groups that might be at risk of helminthiasis infection.

2. Materials and methods

2.1. Study area and population

A cross-sectional study was conducted among schoolchildren enrolled at Gorgora Elementary School, Northwest Ethiopia, from November to December 2010. The school is found in Gorgora, located south of Gondar on the north shore of Lake Tana, in the Amhara Region, it has a latitude and longitude of 12 ° 14'N 37 ° 18'E. In the area, Lake Tana serves as sources of water for bathing, washing, recreational and other purposes.

A total of 326 children (170 male and 156 female) were participated in the study. Children aged between 5 and 15 years, had no history of helminthiasis drug administration in the two weeks prior to screening, absence of any other serious chronic infection, had ability to give stool samples were included in the study.

2.2. Stool collection and examination

Stool specimens were collected using clean plastic sheet from all the study participants at Gorgora Elementary school. The stool samples were processed and examined using Kato-Katz method (template delivering 41.7 mg of stool) immediately at Gorgora hospital, which is located adjacent to the school as described by WHO[13]. Quantitative microscopic examination was done for ova of *A. lumbricoides*, *T. trichiura*, *S. mansoni* and hookworm within 5 d of collection at Gorgora health centre. Egg intensity was determined by multiplying egg count per slide by 24. Patients were classified as with light, moderate and heavy infection according to WHO criteria (for *S. mansoni*: light infection (1–99 epg), moderate (100–399 epg) and heavy (greater than 400 epg). Similarly, for *A. lumbricoides* : light infection (14999 epg), moderate (5000–49999 epg) and heavy (greater than 50 000 epg). Intensity of *T. trichiura* : light infection (1–999 epg), moderate (1000–9999 epg) and heavy (greater than 10 000 epg). For hookworm: light infection (1–1999 epg), moderate (2000–3999 epg) and heavy (greater than 4000 epg)[14].

2.3. Quality control

Before starting the actual work, quality of reagents and instruments was checked by experienced laboratory technicians. The specimens were also checked for serial number, quantity and procedures of collection.

2.4. Data analysis

The raw data was entered in to Microsoft excel data base system first and referenced with age, sex and types of parasite. *Chi*-square was used to determine association. Values were considered to be statistically significant when *P*-values were less than 0.05.

2.5. Ethical clearance

The study protocol was reviewed and approved by the Ethical Review Committee of University of Gondar. Written informed consent was obtained from mothers/caretakers of children after explaining the purpose and objective of the study.

3. Results

3.1. General characteristics of the study participants

A total of 326 individuals are participated in the study. Fifty six males and 64 females were positive for one or more parasitic infection. However, there was no significant difference in parasitic infection between males and females (*P*=0.46). Further analysis was also done to determine difference in prevalence of parasitic infection between different age groups. The analysis showed a significant difference in parasitic infection between different age groups (*P*<0.001) (Table 1).

Table 1
Characteristics of the study participants.

Categories	Total (%)	Infected (%)
Sex		
Male	170 (52.15)	56 (21.18)
Female	156 (47.85)	64 (25.64)
<i>P</i> value †	NA §	0.46
Age		
0–7	14 (4.4)	7 (2.15)
7–14	231 (70.9)	93 (28.53)
>14	81 (24.9)	20 (6.13)
<i>P</i> value †	NA §	<0.001 §

* Significant difference; † Chi square; NA § , not applicable.

3.2. Prevalence and intensity of parasitic infection

The overall prevalence of helminth infections was 36.80%. The prevalence of *A. lumbricoides*, *T. trichiura*, *S. mansoni* and hookworm in the study population is shown in Table 2. *A. lumbricoides* was the most prevalent parasite. *T. trichiura* made up only 4.6% of cases compared to 10.10% and 5.50% of the *S. mansoni* and hookworm cases, respectively (Table 2). Furthermore, 1.84% of the study participants were co-infected with hookworm & *A. lumbricoides*, and 1.84% of the study participants were co-infected with hookworm & *S. mansoni* (Table 3).

Table 2
Prevalence of intestinal schistosomiasis and soil transmitted helminthiasis.

Types of parasites	Positive (n=110)	Positive %
<i>A. lumbricoides</i>	54	16.6
<i>S. mansoni</i>	33	10.1
Hookworm	18	5.5
<i>T. trichiura</i>	15	4.6
<i>P</i> value †	<0.001	NA §

* Significant difference; † *Chi*-square; NA § , not applicable;

HW=Hookworm; AL= *Ascaris lumbricoides*; Sm= *Schistosoma mansoni*; T=*Trichuris trichiura*.

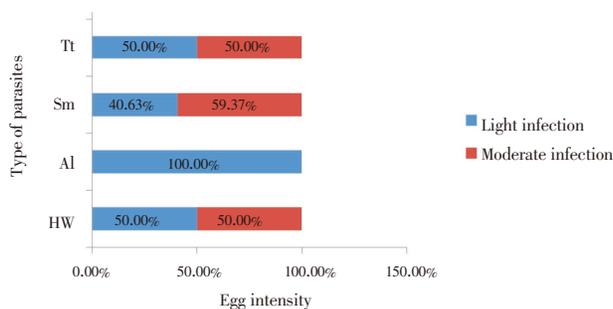
Table 3

Prevalence of multiple intestinal schistosomiasis and soil transmitted helminthiasis infection.

Types of parasites	Positive (n=110)	Percentage (%)
HW& Al	6	1.84
HW& Sm	3	0.92
Al & Tt	8	2.45
Al & Sm	9	2.76
Sm & Tt	5	2.45
P value†	0.45	NA §

* Significant difference; † *Chi*-square; NA §, not applicable.

Moreover, 40.63% and 59.37% of schistosomiasis positive individuals had light to moderate burden of schistosomiasis, whereas, all cases of *A. lumbricoides* infection were of light worm burden. Out of the total *T. trichiura* infected cases, 50 percent had light and the other 50% had moderate burden of infection (Figure 1).

**Figure 1.** Intensity of *A. lumbricoides*, *S. mansoni*, *T. trichiura* and hookworm infection.

4. Discussion

In the present study, there was low percentage of *A. lumbricoides* cases as compared to previous report, where there was high percentage (42.9%) of *A. lumbricoides* cases among children in Northwest Ethiopia[21]. Furthermore, High prevalence of *A. lumbricoides* in school children was also reported from Adarkay and Dembia districts of North West Ethiopia with 43.0% and 35.0% of *A. lumbricoides* cases, respectively[22,23]. However, high prevalence of *A. lumbricoides* as compared to the other helminth infections in the present study is in agreement with previous reports around the world, where ascariasis is more prevalent compared to the other helminth infections[24,25].

The present study also showed lower prevalence of *S. mansoni*, hookworms and *T. trichiura* as compared to studies conducted among school children in different parts of Ethiopia[22,23]. For instance, a study conducted in Chilga District reported overall prevalence rates of 55.3% for *S. mansoni*, 20.2% for hookworm and 11.8% for *T. trichiura* infections[23]. Similar other studies undertaken in Adarkay District showed infection rates of 43.0%, 20.2%, 11.8% for *S. mansoni*, hookworms and *T. trichiura*, respectively[22]. The contradictory report on the prevalence of intestinal schistosomiasis and soil transmitted helminthiasis between the different studies and the present study may be due to the difference in environmental sanitation, water supply and socioeconomic status in the districts, although this needs to be verified in more extensive follow up studies.

Frequent mass chemotherapy which was reported in western and some northwest parts of the country may also be the reason for the contradictory report on the prevalence of intestinal schistosomiasis and soil transmitted helminthiasis between the present study and the previous studies[26].

The present study also showed multiple heminth infections. The most common combinations in the study areas involve infections by *A. lumbricoides* and *T. trichiura*, *A. lumbricoides* and the hookworms, and *S. mansoni* and *T. trichiura*. The presence of multiple heminth infection with different prevalence and combination was also reported in schoolchildren in different districts of Northwest Ethiopia[22,26,27]. Furthermore, about half of the subjects infected with *T. trichiura* or hookworm had light and the remaining had moderate worm burden. Previously it was reported that moderate to heavy infection with *A. lumbricoides*, *T. Trichiura* or hookworms causes growth retardation, iron deficiency anaemia, Vitamin A deficiency, poor cognitive function, school absenteeism and a dismal academic performance[28–33]. Therefore, introducing an integrated national helminth control programme, focusing on the vulnerable populations as recommended by the world health organization is necessary to reduce the prevalence and intensity of intestinal schistosomiasis and soil transmitted helminthiasis in the area.

In conclusion, the present study showed the presence of single and multiple helminth infection with light to moderate worm burden among schoolchildren in Gorgora, Northwest Ethiopia. This shows the need of an urgent integrated control measures to reduce helminth infection in the study area. These measures should focus on reducing poverty, providing proper sanitation, health education as well as the provision of clean and safe drinking water. Introduction of frequent school-based de-worming programmes will also help to control the prevalence and intensity of intestinal schistosomiasis and soil transmitted helminthiasis in the area.

Conflict of interest statement

We declare that we have no conflict of interest.

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Comments

Background

Intestinal schistosomiasis and other helminths constitutes a major health problems among children in tropical and subtropical countries. The rate of infection depends mostly on the sanitation, personal hygiene, environment conditions and socio economic status of the country.

Research frontiers

This cross – sectional study aimed to determined the prevalence of *S. mansoni* and soil transmitted intestinal nematodes among school children. Stool samples were

collected and examined by using Kato–Katz method. Four helminths were detected and the high prevalent worm was *A. lumbricoides* (6.66%).

Related reports

In Ethiopia, intestinal helminthes considered the major causes of mortality and morbidity due to poor sanitary conditions, overcrowding and irrigation system, which are responsible for high prevalence of those helminthes (O'Lorrcaïn & Holland, 2000).

Innovations & breakthroughs

Results of this study give very good indication about the prevalence of intestinal schistosomiasis and soil transmitted helminthes in school children in Gorgora/Ethiopia. The most prevalent was *A. lumbricoides* followed by *S. mansoni*, hookworm and *T. trichiura*.

Applications

The study will help the researchers in epidemiological studies in other parts of Ethiopia specially in children in rural areas.

Peer review

The work is good, ringing the alarming bell for the school administrators, more personal hygiene sanitation work should be conducted among the school children in this area.

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