## Original article

# Intestinal parasitism among students in three localities in South Wello, Ethiopia

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**Abstract**: A cross-sectional study to estimate the prevalence of intestinal parasites has been conducted in 1996 in South Wello in the towns of Kembolcha, Bati, and Mekaneselam. A total of 698 students were selected randomly by using the master list of the school as a sampling frame. The students were interviewed using a questionnaire on the use of toilets, sources of water for drinking, and purpose of washing. From the study subjects stool samples were collected and, screened for intestinal parasites using the Ritchie formol-ether technique. Of the examined, 304 (43.6%) were positive for various intestinal parasites. *Schistosoma mansoni* (24.9%) was commonest followed by *Ascaris lumbricoides* (18.3%) and *Trichuris trichiura* (4.4%). Other less frequent parasites were *Hookworm Spp*. (2%), *Hymenolepis nana* (1.3%), *Giardia lamblia* (1.1%), *Strongyloides stercoralis* (0.9%), *Enterobius vermicularis* (0.3%), and *Trichostrongylus* Sp. (0.1%). Prevalence of *S.mansoni* was significantly higher in males than in females ($P<0.01$); in the 10-14 year old than in the 15-19 and 20+ age groups ($P<0.05$), and among the Bati students than in those in Kembolcha and Mekaneselam ($P<0.001$). Markedly higher rates of Ascaris and Trichuris were observed in Kembolcha($P<0.01$) than in Bati and Mekaneselam but showing no difference between males and females, and between the two age groups. The public health implications of intestinal parasites among school children and possible control measures are discussed. [*Ethiop. J. Health Dev.* 1998;12(3):231-235]

**Introduction**

Intestinal helminths are estimated to account for the infection of over 1400 million people globally and are among the most important health problems in the world, particularly in the developing countries (1). In Ethiopia, intestinal parasites are widely distributed largely due to the low level of environmental sanitation and lack of awareness of simple health promotion practices.

Depending on the geographic, climatic, and the micro environments of different communities, varying degrees of prevalence rates have been reported (2,3,4,5). A prevalence rate of 93% among Felasha immigrants in Israel has been the highest ever reported in Ethiopia(6). Among the common intestinal parasites, *Schistosoma mansoni* has been recorded from all regions of the country and about 19 million people are assumed to live at risk of infection (7). The two prominent parasites, *Ascaris lumbricoides* and *Trichuris trichiura* are frequently reported as co-existing, highly prevalent parasites in the country (2,3,4,5 This study was done as a side project to a study targeted at identifying the association of water source used for washing and bathing and its impact on the transmission and acquisition of *S.mansoni* infection. These areas were selected on the basis of previous reports of prevalence of *S.mansoni* as highly endemic in Bati (60%), moderate in Kembolcha (18%), and non-endemic in Mekaneselam (8,9). In

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parallel with the above study, a cross-sectional survey was carried out to identify the prevalence of intestinal parasites among school children and, thereby, suggest the implementation of some possible control measures in the same localities and similar other communities.

## Methods

South Wollo is one of the zones in the Amahara Regional State. It has about 17 woredas and a total population of 2,123,803. Of these 1,047,512 are male and 1,076,291 are female. The three woredas that have been selected as study sites include Bati, Kembolcha and Mekaneselam with altitudes of 1580m, 1800m, and 2200m, respectively.

A cross-sectional study design to estimate the prevalence of different parasites in South Wollo Zone. The study subjects were randomly selected students of junior and senior secondary schools in each locality. The master list in each school served as a sampling frame during the selection process. All in all, 698 students were selected for the study from the three sites. Of these, 68.7% were males and the rest females. Each selected student was interviewed and relevant information comprising age, sex, use of toilets, and source of drinking and washing water were recorded on a predesigned format.

According to Ritchie formal-ether technique(10) about two grams of freshly voided faeces from each selected individual was collected in screw capped vials containing 10 ml of 10% normal-saline solution, thoroughly stirred and filtered through cotton gauze into a centrifuge tube. To this suspension 3ml of ether was added, vigorously shaken and centrifuged at 2000 rpm for 2 minutes. The supernatant was decanted and the sediment was shaken and poured on to a slide, covered and examined under 10X and 40X objectives of a microscope. Results were recorded on a predesigned format.

All the positive cases were treated for various intestinal parasites at the end of the study.

Statistical analysis of the association of each parasite with age, sex and area was determined using the chi-square test (x2).

## Results

Of the 698 students whose stool specimens were examined, 304 (43.3%) were positive for various intestinal parasites. The dominant parasite was *S.mansoni* followed by

Table 1: **Prevalence of different intestinal parasites in three localities, South Wello, Ethiopia, 1996.**

| Parasite species | Bati n=405 | Kembolcha n=105 | Mekaneselam n=188 | Total n=698 |
|---|---|---|---|---|
| *S. mansoni* | 149(36.8)* | 24(22.9) | 1(0.5) | 174(24.9) |
| *A. lumbricoides* | 70(17.3) | 40(38.1)* | 18(9.6) | 128(18.3) |
| *T. trichiura* | 15(3.7) | 11(10.5)** | 5(2.7) | 31(4.4) |
| *Hookworm sp.* | 7(1.7) | 0 | 7(3.7) | 14(2.0) |
| *H. nana* | 3(0.7) | 2(1.9) | 4(2.1) | 9(1.3) |
| *G. lamblia* | 8(2.0) | 0 | 0 | 8(1.1) |
| *S. stercoralis* | 1(0.2) | 1(1.0) | 4(2.1) | 6(0.9) |
| Others | 1(0.2) | 0 | 2(1.0) | 3(0.45) |

( ) Precent positive * P values < 0.001 ** P<0.01

*A.lumbricoides* and *T.trichiura* ranking as the second and third prevalent parasites, respectively (Table 1). Other parasites less frequently encountered in this study were *Hookworm spp.* (2%), *H.nana* (1.3%) *G.lamblia* (1.1%), and *Trichostrongylus sp* (0.1%).

Table 2: **Prevalence of intestinal parasites, by Sex, in the three localities, South Wello, Ethiopia, 1996.**

| Parasite species | Male n=479 | Female n=219 |
|---|---|---|
| *S. mansoni* | 136 (28.3)* | 38 (17.4) |
| *A. lumbricoides* | 82 (17.1) | 46 (21.0) |
| *T. trichiura* | 18 (3.8) | 13 (6.0) |
| *Hookworm sp.* | 12 (2.5) | 2 (0.9) |
| *H. nana* | 6 (1.3) | 3 (1.4) |
| *G. lamblia* | 5 (1.0) | 3 (1.4) |

| | | |
|---|---|---|
| *S. stercoralis* | 4 (0.8) | 2 (0.9) |
| Others | 2 (0.4) | 1 (0.5) |

* p<0.01

Markedly more males than females were infected with *S.mansoni* (P<0.01) (Table 2). In general, *S.mansoni* was significantly more common in the 10-14 year old (P<0.05) (Table 3). This was more apparent in Bati (P<0.001) than in Kembolcha and Mekaneselam (Table 1).

Table 3: **Prevalence of intestinal parasites among the different age groups, South Wello, Ethiopia., 1996**

| Parasite species | 10-14(n=276) | 15-19(n=307) | 20+(n=115) |
|---|---|---|---|
| *S. mansoni* | 89(32.2)* | 58(18.9) | 27(23.5) |
| *A. lumbricoides* | 51(18.5) | 56(18.2) | 21(18.3) |
| *T. trichiura* | 9(3.3) | 16(5.2) | 6(5.2) |
| *Hookworm sp.* | 7(2.5) | 4(1.3) | 3(2.6) |
| *H. nana* | 3(1.1) | 6(2.0) | 0 |
| *G. lamblia* | 6(2.2) | 1(0.3) | 1(0.9) |
| *S. stercoralis* | 2(0.7) | 4(1.3) | 0 |
| Others | 1(0.4) | 2(0.6) | 0 |

* p<0.05

Table 4: **Source of water and latrine distribution, by study site, South Wollo, Ethiopia, 1996.**

| Study site | source of water | | latrine | | No of study Subjects=n |
|---|---|---|---|---|---|
| | Safe | unsafe | yes | no | |
| 1. Bati | 79.3 | 20.7 | 68.6 | 31.4 | 405 |
| 2. Kembolcha | 89.5 | 10.5 | 80.2 | 19.8 | 105 |
| 3. Mekaneslam | 51.1 | 48.9 | 31.5 | 68.5 | 188 |
| Total | 73.2 | 26.8 | 60.2 | 39.8 | 698 |

Yes = Latrine available

No = Latrine not available

As shown in Table 1, relatively higher rates of Ascaris and Trichuris infections were recorded in students of Kembolcha (P<0.01). But no difference was observed between the sexes and age groups.

The student population lacking toilets and safe drinking water accounted for 31.4% and 20.7% in Bati, 19.8% and 10.5% in Kembolcha, and 68.5% and 48.9% in Mekaneselam, respectively (Table 4). To the contrary, Ascaris and Trichuris infection rates were found to be higher in Kembolcha than in Bati and Mekaneselam.

## Discussion

Intestinal parasites have earlier been recorded from Kembolcha and Bati by McConnel and Armstrong (2). But information regarding Mekaneselam has not so far been made available.

Among the intestinal parasites encountered in this study, *Schistosoma mansoni* was the commonest among the 10-14 year old students. This may be attributed to higher chances of water exposure with infected water source during swimming, bathing, washing or playing as this age group is naturally active and often has strong affinity for water related activities. This is in agreement with the findings of Bekele Mamo in Akaki (11) and Buck *et al* in Adwa (12). Although the majority of the students claimed using pipe water for washing and bathing, there may probably be simultaneous use of water sources, such as rivers and streams.

Taking the sexes into consideration *S.mansoni* was dominant among the male students. Similar observations have been made by Molineaux in Gondar (13), Kloos *et al* in Tensae Berhan (14) and Berhanu *et al* in Bahir Dar (15). In agreement with these investigators, we think this is likely due to

frequent involvement of males in activities like swimming and bathing which often expose them to infection compared to females who seldom participate in such activities.

Comparing the three sites, a high rate of *S.mansoni* infection was observed in Bati, a known endemic area where prevalence rate as high as 72% has previously been documented (8). Regarding the present survey, the location of the river may probably be the main predisposing factor as almost all students, while going to and from school, cross the river which passes through the town. This frequent contact in addition to activities including washing bathing, and swimming, might have resulted in an increased *S.mansoni* cases in this town. Abundant *Biomphalaria Pfeifferi* snails have also been observed around the river banks. Similarly, in earlier studies in Tensai Berhan, it was in the farmers and the daily labourers, who often cross the rivers and do washing, that high risk of contracting the disease was observed (16).

In the present study, Ascaris and Trichuris are the two common parasites, next to *S.mansoni*, found significantly at higher rates in Kembolcha. Similarly, McConnel and Armstrong (2) have come across comparable outcomes in Kembolcha than in Bati. Kembolcha, in comparison with the other two sites, is a relatively more industrial town where people from its vicinities may come looking for job opportunities. The reasons for the increased Ascaris and Trichuris infection rates in Kembolcha may, thus, likely be as a result of influx of people, overcrowding, or poor sanitation and ignorance. Similar comparative studies carried out in Addis Ababa, Debrezeit, and Woliso revealed Ascaris and Trichuris to be highly prevalent in the former than in the latter two towns (17,18). From the present survey, students in Kembolcha were better provided with toilets and piped water than in those from Mekaneselam. However, high rates of Ascaris and Trichuris were recorded indicating that the mere availability of these facilities, unless properly used, do not guarantee protection against infection by intestinal parasites.

The low prevalence of other parasites may probably be due to the technique used in this study. Specific methods such as the scotch tape for *Enterobius vermicularis,* Baermanns for *Strongyloides stercoralis* and Kato for hookworm are preferred methods. Thus much higher rates of these parasites would have been observed. For example, a study by Okubagzhi (19), among school children in Gondar area, has shown that 5% had *E.vermicularis* under their fingenails whereas only 0.5% of them shed eggs in stools. This indicates that some parasites need alternative and sensitive techniques to determine their true prevalence in a community.

As has been observed from the WHO report, the debilitating effect of intestinal helminths on the growth, development, and learning capacity of school children is considered to be greater than previously expected (1). For this reason WHO recommends the integration of low cost treatment with other health interventions in school children. Consequently, Tanzania has launched this low cost programme in school children where significant reduction of morbidity owing to intestinal worms is reported. Based on this, we also suggest that chemotherapy be administered to all school children as they are among the most vulnerable groups and future productive forces of the country. Besides, health education should be regarded as an important component which may have to be included in the school curricula to enhance their awareness in the transmission and control mechanisms of intestinal parasites.

**References**

1. Savioli L, Mott Ke, and YU sen Hai. Intestinal worms. World Health. July-August 1996. 49th year No.4:28.
2. McConnel E, and Armstrong Jc. Intestinal Parasitism in fifty communities on the central plateau of Ethiopia. Ethiop Med J. 1976;14: 159-168.
3. Lo CT; Ayele T, and Birrie H. Helminth and Snail Survey in Harargie region of Ethiopia. Ethiop Med J. 1989;27:73-83.
4. Tatichef S, Abdulahi Y and Hailemeskel F. Intestinal parasitic infection in pre-school children in Addis Ababa. Ethiop Med J. 1981; 19:35-40.

5. Kloos H, Lemma A, and Kirub B. Intestinal parasitism in migrant farm labour populations in irrigation schemes in the Awash Valley, Ethiopia, and in major labour source areas. Ethiop Med J. 1980;18:53-62.

6. Berger SA, Schwartz T, and Michaeli D. Infectious diseases among Ethiopian immigrants in Israel. Arch Internal Med. 1989;149:117-119.
7. Birrie H, Kloos H, Eshete H, Tedla S. The distribution of schistosomiasis in Ethiopia and factors affecting it. In: Tedla S, Kloos H, Tilahun G, eds. Addis Ababa University press, 1989:28-70.
8. Kloos H, Lemma A, and Desole G. Schistosomiasis mansoni distribution in Ethiopia: a study in medical geography. Ann. Trop Med Parasitol. 1978;72:461-470.
9. Birrie H, Survey of schistosomiasis mansoni in the Borkena river basin, Ethiopia. Ethiop Med J. 1986;24:159-167.

10. Ritchie LS. An ether sedimentation technique for routine stool examination. Bull US Army Dept. 1948;8:326-8.
11. Mamo B, Assefa B, and Lo CT. Intestinal helminths in Akaki town, with special emphasis on the epidemiology of *Schistosoma mansoni*. Ethiop Med J. 1989; 27:183-191.

12. Buck AA, spruyt DJ, Wade MK, Deressa A, and Feyissa E. Schistosomiasis in Adwa. A report on an epidemiological pilot study. Ethiop Med J. 1964;3:93-106.
13. Molineaux L. Intestinal Parasitism among inpatients of the Haileselassie Hospital, Gondar, Ethiopia. Ethiop Med J. 1967;5:77-83.
14. Kloos H, Lemma A. The epidemiology of *Schistosoma mansoni* infection in Tensae Berhan: Human water contact pattern. Ethiop Med J. 1980;18;91-98.
15. Erko B, Tedla S, and Petros B. Transmission of intestinal Schistosomiasis in Bahir Dar, North west Ethiopia. Ethiop Med J. 1991;29:199-211.
16. Lemma A, Desole G, Polderman AM, Mazengia B, Redda A, Kloos H. The epidemiology of *Schistosoma mansoni* infection in Tensae Berhan, Ethiopia. Ethiop. Med J. 1979;17:63-74.
17. Lemma A. Parasitological survey of Addis Ababa and Debrezeit School children, with special emphasis on Bilharziasis. Ethiop Med J. 1968;61-71.
18. National Research Institute of Health, Report of an integrated project on family planning, health education and parasite control in Addis Ababa and Woliso. January 1995, 106 pp.
19. Okubagzhi Gebreselassie. Ova, larvae and cysts in fingernail contents. Ethiop Med J. 1988;26:33-36.