INTESTINAL PARASITISM AMONG THE STUDENT POPULATION OF THE WONJI-SHOA SUGAR ESTATE

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ABSTRACT: Students from the five schools of the Wonji Shoa Sugar Estate had their stool specimens examined for intestinal parasites. The method of student selection was by the stratified simple random sample employed for each school. The formol ether concentration supplemented by the direct saline method was used to detect the diagnostic stages of the parasites. Of the 964 examined, 563 (58.4%) were found positive for one or more parasites. Significantly higher infection rate was noted in males than in females ($p<0.001$). Infection with multiple parasite species was observed in 48% of the positives. On the coverage, 1.7 parasite species per infected individual was recorded for all positive students. Of the ten parasites detected, the leading in order of their level of prevalence were; *Ascaris lumbricoides* (22.2%) *Trichuris trichiura* (19.5%), *Schistosoma mansoni* (15.4%) and *Hookworm sp.* (14.7%). The prevalence of the other parasites ranged from 0.7% *(Enterobius vermicularis)* to 6.7% *(Giardia lamblia)*. While the frequency of infection with *Schistosoma mansoni*, *Hookworm sp.* and *Strongyloides stercoralis* were significantly higher in males than in females respectively ($p<0.001$, $p<0.001$, $p<0.05$) the reverse was true with *Taenia sp.* ($p<0.05$). The implications of the present findings with the possible lines of control are discussed.

INTRODUCTION

The occurrence of intestinal parasites in a community is largely due to deficient or absent sanitary facilities as transmission is usually effected directly or indirectly through faecal contamination. Their distribution in different geographical locations however may vary depending on factors involved in the maintenance of the life cycle of each parasite. The majority do not require intermediate hosts and therefore have wider distribution while some need obligatory secondary hosts, climatic and or habitat requirements naturally found or modified by human activities.

In Ethiopia, like in other developing countries, intestinal parasites are widely spread. Most of the intestinal parasites such as A.lumbricoides and *T.trichiura* show wider distribution (1,2) and some parasites appear more prevalent in some defined areas. In places where conditions are favorable due to human interference as in the development of large scale agricultural schemes, the less common parasites such as schistosomes have equally been reported (3,4).

The purpose of the present study was to investigate intestinal parasitism among the school children of the Wonji Shoa Sugar Estate, Awash Valley, and to consider some action oriented approaches for control.

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MATERIALS AND METHODS

The Wonji-Shoa Sugar Estate is a continuously operating scheme located in the upper part of the Awash Valley some 110 kms south east of Addis Ababa. The plantation area consists of over 7000 hectares with a gravity fed canal network of about 530 kms. According to the 1988 census result conducted by the Wonji Hospital (personal communication), the population has reached nearly 28,000. The residents live in two factory and 14 plantation villages. This population size does not include the estimated 15,000 settlers around the plantation villages and about 6000 seasonal cane cutters.

Between mid November to mid December 1989, 964 students selected by the stratified simple random method from one
elementary school, three junior high schools and a comprehensive senior high school were examined for intestinal parasites. Each selected student was provided with a labelled stool cup, toilet or waste paper and a clean piece of applicator stick. On delivery, the stool specimens were examined at the Wonji Hospital Laboratory using the Ritche formol ether concentration method (5) supplemented by a direct saline examination for detection of protozoan trophozoites.

RESULTS

There were 800, 1884, 1333, 1060 and 3000 (total 8077) students who attended the Elementary School, Wonji Junior High School, Shoa Junior High School, Camp-7 Junior High School, and the comprehensive High School, respectively, at the time when this investigation was conducted. Piped water at a single delivery point was available for the students. A pit latrine with spaced holes was also available at each school except at Camp-7 Junior High School. However, the latrines were all improperly used.

Table 1 shows the number of positive students for any one or more parasites at each school. The prevalence among the schools ranged from 53% to 72%. The overall prevalence was 58.4% (563/964). Significantly higher prevalence was recorded among males than females ($p<0.001$). Similarly, the infection rate among the Camp-7 students was significantly higher than the remaining schools ($p<0.001$).

The prevalence of each parasite species at each school and the cumulative for all is shown in table 2. Ten different parasite species were detected, among which *A.lumbricoides*

Table 1. Number of students positive for one or ore parasite species (Positive/Examined, (%))

School	Male	Female	Total
Elementary	26/33 (78.8)	21/38 (52.3)	47/71(66.2)
Wonji J.H.	64/108 (59.3)	59/126 (46.8)	123/234(52.6)
Shoa J.H.	43/599 (73.0)	49/84 (58.3)	92/143 (64.3)
Camp-7 J.H	57/75 (76.0)	43/64 (67.2)	100/139 72.0)
Compr.H.	126/220 (57.3)	75/157 (47.8)	210/337(53.3)
Total	316/495 (63.8)	247/469 (52.7)	563/964 (58.4)

M>F ($p<0.001$);
Camp-7>Others in infection rate ($p<0.001$)

(22.2%), *T.trichiura* (19.5%), *S. mansoni* (15.4%) and *Hookworm sp.* (14.7%) were the most common. The highest and lowest prevalence of *A.lumbricoides* was observed among the elementary and the comprehensive high school students respectively, while the highest prevalence rates of *T.trichiura*, *S.mansoni* and *Hookworm sp.* were observed among the Camp-7 Junior High School students. The rarer parasites showed prevalence rates ranging from 0.7% (*E.vermicularis*) to 6.7% *(G.lamblia)*.

Of the positive students, 48% were infected with two or more parasite species (table 3). Over 50% of the positives from the senior high school and Wonji Junior High School students were infected with single

parasite species and over 60% of the Camp-7 and close to 60% of the elementary school positive students were infected with two or more parasites. The parasite species per infected student varied from 1.5 (Comprehensive High School) to 1.9 (Elementary and Camp-7 Junior High School). The overall parasite species per infected individual was 1.7. The most common combination of parasites were: *A.lumbricoides, T.trichiura, Hookworm sp.* and *S. mansoni.*

Table 2. Parasite Prevalence by Species in each school

Parasite	Elems. (n=71)	Wonji J.H. (n=234)	Shoa J.H. (n=143)	Camp-7 J.H. (n=139)	Compr.H n=377).	Total (n=964)
A.lumbricoides	29(40.8)	44(18.8)	49(34.3)	2(323)	60(16)	214(22.2)
T.trichuira	21(29.6)	53(22.6)	26(18.2)	46(33.1)	42(11.1)	188(19.2)
S.mansoni	12(17)	29(12.4)	21(14.7)	37(26.6)	49(13)	148(15.4)
Hookworm sp.	9(12.7)	33(14.1)	8(5.6)	40(28.8)	52(13.8)	142(14.7)
G.lamblia	3(4.2)	14(6)	18(12.6)	8(5.6)	22(5.8)	65(6.7)
E.histolytical	2(2.8)	5(2.1)	10(7)	5(3.6)	40(10.6)	62(6.4)
Hymenolepis sp.	5(7)	10(4.3)	13(9.1)	8(5.8)	14(3.7)	50(5.2)
S.stercoralis	5(7)	9(3.8)	8(5.6)	9(6.5)	14(3.7)	45(4.7)
Taenia sp.	2(2.8)	5(2.1)	2(1.4)	6(4.3)	7(1.9)	22(2.3)
E.vermicularis	1(1.4)	4(1.7)	_	2(1.4)	_	7(0.7)

While most of the parasite species showed similar frequency in male and female students (table 4), *S.mansoni, Hookworm sp.and S.stercoralis* were detected significantly more in males than in females ($p<0.001$, $p<0.001$, $p<0.05$). *Taenia sp.* however was found significantly higher in females than in males ($p<0.05$).

DISCUSSION

The investigation indicates the presence of a range of intestinal parasites among the school children of the area. The fact that the excreta disposal pits in the schools were improperly used implies there is lack of awareness on the side of the students. Hence the risk of continuous contamination and direct mode of transmission of most parasites could be predictable. Although availability of a pit latrine by itself, if not properly used, does not prevent the students from acquiring faecal borne infection, the highest prevalence rate observed at Camp-7 Junior High School could primarily be due to lack of a pit latrine altogether. Besides as observed subjectively, the bare-footed majority of the children presumably belonging mainly to the plantation workers happened to attend this school.

Of the parasites encountered, *A.lumbricoides* and *T.trichiura* were the most common. This may be attributed to the simple life cycle and direct mode of transmission of the parasites. Although direct comparison may not be possible to make, due to variations in study subjects and diagnostic methods, the present findings with regards to *A.lumbricoides* and *T.trichiura* are in agreement with most previous reports. Wang (6) in Begemider school children, Aklilu Lemma (3) in the Awash Valley, Kloos et al. (4) in the Awash Valley including the Wonji-Shoa Sugar Estate, Seyoum Taticheff et al. (7) among preschool children in Addis Ababa and Bakale Mamo and colleagues (8) in Akaki, reported similar findings indicating *A.lumbricoides* followed by *T.trichiura* as the most common parasite. *Schistosoma mansoni* and *Hookworm sp.* were also amongst the leading four parasites. Occurrence of these latter parasites more in males than in females, observed in the present study, was also communicated earlier by Kloos et al. (4) in the Awash Valley. This may reflect a higher exposure risk of males as they spend most of their spare time outdoors playing, working or wading in canals much more than their female counterparts. For similar reasons, the overall prevalence rates of the parasites were significantly higher in males than in females. On the other hand the situation of *Taenia sp.* to be found significantly higher in females than in males may perhaps be associated with the increased opportunity of females to handle and eventually consume raw meat prior to cooking.

There appears no strong evidence to justify the low prevalence of *E.histolytica, G.lamblia* and *Hymenolepis sp.* reported in the present study. Low level of prevalence of these in Wolega and the latter two parasites in the

Table 3. Multiple Parasitism

	Elems.	Wonji J.H.	Shoa J.H.	Camp-7 J.H.	Compr.H.	Total
Single	19(40.4)	71(57)	45(49)	38(38)	120(59.7)	293(52)
Double	20(42.6)	30(24.4)	39(32.6)	35(35)	56(27.9)	171(30.4)
Triple	4(8.5)	16(13)	16(17.4)	20(20)	22(10.9)	78(13.9)
Quadruple	3(6.4)	5(4.1)	1(1)	4(4)	3(1.5)	16(2.8)
> Four	1(2.2)	1(0.8)	0	3(3)	0	5(0.9)

P.S/Infected 1.9 (89/47) 1.7 (206/123) 1.6 (145/92) 1.9 (193/100) 1.5 (300/201) 1.7 (943/563)
P.S/Infected = Parasite species per infected student

Awash Valley were also reported by Gunderson and Hailu Birrie (9) and Kloos et al (4) respectively. The low prevalence of *S.stercoralis, Taenia sp.* and *E.vermicularis* may however be due to the diagnostic method. For example, the same time when this investigation was made, theprevalence of *S.stercoralis* in the same school children was found to be four fold (17%) by the Baermann's filtration method (10). The actual prevalence of such parasites could therefore be higher than reported in this study. Similarly, had the scotch tape anal swab technique been employed, a higher rate of *E.vermicularis* may have been observed.

The occurrence of *Hookworm sp.* almost invariably in many places where *A.lumbricoides* and *T.trichiura* are found has been noted (11). *Schistosoma mansoni* and *Hookworm* have also been reported more often as double infection in the irrigation schemes of the Awash Valley (4). These helminth parasites are associated as causes of compromised growth (12,13) and reduced physical fitness (14) that in turn influence the educational attainments of school children (15). Another consequence following infection with such helminth parasites could be impaired productivity among those occupationally exposed labor force in development areas like in the Wonji-Shoa Sugar Estate.

In the absence or inadequate effort to mitigate the problem, the introduction of new parasitic diseases and further spread of the already existing ones in Wonji and similar other areas is highly probable. Periodic chemotherapeutic measures targeted at the school children and at the occupationally exposed groups may be implemented within the capability of local

health infrastructure. Since there are already available anthelmentics which show broad spectrum activities and apparently safe (16), the new concept of helminth control mainly by chemotherapy should perhaps be exercised
among target groups. As individual screening generally incurs high cost, targeted chemotherapy with a long term improvements of sanitation, health education and multi-sectoral activities seems appropriate in endemic countries like Ethiopia. The advantages, in terms of the dynamics of transmission, targeting chemotherapy at school children have been well established (17). This approach has also been

Table 4. Distribution of Parasite Species among male and female students

Parasite Species	Male	Female	Total
A. lumbricoides	107	107	214
T.trichiura	96	92	188
S.mansoni	101	47	148*
Hookworm sp.	93	49	142*
G.lamblia	35	20	65
E.histolytica	34	28	62
Hymenolepis sp.	30	20	50
S.stercoralis	30	15	45*

Taenia sp.	6	16	22a
E.vermicularis	6	1	7
Total	538	405	943

* = M>F ($p<0.001$, $p<0.001$, $p<0.05$)
a = F>M ($p<0.05$)

demonstrated elsewhere in Kenya where remarkable reduction in morbidity and rapid improvement in child development were attained following repeated chemotherapy (14). It is our opinion therefore that control measures spearheaded by chemotherapy could alleviate intestinal parasitism among the vulnerable school age groups and the occupationally exposed risk groups in Wonji and similar other development schemes in Ethiopia.

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