ORIGINAL ARTICLE

Major Intestinal Helminth Infections in the Anuak Population of Four Rural Villages in Southwestern Ethiopia

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ABSTRACT: A cross-sectional survey was conducted in 1996 on 496 people from four villages near the town of Gambella, Southwestern Ethiopia, in order to characterize the major types of helminth parasites in the area. Stool examination was carried out, using the formol-ethyl acetate centrifugal sedimentation technique. Infection due to hookworm species was the most prevalent (55.0%) followed by **Ascaris lumbricoides** *(41.1%) and* **Trichiuris trrichiura** *(8.9%). The prevalence of* **Schistosoma mansoni** *infection was 1.4%. It was found that 59.3%, 63.7% and 55.7% of the infections due to ascaris, trichiuris and hookworms, respectively, were encountered in children below the age of 15 years with high infection rates in the 5-14 years age group. Multiple infections were common with 41.7% of the examined having two or more parasite combinations the double infections. Of all the double infections, 66.2% were due to* **Ascaris lumbricoides** *and the hookworms. It is recommended that any control attempt towards intestinal helminthes in the areas should target at the youngest segment of the population.*

INTRODUCTION

In the developed countries, efficient control, urbanization and other socio-economic factors have created better conditions for the decline in the prevalence of intestinal helminthic infections. In the developing countries, particularly in tropical regions where the environment, socio-economic status and cultural practices favor transmission, intestinal helminthiasis is still a major and serious medical and public health concern. The problem is much more pronounced in the rural areas of developing countries where the population increase has considerably enlarged the population at risk. Knowledge of the distribution and extent of helminthic infections in these areas is essential for prevention and control programs.

Intestinal helminthiases such as trichuriasis, ascariasis, schistosomiasis and hookworm infections are of major public health importance in Ethiopia. A number of studies have provided information on the prevalence (1-6) and distribution (1-2,7-10)

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of the major intestinal helminth parasites of man for different parts of the country. Such information is important when considering intervention measures during control programs. However, the studies made to date are not exhaustive. Epidemiological investigations in many areas where these helminthiases are endemic is lacking. Health strategy and control programs demand knowledge of the prevalence and distribution of diseases on a large scale and their changes in the course of time.

The present study was aimed at eliciting the type and status of major intestinal helminthic infections in the population of four rural villages located more inland from the town of Gambella in Southwestern Ethiopia. It is hoped that the knowledge obtained through this study will serve as part of he baseline data required for future control programs in the region.

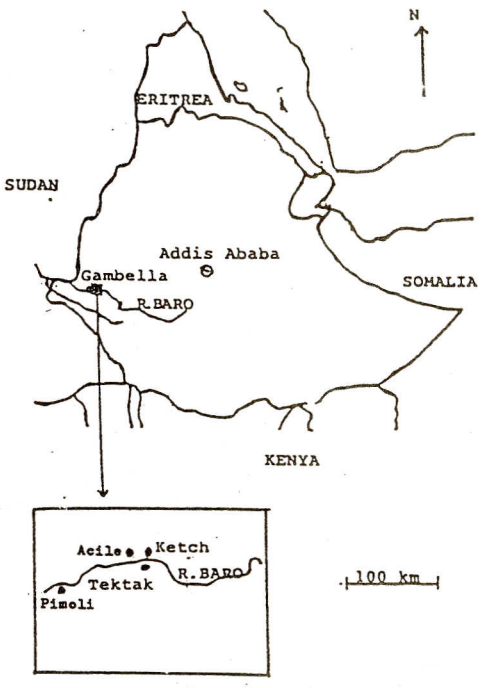

Fig. 1. Map showing the study villages.

MATERIALS AND METHODS

This study was carried out in four rural villages; Tektak, Ketch, Acile and Pimoli; located more inland from the town of Gambella, Southwestern Ethiopia, adjoining the Baro River which is a tributary of the White Nile and the only source of water for the villagers (Fig. 1).

The elevation of the area is approximately 525 meters above sea level. Average monthly 24-hour relative humidity is 56% during the wet season and 42%-51% during the dry season (11). There are low shrubs, savanna grasses and thorn bushes in the area. Mango trees and banana are commonly encountered. The villages surveyed are populated mainly by members of the Nilote Anuak Tribe who live in grass huts or grass and mud huts. The Anuak are mainly fishing and cultivating people who prefer to dwell temporary along the Baro River banks which they use for cultivation. Maize, millet and soya beans are grown. The inhabitants use an open fecal disposal method.

During the survey all houses in the villages were numbered sequentially. People living in each house were registered starting with the head of the family, spouse, etc. The age and sex of each registered individual was recorded. The purpose and aims of the study were elaborated to the villages through the village elders and consent was obtained. All people, from the age of one year and above, in each village were requested to collect stool specimens were collected on the morning of the following day. A small quantity of stool was then preserved in a screw-capped vial containing 10% formalin. The preserved stool specimens were transported to the

Laboratory of the Department of Microbiology and Parasitology, Faculty of Medicine, Addis Ababa University, and were processed by the formalin-ethyl acetate centrifugal sedimentation technique, a modification of the formalin-ether concentration of Richie (12). The formalin-ethyl acetate procedure (13) avoids problems with flammability and storage of ether and is best suited for specimens which have been fixed in formalin. Positivity was established on finding the characteristic eggs of intestinal helminthes and the corresponding results were entered into a parasitological result sheet. The data were analyzed using the EPI Info Version 5 statistical package. Positive individuals were informed of the type of helminth parasite they harbored and advised to get medical treatment.

RESULTS

A total of 496 (221 males and 275 females) people in the four villages were examined (Table 1). Of these 212, 144, 90 and 50 were from Acile, Pimoli, Ketch and Tektak, respectively. The turn up rate was 95%. The parasites seldom encountered, like *Enterobius spp.*, were not included in the analysis. The term hookworm is used to denote both human hookworm species, *Necator americanus* and *Ancyostoma duodenale*.

As is shown in Table 1, of the 496 examined individuals 273 (55.0%), 204 (41.1%) and 44 (8.9%) harbored, respectively, hookworms, *A. lumbricoides* and *T. trichiura*. The prevalence of *Schistosoma mansoni* infection was 1.4% (7).

Table 1. Prevalence of infection due to *S. mansoni, A. lumbricoides, T. trichiura* & hookworms in 496 examined people living in Acile, Pimoli, Ketch and Tektak in 1996.

Village	No. Examined			% (No) positive			
	M	F	T	SM	AL	TT	HW
Acile	97	115	212	1.9	36.3	11.3	48.6
				(4)	(77)	(24)	(103)
Pimoli	56	88	144	0	51.4	8.3	56.9
					(74)	(12)	(82)
Ketch	41	49	90	3.3	35.6	5.6	66.7
				(3)	(32)	(5)	(60)
Tektak	27	23	50	0	42.0	6.0	56.0
					(21)	(3)	(28)
				1.4	41.1	8.9	55.0
Total	**221**	**275**	**496**	**(7)**	**(204)**	**(44)**	**(273)**

M = Male; F = Female; T= Total; SM = *Schistosoma mansoni;*
AL = *Ascaris lumbricoides*; TT = *Trichuris trichiura*; HW = Hookworms.

Table 2. Number of people infected by *A. lumbricoides*, *T. trichiura* and the hook worms by age group and sex (Acile, Pimoli, Ketch, Tektak) in 1996.

Age	No. Examined			*A. lumbricoides*			*T. trichiura*			Hookworms		
gr.	M	F	T	M	F	T	M	F	T	M	F	T
1-4	23	37	60	9	9	18(8.8)	2	3	5 (11.4)	10	11	21(7.7)
5-14	105	107	212	56	47	103(50.5)	15	8	23 52.3)	71	60	131(48)
15-24	25	35	60	10	14	24(11.8)	1	5	6(13.6)	12	20	32(11.7)
25-34	28	46	74	9	20	29(14.2)	2	4	6(13.6)	8	30	38(13.9)
35-44	18	24	42	8	11	19(9.3)	1	1	2(4.5)	8	16	24(8.8)
45-64	17	23	40	5	5	10(4.9)	2	0	2(4.5)	11	14	25(9.2)
65+	5	3	8	1	0	1 (0.5)	0	0	0 (0.0)	1	1	2 (0.7)
Total	221	275	496	98	106	204	23	21	44	121	152	273

Values in parenthesis are percentages of the infected in each age group.

Table 3. Number of individuals harboring two or more parasites and the types of helminth combinations in Acile, Pimoli, Ketch, Tektak in 1996.

Parasite combinations	Males (N-221)	Females (N=275)	Total (N=496)
SM, AL	1	0	1
SM, TT	2	1	3
SM, HW	4	0	4
AL, TT	12 (11.4)	10 (9.8)	22 (10.6)
AL, HW	64 (60.9)	73 (71.6)	137 (66.2)
TT, HW	18 (17.1)	16 (15.7)	34 (16.4)
AL, TT, HW	4	0	4
SM, AL, TT	0	1	1
SM, AL, HW	0	1	1
SM, HW, AL, TT	0	0	0
Total	105 (47.5)	102 (37.1)	207 (41.7)

Abbreviations as in Tables 1 and 2.

In all four villages, infection due to the hookworm species is more pronounced followed by *Ascaris lumbricoides*. Infection due to hookworms, *A. lumbricoides* and *T. trichiura* was encountered in all ages with varying prevalence rates (Table 2). Very high prevalence rates of ascaris, trichuris and hookworms were found in children aged 1-14 years. Of the ascaris, trichuris and hookworm infections, 59.3% (121/204), 63.7% (28/44), and 55.7% (152/273) occurred in this are group respectively, with apparent high infection rates in the 5-14 years age group. In the age group 5-14 years infection appeared more frequently in males than in females for *A. lumbricoides, T. trichiura* and the hookworms. However, above the age of 15, generally, females were more affected than males by all three helminthes.

Multi-parasitism, mostly with two parasites in the same individual, has been recorded in 41.7% (207) of the examined (Table 3). Double infection of ascaris and hookworm was the .most common combination accounting to 66.2%. The overall parasite index per infected person was 1.06 (range: 0.98-1.17).

DISCUSSION

The findings of this cross-sectional study shows that soil-transmitted helminthes infection, hookworm being the most important, is well established in the area there by causing serious health threat. Although direct comparison may not be possible due to the differences in the diagnostic method used and in the study subjects, the overall parasite prevalence reported in this study is similar to most of the reports from works carried out in villages elsewhere in the country (5-8). Such high prevalence and the presence of different helminth species is a common phenomenon under conditions of rural settings. Low level of sanitation, open field defecation and low socio-economic status appear to favour transmission of infection.

Among the prevailing helminth gut infestation the hookworms were predominant. Similar high prevalence rate has been reported for Gambella town earlier (9). Tedla and Jemaneh (9) also showed that the only hookworms species found in the area was *Nectaor americanus* with a prevalence rate of 48.4%. The observed presence of sandy and sandy-loam soil in the villages and the damp shady areas used for defecation and cultivation at the back of the houses, favour the this study that mutihelminthism is more pronounced in the 5-14 years of age (Table 3) which coupled with high prevalence of helminth infection in the same age group (Table 2) supports and strengthens the need propagation and transmission of this species of hookworm. The high prevalence of ascaris is due to the hookworm and ascaris rates, low prevalence of *T. trichiura* was observed. This could possibly be explained by low humidity, unfavorable soil formation and other factors.

Hookworm infection is a public health problem of great magnitude, which produces morbidity due to blood loss, with consequent iron deficiency anemia and hypoproteinaemia. In addition, where there is frequently poor iron intake in the diet, the resulting combination of events can lead to serious manpower and economic losses among the rural farming populations.

The fact that more than 50% of the hookworm, ascaris and trichuris infections are found in people below 15 years of age shows that the infections are acquired in and around dwelling areas used for cultivation. On the other hand, it is worth noting that the overall prevalence rate of *Schistosoma mansoni* is 1.4%. The low prevalence rate coupled with the absence of snail vectors during inspection of the river banks signifies that schistosomiasis is not endemic in the area. Although attempts were not made to collect information on their history of travel the seven schistosome-infected cases have probably acquired the infection elsewhere out of the study villages.

In areas where several kinds of intestinal helminthes are found, polyparasitism is a common phenomenon. The most frequently seen combinations in some regions are infections which involve ascaris, trichiuris and hookworms (6, 14-15) to which the findings of the present study also concede. Of particular importance is the finding in of targeting chemotherapy to the youngest section of the population who are at the highest risk of morbidity due to intestinal helminths (16, 17).

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