ORIGINAL ARTICLE

INTESTINAL PARASITES IN ASYMPTOMATIC CHILDREN IN SOUTHWEST ETHIOPIA

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ABSTRACT

BACKGROUND: ***Parasitic infections, caused by intestinal protozoan and helminths, affect more than two billion people worldwide (1). These infections are more prevalent in the poorest sections of the population and re-infection in endemic areas is continuous. The aim of this study was to determine the prevalence of intestinal heliminths in an area of urban and rural Jimma, and compare the rates among different socio-demographic variables.***

METHODS: ***A cross-sectional survey of 924 children aged 1-5 years living in and around the town of Jimma in Southwest Ethiopia was conducted. Data was collected using structured questionnaire by house-to-house visit. Fresh stool sample was collected and examined under microscope.***

RESULTS: ***Nine hundred and twenty four (88%) of the targeted 1045 children participated in the study. The age of studied children ranges from 12 to 60 months with median age of 36 months. Out of 924 children studied, 53% were male with male to female ratio 1.1:1. Fifty eight percent of these children were from Jimma town, majorities (66%) Oromo and 59% Muslim. The mothers of majority (43%) were not educated and the household income was less than 201 Birr in 69%. The overall prevalence rate of intestinal helminths was 57.4% with Trichuris trichura 31%, Ascaris lumbricoids 30.5%, Hymenolopis nana 4.3% and hookworm spp 4%. One hundred and thirty five children had double infections, commonest being with Ascaris lumbricoids and Trichuris trichura and 13 had triple infections. It is shown as the prevalence rates and intensity of infection by the identified intestinal helminths was increasing with child's age and more males were affected.***

CONCLUSION: ***This study has shown that intestinal helminthic infections, mainly ascariasis and trichuriasis are abundant in toddlers and pre-school children; and prevalence rate and intensity of infections increased as the age of the child increase. It also showed that the rate of infection was high in urban settings, male sex, Dawro ethnic group, educated mothers and better income family.***

KEY WORDS: ***Intestinal parasites, Children, Ascaris lumbricoides, Helminths***

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INTRODUCTION

Parasitic infections, caused by intestinal protozoan and helminths, affect more than two billion people worldwide. These infections are more prevalent in the poorest sections of the population and re-infection in endemic areas is continuous. According to the WHO, 980 million people are infected with intestinal roundworm *Ascaris lumbricoides (1)*. Several studies world wide show that the prevalence of *A. lumbricoides* and *Trichuris trichiura* is very high in the patients examined, when compared with other parasites such as Hookworm, *Strongyloides stercoralis*, *Hymenolepis nana* and others (2-5). Intestinal helminthic infections, such as ascariasis, trichuriasis, schistosomiasis and hookworm are also found to be prevalent in Ethiopian children with some variation in individual parasitic prevalence from one place to another (6-10).

Among the conditions influencing the development of these infections are poor sanitary conditions, lowering resistance of the host, population explosion, inadequate control of vectors and infection of reservoirs, increased migration, and military operation and travelling around the world (11-13). This disease can undermine child development, educational achievement, reproductive health and social and economic development [14, 15] and some of these parasitic infections can cause morbidity and mortality (16). Nevertheless, treatment is often neglected for economic reasons and because most patients have no symptoms (14).

Chemotherapy is the cornerstone of the strategy of control of morbidity, reduction of transmission and delay of soil-transmitted helminth re-infection (15, 17). The benzimidazole antihelminthics are largely used for treating intestinal nematode infection together with praziquantel for schistosomiasis (18). These drugs are safe, inexpensive and very effective, have a broad-spectrum of activity, and easy administration (11,14).

Though several studies have been done in different parts of the country on different age groups mainly on school age children, there are no studies on toddlers and pre-school age children in representative sample. There fore the present study aimed at assessing prevalence rates and intensity of infection of intestinal helminths in asymptomatic young children in southwest Ethiopia.

MATERIALS AND METHODS

Study area and target population: Jimma zone is a province in southwest Ethiopia with a population of approximately 2.6 million inhabitants, 120,000 of whom live in the urban area of Jimma town (19). Jimma zone is a tropical area with an altitude ranging from 1500-2000 meters above sea level and temperature ranges from 0 °C in October-November to 37° c in March. The study was carried out in the second half of 2003, and targeted all children aged 12-60 months living in Jimma town and 11 rural farmers' association areas in the Mana and Seqa-chekorsa districts some 20-50 kilometres far from urban Jimma.

Study design and Sample size: In December 2003 a cross-sectional survey was carried out on children in the study area. Taking the population of 50,000 for children aged 12-60 months in the area, 50% prevalence of intestinal helminths, 95% confidence interval and 3% margin of error the sample size was determined to be 1045. All households in all kebeles of jimma town and the 11 farmer's associations (selected by lottery method) were included in the study.

Data collection: A house-to-house visits was made guided by a map of the kebele (the smallest governmental administration unit) or farmers' association map to collect data. Children who were not at home at the time of the survey visit were revisited on the next day. A brief interviewer-administered questionnaire was used to obtain information from parents or other caretakers on socio-demographic characteristics of the household and collected fresh stool sample using labelled plastic container from all children. The data for this paper was collected while we were studying risk factors for atopic dermatitis and diagnostic validation study in children which is reported elsewhere. The data was collected during our survey for risk factor of atopic eczema which is published elsewhere.

Stool sample processing: On the day of collection, samples were processed by formaline-ether concentration technique by a senior Laboratory Technologist in Jimma University Specialized Hospital Laboratory and examined under microscope for ova and parasite (20).

Analysis: All data were entered to computer and analysed using the Statistical Package for the Social Sciences (SPSS) version 11.0. Chi square and p-value used for comparisons.

Ethical clearance: Ethics approval for the study was obtained from Jimma University research and publication office. Consent was obtained from parents/carers after a verbal explanation of the procedures and the purpose of the study. All children who were found to be positive to any of the parasite were treated accordingly and told to report if they encounter unwanted effect of the drugs.

Limitations: Weight, height and haemoglobin levels were not included in the variables during the data collection to compare the nutritional status and haemoglobin (hmatocrit) level of children with and without intestinal heliminthiasis.

RESULTS

Response rate and Socio demographic characteristics: Nine hundred and twenty four (88%) of the targeted 1045 children participated in the study. The age of studied children ranges from 12 to 60 months with median age of 36 months: 164 (17.5%) in the age group of 12-23 months, 220 (23.8%) 24-35 months, 181(19.6%) 36-47 months, 195 (21.1%) 48-59 months and the remaining 164 (17.7%) were 60 months. Out of the 924 children studied, 487 (52.7%) were male and 437 (47.3%) female making the male to female ratio 1.1:1. Five hundred thirty seven (58%) of these children were from Jimma town, majorities, 606 (66%) Oromo and 547 (59%) Muslims. The mothers of majority, 399 (43%) were not educated and the household income was less than 201 Birr in 637 (69%) [Table 1].

Table 1. Stool test result to any of endoparasite by socio-demographic characteristics of children, Jimma, Southwest Ethiopia, 2004.

Socio-demographic characteristics	Total examined No (%)	Positive to parasite No (%*)	x^2	P-value
Age in months				
12-23	164 (17.7)	79 (48.2)		
24-35	220 (23.8)	114 (51.8)		
36-47	181 (19.6)	114 (63.0)	4.32	0.36
48-59	195 (20.7)	115 (55.0)		
60	164 (17.7)	108 (65.8)		
Sex				
Male	487 (52.7)	295 (60.6)	1.45	0.23
Female	437 (47.3)	232 (53.1)		
Address				
Urban	537 (58.1)	325 (60.5)	1.43	0.23
Rural	387 (41.9)	205 (53.0)		
Ethnic group				
Oromo	606(65.6)	353(58.3)		
Amhara	120(13.0)	69(57.5)		
Keffa	36(3.9)	17(47.2)		
Dawaro	29(3.1)	20(69.0)	8.50	0.20
Guragie	94(10.2)	62(65.9)		
Tigre	9(0.9)	1(11.1)		
Others	30(3.2)	8(26.7)		
Religion				
Christian	377(40.8)	217(57.6)	0.00	0.95
Muslim	547(59.2)	313(57.2)		
Mother's Education	399(43.2)	222(55.6)		
Not educated	317(34.3)	184(58.0)	0.26	0.88
Elementary	208(22.5)	124(59.6)		
Secondary and above				
Monthly income				
≤201 Birr	637(68.9)	361(56.7)		
201-500 Birr	215(23.3)	123(57.2)	0.36	0.83
≥ 501 Birr	72(7.8)	46(85.7)		

• Percent calculated horizontally.

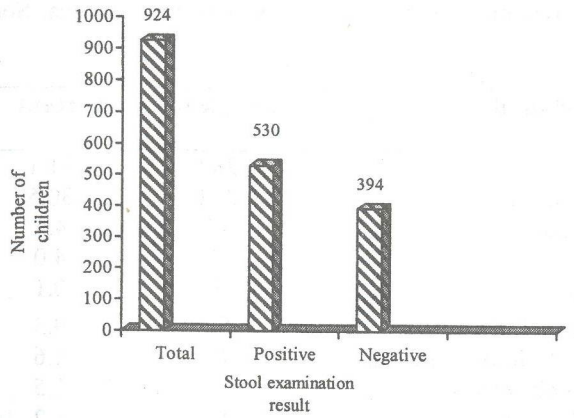

Fig. 1 Helminthic infection in children, Jimma, southwest Ethiopia,2004.

Prevalence: Microscopic stool sample examination showed that 530 (57.4%) children were infected with one or more intestinal helminths (Fig 1). Seventy-nine (48.2%) of the 164 children aged 12- 23 months, 108/164 (66%) at the age of 60 months and 295/487(61%) male were infected. The prevalence of helminthiasis was high in those from Jimma town 61%, Dawaro ethnic group (69%), educated mother 60% and better income family 86%. The prevalence rate in the two main religions (Muslim and Christian) was the same, 57%.

Though there was difference in prevalence rates, it was not statistically significant in any of the socio-demographic variables with p value > 0.05 (Table 1).

Among the intestinal helminths, *Trichuris trichura*, *Ascaris lumbricoids*, *Hymenolopis nana* and Hook worm spp. accounted for 287(31%), 282(30.5%), 40(4.3%) and 37(4%) respectively. One hundred and thirty five children had double infections, commonest being with *Ascaris lumbricoids* and *Trichuris trichura* and 13 had triple infections (Table 2).

Table 2. Magnitude of infections of children by different helminths, Jimma, Southwest Ethiopia, 2004.

Categories of infection	Helminths	Frequency	Percent
Single infection	*Trichuris trichura*	287	31.1
	Ascaris lumbricoides	282	30.5
	Hymenolopis nana	40	4.3
	Hook worm	37	4.0
	Schistosomiasis	1	0.1
Double infections	*A. lumbricoides* + *T. trichura*	86	9.3
	A. lumbricoides + Hookworm spp	15	1.6
	T. trichura + Hookworm spp	14	1.5
	T. trichura + *H. nana*	11	1.2
	A. lumbricoides + *H .nana*	9	1.0
Triple infections	*A. lumbricoides* + *T. trichura* + Hookworm spp	7	0.8
	A. lumbricoides + *T. trichura* + *H. nana*	6	0.6

Of the 282 children with ascariasis 67(24%) were in the age group of 48-59 months, of 287 children with trichuriasis 72(25%) were in the age group of 36-47 months. One hundred sixty one (57%) out of 282 children with ascariasis, 163 (57%) out of 287 with trichuriasis and 22 (59%) out of 37 with hookworm infection were male as shown in table 3 and figure 2.

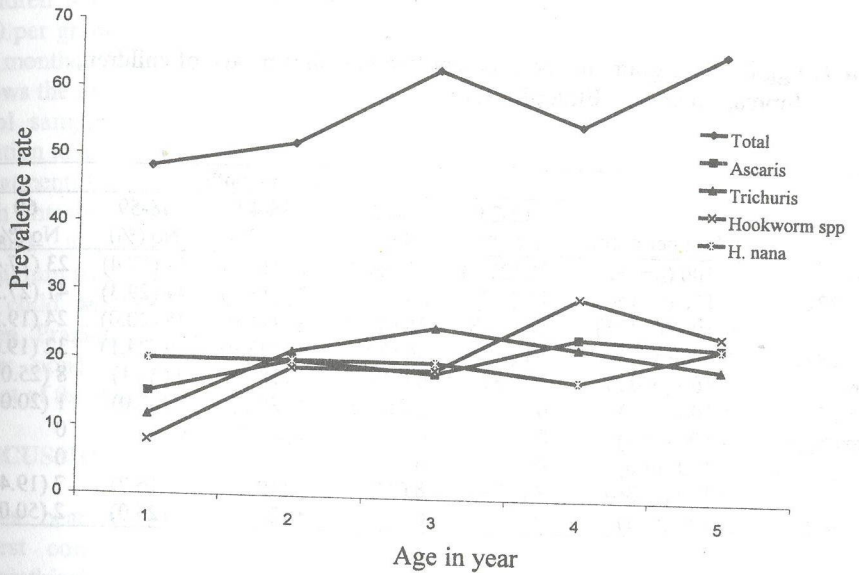

Figure 2. Intestinal helminthic infection by age of children, Jimma, Southwest Ethiopia, 2004

Table 3. Distribution of individual intestinal parasites by age and sex of affected children, Jimma, Southwest Ethiopia, 2004.

Variables	*A. lumbricoides* (n = 282) No (%)	*T. trichura* (n = 287) No (%)	Hookworm (n = 37) No (%)	Schistosomiasis (n = 1) No (%)	*H. nana* (n = 40) No (%)
Age in months					
12-23	43(15.2)	34(11.8)	3(8.1)	0	8(20.0)
24-35	56(19.9)	61(21.3)	7(18.9)	0	8(20.0)
36-47	52(18.4)	72(25.1)	7(18.9)	1(100.0)	8(20.0)
48-59	67(23.8)	64(22.3)	11(29.7)	0	7(17.5)
60	64(22.7)	56(19.5)	9(24.3)	0	9(22.5)
Sex					
Male	161(57.1)	163(56.8)	22(59.1)	1(100.0)	26(65)
Female	121(42.9)	124(43.2)	15(40.9)	0	14(35)

Table 4. Egg load per gram of stool of identified parasites by age of children, Jimma, Southwest Ethiopia, 2004.

		Age in months				
Parasite	Egg per gram	12-23 No (%)	24-35 No (%)	36-47 No (%)	48-59 No (%)	60 No (%)
A. lumbricoides	< 100 (n=132)	30 (22.7)	32 (24.2)	24 (18.2)	23 (17.4)	23 (17.4)
(n = 282)	≥ 100 (n=150)	13 (8.7)	24 (16.0)	28 (18.7)	44 (29.3)	41 (27.3)
T. trichura	< 100 (n=125)	16 (12.8)	25 (20.0)	30 (24.0)	25 (20.0)	24 (19.2)
(n = 287)	≥ 100 (n=162)	18 (11.1)	36 (22.2)	42 (25.9)	39 (24.1)	32 (19.6)
Hookworm	< 100 (n=32)	3 (9.3)	6 (18.8)	6 (18.8)	9 (28.1)	8 (25.0)
(n = 37)	≥ 100 (n=5)	0	1 (20.0)	1 (20.0)	2 (40.0)	1 (20.0)
Schistosoma Spp.	< 100 (n=1)	0	0	1(100.0)	0	0
(n=1)	≥ 100 (n=0)	0	0	0	0	0
H.nana	< 100 (n=36)	8 (22.2)	8 (22.2)	7 (19.4)	6 (16.7)	7 (19.4)
(n = 40)	≥ 100 (n=4)	0	0	1 (25.0)	1 (25.0)	2 (50.0)

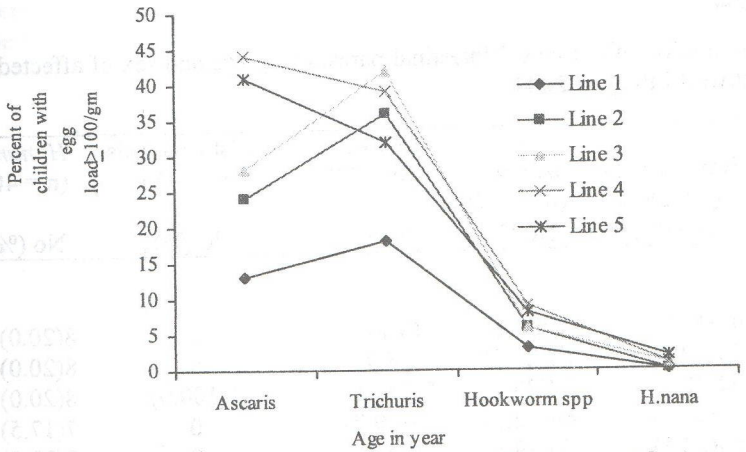

Figure 3. Distribution of egg-load ≥ 100/gm of stool by age of children, Jimma, southwest Ethiopia, 2004.

Eighty five (57%) of the 150 children with ascariasis and 71 (54%) of 162 children with trichuriasis with egg load ≥ 100 per gram were in the age group of 48-60 months (Figure 3 and Table 4). This shows the increase egg load per gram of stool sample for identified heliminths in relation to age of the child.

Treatment: Irrespective of age all children with intestinal helminthic infection were treated with oral Mebendazole 100 milligram twice daily for three days except the child with schistosomiasis who were given Praziquantel 400 milligram single dose; none of them reported unwanted effect of the drugs.

DISCUSSION

To the best of my knowledge, this is the largest community survey of intestinal helminthiasis on "asymptomatic" pre-school children in both urban and rural settings in Ethiopia. According to this data, most of the children studied were found to be infected by one or more intestinal parasites. In the specified age group, intestinal helminthiasis was more prevalent in the urban than rural areas of Jimma; in contrary to our expectation, the prevalence should have increased in children from rural settings where they are less privileged in terms of sanitation and water supply. On the other hand, the presence of rubbish deposits near houses is likely in towns than rural area which may contribute for the high prevalence in urban areas.

The overall prevalence rate of intestinal heliminths was found to be 57% which is much lower than the report from Brazil (21). It is very difficult to compare the over all prevalence rate of helminthiasis in this population with reports from other parts of Ethiopia since most of the studies were done on either school age children or general population (with different age strata) (6-10,22). Though most children do start to walk by the age of 13 months, they might not be strong enough to go out and get contaminated until the age of 2 years (23). This developmental factor must be the reason for the slightly lower prevalence in those who are 12-23 months of age; and an increasing trend there after. Though not statistically significant, the prevalence was slightly higher in boys than girls. Culturally it is clear that girls do stay home with their mothers which may decrease the exposure risk and also give better access for washing; while boys' especially older ones go to field with their fathers so that their exposure to geohelminths is likely to increase. Though the living environment, sanitary facility and water supply system is similar, the prevalence of helminthiasis was high in Dawaro and Guragie ethnic groups which may be due to difference in living habit that needs further investigation.

As other studies showed (21), logically as well, those from analphabet mother and low income family should have more intestinal parasitosis because of the unavailability of good sanitary conditions and poor water supply. In contrary our study showed higher prevalence rates of helminthiasis in educated and better income family.

Of the five helminths identified in 530 under five children, trichuris and ascaris were predominant with prevalence rate of 31% and 30.5%, respectively followed by H. nana and hookworm spp in agreement with the report from Philipines (24). The wide distribution of these two helminths may be related to either the promiscuous open field defecating habit of the people or the favouriteness (fertile soil, humid and wet) of the environment for the completion of the life cycle of the parasite and transmission. This as well shows the poor hygienic condition of the children experiencing.

One hundred and thirty five children had double infections; mainly by ascaris

and trichuris, hookworm and trichuris and fifteen children had triple infections. The prevalence rates of double and triple infections are more or less in agreement with the report from Brazil (25). It is clear that this high degree of multiple infections could have adverse health and related effects in these young growing children like delayed growth and development and poor educational achievement (14,15).

Though not smooth, it is as well shown the increased prevalence of ascaris, trichuris and hookworm with the age of the child. This demonstrated that the increased risk of contamination from the environment increases as the child gets matured. The fact that the intermediate hosts (rodents and fleas) for H. nana are most of the time home based may be the reason why infection rate was the same in all age groups. Since study subjects were too young to have river water contact, it is not surprising that only one case of schistosomiasis was identified unlike other previous reports (9,22).

The finding that boys are affected more by ascaris, trichuris and hookworm is more likely due to the cultural values that males are encouraged to go to field with their fathers elder brothers.

The intensity of infection of helminths expressed by high egg load per gram of stool sample in toddler and preschool children was not studied before in this country. However, as shown in figure 3 this study showed a direct relation between the age of the child and intensity of infection. This reflects the increment of adult worms number harboured as the child age increases.

In conclusion this study has shown that intestinal helminthic infections mainly trichuriasis and ascariasis are abundant in toddlers and pre-school children in the study area. The prevalence rate and intensity of infection increased with age of the child. It has as well shown as rate of infection was high in urban setting, male sex, Dawro ethnic group, educated mother and better income family. At last this study again underlines the occurrence of marked intestinal parasitosis in the asymptomatic children in rural and urban settings. Therefore, actions by the health professional are necessary to provide adequate clinical care within the health system (1). According to Olsen *et al.* (12), health education is an important factor in the prevention of parasitic infections. Since most of the helminthic transmission is preventable, it is recommended to improve sanitation facilities, avail potable water and educate the people on mode of transmission and prevention. On top of this as chemotherapy is the corner stone strategy in controlling helminths, periodic de-warming should be done in all children even in the under 2 years old every 3-6 months (23-25).

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