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Full Length Research Paper

A study of the prevalence of *S. mansoni* and geo-helmenthic infections among patients examined at Workmeda Health Center

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***Schistosoma mansoni* and geo-helminths are considerable medical and public health problems in Ethiopia. However, information is limited on the epidemiology of these parasitic infections in different areas, it is very important to plan effective prevention and control measures. Therefore, the aim of this study was to determine the prevalence of *S. mansoni* and geo-helmenthic infections among patients examined at Workmeda Health Center. Institution based retrospective cross sectional study was conducted to determine the prevalence of *S. mansoni* and geo-helmenthic infections among patients from September 2012 to August 2013. A total of 604 participants (56.6% males and 43.4% females) within the age range of six to eighteen were included. A single stool sample was collected and processed using direct microscope. The analysis of the generated data revealed that the overall prevalence of intestinal parasites infection was 32%. The prevalence of *S. mansoni and* hookworm species were 7.3 and 20.7%, respectively. Patients in the age range of 10 to 14 years had higher (14.7%) rate of infection. Prevalence of *S. mansoni* (12%) infection was higher in the age range 10 to 14 years. High prevalence of *S. mansoni* and hookworm species need periodic deworming programme and health education urgent to reduce morbidity and mortality.**

Key words: Prevalence, *Schistosoma mansoni*, geo-helminths, Workmeda.

INTRODUCTION

Intestinal parasites affect human's health in many parts of the world. Their problem is magnificent, particularly in developing nations (WHO, 1981). Several reports showed that the overall high prevalence of intestinal helminths in the world mainly attributed to infections emanating from environmental contamination by human excreta. Thus, helminthic infections as a whole can be viewed as the best indicators of the sanitation level of a community (Mahfouz et al., 1997).

The most prevalent and important helminths in developing countries are Schistosomes (Rozendaal, 1998) and geo-helminths also called soil-transmitting helminthes (STHs) including *Ascaris lumbricoides*, *Trichuris trichiura* and Hookworms (WHO, 1962). Recent global prevalence estimate shows that *A. lumbricoides* infect 1.221 billion, *T. trichiura* infect 795 million and hookworm infect 740 million people worldwide (Silva et al., 2003).

Schistosomiasis also remains one of the most prevalent parasitic diseases in the world and is endemic in 74 tropical countries worldwide. Approximately, 500 to 600 million people are at risk of schistosomal infection, and 80% of the 200 million people are infected worldwide live in sub-Saharan Africa where *Schistosoma mansoni* and *Schistosoma haematobium* are widely distributed (WHO, 2002; Davis et al., 2003). Schistosomiasis is also endemic in many parts of Ethiopia. The intestinal form of schisosomiasis caused by *S. mansoni* is widely distributed in the country, however, the urinary form caused by *S. hamatobium* is limited to some lowland areas of Ethiopia (Lo et al., 1988; Tedla et al., 1998).

Intestinal schistosomiasis and geo-helminths infections are the major causes of morbidity and mortality in different parts of Ethiopia (Aklilu et al., 1986; Leykun, 2001) causing a series of public health problems such as malnutrition, anaemia, and growth retardation as well as higher susceptibility to other infections (Silva et al., 1997). Although many studies previously conducted in Ethiopia indicated that the distribution of different intestinal parasites on different altitudes in different community groups such as preschool children, school children and other groups confined to camps and refugees, the prevalence of *S. mansoni* and STHs infections was not well addressed in different parts of Ethiopia including our study area. In addition, the scarcity of reports on the distribution and prevalence of *S. mansoni* and STHs infections in Ethiopia promoted investigation of the conditions in Northwest Ethiopia.

Therefore, the aim of this study was to determine the prevalence of *S. mansoni* and STHs infections among patients examined at Workmeda Health Center, Northwest Ethiopia. The research finding could provide baseline data on the distribution and prevalence of intestinal parasites and assisting in proposing strategies to protect parasitic infections.

MATERIALS AND METHODS

Study population, area and period

Institution based retrospective cross sectional study was conducted to determine the prevalence of *S. mansoni* and geo-helminths among patients examined at Workmeda Health Center, Jawe Woreda, Northwestern Ethiopia from September 2012 to August 2013. The area has an elevation of about 1000 to 1050 m above sea level. The study subjects engaged in this study were 604 clinically suspected cases of intestinal parasite infection within age range 6 to 18 who visited Outpatient Department (OPD) of Workmeda Health Center. Eligible study subjects for the study were those patients clinically suspected of intestinal parasitosis and had stool examination from 6 to 18 years. Children less than 5 years and adults greater than 18 years with diarrhea and suspected of intestinal parasitosis were excluded from this study.

Clinical and laboratory diagnosis

One year retrospective data of intestinal parasitosis were collected from Workmeda Heath Center. In this Health Center, direct stool examination of well-prepared smears is used in confirming the presence of Schistosomiasis and other intestinal parasites infection. In Ethiopia, detection of intestinal parasites in stool is conducted according to a standard operating procedure (SOP) in each health center throughout the country. The direct smear method is done by mixing 2 mg of stool with either one drop of saline (diarrhea) or iodine (formed) on a slide, covered with cover slide and sealed first with low power, then high power (WHO, 2004) . Therefore, for this study objective, one year (September 2012 to August 2013) of *S. mansoni* and Geo- helminths data, Socio-demographic information and environmental related factors at Workmeda Health Center in October 2013 had been collected by reviewing the patient's card and laboratory log book.

Statistical methods

Data were entered in to excel and transported to SPSS. Analysis was performed by SPSS version 16 statistical software package. Frequency and percentage were calculated for the study variable. Chi-square, p- value and two tail Fisher's exact test were used to calculate and determine significance. In all statistical tests, the differences were considered to be statistically significant if p-value less than 0.05.

Ethical consideration

The department ethical review committee of Microbiology, Immunology and Parasitology, College of Medicine and Health Science, Bahir Dar University approved the project. The researchers obtained informed consent from the Workmeda Health Center.

RESULTS

Socio-demographic characteristics of study subjects

A total of 604 clinically suspected intestinal parasitosis cases who attended at Workmeda Health Centre were enrolled in this study. The mean age of the attendants was 12.24 years with a standard deviation (SD) of 4.05 ranging from 6 to 18. There were more males (56.6%) than females (43.4%). Nearly 9% of the cases were under 7 years, 56% of the cases were between 7 and 14 years, the rest 35% were great than 14 years old. And majority of the study group were greater than 10 years old (Table 1).

The overall prevalence of parasitic infection was 32%. Of which, hookworm species accounted for (20.7%) parasites infection followed by *S. mansoni* (7.3%) (n=604) (Table 2). About 3.6% of the cases were co-infected with hookworm species and *S. mansoni* (n = 193). However, no triple, quadruple and multiple infections were found (Table 2).

Prevalence of *S. mansoni* and geo-helminths

The overall prevalence of *S. mansoni* and geo-helminths

Table 1. Prevalence of intestinal parasitosis infections based on their socio-demographic characters in Northwest Ethiopia [n, %].

Result	Age			Sex		Address	
	6-9	10-14	15-18	M	F	Urban	Town
Positive	45 (25.4)	92 (42.6)	56 (26.5)	114 (33.3)	79 (30.2)	183 (31.9)	10 (33.3)
Negative	132 (74.6)	124 (57.4)	155 (73.5)	228 (66.7)	183 (69.8)	391 (68.1)	20 (66.7)
Total	177 (29.3)	216 (35.8)	211 (34.9)	342 (56.6)	262 (43.4)	574 (95)	30 (5)
χ^2, P		29.09, 0.04		8.53, 0.481		7.839, 0.550	

Table 2. Distribution of intestinal parasites in relation with their address in Northwest Ethiopia [n, %].

Result	Address						
	Asech	Cimida	Dire	Kava	Workmeda	Wobo	Total
Hookworm	22 (17.6)	24 (19.2)	13 (10.4)	45 (36)	8 (6.4)	13 (10.4)	125 (4.8)
A. lumbricoides	0 (0)	1 (33.3)	1(33.3)	1 (33.4)	0 (0)	0 (0)	3 (.11)
T. trichiura	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
S. mansoni	3 (8.1)	9 (24.3)	8 (21.6)	14 (37.9)	1 (2.7)	2 (5.4)	37 (19.2)
Strongyloides stercoralis	1 (16.7)	2 (33.3)	1 (16.7)	2 (33.3)	0 (0)	0 (0)	6 (31)
H. nana	0 (0)	0 (0)	0 (0)	2 (66.7)	1 (33.3)	0 (0)	3 (.11)
Hookworm + *S. mansoni*	1 (14.2)	0 (0)	3 (42.9)	3 (42.9)	0 (0)	0 (0)	7 (36.3)
Hookworm + *A. lumbricoides*	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.5)
Entamoeba histolytica	1 (12.5)	0 (0)	0 (0)	5 (62.5)	0 (0)	2 (25)	8 (41.5)
Giardia lamblia	0 (0)	0 (0)	2 (66.7)	1 (33.3)	0 (0)	0 (0)	3 (1.55)
Total positive	28 (5.4)	37 (35.9)	28 (35.9)	73 (29.3)	10 (33.3)	17 (26.2)	185 (30.6)
Total	79 (3.1)	103 (17)	78 (12.9)	249 (41.2)	30 (5)	65 (10.8)	604
χ^2, P				47.622, 0.366			

was 30%. The prevalence of *S. mansoni*, hookworm species, *A. lumbicoids* and *T. trichuria* in this study was found to be 7.3, 22, 0.7, and 0%, respectively (n = 604). The prevalence of *S. mansoni* which was 2.8% found in Kava was high followed by 1.8% in Dire Kebele. Similarly, the prevalence of hookworm species (7.9%) was high in Kava Kebele, followed by 4.1% in Cimida (Table 3).

Prevalence of *S. mansoni*

The prevalence of *S. mansoni* obtained from rural and urban was 34 (5.6%) and 10 (1.7%) (n=604), respectively but not statistically associated (Table 4). About 8.2% of male (n= 342) and 6.1% of female (n= 262) cases were found to be infected with *S. mansoni* (Table 4). The prevalence of *S. mansoni* infection was high (12%) in age group 10 to 14 (n = 216), followed by 5.1% in age group 6 to 9 (n = 177). *S. mansoni* infection was statistically associated with high prevalence in males and age group 10 to 14 (Table 4).

DISCUSSION

The prevalence of *S. mansoni* and geo-helminths among school age segments of the population of Jawe Woreda was determined. The overall prevalence of parasitic infection in this study was 32% and the infection rates were very high in children age range of 10 to 14. Prevalence of parasitic infections obtained in the present study was comparable with those previously reported (34.4%) in South Western Ethiopia (Awole et al., 2003) and 36.6% in North Western Tanzania (Mazigo et al., 2010). In contrast to the present study, high prevalence of parasitic infection (50.6%) was reported in Gorgora Town, Northwest Ethiopia (Assefa et al., 2013).

In Ethiopia, most *S. mansoni* infections and transmission sites are in agricultural communities along streams between 1300 and 2000 m altitude (Kloos et al., 1988). The prevalence of *S. mansoni* (7.3%) in the present study was comparable with 10.1% in North West Ethiopia (Zinaye et al., 2013), and 5.6% in North Western Tanzania (Mazigo et al., 2010), but higher than 3% in South Western Ethiopia (Awole et al., 2003). In contrast to the present study, high prevalence of *S. mansoni* infections, 73.7% in Southern Ethiopia (Terefe et al., 2011), 27.1% in Northern Ethiopia (Dejenie et al., 2009), and 23.1% in South Cote De voire (Coulibaly et al., 2013) was reported.

The low prevalence of *S. mansoni* in this study may be due to the direct diagnosis method applied in the Ethiopian health system. The best diagnosis method for

Table 3. Prevalence of *S. mansoni* and geo-helminths in Northwest Ethiopia [n, %].

Result	Address						Total
	Asech	Cimida	Dire	Kava	Workmeda	Wobo	
Hookworm	23 (3.8)	25 (4.1)	16 (2.7)	48 (7.9)	8 (1.3)	13 (2.2)	133 (22)
A. lumbricoides	0 (0)	2 (0..3)	1 (0.2)	1 (0.2)	0 (0)	0 (0)	4 (0.7)
T. trichuria	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
S. mansoni	4 (0.7)	9 (1.5)	11 (1.8)	17 (2.8)	1 (0.2)	2 (0.3	44 (7.3)
Total positive	27 (4.50)	36 (6)	28 (4.6)	66 (10.9)	9 (1.5)	15 (2.5)	181(30)
Total cases	80 (13.3)	102 (16.9)	78 (12.9)	246 (40.7)	31 (5.1)	67 (11.1)	604

Table 4. Distribution of *S. mansoni* infection based on patients age, sex and address in Northwest Ethiopian [n, %].

Result	Total	Age			Sex		Address	
		6-9	10-14	15-18	M	F	Rural	Urban
Positive	44 (7.3)	9 (5.1)	26 (12)	9 (4.3)	28 (8.2)	16 (6.1)	34 (5.6)	10 (33.3)
Negative	560 (92.7)	168 (94.9)	190 (88)	202 (95,7)	314 (91.8)	246 (93.9)	540 (94.1)	20 (66.7)
Total	604	177 (29.3)	216 (35.8)	211 (34.9)	342 (56.6]	262 (43.4)	574 (95)	30 (5)
χ^2, P		10.527, 0.005			4.156, 0.028		0.708, 0.400	

S. mansoni is the Kato Katz test which is not used as a routine diagnosis method in Ethiopia (Endris et al., 2012). On the other hand, the prevalence of intestinal parasites in the present study may be attributable to walking on bare foot, unhygienic conditions, insufficient provision of safe water, in appropriate utilization of latrine, crossing the river when going to their field work and use river water for washing, swimming and playing. The magnitude of the problem emphasizes the need to take immediate intervention measures. Combined mass chemotherapy and focal snail control using primary health care systems may have an effect on the prevalence and intensity of parasitic infections in the study area.

The distribution of *S. mansoni* infection among age groups showed that there was high prevalence of *S. mansoni* (12%) in age groups 10 to 14. This study was in agreement with previous study reports (28.5%) in South West Ethiopia (Mengistu et al., 2007), 28.53% in North West Ethiopia (Zinaye et al., 2013), and 30.71% in Northern Ethiopia (Assefa et al., 2013) which showed high prevalence of *S. mansoni* in age group 10 to 14.

The prevalence of *S. mansoni* infection was high among males than females. A similar high prevalence of *S. mansonai* in males than females was reported previously in South West Ethiopia (Dejenie et al., 2008). This might be due to males are mostly engaged to mani-pulate the farming activity so that they might be exposed to river water in washing, crossing and swimming more frequently than females. In addition, there are two main rivers (Burabur and Asewe) which are used for a source of water in the study area. Males do not have any problem to swim and wash in these rivers, but females are culturally influenced by the community not to swim and to swim and wash in the rivers.

Among the geo-helminths, the prevalence of hookworm species (22%) was high in this study. Similar previous high hookworm species prevalence (25.2%) in Tanzania (mazingo et al., 2010) and 28.4% in Southern Ethiopia (Kloos et al., 1988) was reported. In contrast to this study, lower hookworm prevalence reports 12% in South Western Ethiopia (Awole et al., 2003) and 8.2% in North West Ethiopia (Endris et al., 2012).

Though, multiple infections were common in Ethiopia (Mengistu et al., 2007), only 1 to 2 species of parasites per individual were observed in this study and majority of the co-infections were between *S. mansoni* and hookworm species. Prevalence of co-infection of *S. mansoni* and hookworm (3.6%) in this study was in agreement with previous 7.4% in North Ethiopia (Kloos et al., 1988), and 74.6% in Eastern Uganda (Moira et al., 2012). This may be because of the higher prevalence of each parasites and/or their similar mode of transmission which favors dual infections and could also be the different stool examination method.

Conclusion

This study showed that high prevalence of hookworm species and *S. mansoni* were an important health prob-lem in Jawe Woreda North West Ethiopia. Factors such as low awareness of schistosomiasis, swimming, wa-shing, bathing and crossing the river water, and walking on bare foot might be associated risk factors for hook-worm species and *S. mansoni* infection in the study area. This calls for periodic deworming programme to reduce transmission, worm burden and morbidity. Deworming for both *S. mansoni* and STHs should be supplemented with improved sanitation and access to clean water, appropriate health education and environmental measures to have a lasting impact on transmission. The impact of each measure would be maximized through a health education program directed to school age children in particular, and to communities in general.

Conflict Interests

The authors declare that there is no conflict of interests regarding the publication of this article.

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