Prevalence of Intestinal Parasitic Infections and Associated Risk factors among School children in Adigrat town, Northern Ethiopia

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Abstract

Intestinal parasitic infections are among the major public health and socioeconomic problems in developing countries. A cross sectional parasitological examination was conducted on 309 school children to assess the prevalence of Intestinal parasitic infections and to explore the possible associated risk factors among school children in Adigrat town. Stool sample was collected and examined for Intestinal parasitic infections by formal ether concentration technique. Moreover, data on socio-demographic and sanitation factors were collected using questionaries and interviews. Out of the total examined children, 157(50.81%) were found to be infected with one or more intestinal parasites. Higher infection prevalence was in females (52.94%) than in males (49.13%). The highest prevalence was in children ages from 10 to 12 (54.8%) followed aged > 13 (52.94%) and 5 to 9 years old (47.8%), respectively. Frequently encountered parasites were A. lumbricoides (19.1%), Hook worm (10.03%), S. stercolaris (7.77%), E. hitolytica (4.5%), E. vermicularis, (3.56%), T.trichiura (3.24%) and Giardia lamblia (2.29%). Multiple logistic regressions revealed that not practice of fingernail trim; unprotected well water source and rural residence were independently associated with infection. Intestinal parasitic infections are prevalent among the school children in Adigrat town. Therefore, control measures including education on personal hygiene, environmental sanitation, water supply and treatment should be taken into account to reduce the prevalence of intestinal parasites in the study area.

Keywords: *Intestinal parasites, prevalence, risk factors, school children, Adigrat, Ethiopia.*

Introduction

Intestinal parasitic infections (IPI's) caused by pathogenic helminthic and protozoal species are endemic throughout the world [20]. They affect an estimated 3.5 billion persons and cause clinical morbidity in approximately 450 million [21, 20]. Developing countries are reported to be the most affected and within these, the majority of the cases occur among school aged children [19, 20]. The distribution of IPI depends on many factors. These include socio-demographic variables associated with poverty such as reduced access to adequate sanitation, potable water, and health care as well as the prevailing climatic and environmental conditions [19, 14]. The

economic burden caused by hookworm, roundworm and whipworm infections is high. This was recently estimated by Stephenson and colleagues [17] to cost 39.0 million disability-adjusted life years.

School age children are one of the groups at high-risk for intestinal parasitic infections. The adverse effects of intestinal parasites among school children are diverse and alarming. Intestinal parasitic infections have detrimental effects on the survival, appetite, growth and physical fitness, school attendance and cognitive performance of age children [7].

The global prevalence of the soil-transmitted helminthes is high. Recent estimates indicate that

approximately 1,472 million people have roundworm infection, 1298 million have hookworm infection, and 1049 million have whipworm infection [4, 21]. The global prevalence of intestinal infections caused by pathogenic protozoal species is also reported to be high. *Entamoeba histolytica,* the cause of amoebiasis, is estimated to inflict severe disease in 48 million individuals around the globe [15]. Infections caused by *Entamoeba histolytica* result in the deaths of 100,000 persons per year, second only to another protozoal infection, malaria [20]. The worldwide prevalence of giardiasis is suspected to be in the millions. Infection prevalence of intestinal parasites has been studied in different area of tropics and sub tropics showed that they are highly prevalent and have great impact on human health [12, 20]. Several studies were conducted on Intestinal parasitic infections in different community group such as pre-school children; school children and campus in different parts of Ethiopia, showed that these infections are widely distributed due to low level of food and drinking water that results from improper disposal of human excreta [12]. However, there are still several areas in which epidemiological information of intestinal parasitic infections is not well documented in Tigray region, particularly in eastern Tigray. Epidemiological information on the occurrence of IPIs and the associated risk factors is a pre- request to develop appropriate control strategies. Therefore, this study was aimed to assess the prevalence and associated risk factors of intestinal parasitic infections among school children in Adigrat town, northern Ethiopia.

2. Materials and Methods
2.1. Study area
The study was conducted in eastern zone of Tigray in Adigrat town. Adigrat town found in northern part of Ethiopia at 921km far from Addis Ababa, which is the capital city of Ethiopia and 115km from Mekele city of Tigray regional state. Adigrat town has altitude ranging from 200 -300 meters above sea level and also located at 014^0

16' 34''N latitude and 040^0 27' 5''E longitude. The annual rainfall of the area most of the time occurs from May-July. The major occupation of the inhabitants includes agriculture, civil services, business and daily labors. In the town there are about seven governmental and non Governmental primary schools with a total of 3,873 students. Out of these, two primary schools namely, Agazian and Genahti primary schools were purposely selected for the study.

2.2. Study design and study population
A cross- sectional parasitological study was conducted in school children of the selected schools who attend the class during sample collection from February to May 2015.

2.3. Sample size and sample collection
The sample size of the study was estimated using the technique described by [5].

$N = Z^2.P (1-p)/ D^2$, Where; N = minimum number of sample size, Z^2 = standard value, P = expected prevalence of intestinal parasitic infections in the study area and D = marginal error, at 95% confidence interval Z =1.96 and D = 5% since no report was recorded for infection prevalence of intestinal parasitic infections in the area, P =50%.

Accordingly, $N = (1.96)^2$ x 0.5 (1-0.5)/ $(0.05)^2$ = 384. However, 309 school children were taken as minimum sample size. To select the students, they were stratified according to their educational level. A quota was then allocated for each grade. Finally, the participating children were selected using random sampling technique using class roster as a sample frame.

2.4. Sample collection and Laboratory processing
A pre-tested questionnaire was developed and direct interview was administrated to the study children. The interview was incorporated information on socio-demographic and sanitation factors such as age, sex, source of drinking water, presence of latrine, eating uncooked foods, family

educatical level, family occupation, family size and residence. During the interview, interviewers were also inspected the foot wear and finger nails of the children. To ensure the reliability of the information, children were interviewed by their mother tongue (Tigrigna). After obtaining verbal consent, children who were volunteer to participate in the study was given a labeled stool cup with applicator stick to bring their fresh stool and the collected stool samples were preserved in 10% formalin solution and transported to Biology laboratory of Adigrat University. Stool examinations were conducted using formal ether concentration technique [7].

2.5. Data Analysis

Collected data was coded and stored in to Microsoft excel and analyzed by SPSS version 20. Univariate logistic regression analysis was used to assess the association between each risk factor and intestinal parasitic infections using chi square test. To determine the independent risk factors for infection, multiple logistic regression analysis was performed using adjusted odd ratio at 95% confidence interval. P-value of less than 0.05 was considered statistically significant.

2.6. Ethical Consideration

The study was approved by the department of Biology and official letter was submitted to the study school before the collection of required data to keep the confidentiality of the information regarding the studied population.

3. Results

3.1. Prevalence of Intestinal Parasitic Infection

From a total of 309 school children examined, 157 (50.81%) were found to be positive by various IPIs. The frequently encountered parasites included *A. lumbricoides* (19.1%), *Hook worm* (10.03%), *S. stercolaris* (7.77%), *E. hitolytica* (4.5%), *E. vermicularis,* (3.56%), *T.trichiura* (3.24%) and *Giardia lamblia* (2.29%) (Table 1). Infection prevalence of intestinal parasites with respect to sex shows that higher infection

prevalence was in females (52.94%) than males (49.13%) (X^2 = 10.98, P = 0.202) (Table 1). Infection prevalence of IPs with respect to age group revealed that the highest prevalence (54.8%) was in children with ages ranging from 10 to 12 years followed by children with aged more than > 13 and 5 to 9 years 52.94 and 47.8%, respectively (x^2 = 12.984, p =0.678) (Table 2).

3.2. Associated risk factors for Intestinal Parasitic infection

According to the univariate logistic regression practice of fingernails trim, foot wearing, water source, and residence of the study subjects were significantly associated with IPIs. However, sex, age, family level of education, family occupation, presence of latrine, eating of raw vegetables and family size were not significantly associated with the infection (p > 0.05). Factors including not practice of fingernail trim, unprotected well water source and living in rural area were independently associated with IPIs (Table 3).

Although there was no statistically significant association between IPIs and sex but females was more infected than males. Children ages ranging from 10 to 12 years were more infected than the other age groups. Children who not trim their finger nails were more infected than those who trim their finger nails (AOR 0.339; 95% CI 0.046-2.481, P = 0.043) and children who use water source from um protected well were more infected than those who use pipe water (AOR 0.623; 95% CI 0.781- 0.536, P = 0.000). Similarly children those who are from rural area were also more infected those who live urban (AOR 0.048; 95% CI 0.001-1.828, p = 0.025).

Table 1: Prevalence of intestinal parasitic infection among school children in Adigrat town

Parasites	Male N = 173 Positive N (%)	Female (N = 136) Positive N (%)	Total N= 309 Positive N (%)	Chi square
A .lumbricoides	28(16.2)	31(22.8)	59(19.1)	
Hook worm	18(10.4)	14(10.3)	32(10.36)	
S. stercoralis	16(9.25)	8(5.9)	24(7.77)	$X^2 = 10.987$
E. histolytica	4 (2.31)	10(7.35)	14(4.5)	$P = 0.202$
E.vermicularis	8 (4.62)	3(2.2)	11(3.56)	
T.trichiura	7(4.05)	3(2.2)	10(3.24)	
Giardia lamblia	4(2.31)	3(2.2)	7(2.29)	
Total	85(49.13)	72(52.94)	157(50.81)	

Table 2: Prevalence of intestinal parasitic infection according to age group in Adigrat town

Age	Number of examined	Positive (%)	Negative (%)	X^2
5 - 9	157	75 (47.8)	82 (52.2)	$X^2 = 12.984$
10 -12	84	46 (54.8)	38 (45.2)	$P = 0.678$
> 13	68	36 (52.94)	32 (47.06)	
Total	309	157 (50.81)	152(49.19)	

Table 3: Multiple logistic regression analysis for risk factors independently associated with infections in schoolchildren in Adigrat Town

Risk factors	Adjusted OR (95% CI)	P-value
Practice of fingernail trim		
No	0.339(0.046-2.481)	0.043
Yes	-	-
Water source		
Pipe	-	-
Well	0.623(0.781-0.536)	0.000
Residence		
Rural	0.048 (0.001-1.828)	0.025
Urban	-	-

(Note: AOR: adjusted odd ratio,   CI: 95 % confidence interval)

4. Discussion

The observed prevalence of intestinal parasites of 157 (50.81%) was relatively in agreement with the study conducted by [18] (39.9%) in Gamo area, south Ethiopia. It was lower as compared with reports of other similar studies, 79.9% in North Gondar [3], 91.2% in Jimma [1] and 63.8% in Egypt [8]. On the other hand, it was higher than a study conducted in Babile (27.2%) [10], in Gorgora, North west Ethiopia (36.8%) [22] and in Gondar (34.2%) [2].

According to the present study, the most frequently encountered parasite was *A. lumbricoide* (19.1%). This prevalence was in consistent with the prevalence reported in Jimma (15%) [1]. However, it was higher than study conducted in Babile [10], 3.9 %, in Gondar [2], 5.9%, in Gamo area [18], 7.8% and in India [16], (3.4%) and lower than with the study conducted in

Gondar by [3] (48%) and in northern Ethiopia [6] which is (83.4%).

The prevalence of hookworm infection in this study was 10.36%. This prevalence is higher than the previous study in Gamo area and Gondar [18] and [2] recorded as 4.9 and 2 % prevalence, respectively. However, the present findings on prevalence of *S. stercoralis*, *E.vermicularis* and *T.trachura* were not much different from the findings of previous studies reported [3] and [9]. On the other hand, the present study showed that the prevalence rate of the remaining IPIs varies in some areas and also comparable in other study areas. The differences in prevalence rate between the study areas might be due to cultural practice, living standard and category of the study population, environmental condition, personal hygiene and period of study.

In present study, significant sex related difference in infection prevalence of intestinal parasite was

not observed but females were more vulnerable than males. This is in agreement with previous report by [18] in Gamo area, southern Ethiopia. However, other authors indicated that males were more infected than females [15, 10, 3, 8 and 11]. This difference might be due to the fact that females are mostly participated in domesticate sanitation and other activities that causing them vulnerable to the infection of intestinal parasites than males.

In this study, the highest infection prevalence was examined in children age ranging from 10 to 12 years. This is inconsistent with previously conducted study by [10] from Babile, [1] from Jimma, [2] from Gondar and [9] also from Egypt. However, other investigator reported that the highest infection was in children aged greater than 13 years old [11]. In this study family level of education, family occupation, family size, presence of latrine and eating of uncooked vegetables were not significantly associated with intestinal parasitic infections. However, according to the study conducted by [6] and [3], family level of education, family occupation and eating of raw vegetables were strongly associated with infections. This is more likely that parents of children at high level of education provide better sanitation condition for their children than low educational level parents, due to low knowledge of children about the feco-oral transmission of intestinal parasite through their unwashed hands and the contamination of vegetables with fecal materials in the farm.

One of the factors strongly associated with intestinal parasite infection in this study was living in the rural areas. This might be due to poor environmental sanitation and personal hygiene. Significantly higher prevalence of intestinal parasitic infections was found among children who were not practice in fingernail trim compared to those who trimmed their finger nails. This finding is similar with the result of [13]. This is probably due to low knowledge of children about the feco-oral transmission of intestinal parasite through their untrimmed finger nails. The present study also found that using water from unprotected well was considered as risk factors for infections in children. This is in consistent with a study conducted in Gondar[3]. This may arise from the contamination of water with animals and human waste that flooding in to the unprotected well.

5. Conclusion and Recommendation

Intestinal parasitic infections were highly prevalent and important health problem among school children in Adigrat town. *A. lumbricoides* and *Hook worm* were the most frequently encountered parasites. In this study, practice of fingernail trim, unprotected well water source and living in rural area were not independently associated with intestinal parasitic infections. Therefore, control measures including education on personal hygiene and environmental sanitation, water supply and continuous treatment should be taken into account to reduce the incidence of the infection in the study area.

References

1. Alemeshet Y., Yoseph M., Seleshi K., 2011. Prevalence and predictors of intestinal helminthiasis among school children in jimma zone; a cross-sectional study. Ethiop J Health Sci., 21(3): 167 -174.

2. Aschalew G., Belay, A. Bethel N., Betrearon S., Atnad Y. Meseret A., Mengistu E., and Baye G. 2013. Prevalence of intestinal parasitic infections and risk factors among schoolchildren at the University of Gondar Community School, Northwest Ethiopia: a cross-sect-ional study. BMC Public Health , 13:304

3. Asrat A. Tewodros D and Alemayehu W. 2011. Prevalence and risk factors of intestinal parasites among Delgi school children, North Gondar, Ethiopia. Journal of Parasitology and Vector Biology,. 3(5): 75-81.

4. Crompton D. 1999. How much Human helminthesis is there in the world? Journal of paarsitology. 85: 397-403.

5. Daniel W. 1995. Biostastics a foundation for analysis in health scince. Thon willey and sonsinic.., New York, USA.

6. Erko B. Medhin G. 2003. Human helmenhasis in wodogenet, southern Ethiopia, with emphasis on geohelmethasis, Ethiop MED J: 41:333-44.

7. Gad YZ, Ahmad NA, El-Desoky I, Arafa MM, Farag RE, 2011: Colorectalschistosomiasis: Is it still endemicin delta Egypt, early in the third millennium. Trop. Parasitol. 1, 2:108-10.

8. Gehad E and Mostafa M. 2013. Risk factors associated with intestinal parasitic infections among children. Journal of the Egyptian society of parasitology, .43 (1): 287-294.

9. Girum T. 2005. .Prevalence of intestinal helmets and associated risk factors among school children eastern Ethiopia, Ethiop. J. health dev; 19(2).

10. Laura M., Federica B., David D. Lucia E., Gioia C., Domenico O. and Annunziata G. 2012. Intestinal parasite infections in imm-zigrant children in the city of Rome, related risk factors and possible impact on nutritional status. Parasites & Vectors, 5:265.

11. Leykun J. 2001. Soil transmitted helmith infection and *S.mansoni* in school children from Chilga district, Northwest Ethiopa. Ethiopian Journal of Health Science, 11: 79-87.

12. Montresor A. Crompton D. Gyorkos T, and Savioli L. 2002. Healmenth control in school age children.A guide for managers of control programs. Geneva, WHO.

13. Montresor A., Crompton D. Hall A. Bundy D and Savoli L. 1998. Guidelines for the evaluation of STH and schistosmiasis at community level. Geneva, WHO/CTD/-SIP/98.1

14. Petri W. and Singh U. 1999. Diagnosis and Management of Amoebiasis. Clinical infectious disease 29: 1117-25.

15. Sehgal G. Reddy J. Verweij A., Subba R. 2010. Prevalence of intestinal parasitic infections among school children and pregnant women in a low socio-economic area, chandigarh, north india. rif 1(2):100-103

16. Stephenson l., Latham M and Ottesen E. 2000. Malnutrition and parasitic helmintheic infections. Parsitology, 121: 23-38.

17. Teklu W. Tsegaye T. Belete S. Takele T. 2013. Prevalence of intestinal parasitic infections among highland and lowland dwellers in Gamo area, South Ethiopia, BMC Public Health 13:151.

18. WHO, 1996. Health surveillance and management procedures of food handling personnel, Geneva, p7-36.

19. WHO, 2002. Expert committee, prevention and control of schistosomasis and soil transmitted helmenthasis, WHO, technical report series. 912:1-57.

20. WHO, 1999. Monitoring Helminth Control programm (WHO/CDC/SIP/99.3).WHO. Geneva.

21. WHO, 1997. Prevention and control of intestinal diseases.

22. Zinaye T, Yeshambel B., Amare G., Beyene M., Meseret W., Genet A., Misganaw M., and Afework K. (2005). Epidomology of intestinal schistosomasis and soil transmitted helmenthsis among school children in Gorgora, North west Ethiopia. Asian pac J. Trop, 3(1):61-64.