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Full Length Research Paper

Danger elements and pervasiveness of intestinal parasites among school kids in Delgi, Ethiopia

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Epidemiological data on the commonness of different intestinal parasitic diseases and ID of neighborhood danger calculates in diverse districts/areas is an essential to create proper control procedures. Thus the point of this study was to focus the predominance of intestinal parasites and danger elements among school youngsters. A cross sectional study including 704 school kids was led from 27 September to 6 December, 2010. Organized poll were utilized to distinguish natural, socio demographic and behavioral components. Stool examples were gathered from all study subjects and inspected for parasites utilizing immediate smear and formolether fixation strategy. At last, information passage and examination was carried out utilizing Epi-insight and SPSS factual delicate product individually. Ten types of intestinal parasites were related to a general predominance of 79.8% (562 of 704 kids). The most predominant intestinal parasites distinguished were Ascaris lumbricoides 338 (48%), Giardia lamblia 295 (41.9%), Entamoeba histolytica/dispar 192 (27.3%), Schistosoma mansoni 112 (15.9%), Hookworm 81(11.5%). Of the aggregate positive feces tests 96 (13.6%) were single disease and 466 (66.2%) were blended contamination, from this blended diseases lion's share of the youngsters had twofold contamination 309 (43.9%). Intestinal parasite predominance was higher in kids with less instructed mother, in youngsters who have propensity for consuming crude/ unwashed vegetables, drinking unprotected well/spring water and who don't have hand washing practice before dinner (P< 0.05). Taking everything into account, Intestinal parasite contamination is a wellbeing issue among Delgi school youngsters. Thusly, intercessions including change of sanitation, procurement of safe water, and wellbeing instruction on individual cleanliness to the understudies and to their guardians ought to be given.

Key words: Intestinal parasites, Delgi school children, Ethiopia, schistosoma mansoni, entamoeba.

INTRODUCTION

Intestinal parasitic infections are among the most common infections worldwide. It is estimated that 3.5 billion people are affected, and 450 million are ill as a result of these infections, the majority being children (WHO, 1998). Epidemiological studies carried out indifferent countries have shown that the situation of an individual is an important cause in the prevalence of intestinal parasitic infection, having a greater rate in children (Udonsi and Amabibi, 1992; Nokes et al., 1992). Inadequate water sanitation and hygiene are responsible for a major proportion of the burden of disease and death in developing countries (Merid et al., 2001). In addition, intestinal parasitic agents increase in polluted environments such as refuse heaps, gutters and swage units in and around human dwelling and living conditions of the people in crowded or unhealthy situations (Phiri et al., 2000).

The level of harm caused by intestinal parasite infection to the health of individual and communities depend on: the parasite species, the nature of the interaction between the parasite and the concurrent infections, the

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intensity and course of infection and nutritional and immunological status of the population (WHO, 1987; Hadidjaja et al., 1998). The common consequences of intestinal parasitic infections have been shown to affect nutritional status, physical development, mental function, verbal ability and cognitive behavior in children (Stephenson et al., 1993; Nokes and Bundy, 1994; Hadidjaja et al., 1998). Similarly, the distribution and prevalence of various species of intestinal parasites also differs from region to region because of several environmental, social and geographical factors. Hence, study on the prevalence of various intestinal parasitic infections is a prerequisite not only for formulation of appropriate control strategies but also to predict risk for communities under consideration.

In Ethiopia intestinal parasitosis is prevalent because of low level of living standards, poor environmental sanitation and ignorance of simple health promoting factors (Wolde-michael et al., 1990; Kloos and Tesfa-Yohannes, 1993; Yeneneh, 1994). But there are still several localities for which epidemiological information is not available including the study area. Therefore, the objective of the present study was to determine the prevalence and risk factors of intestinal parasitic infections among school children in Delgi elementary and junior secondary school.

MATERIALS AND METHODS

Study area and population

This study was conducted in Delgi elementary and Junior Secondary School, Delgi town; located in North-West of Gondar city; North Ethiopia. The town Delgi is located 824 km from the capital city Addis Ababa and surrounded by Lake Tana margin with an altitude of 2100 m above sea level and an average temperature of 25 to 28°C. The area is predominately rural and most residents live in villages as agriculturists growing maize, teff (Eragrostos tef) and pepper. The total population of the study area is approximately 16319 with the majority Amahara ethnic group (DMR, 2009).

Study design and sampling procedures

Cross-sectional study design was conducted from 27 September to 6 December, 2010 at Delgi town. The sample size was determined using the single proportion population formula, since the overall prevalence rate (P) of intestinal parasite is not known in the study area; (p) was taken as 50%. For the calculation a 95% confidence interval (z) and a 5% margin of error (d) and design effect of 2 was used to allow for cluster sampling. The calculated study population size was 704 including ten percent of the sample size to minimize errors arising from the likely hood of non compliance. Cluster sampling was used in the selection of the study sample. From 1888 students in the school (grade 1 to grade 8), there were a total number of thirty sections; grade 1 to 4 two sections each, grade 6 and 8 five sections each and grade 5 and 7 six sections each, with an average number of 60 students in each section. From these total thirty sections, twelve clusters (sections) were selected randomly to get the required amount of sample size (n=704), accordingly from grade 1 to 4 one section each and from grade 5 to 8 two sections each were totally included in the study.

Data collection procedure and specimen analysis

A pre-tested questionnaire based on known risk factors was developed and modified (The questions are listed on Table 2). Data were collected by laboratory technicians who were selected and trained for the purpose. To ensure reliable information, the children were interviewed in their mother tongues. The interview included information on socio demographic data, environmental and behavioral factors. At the time of conversation, interviewers also inspected whether the fingernails of the students were trimmed and their foot wear. After checking the completion of the questioners, proper stool samples were taken with labeled clean plastic container, toilet tissue paper, pieces of applicator sticks from all students. As soon as the stool samples presented all specimens were checked for their label, quantity, time, procedure of collection and stool examinations were done by laboratory technologists using direct technique (saline and iodine mounts) and formol-ether concentration technique to identify and detect each stage of intestinal parasites in less than 20 min of stool sample collection. After completion of stool examination, samples were emulsified in a 10% formalin solution and 20% of stool samples were randomly selected and transported to University of Gondar Parasitological laboratory and rechecked blindly to assure the quality control.

Data analysis procedures

Data entry and analysis was done using Epi-info version 3.5.1 and SPSS version 15 computer software respectively. The base line characteristics of the study population were summarized using medians and ranges for continuous variables, simultaneously proportions and frequencies for categorical variables. Internal comparison was made using logistic regression to determine the independent effect of the variables by calculating the strength of the association between infection and risk factors using odds ratio (OR) and 95% confidence interval (CI). Crude and adjusted OR were computed using bivariate and multivariate logistic regression analysis respectively. P value less than 0.05 (5%) was considered statistically significant.

Ethical consideration

The study was approved by the Ethics Committees of Addis Continental Institute of Public Health (ACIPH) and University of Gondar. Participation was fully voluntary and informed written consent was obtained from each study subject. For those children whose age was under fifteen years or unable to understand the purpose of the study written consent was obtained from their family through school director. Finally appropriate treatment was given to those students who were positive for intestinal parasitic infection by local nurses.

RESULTS

Prevalence of intestinal parasites

A total of 704 students took part in the study and were included in the present analysis. Of these, 358 (50.9%) were male and 346 (49.1%) female. The mean age of the

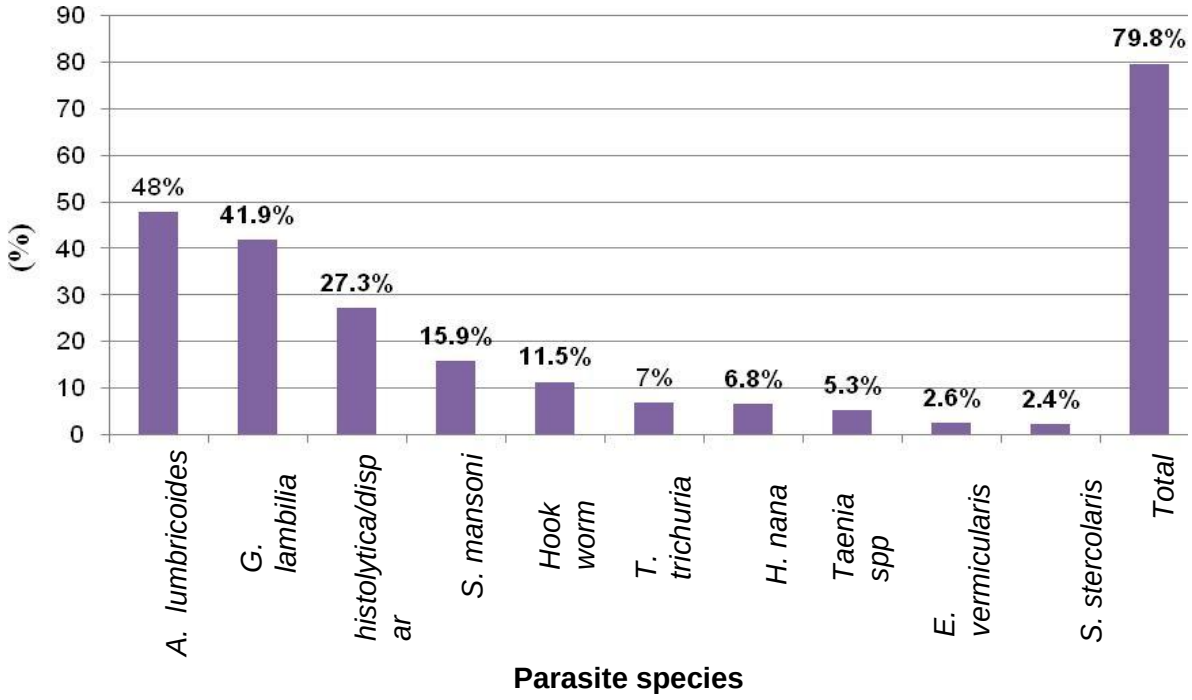

Figure 1. Prevalence of each intestinal parasite based on wet mount and formol-ether concentration technique among Delgi school children, September to December 2010.

Table 1. Prevalence of single and mixed intestinal parasite infection among Delgi school children, September to December, 2010.

Type of infection	Total frequency n (%)	Most prevalent intestinal parasite species in each type of infection	
		Species	Total frequency n (%)
Single infection	96(13.6)	G.l	44(6.3)
Double infection	309(43.9)	A.l + G.l	99(14.1)
Triple infection	155(22.3)	A.l + S.m + E.m	28(4)
Quadruple infection	2(0.3)	A.l + S.m + E.m + Hw	2(0.3)

G.l*=*G. lamblia*; A.l*=*A. lumbricoids*; E.h*=*E. histolytica/dipar*; H.w*=Hookworm; S.m*=*S. mansoni.*

study subject was 12.8 years with a minimum and maximum age of 7 and 25 years respectively. Majority of the study subjects were reside in urban 441(62.6%). Most of the students mothers' were illiterate 395 (56.1%), primary school 195 (27.3%), secondary and above 114 (16.2%). Majority of students were grade 5 to 8, 480 (68.2%).

Microscopic stool sample examination using wet mount and formol-ether concentration technique showed that infections with various intestinal helminthes and protozoan parasites were common in Delgi school children. Out of the 704 school children examined, ten species of intestinal parasites were identified with an overall prevalence of 562 (79.8%). The most prevalent intestinal parasites identified were *A. lumbricoides* 338 (48%), *G. lambilia* 295 (41.9%), *E. histolytica/dispar* 192(27.3%), *S. mansoni* 112(15.9%), Hookworm 81(11.5). The prevalence of *A. lumbricoides* was the highest compared with other parasite species (Figure 1).

Of the total 562 (79.8%) positive individuals 96 (13.6%) were single infection and 466 (66.2%) were mixed infection; from this mixed infection the majority of the students had double infection 309 (43.9%) (Table 1).

Analysis of risk factors

Among the potential risk factors explored using univariate analysis, mothers'educational level, hand washing practice before meal, habit of eating raw/ unwashed vegetables, water source for drinking, open field defacation and finger nail condition had statistically

Table 2. Bivariate logistic regression analysis for factors potentially associated with Intestinal parasite infection among Delgi school children, September to December 2010.

Risk factors	Intestinal parasites		Crude OR (95% CI)
	Total positive n (%)	Total negative n (%)	
Sex			
Male	290(51.6)	68(47.9)	1.16(0.80,1.68)
Female	272(48.4)	74(52.1)	1.00
Age group in years			
5 to 9	127(26.6)	23(16.2)	1.05(0.57,1.93)
10 to 14	298(53.0)	93(65.5)	0.61(0.38,0.98)
15^{+}	137(24.4)	26(18.3)	1.00
Grade level			
1 to 4	183(32.6)	41(28.9)	1.19(0.79,1.78)
5 to 8	379(67.4)	101(71.1)	1.00
Residence			
Urban	358(63.7)	83(58.5)	1.25(0.86,1.82)
Rural	204(36.3)	59(41.5)	1.00
Mother educational status			
Illiterate	325(57.8)	70(49.3)	2.06(1.28,3.31)
Primary school	158(28.1)	37(26.1)	1.89(1.11, 3.23)
Secondary school and above	79(14.1)	35(34.6)	1.00
Hand washing before eating			
Yes	261(46.4)	110(77.5)	1.00
No	301(53.6)	32(22.5)	3.96 (2.59,6.08)
Practice of eating raw/ unwashed vegetables			
Yes			
No	438(77.9)	67(47.2)	3.95 (2.69,5.81)
	124(21.1)	75(52.8)	1.00
Water source for drinking			
Pipe	315(56.0)	110(77.5)	1.00
River	135(24.0)	21(14.8)	2.25(1.35,1.73)
Unprotected well /Spring	112(19.9)	11(7.7%)	3.54(1.85,6.85)
Open field Defecation			
Yes	97(17.3)	8(5.6)	3.49 (1.65,7.37)
No	465(82.7)	134(94.4)	1.00
Practice of fingernail trim			
Yes	431(76.7)	125(88.0)	1.00
No	131(23.3)	17(12.0)	2.24(1.30,3.85)

significant association to any intestinal parasite infections identified in the study (Table 2).

Multivariate analysis was performed for all variables that were significantly associated with any intestinal parasite infection from univariate analysis. After adjustment, open field defecation and finger nail

Table 3. Bivariate and multivariate logistic regression analysis for factors potentially associated with Intestinal parasite infection among Delgi school children September to December 2010.

Risk factors	Intestinal parasites		Adjusted OR (95% CI)
	Total positive n (%)	Total negative n (%)	
Mother educational status			
Illiterate	325(57.8)	70(49.3)	2.14(1.27,3.63)
Primary school	158(28.1)	37(26.1)	1.85(1.03,3.35)
Secondary school and above	79(14.1)	35(34.6)	1.00
Hand washing before eating			
Yes	261(46.4)	110(77.5)	1.00
No	301(53.6)	32(22.5)	3.88 (2.46,6.08)
Eating practice of raw/ unwashed vegetables			
Yes	438(77.9)	67(47.2)	3.62(2.40,5.45)
No	124(21.1)	75(52.8)	1.00
Water source for drinking			
Pipe	315(56.0)	110(77.5)	1.00
River	135(24.0)	21(14.8)	1.86(1.08,3.20)
Unprotected well/spring	112(19.9)	11(7.7)	3.42(1.71,6.83)

condition were excluded from the model (P>0.05). All other variables remained significant positive association with any intestinal parasite infection; these include children who have illiterate mothers (Odds Ratio 2.14; 95% CI 1.27 to 3.63) and primary school (Odds Ratio 1.85; 95%CI 1.03 to 3.35) were more likely to acquire intestinal parasite infection than secondary school and above. In addition, children who did not wash their hands before eating (Odds Ratio 3.88; 95% CI 2.46 to 6.08) were more likely to acquire intestinal parasite infection than children who wash their hands before meal. Similarly, children who had habit of eating raw/unwashed vegetables (Odds Ratio 3.62 95% CI 2.40 to 5.45) were more likely to acquire intestinal parasite infection. Students who drink unprotected well/spring water (Odds Ratio 3.42; 95 CI 1.71 to 6.83) and who drink river water (Odds Ratio; 1.86; 95% CI 1.08 to 3.20) were more likely to acquire intestinal parasite infection as compared to those who drink pipe water (Table 3).

DISCUSSION

Epidemiological studies carried out indifferent countries have shown that the situation of an individual is an important cause in the prevalence of intestinal parasitic infection, having a greater rate in children. In line with this view, the present study attempted to assess the prevalence of different intestinal parasitic infections and associated risk factors in school children of Delgi, North Gondar. In this study, the observed overall prevalence rate of intestinal parasite was found to be (79.8%) relatively higher than previously reported among different regions in Ethiopia, (Jemaneh, 1997; Assefa et al., 1998; Jemaneh, 2000; Tadesse, 2005) and other countries (Magambo et al., 1998; Glickman et al., 1999; Chandrasekhar and Nagesha, 2003; Pinar et al., 2004; Ahsan et al., 2005; Agbolade et al., 2007; Evi et al., 2007). This high prevalence could be due to the place and living standard of study subjects or due to a reflection of the local endemicity and geographic condition of the study area. This is almost similar to the study done around Lake Langano 83.8% (Legesse and Erko, 2004). In contrast to Seychelles, north Madagascar 94.4% (Albonico et al., 1996) the prevalence of present study was very low.

In the current study, the prevalence rate of *A. lumbricoides* (48%) was found to be higher than studies conducted in Ethiopia around lake Langano (6.2%), Dembia plains (41.3%), South Wollo (18.3%), North Gondar Dembia District (34.4%) and Adarkay (43%) (Melakebirhan et al., 1995; Jemaneh, 1997; 1998; Assefa et al., 1998; Legesse and Erko, 2004) and other countries Pakistan (4%), Cote d'Ivoire (10.8%) and Guinea (18.9%) (Glickman et al., 1999; Ahsan et al., 2005; Agbolade et al., 2007). Environmental sanitation and personal hygiene of study subjects probably play an important role for the higher prevalence rate of Ascariasis. In contrast, lower in the studies conducted in Nigeria (53.4%) and south Ethiopia Wondo Genet (84.3%) (Erko and Medhin, 2003;

Agbolade et al., 2007).

The second and third most prevalent intestinal parasites in this study were *G. lamblia* (41.9%) and *E. histolytica/dispar* (27.3%) respectively. This rate falls just above the upper range for nationwide prevalence rate of amoebiasis and giardiasis (Tesfa-Yohannes and Kloos, 1988). This could be due to the study season, poor environmental sanitation, water source of the study subjects and the favorable environmental condition of the study area for the multiplication of these parasites. However, which need further investigation.

In the present study the prevalence rate of *S. mansoni* (15.9%) was higher than compared to the previous study done in Babile 4.3%, Dembia district 5.2% (Jemaneh, 1998; Tadesse, 2005). The reason could be due to the place of the study subjects, which were found near shore of Lake Tana and the behavioral factors of the study subjects (such as frequent contact, drinking and swimming) in the lake. In contrast, much lower in the studies conducted in other areas of the country (Jemaneh, 1997; 1998; Assefa et al., 1998; Tiruneh et al., 2001; Legesse and Erko, 2004). However, it was comparable to the study done in south Gondar (14.6%) (Jemaneh, 2000).

On the other hand, the present study showed that the prevalence rate of the remaining intestinal parasite infection varies in some areas and also comparable in other study areas. The differences in prevalence rate between the study areas might be due to culture, practice, living standard and category of the study population in addition to the period of study and the methods employed for stool examination. In localities where numerous kinds of intestinal parasites found, multiple infection was frequently encountered. In this study single, double, triple and quadruple infection (13.6, 43.9, 22 and 0.3%) were respectively observed. The most frequent mixed infections in some areas were infections which involve *A. lumbricoids*, *T. trichuria* and Hookworm (Chandrasekhar and Nagesha, 2003; Agbolade et al., 2007; Evi et al., 2007). In contrast, *A. lumbricoids* and *G. lambilia* tends to appear the most frequent intestinal parasites in this study. This is probably due to environmental conditions that was favorable for the two parasites live together or the occurrence of high prevalence of the two parasites in the study area.

The present study also assessed the possible association of intestinal parasite infection with potential risk factors among school children. Several recent studies have identified a range of environmental, behavioral and social risk factors associated with intestinal parasite infections (Tesfa-Yohnnes and Kloos, 1988; Erko et al., 1995; Wördemann et al., 2006).

However, very few were significantly associated in this study making it comparable to earlier studies in Ethiopia and other less developed countries. One of the factors strongly associated with intestinal parasite infection in this study was low educational level of children mothers'. This finding is similar with the results of other study (Pinar et al., 2004; Wördemann et al., 2006). 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. Significantly higher prevalence of intestinal parasite infection also found among subjects who were not washed their hands before meal compared to those who were washed their hands regularly. This is probably due to low knowledge of children about the feco-oral transmission of intestinal parasite through their unwashed hands. The other factor that exposed children for intestinal parasite infection identified in this study was eating of unwashed /uncooked vegetables. The reason might be due to the contamination of vegetables with fecal materials in the farm. Similar findings also found in other studies growing of vegetables in faecally-polluted gardens were all found to be conducive for transmission of geohelminthes and intestinal protozoa (Erko et al., 1995).

The present study also found that using water from a river and unprotected well/spring were risk factors for intestinal parasite infection in children. This may arise from the contamination of water with animals and human waste that flooding in to the river or unprotected spring. However, other unknown factors may contribute to the increased risk associated with river/spring water and merit further investigation.

Conclusion

Intestinal parasitic infection was highly prevalent and important health problem among Delgi School children. Therefore, an intervention strategy should be designed and implemented including provision of adequate and safe water supply, regular deworming and health education on personal hygiene to the students and to the parents.

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