

## Full Length Research Paper

# Intestinal parasitosis in school age children in Lalitpur District of Nepal

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Enteric parasites are the most common cause of parasitic diseases, and they cause significant morbidity and mortality, particularly in developing countries like Nepal. This study was conducted to estimate the intestinal parasitic infestations among school children in Lalitpur district of Nepal. A total of 1392 stool samples were collected from school children selected from two governments, two private, one community and one slum school from the same district. The stool samples were examined for evidence of parasitic infections by direct microscopic examination and further confirmed by concentration and flotation methods, for the coccidian parasite modified ZN staining was performed. Prevalence of intestinal parasites was 16.7%. The highest prevalence was seen with *Giardia lamblia* (7.4%) followed by *Entamoeba histolytica* (3.4%) and *Cyclospora cayentensis* (1.7%). Highest number was seen in male child (17.8%) and the highest prevalence of parasites were seen in age between 11 to 15 years that is, 7.3%, whereas highest prevalence was seen in government school (12.2%). The results designated that intestinal parasitic infestation among school children in the study area is mainly water-borne. The burden of parasitic infestations among the school children, coupled with the poor sanitary conditions in the schools, should be regarded as an issue of public health priority.

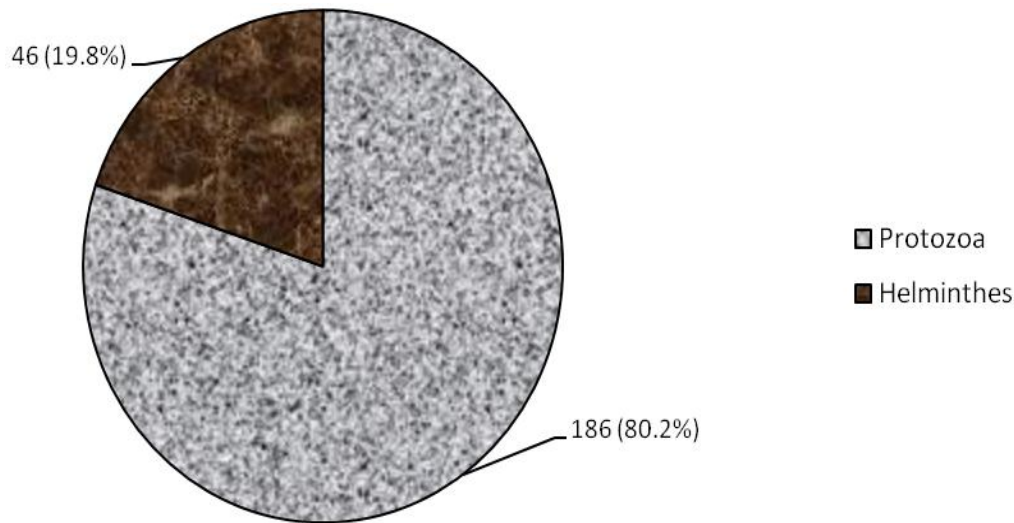
**Key words:** *Entamoeba histolytica*, *Giardia lamblia*, Intestinal parasite, Nepal, school children.

## INTRODUCTION

Intestinal parasitic infection is a serious public health problem throughout the world particularly in developing countries (World Health Report, 2000). Intestinal parasitosis was estimated to affect around 3.5 billion people globally and 450 million were ill due to parasitic infection (Chandrashekhar et al., 2005). It is common, particularly in developing countries, and continues to be a major cause of morbidity and mortality and was most common in school-going children, street children, farmers and their children due to use of contaminated drinking water, inadequate sanitary conditions and poor personal hygiene (Rai et al., 1994; Estevez et al., 1993; Yong et al., 2000; Rai et al., 1995; Sharma et al., 2004; Pokhrel and Viraraghavan, 2004; Sherchand et al., 1996).

In Nepal, over 70% of morbidity and mortality are associated with infectious diseases and is also reflected in the "top ten diseases" of Nepal (Rai et al., 2008). Diarrhea is produced by a variety of etiological agents. Of them, intestinal parasitic infection alone contributes to a great extent in the cause of diarrhea and intestinal parasitosis and is one of the most common public health problems in Nepal (Rai et al., 1998). A total of 81.94% of the children were found infested with parasites that was collected from 515 healthy urban and rural school children of Lalitpur district in the age group between 7 to 12 years (Shrestha, 2001). The common intestinal helminths reported from Nepalese children are *Ascaris lumbricoides* (Rai et al., 2008; Marothi and Singh, 2011), hookworm, and *Trichuris trichiura* (Thapamagar et al., 2011), with manifestations as varied as malnutrition, iron deficiency anemia, mal-absorption syndrome, intestinal obstruction, and mental and physical growth retardation.

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**Figure 1.** Distribution of Protozoal and Helminthic parasites.

Enteric protozoan parasites contribute significantly to the cause of traveler’s diarrhea, which affects 20 to 50% of people from developed countries visiting developing countries (Lima, 2001).

**METHODS**

A cross-sectional study was conducted in periods between July to December 2011. A total of 10392 samples were collected from the children of six different schools of Lalitpur district of Nepal. Informed consent was taken from the parents of all children. Ethical clearance was taken from Institutional Review Board (IRB) of Institute of Medicine, Tribhuvan University Teaching Hospital, Kathmandu, Nepal. A short questionnaire was designed which included, a) socio-demographic data: address, age, gender, socio-economic status b) behavioral data: hand washing habits and types of drinking water c) participant’s present medical history: any complaints of abdominal pain/discomfort, nausea, vomiting.

Each participant was provided with a standard stool collection container labeled with the participant’s code. Instructions were given to the participant and the parents for the collection of stool sample. Collected stools were examined for the presence of parasites macroscopically and microscopically at Public Health Research Laboratory, Institute of Medicine, Kathmandu, Nepal. Microscopic examination was carried out by direct wet mount using normal saline (0.85%), five times diluted Lugol’s iodine. Concentrations of samples were carried out by formal-ether sedimentation technique and floatation technique by using Sheather’s sugar solution for coccidian parasites. For coccidian parasites smear

was also prepared for the modified Kinyoun’s acid-fast staining (John and Petri, 2006).

**Data analysis**

Statistical analysis was performed using Epi-Info and SPSS-11.5 version. Association of demography, personal habits and symptoms were assessed by using the Chi-square test. P values < 0.05 were considered statistically significant.

**RESULTS**

A total of 1392 children belonging to six schools were enrolled in the study. Among the total enrolled cases of 1392, 732 were male children and 660 were female children with male to female ratio of 1.1:1. Out of 732 male cases, 130 (17.8%) were found to be infested with enteroparasites while out of 660 female cases, 102 (15.5%) were found to be infested with enteroparasites (P<0.05). Of the total 232 positive cases, Protozoal parasites were found in 186 (80.2%) of cases and Helminthic parasites were found in 46 (19.8%) of cases with prevalence of Protozoal parasites to be 13.4% and that of Helminthic parasites to be 3.3% (Figure 1).

Of 1392 samples, 464 samples belonged to each of less than 5 years, 5 to 10 years and 11 to 15 years of age. The age group of 11to 15 years was found to be highly infected age group with 102 (21.98%) positive cases with prevalence of 7.3% (Table 1).

Out of total samples, 450 samples belonged to Private school, 475 samples belonged to Government school and 467 samples belonged to slum school. The highest cases of 170 (35.8%) were found to be infested with

**Table 1.** Age wise distribution of different entero-parasites.

Frequency of Intestinal parasites	Less than 5 years (total cases=464)	5-10 years (total cases=464)	11-15 years (total cases= 464)	Total
<i>G.lamblia</i>	20	42	41	103
<i>E. histolytica</i>	6	14	27	47
<i>Cyclospora cayetanensis</i>	6	10	7	23
<i>Entamoeba coli</i>	3	6	4	13
<i>A. lumbricoides</i>	2	2	6	10
<i>H. nana</i>	0	3	10	13
<i>Trichuris trichiura</i>	0	4	1	5
<i>Enterobius vermicularis</i>	2	3	1	6
<i>Taenia spp.</i>	0	1	2	3
<i>Strongyloides stercoralis</i>	1	2	0	3
<i>Ancylostoma duodenale</i>	1	1	1	3
<i>Balstocystis hominis</i>	0	1	2	3
Total	41 (8.83%)	89 (19.18%)	102 (21.98%)	232

**Table 2.** Distribution of different entero-parasited in different types of school.

Intestinal parasites	Private school (total cases=450)	Government school (total cases=475)	Slum school (total cases=467)	Total
<i>G. lamblia</i>	27	69	7	103
<i>E. histolytica</i>	8	37	2	47
<i>C. cayetanensis</i>	4	16	3	23
<i>E. coli</i>	2	9	2	13
<i>A. lumbricoides</i>	2	6	2	10
<i>Hymenolepis nana</i>	0	13	0	13
<i>T. trichiura</i>	0	5	0	5
<i>E. vermicularis</i>	0	6	0	6
<i>Taenia spp.</i>	0	3	0	3
<i>S. stercoralis</i>	0	3	0	3
<i>A. duodenale</i>	1	1	1	3
<i>B. hominis</i>	0	2	1	3
Total	44 (9.8%)	170 (35.8%)	18 (3.9%)	232

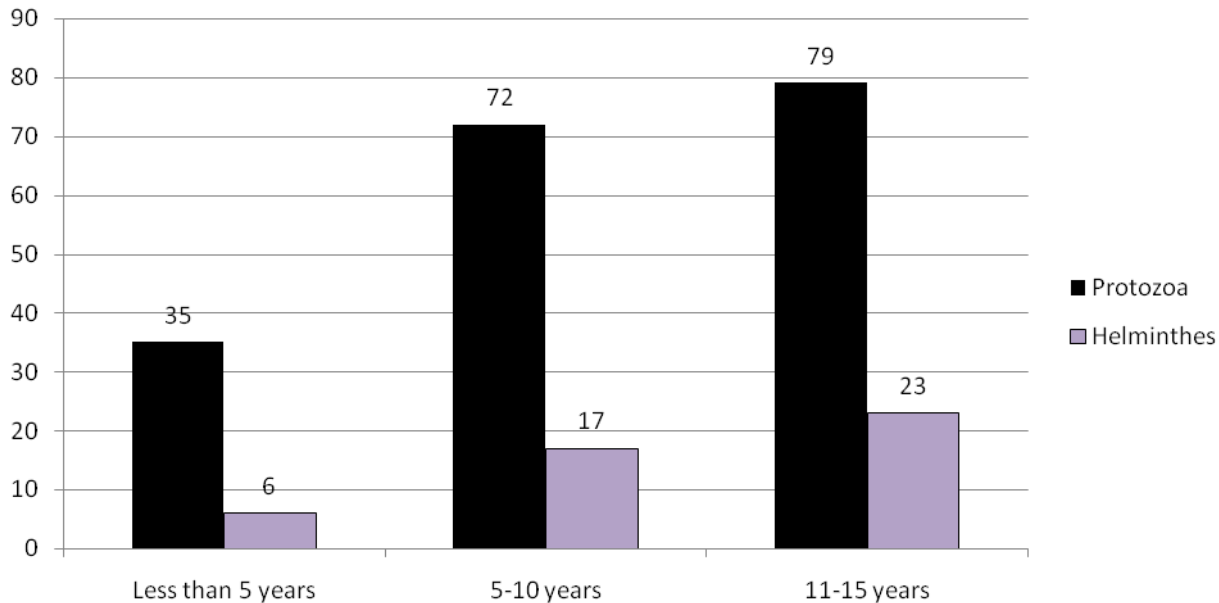
enteroparasites in children of Government school with prevalence of 12.2% (Table 2).

Among total 186 protozoal parasites positive cases, the highest cases of 79 (42.5%) belonged to age group of 11 to 15 years and the highest cases of 131 (70.43%) belonged to children of Government school while out of 46 Helminthic parasites positive cases, the highest cases of 23 (50%) belonged to age group of 11 to 15 years and the highest cases of 39 (84.8%) belonged to the children of Government school (Figures 2 and 3). Mixed infections were also found in 23 cases with Helminth and Helminth (1 case), Helminth and Protozoa (6 cases) and Protozoa and Protozoa (16 cases). Of the total 232 positive samples, the commonest intestinal parasite found was *G. lamblia* 103 (44.4%) followed by *E. histolytica* 47

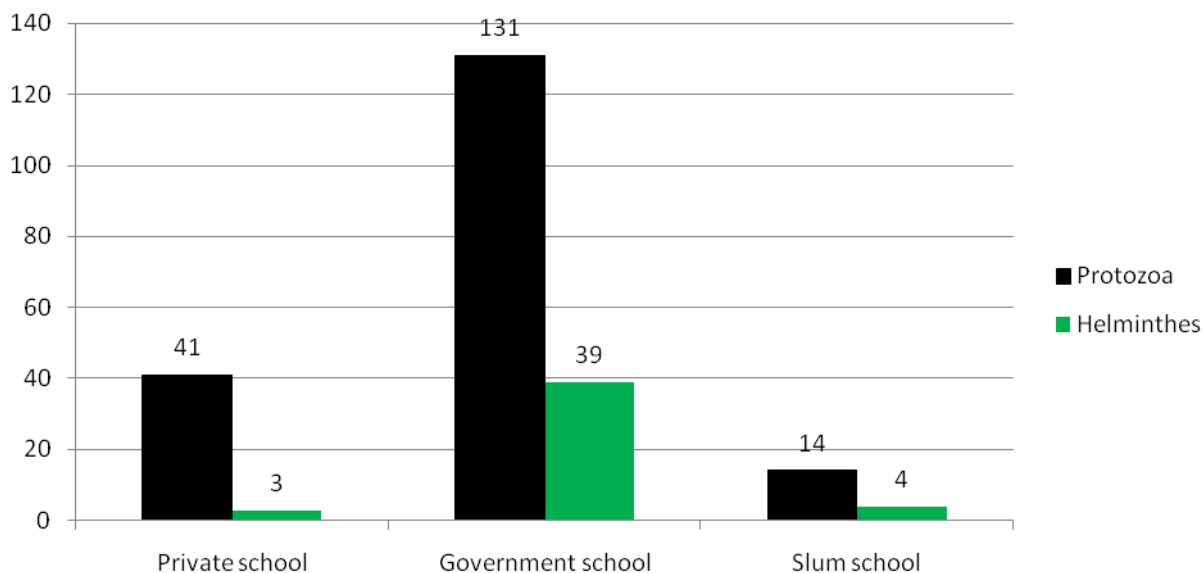
(20.26%) with prevalence of *G. lamblia* to be 7.4% followed by *E. histolytica* to be 3.4% as shown in (Tables 1 and 2).

## DISCUSSION

Intestinal parasitic infections are among the most common infections worldwide. The prevalence of intestinal parasitic infection depends upon various socioeconomic factors like, hygiene, availability of clean drinking water poverty. The study showed that the parasitic infestation was 16.7% of the total cases. Similar prevalence of 21.05% (Shrestha et al., 2012), 17.6% (Khanal et al., 2011) and 21.3% (Chandrashekhar et al.,



**Figure 2.** Distribution of Protozoal and Helminthes enteroparasites in different age groups.



**Figure 3.** Distribution of Protozoal and Helminthes enteroparasites in different group of schools.

2005) of intestinal parasites in school children were also detected.

In this study higher infection of 17.8% was found in male compared to that of female (15.5%). Similarly in a study 22.78% male and 19.38% female children were found to be infested with enteroparasites (Shrestha et al., 2012).

The higher prevalence of protozoal parasites was found to be 13.4% in comparison to helminthic parasites (3.3%). Among protozoal parasites, *G. lamblia* is commonest flagellate of the intestinal tract, causing

giardiasis in humans and are the only important reservoir of the infection and infection is most common in parts of the world where sanitation is at its lowest. *E. histolytica / dispar* are the only species found to be associated with intestinal disease. Although many people harbor this organism worldwide, only about 10% develop clinically invasive disease. Giardiasis is an infection of the upper small bowel, which may cause diarrhea. In this study, the most frequently seen protozoal parasites were *G. lamblia* with prevalence of 7.4% followed by that of *E. histolytica* to be 3.4%. Similarly higher prevalence of 13.2% with *G.*

*lamblia* and 1.7% with *E. histolytica* was also found by Chandrashekhar et al. (2005). It indicates that high water contamination with protozoa in the locality, further, water supply systems need to be corrected and protected from fecal contamination. Of the protozoal infections, amoebiasis and giardiasis are most frequently reported which was spread by faeco-orally through contaminated sources. School-age children are particularly susceptible to parasitosis, often carrying higher burdens of parasites than adults. The greatest obstacle to effective control of parasites in at-risk populations is inadequate knowledge of the geographical distribution of infection and the demographic variables that influence the prevalence of infection (Cook et al., 2009).

*A. lumbricoides* are the most common helminth among school children (Rai et al., 1994, 1997, 1998), while in contrast to our findings helminthic infections were less prevalent as compared to the protozoal infections, although studies from other parts of Nepal have shown a higher prevalence of soil transmitted helminthes (Chandrashekhar et al., 2005; Rai et al., 1994; Estevez et al., 1993; Yong et al., 2000; Rai et al., 1995). Helminthic infections are associated with nutritional deficiencies, particularly of iron and vitamin A, with improvements in iron status and increments in vitamin-A absorption seen after deworming (Shrestha et al., 2012). So, periodic campaign of anti-helminthic drug administration to the children could possibly explain the lower prevalence of helminthic infections seen in this study.

The highest prevalence of 7.3% was found in age between 11 to 15 years. Similar result was also reported by other author (Shrestha et al., 2012). In this age most children are fascinated towards street food and drinks that may be reason behind the highest prevalence in this age group.

Whereas highest parasitic prevalence was seen in government school children (12.2 %) which again indicating poverty since in country like ours those family having low income send their children in government school.

Child malnutrition still exists at alarmingly high levels in countries like Nepal. The large number of people below the poverty line, lack of nutritional education, inadequate health services, lack of clean drinking water and proper sanitation all contribute to the child mortality rate. A significant association was also seen with the socio-economic status, the prevalence rate being higher amongst the lower-middle and lower economic classes. This can be attributed to their inaccessibility to safe drinking water, unhygienic personal habits due to lack of knowledge and awareness and also indirectly to their occupation as farmers.

Abdominal discomfort was the commonest complaint in most of the microbiologically proven cases. It should therefore be taken as a valuable pointer for clinical suspicion of parasitic infection in this age group.

This study will help to determine the prevalence and types of the intestinal parasites in school-going children under 15 years, thus will help to improve in policy-makers and also the data will contribute to the overall understanding of the epidemiology of different intestinal parasites especially in Lalitpur district.

## CONCLUSION

Intestinal parasitic infection is an important public health problem in Nepal. Poverty, lack of awareness, failure to practice proper hand washing after defecation, unsafe drinking water are some of the reasons highlighted by this study as causes of parasitic infections. Appropriate health education should be given to children and their parents concerning disease transmission, personal hygiene and safe drinking water.

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