

# Prevalence of intestinal helminth parasites among school-children of Bhaktapur district, Nepal

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## Abstract

The present study has been carried out on school children of Everest English School and Prabhat English Higher Secondary School of Bhaktapur District, Nepal from June 2011 to March 2012 in order to determine the prevalence of intestinal helminthes. A total of 495 stool samples from the children of two schools were examined by direct smear method under microscope. Among them, 137 (27.67%) were found positive for one or more intestinal helminth parasites. *Ascaris lumbricoides* (22.63%) showed highest prevalence followed by *Trichuris trichiura* (6.06%), *Strongyloides stercoralis* (1.82%), Hookworm (1.62%), *Taenia* sp. (1.01%), *Hymenolepis nana* (0.81%) and *Enterobius vermicularis* (0.40%). The helminthic infection was found to be almost equal in male and female children and statistically no significant difference was found ( $\chi^2 = 8.31 \times 10^{-6}$ ,  $p > 0.05$ ). Out of 137 positive cases, 78.83% were infected with single parasites. Double and multiple infections were found among 18.98% and 2.19% of students respectively. The occurrence of intestinal helminth parasites may be attributed to unhygienic way of life, poverty, ignorance and poor sanitation.

**Keywords:** *Ascaris*, Hookworm, Prevalence, School children, *Trichuris*.

## Introduction

Nepal is a nation full of ancient glories rich in tradition, culture and civilization. Nepal exhibits social, ethnical, linguistic and cultural diversity. Life in Nepal, like in most of the third world countries is characterized by poverty, ignorance and diseases. Intestinal infestations like giardiasis, amoebiasis, ascariasis, ancylostomiasis, fascioliasis and taeniasis were common in Nepal (Acharya 1979). Children were found to be infected more frequently by intestinal parasites than adults (Rai et al. 1994). Intestinal parasitic infections are major

causes of morbidity and mortality among school aged children of developing countries (WHO 1987). School-aged children and preschool children are the most vulnerable group as compared with any other age group, and they harbour the greatest numbers of intestinal worms. As a result, they experience growth stunting and diminished physical fitness as well as impaired memory and cognition (Stephenson et al. 2000, Crompton and Nesheim 2002, Bethony et al. 2006, Tchuem Tchuente 2011). The public health importance of intestinal parasitoses continues because of its high prevalence, virtually global distribution and effects on both nutritional and immune status of individuals (WHO 1987). Over 270 million preschool-age children and over 600 million school-age children live in areas where soil-transmitted helminth (STH) parasites are intensively transmitted, and are in need of treatment and preventive interventions (WHO 2012). The relative importance of the major groups of helminthes may be roughly judged by Stoll's (1947) estimate that explains among 2200 million people, 72 million cestodes, 148 million trematodes and over 2000 million nematodes are present (Stoll 1947, Chandler and Read 1961). Fifty years after Stoll published his 'This Wormy World' article, the global prevalence of infections with intestinal nematodes remains virtually unchanged (Chan 1997).

## **Materials and Methods**

Bhaktapur is divided into two municipalities and 16 Village Development Committees (VDCs) for administrative purpose. The two municipalities include Madhyapur Thimi and Bhaktapur municipality among which latter was chosen as study area. The total population of Bhaktapur municipality is 72,543 with 12,395 households according to census 2001 (CBS, Nepal 2001). Two schools: Everest English School (EES) (in ward no. 15) and Prabhat English Higher Secondary School (PEHSS) (in ward no.10) were purposively selected for the study. The study was designed to include the school-children of the age group 9-12 years. According to the school records, school children of this particular age group belonged to classes 4, 5 and 6. Hence, all students from class 4, 5 and 6 of these two schools were decided to include as sample population. Out of 585 students of target population (358 from EES and 227 from PEHSS), stool samples from altogether 495 students (295 from EES and 200 from PEHSS) were collected. Stool samples were transported to parasitology laboratory

of Central Department of Zoology, Kirtipur, Kathmandu and examined by direct smear method for detection of intestinal helminth parasites. Macroscopic and microscopic examinations were conducted for laboratory diagnosis of helminth parasites in the collected stool samples.

## Result

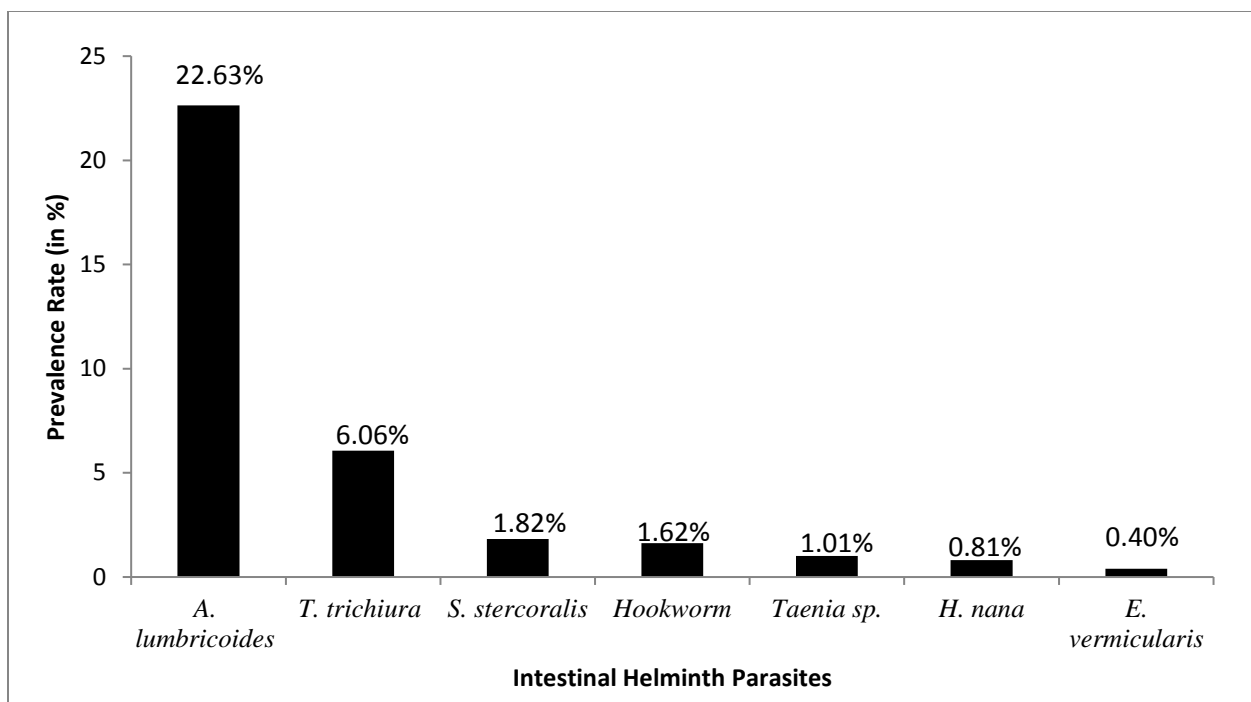
Out of 495 stool samples examined, 137 (27.67%) were found to be infected with one or many types of intestinal helminth parasites. The male and female children accounted for 58.39% and 41.60% of total positive cases (i.e., 137). Statistically, no significant difference was found in prevalence of intestinal helminth parasites in male and female ( $\chi^2 = 8.31 \times 10^{-6}$ ,  $p > 0.05$ ).

### School-wise prevalence of intestinal helminth parasites

Among 295 stool samples collected from Everest English School, 85 (28.81%) school children were infected with at least one of the intestinal helminth parasites. Likewise, 200 stool samples were collected from Prabhat English Higher Secondary School of which 52 (26.00%) school children were found to be infected. The rate of infection was observed to be slightly higher in Everest English School than in Prabhat English Higher Secondary School. Statistically, no significant difference was found in school-wise prevalence of intestinal helminth parasites ( $\chi^2 = 0.471$ ,  $p > 0.05$ ).

### Prevalence of intestinal helminth parasites

The study revealed that *Ascaris lumbricoides* was most common intestinal helminth parasite with a prevalence rate of 22.63% (112/495). *Enterobius vermicularis* was the least prevalent helminth parasite with prevalence rate of 0.40% (2/495). 30 (6.06%) students were infected with *Trichuris trichiura*, 9 (1.82%) with *Strongyloides stercoralis*, 8 (1.62%) with Hookworm, 5 (1.01%) with *Taenia* sp. and 4 (0.81%) with *Hymenolepis nana*. Among 137 positive cases, *A. lumbricoides* accounted for 81.75%, *T. trichiura* 21.89%, *S. stercoralis* 6.57%, *Taenia* sp. 3.65%, Hookworm 5.84%, *H. nana* 2.92% and *E. vermicularis* 1.46% (Figure 1).



**Figure 1.** Prevalence of different species of intestinal helminth parasites

### Concurrent helminth infection among school children

Infection with single helminth parasite in an individual was more common than double or multiple infections. Out of 137 positive cases, 108 cases (78.83%) included infection with single parasite, 26 (18.98%) were infected by double helminth parasites and 3 (2.19%) were infected by multiple species of helminth parasites. Regarding double infection, co-infection of *T. trichiura* with *A. lumbricoides* was found to be most prevalent i.e., 14 (56.00%). In multiple infections, one case each of co-infection of *Ascaris*, Hookworm and *Trichuris*, co-infection of *Ascaris*, *Enterobius* and *Trichuris* and co-infection of *S. stercoralis* with Hookworm, *A. lumbricoides* and *T. trichiura* were observed.

### School, Sex and Species-wise prevalence of intestinal helminth parasites

*A. lumbricoides* was most prevalent helminth parasite in both male (21.10%) and female (24.76%) children. *E. vermicularis* was least prevalent among male children (0.69%) while *E. vermicularis* and *H. nana* were completely absent among female children (0.00%). The prevalence rates of infection with *T. trichiura* were 7.27% and 4.37%, *Taenia sp.* were 1.38% and 0.49%, *S. stercoralis* were 2.08% and 1.46%, Hookworm were 2.08% and 0.97% and *H.*

*nana* were 1.38% and 0.00% in male and female school children respectively. The prevalence of *A. lumbricoides* was highest in both the schools under study. Among 295 students in Everest School, 70 (23.73%) were infected with *A. lumbricoides* followed by 14 (4.75%) infected with *T. trichiura*, 5 (1.69%) with *Taenia* sp., 4 (1.36%) with *S. stercoralis*, 3 (1.02%) with Hookworm, 2 (0.68%) with *E. vermicularis* and 1 (0.34%) with *H. nana*. Among 200 students from Prabhat School, 42 (21.00%) were infected with *A. lumbricoides* followed by 16 (8.00%) infected with *T. trichiura*, 5 (2.50%) with *S. stercoralis*, 5 (2.50%) with Hookworm and 3 (1.50%) with *H. nana*. However, *Taenia* sp. and *E. vermicularis* were not recorded (Table 1).

**Table 1.** School, Sex and Species- wise prevalence of intestinal helminth parasites

Name of Parasite	Everest English School				Prabhat English School				Grand Total (N=495)	Prevalence %
	Male (n=179)	Female (n=116)	Total (N=295)	Prevalence %	Male (n=110)	Female (n=90)	Total (N=200)	Prevalence %		
<i>Ascaris</i>	38	32	70	23.73	23	19	42	21.10	112	22.63
<i>Trichuris</i>	9	5	14	4.75	12	4	16	8.00	30	6.06
<i>Taenia</i> sp.	4	1	5	1.69	-	-	-	-	5	0.81
<i>E. vermicularis</i>	2	-	2	0.68	-	-	-	-	2	0.40
<i>S. stercoralis</i>	2	2	4	1.36	4	1	5	2.50	9	1.82
Hookworm	2	1	3	1.02	4	1	5	2.50	8	1.62
<i>H. nana</i>	1	-	1	0.34	3	-	3	1.50	4	0.81
<b>Total</b>	58	41	99		46	25	71		170	

## Discussion and Conclusion

Intestinal parasites are worldwide in distribution. Among them Soil Transmitted Helminthes (STHs) and other helminth parasites pose serious threat in the physical well-being of human. Poverty, illiteracy and different aspects of culture may play leading role in increasing rate of prevalence of such parasites.

The present study indicated that the prevalence of intestinal helminthes in school children was remarkable. Out of 495 children, 137 (27.67%) were found to be infected by at least one type of intestinal helminthes. This high rate of prevalence among school children may be associated with unsanitary living style, poor socio-economic conditions, usual contact with soil and consumption of vegetables, fruits and water contaminated with infected faeces which was not considered in this study. Overall prevalence rate among school children showed comparatively less than several studies which showed higher rate than 50% (Sugari et al. 1985, Gupta and Gupta 1988, Sharma et al. 2004). Comparable prevalences of helminthes were, however, reported in some other studies (Jha 2004, Shakya et al. 2006, Mukhopadhyay et al. 2007). Rai et al. (1994) concluded that the annual rate of positivity for STH ranged from 18.0-36.6%.

Present findings showed that the rate of prevalence is independent of the sex of children ( $\chi^2=8.31 \times 10^{-6}$ ,  $p>0.05$ ). This may be due to the reason that children from both sexes share similar type of environment and feeding habit and hence are equally susceptible for transmission of helminth parasites. Similar findings have also been reported previously (Rai et al. 2002, Manandhar 2007).

In this study seven different types of helminth parasites were found which were: *Ascaris lumbricoides* (22.63%), *Trichuris trichiura* (6.06%), *Strongyloides stercoralis* (1.82%), Hookworm (1.62%), *Taenia* sp. (1.01%), *Hymenolepis nana* (0.81%) and *Enterobius vermicularis* (0.40%). These parasites had also been reported from rural area of Kirtipur (Chaudhari 2004), from rural areas of Southern Nepal (Sherchand et al. 1997) and from Chepang children of Taklung, Gorkha (Pokhrel 2005).

Several previous studies have shown that Hookworm was the most prevalent helminth parasite in Nepal (Estevez et al. 1983, Sherchand et al. 1997, Yong et al. 2000, Kunwar et al. 2006). Similarly, some other studies have shown *Trichuris trichiura* as the most common helminth (Shrestha 1983 in Panchkhal, Uga et al. 2004, Pokhrel 2005 in Gorkha, Rai et al. 2005). However, the present study has shown that *A. lumbricoides* (22.63%) is the most prevalent intestinal helminth parasite followed by *T. trichiura* (6.06%). This result is in agreement with that reported previously (Gupta and Gupta 1988, Chhetri 1997, Manandhar 2007, Sukupayo 2007) which also showed *A. lumbricoides* as most prevalent helminth in Nepal followed by *T. trichiura*. Sharma (1965) showed Roundworm infection was common

in Bhaktapur. Comparable results were also obtained from Jha (2004) with *A. lumbricoides* (23.06%) the commonest helminth among adolescent girls of Kirtipur, Maharjan (2005) and Kunwar et al. (2006). Williams-Blangero et al. (1993) concluded that Roundworm, Whipworm and Hookworm were endemic in Nepal and were the major health problem for the population which seems to be still true. The high prevalence of soil transmitted helminthes (*A. lumbricoides*, *T. trichiura*, *S. stercoralis* and Hookworm) among helminthes has been increasingly recognized by WHO as an important public health problem, particularly in developing countries. Gurbacharya (1981) observed STH infection in Bhaktapur was higher than other types of parasites.

Among two schools where studies were conducted, the prevalence rate showed no statistical difference ( $\chi^2 = 0.471$ ,  $p > 0.05$ ) although higher rate was found in Everest English School (28.81%) than in Prabhat English Higher Secondary School (26.00%). This could be due to the dispersal of parasites in Bhaktapur allowed equal chance of infection to all particular age-grouped children.

Out of 137 positive cases, highest percentage was found for infection with single helminth (78.83%) followed by double infection (18.98%) and multiple infection (2.19%). The most common double infection was that of *A. lumbricoides* plus *T. trichiura* i.e., 10.22% of total positive cases. Previous studies had also shown similar results (Pokhrel 2005, Manandhar 2007). Just two individuals were infected by three species of helminthes (*Ascaris* + *Enterobius* + *Trichuris* and *Ascaris* + Hookworm + *Trichuris*) and only one individual has quadruple infection (*Ascaris* + *Trichuris* + Hookworm + *Strongyloides*). These results also indicated that *Ascaris* was highly distributed among school children followed by *Trichuris*. This finding is also supported by Rai et al. (1994) who reported that the annual rate of the positivity for soil transmitted helminthiasis had the highest prevalence rate than others.

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