

PREVALENCE OF INTESTINAL PARASITIC INFECTION AMONG SCHOOL CHILDREN IN KIRTIPUR MUNICIPALITY, KATHMANDU

Amulya Dahal,¹ Dev Bahadur Roka,¹ Shiv Mangal Prasad,² Srishti Shrestha³

¹Department of Kayachikitsa, ²Department of Kaumarbhritya, Ayurveda Campus, Kirtipur, ³Ministry of Health & Population, Kathmandu, Nepal

ABSTRACT

Intestinal parasitic infections are a major cause of morbidity in developing countries including Nepal. Most common intestinal parasites reported in Nepal are *Ascaris lumbricoides*, *Hymenolepis nana*, Hookworm, *Trichuris trichiura*, *Giardia lamblia* and *Entamoeba histolytica*. This study aimed to find out the prevalence of various intestinal parasitic infections among school children in Kirtipur Municipality, Kathmandu. A cross-sectional observational study was carried out with prepared questionnaire and stool examination between October to November, 2021. Altogether, 409 stool samples were randomly collected from different schools and examined by direct smear method. Out of 409 stool samples, 73 (17.8%) were positive and 336 (82.1%) were negative. Among positive cases, helminthic infection was seen in 45 (11.0%) and protozoan infection was found in 28 (6.8%). Altogether eight species of intestinal parasites were detected, the most common was *A. lumbricoides* (34.2%), followed by protozoa *G. lamblia* (23.3%), *E. histolytica* (15.1%), *T. trichiura* (10.96%), Hookworm (6.8%), *Enterobius vermicularis* (4.11%), *Taenia solium* (4.11%) and *H. nana* (1.37%) respectively. Study showed that, there was 63 (86.30%) single infections, 9 (12.33%) double infections and 1 (1.37%) multiple infection. The present study reveals that intestinal parasites are abundant among students of Kirtipur Municipality, Kathmandu. The situation strongly calls for the use of control measures including treatment of infected individuals, improvement of health status of infected students by health education, public health awareness and also develop the health care facilities and aware the people for the utilization of health services.

KEYWORDS

Intestinal parasitic infections, prevalence, school students, Kirtipur

Received on: January 18, 2022

Accepted for publication: May 05, 2022

CORRESPONDING AUTHOR

Dr. Amulya Dahal
MD Resident (3rd Year)
Department of Kayachikitsa,
Ayurveda Campus, Kirtipur, Kathmandu, Nepal
Email: amulyadahal@gmail.com
Orcid No: <https://orcid.org/0000-0002-5461-2657>
DOI: <https://doi.org/10.3126/nmcj.v24i2.46027>

INTRODUCTION

Intestinal parasitic infections are infections that dwell exclusively in the gastrointestinal tract of humans and cause various signs and symptoms including pain abdomen, pain during defecation, presence of parasites in stool, itching in anal region, emaciation, diarrhoea, anaemia, constipation, generalized physical weakness, increased salivation, loss of appetite and cardiological manifestation such as palpitation and tachycardia.¹⁻³ Intestinal parasitic infections are a major cause of morbidity in developing countries including Nepal. Even now, along with diarrhoeal disease, it ranks fourth in top-ten diseases in Nepal.⁴ It is one of the major causes of childhood malnutrition, anemia, stunted physical and mental growth and psycho-social problems. This remains a major cause of high infant and child mortality in our country.⁵

Globally 1.5 billion people are infected with intestinal parasitic infections.⁶ About 400 million school-aged children are infected with roundworm, whipworm and hookworm worldwide, a large proportion of whom are found in the South Asia region.⁷ Globally intestinal parasite infections related morbidity has been considered as a major threat for public health. A prevalence rate higher than 50.0% has been reported for soil-transmitted helminths in the northern part of India.⁸ In Nepal, a study showed that the prevalence of intestinal parasite infections decreased among school children from 61.0% in 1990 to approximately 20.0% in 2015, indicating a declining pattern in the last two decades.⁹ In Kathmandu, a study reported that the prevalence of intestinal parasite infections is higher among public school children than private school children.¹⁰

In this study, we aimed to assess the recent prevalence of intestinal parasite infections among public and private school students of Kirtipur municipality. We believe, our findings would be beneficial to implement possible preventive measures to control and cure the parasite associated infections among the dwellers.

MATERIALS AND METHODS

This was the cross-sectional observational study conducted from October to November, 2021 in school students of Kirtipur Municipality with qualitative and quantitative (combined) research study method. The sampling frame included all the school students of Kirtipur municipality and probability proportionate

stratified sampling was used in sampling. The sample size calculated was 409.

Inclusion criteria:

- School children aged from 5 to 18 years and who were present in the school during study period.
- School children who haven't used anti-helminthic drug in the past six months.
- Only those school children who were willing to participant.

Exclusion criteria:

- All school students who used anti helminthic drugs within past six months.
- School students who were not willing to participate were excluded.

Sample collection:

Well labeled, clean, dry, disinfectant free, wide-mouthed plastic containers were distributed to the study population with instruction requesting them to bring about 20 gm stool sample the next morning.

Methods of stool examination:

- Macroscopic examination - the stool samples were firstly examined by naked eyes for the eggs and adult helminth parasites.
- Microscopic examination - Stool smear was prepared and was examined via microscope. Findings of macroscopic and microscopic examinations were documented in laboratory form after examination by medical laboratory technologist.

Data analysis and Interpretation:

All data (laboratory findings) were then analyzed. Prevalence was assessed by using SPSS-20 whereas Pearson's chi-square test was done to find the significance of data.

RESULTS

Out of 409 stool samples, the general prevalence of intestinal parasites among school students

Table 1: General prevalence of intestinal parasites among school students of Kirtipur municipality

Study area	Total no. of examined samples	Positive cases	Negative cases
Kirtipur Municipality	409	73 (17.8 %)	336 (82.1%)

of Kirtipur municipality were found to be 73 (17.8%) positive (Table 1).

Out of 409 samples, the distribution of helminthic infection was 45 (11.0%) and the protozoan infection was 28 (6.8%) among school students of Kirtipur municipality (Table 2).

Table 2: Prevalence rate of protozoan and helminthic parasites		
Total no. of examined samples	Positive cases of helminthic infection	Positive cases of protozoan infection
409	45 (11.0%)	28 (6.8%)

Table 3: Sex-wise prevalence of intestinal parasites			
Sex	Total examined sample	Positive cases n (%)	Negative cases n (%)
Female	212	39 (18.4)	173 (81.6)
Male	197	34 (17.2)	163 (82.7)
Total	409	73 (17.8)	336 (82.1)

Out of 409 stool samples examined, 212 were of female and 197 were male students. Out of 212 stool samples examined from female, 39 (18.4%) were found to be positive. Likewise, out of 197 stool samples examined from male, 34 (17.2%) were found to be positive for intestinal parasites. Hence, infection rate was found slightly higher in female people than male (Table 3).

Table 4: Age group-wise prevalence of intestinal parasites		
Age (Years)	Total (n)	Positive cases n (%)
0-5 years	76	17 (22.4)
6-10 years	159	29 (18.2)
11-15 years	159	25 (15.7)
Above 15	15	2 (13.3)
Total	409	73 (17.8)

The entire study population was categorized into four age groups which were 0-5 years, 6-10 years, 11-15 years and above 16 years old. The distribution of intestinal parasites was maximum 17 (22.4%) in 0-5 years of age group and minimum 2 (13.3%) in above 15 years age group (Table 4).

Table 5: Caste wise prevalence of intestinal parasites		
Caste	Total (n)	Positive cases n (%)
<i>Brahmin</i>	96	17 (17.7)
<i>Chhetri</i>	95	13 (13.7)
<i>Newar</i>	116	23 (19.8)
<i>Janajati (Except Newar)</i>	65	13 (20.0)
<i>Dalit</i>	20	6 (30.0)
Others (<i>Madehi, Muslims</i> etc)	17	1 (5.9)
Total	409	73 (17.8)

The entire study population was categorized into six caste which were *Brahmin*, *Chhetri*, *Newar*, *Janajati* (except *Newar*) and *Dalit*. The distribution of intestinal parasites was maximum 6 (30.0%) in *Dalit* caste followed by *Janajati* (except *Newar*) 13 (20.0%) and *Newar* 23 (19.8%) (Table 5).

Out of 409 stool samples examined, 107 were from government school and 302 were from private school. Out of 107 stool samples examined from government school, 29 (27.1%) were found to be positive. Likewise, out of 302 stool samples examined from private school, 44 (14.6%) were found to be positive for intestinal parasites. Hence, infection rate was found higher in government school people than private school (Table 6).

Table 6: School wise prevalence of intestinal parasites			
Type of school	n	Positive cases n (%)	Negative cases n (%)
Government	107	29 (27.1)	78 (72.9)
Private	302	44 (14.6)	258 (85.4)
Total	409	73 (17.8)	336 (82.1)

Out of 73 positive samples, 25 (34.2%) were infected with *A. lumbricoides* followed by *G. lamblia* 17 (23.3%), *E. histolytica* 11 (15.1%), *T. trichiura* 8 (11.0%), hookworm 5 (6.8%), *E. vermicularis* 3 (4.1%), *T. solium* 3 (4.11%), and *H. nana* 1 (1.4%) (Table 7).

Out of 409 examined stool samples, the infection of single parasite was more common than double and multiple species infection. Among 73 positive samples, there was 63 (86.3%) single

Table 7: Infection rate of specific intestinal parasites

Intestinal parasites	n (%)
<i>Ascaris lumbricoides</i>	25 (34.2)
<i>Trichuris trichiura</i>	8 (11.0)
Hookworm	5 (6.8)
<i>Hymenolepis nana</i>	1 (1.4)
<i>Giardia lamblia</i>	17 (23.3)
<i>Entamoeba histolytica</i>	11 (15.1)
<i>Enterobius vermicularis</i>	3 (4.1)
<i>Taenia solium</i>	3 (4.1)
Total	73 (17.8)

infection, 9 (12.3%) double infection and 1 (1.4%) multiple infection in the school students of Kirtipur municipality.

Out of 63 single parasitic infection, the intensity of *A. lumbricoides* was found to be maximum in 17 (27.0%) cases and was followed by *G. lamblia* 16 (25.4%), *E. histolytica* 10 (15.9%), *T. trichiura* 8 (12.7%), hookworm 5 (7.9%), *T. solium* 3 (4.8%), *E. vermicularis* 3 (4.76%) and *H. nana* 1 (1.6%) (Table 8).

Out of 9 double parasitic infection, the intensity of parasitic infection was found to be maximum in *A. lumbricoides* + *E. histolytica* 5 (55.6%), *A. lumbricoides* + *H. nana* 2 (22.2%), *E. histolytica* + *T. trichiura* 1 (11.1%) and *G. lamblia* + *T. trichiura* 1 (11.1%) (Table 9).

Intensity of multiple infection: Out of 73 parasitic infection, the intensity of

Table 8: Intensity of single infection (n=63)

S.N.	Parasites	Infected male	Infected female	Total n (%)
		n	n	
1	<i>Ascaris lumbricoides</i>	8	9	17 (27.0)
2	<i>Trichuris trichiura</i>	4	4	8 (12.7)
3	Hookworm	1	4	5 (7.9)
4	<i>Hymenolepis nana</i>	1	0	1 (1.6)
5	<i>Taenia solium</i>	1	2	3 (4.8)
6	<i>Enterobius vermicularis</i>	1	2	3 (4.8)
7	<i>Giardia lamblia</i>	7	9	16 (25.4)
8	<i>Entamoeba histolytica</i>	4	6	10 (15.9)
Total		27	36	63

Table 9: Intensity of double infection (n=9)

S.N.	Parasites	Infected male	Infected female	Total n (%)
		n	n	
1	<i>A. lumbricoides</i> + <i>E. histolytica</i>	4	1	5 (55.6)
2	<i>A. lumbricoides</i> + <i>H. nana</i>	2	0	2 (22.2)
3	<i>E. histolytica</i> + <i>T. trichiura</i>	0	1	1 (11.1)
4	<i>G. lamblia</i> + <i>T. trichiura</i>	0	1	1 (11.1)
Total		6	3	9

Table 10: Intensity of multiple infection

Parasites	Infected male n	Infected female n	Total Number (n=1)
<i>A. lumbricoides</i> + <i>E. histolytica</i> + <i>T. trichuria</i>	0	1	1
Total	0	1	1

multiple infections was found to be 1 (1.37%) (Table 10).

DISCUSSION

The overall prevalence of intestinal parasitic infection was found to be 17.85%. The finding is almost similar to the various studies done in different places of Nepal.^{9,11-13,15} The intestinal parasites found in school students of Kirtipur Municipality were *A. lumbricoides* (34.2%), *T. trichiura* (11.0%), hookworm (6.8%) *H. nana* (1.4%), *G. lamblia* (23.3%), *E. histolytica* (15.1%), *E. vermicularis* (4.1%) and *T. solium* (4.1%). These parasites were also reported among public school children in a rural village of Kathmandu Valley.¹² Our finding suggested highest prevalence of *A. lumbricoides*. Other studies also showed *A. lumbricoides* as the most common helminth in Nepal.¹⁵⁻¹⁷ Gender-wise parasitic infection rate was found almost equal among males and females, through slightly higher in females (18.4%) which is similar to findings of other studies on general population in Nepal.^{10,12,15} The present study shows agreement with suggestions of various studies regarding gender independence of parasitic infection. Based on the age of patients included in the study, parasitic infection was found to be highest among younger people of age group 0-5 years (22.4%) and it was lowest among above 15 years (13.3%). Such infection indicates that lack of health knowledge regarding parasitic infection among very young people due to their unhygienic behavior, lack of sanitation and contaminated food and water. This finding is similar to the reports of studies done in various places of Nepal.^{16,18} Relatively low parasitic infection was found among elder students in the study might be due to their hygienic behavior,

knowledge of sanitation and use of clean food and water. Among government school and private school, the prevalence rate of intestinal parasite was 27.1% and 14.6% respectively. This could be due to low economic class of students of government school. The distribution of intestinal parasites was maximum 6 (30.0%) in Dalit caste followed by *Janajati* (except Newar) 13 (20.0%) and *Newar* 23 (19.8%).

Based upon our finding and similar studies we recommend Intestinal parasitic infection is an important public health problem in school students of Kirtipur Municipality. The situation strongly calls for the institution of control measures including treatment of infected individuals, improvement of health status of infected persons by health education, public health awareness and also develop the health care facilities, medical needs and aware the people for the utilization of health services. Poverty, lack of awareness, poor environmental sanitation, raw and uncooked food consuming habit and unsafe drinking water can be some of the predisposing factors as causes of parasitic infections. Thus, there is need for intensive and habitual health education for behavioral changes related to personal and mass treatment for the effective control of intestinal parasitic infections in the concerned area.

ACKNOWLEDGEMENT

We express our gratitude towards all the students of Kirtipur municipality who voluntarily participated in this epidemiological study.

Conflict of interest: None

Source of research fund: None

REFERENCES

1. Jameson JL. Harrison's Principles of internal medicine. McGraw-Hill Education; 2018.
2. Mims C, Playfair J, Roitt I, Wakelin D, Williams R, Anderson RM. Medical Microbiology. *Structure* 2004; 7: 7.
3. Ryan KJ, Ray CG. Medical Microbiology. *McGraw Hill* 2004; 4: 370.
4. Aryal KK, Joshi HD, Dhimal M et al. Environmental burden of diarrhoeal diseases due to unsafe water supply and poor sanitation coverage in Nepal. *J Nepal Health Res Counc* 2012; 10: 125-9.
5. Yong TS, Sim S, Lee J, Ohrr H, Kim MH, Kim H. A small-scale survey on the status of intestinal parasite infections in rural villages in Nepal. *Korean J Parasitol* 2000; 38: 275. doi: 10.3347/kjp.2000.38.4.275.
6. Shirley D, Farr L, Watanabe K, Moonah S. A review of the global burden, new diagnostics, and current therapeutics for Amebiasis. *Open Forum Infect Dis* 2018; doi:10.1093/ofid/ofy161
7. Eppig C, Fincher CL, Thornhill R. Parasite prevalence and the worldwide distribution of cognitive ability. *Proceedings of the Royal Society B: Biol Sci* 2010; 277: 3801-8.
8. Sehgal R, Reddy GV, Verweij JJ, Rao AV. Prevalence of intestinal parasitic infections among school children and pregnant women in a low socio-

- economic area, Chandigarh, North India. *Rev Infect* 2010; 1: 100-3.
9. Kunwar R, Acharya L, Karki S. Decreasing prevalence of intestinal parasitic infections among school-aged children in Nepal: a systematic review and meta-analysis. *Trans Roy Soc Trop Med Hyg* 2016; 110: 324-32. <https://doi.org/10.1093/trstmh/trw033>
 10. Sharma BK, Rai SK, Rai DR, Choudhury DR. Prevalence of intestinal parasitic infestation in school children in the northeastern part of Kathmandu Valley, Nepal. *Asian J Trop Med Public Health* 2004; 35: 501-5
 11. Dhakal N. Prevalence of intestinal parasites in Meche Community of Jalthal VDC, Jhapa, Nepal in relation to their socio-economic status (Doctoral dissertation, Central Department of Zoology Institute of Science and Technology Tribhuvan University, Kirtipur, Kathmandu). 2018.
 12. Pradhan P, Bhandary S, Shakya PR, Acharya T, Shrestha A. Prevalence of intestinal parasitic infections among public school children in a rural village of Kathmandu Valley. *Nepal Med Coll J* 2014; 16: 50-3.
 13. Oli KB. Prevalence of intestinal parasites in Tharu Community of Pawannagar VDCs of Dang District in relation to their socio-economic status (Doctoral dissertation, Central Department of Zoology Institute of Science and Technology Tribhuvan University Kirtipur, Kathmandu). 2016.
 14. Dahal C, Katwal P, Thapa A, Sharma D, Khadka R. Intestinal parasitosis among the school children of Kathmandu, Nepal. *Tribhuvan Univ J Microbio* 2018; 5: 89-96. Available from: <https://www.nepjol.info/index.php/tujm/article/view/22320> DOI:<https://doi.org/10.3126/tujm.v5i0.22320>
 15. Khanal LK, Choudhury DR, Rai SK *et al.* Prevalence of intestinal worm infestations among school children in Kathmandu, Nepal. *Nepal Med Coll J* 2011; 13: 272-4.
 16. Shrestha R, Maharjan M. Prevalence of intestinal helminth parasites among school-children of Bhaktapur district, *Nepalese J Zool* 2013; 1: 48. Available from: <https://www.cdztu.edu.np/njz/index.php/NJZ/article/view/39>. [cited 2022]Jan.18]
 17. Shakya B, Bhargava D, Shrestha S, Rijal BP. Intestinal parasitosis. *J Inst Med (Nepal)* 2009; 31: 13-6. DOI: 10.3126/joim.v31i3.2974
 18. Dhital S, Pant ND, Neupane S *et al.* Prevalence of enteropathogens in children under 15 years of age with special reference to parasites in Kathmandu, Nepal; a cross sectional study. *Springer Plus* 2016; 5: 1-6. DOI 10.1186/s40064-016-3477-6