Intestinal Parasitic Infection among the School Children of Kathmandu, Nepal

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ABSTRACT

Objectives: The study was conducted to determine the intestinal parasitosis among the school children of Kathmandu, Nepal.

Methods: This study was carried out from February to May 2018. A total of 194 stool samples were collected from school going children of age 6 years to 14 years old and processed in Padma Kanya Microbiology Laboratory. The questionnaire accompanying the queries related to the study were filled. The Formal-ether sedimentation technique was used for the detection of parasites.

Result: Among 194 total cases, 12.4% (24/194) children were infected with intestinal parasites where female were highly infected (70.8%) of the age group 9-11 years (58.3%). The most common protozoan and helminthes parasite detected in this study was *E. histolytica* (33.3%, 8/24) and *Taenia* spp. (16.7%, 4/24) respectively. Intestinal parasitic infection was high in non-vegetarian children (83.3%, 20/24) than vegetarian children (16.7%, 4/24). In symptomatic cases, the intestinal parasitic infection (66.7%, 16/24) was found to be higher than asymptomatic cases (33.3%, 8/24). Due to lack of sanitation condition, the parasitic infection was found in higher in public school children (66.7%, 16/24) as compared to private school children (33.3%, 8/24). The children who don't wash hands with soap before meal (87.5%) and not taking anti helminthic drugs (95.8%) were more infected with parasitic infection. Further, children using direct tap water (45.9%) for drinking purpose were highly infected with parasitic infection.

Conclusion: The intestinal parasitic infection among school children was found closely related to their health hygiene, sanitary condition, water consumption and other activities.

Key words: Intestinal parasites, school children, formal-ether sedimentation technique, Kathmandu.

INTRODUCTION

Intestinal Parasitic Infections (IPIs) continue to be a major cause of morbidity in developing countries and are among the most common infections worldwide. Protozoal infections and Soil Transmitted Helminths (STHs) are the predominant causative agents of IPIs. The widespread nature and global impact of these infections is revealed by the fact that infections by STHs have been included as 'Neglected Tropical Diseases' (NTDs) in the initiative taken by WHO (2016). It is estimated that some 3.5 billion people are affected, and that 450 million are ill as a result of the parasitic infections, the majority being children (WHO 2013). The most common cause of parasitic infections in school going children ultimately leading to impaired physical and mental development (Halliez 2013; Sehgal 2010).

Intestinal protozoan infection and helminthic infection rank the third and the fourth respectively in Nepal (Agrawal et al. 2012). The survey that has been carried in Kathmandu valley and northern Kathmandu valley among school children has shown the prevalence ranging from 13.9% (Shakya et al. 2012) to 15% (Pandey et al. 2015) and it reaches peak level during rainy season. So, the capital city is also highly endemic for intestinal helminthes infections due to the poor sanitary conditions and unplanned urbanization (Adhikari et al. 2007). Similarly, a study of intestinal

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parasitosis conducted among school-going children in Dadeldhura district showed low prevalence of 31.13% (Tiwari et al. 2013) and Rupandehi district showed high prevalence as 60% (Khanal et al. 2016). The Most common intestinal parasites reported from school going children in Nepal are *A. lumbricoides*, *H. nana*, Hookworm, *T. trichiura, Entameba histolytica* and *G. lamblia* (Khanal et al. 2016; Pandey et al. 2015; Shakya et al. 2012; Tiwari et al. 2013). These parasites are associated with diverse clinical manifestations such as malnutrition, iron deficiency anemia, mal absorption syndrome, intestinal obstruction, and mental and physical growth retardation (Gyawali et al. 2009).

Consequently, a resolution for intestinal parasitic infection had been passed by the World Health Assembly in 2001 for control of morbidity due to STHs through mass administration of antihelminthics in school children in developing countries (Pullan 2010). Several studies have dealt with the prevalence and risk factors associated with IPIs and have mostly concluded that the spectrum of IPIs vary according to geographical location and poor hygiene and low socio-economic conditions along with inadequate medical facilities and lack of access to safe drinking water are the common risk factors (Bisht et al. 2011; Wani et al. 2007). Therefore, this study was undertaken to study the distribution of IPIs and related risk component in school going children of Kathmandu valley.

MATERIALS AND METHODS

A total of 194 stool samples were collected from different schools of Kathmandu valley. The population targeted for research purpose was school going children from age groups 6-14 years**.** The time duration for the research work was February to May 2018. Before sample collection, a short and simple introduction classes about parasites were given to the children. The plastic containers were distributed among the children with their name, sample number, date and time of collection labeled to it. Then, they were advised aseptically collect the sample, not to contaminate the stool with water, soil, urine etc. The questionnaire accompanying the queries related to the study were filled there with the children capable of giving answers while others were provided with the questionnaire to be filled by their parents. On the next day, containers containing samples along with remaining questionnaires were collected from children. The samples were brought to the laboratory and macroscopic followed by microscopic observation of the samples were done. Macroscopic Examination of all stool samples were examined macroscopically for presence of blood, mucus, adult worms, segments of tapeworm, and larvae. The consistency of stool as formed, loose or watery or soft with colour were noted. For microscopic observation, concentration technique (Formal-ether sedimentation method) was done and iodine mount was used for slide preparation and observed first under low power (10x) followed by higher power (40x) under microscope. The result was recorded and analysis was done using SPSS (version 21) and chi-square test was used for data analysis.

RESULTS

Distribution of parasites in the stool samples

Among total of 194 stool samples collected from school going children, the prevalence of intestinal parasites was found to be 12.4% (24/194) in which protozoan parasites was found higher (66.7%, 16/24) compared to helminthic parasites (33.3%, 8/24). The most common protozoan parasite and helminthic parasite were *E. histolytica* (33.3%, 8/24) and *Taenia* spp. (16.7 %, 4/8) respectively.

Table 1: Distribution of parasites in the stool samples

Parasites	Total	Percentage
G. lamblia	5	20.9
E. histolytica	8	33.3
B. hominis	2	8.3
B. coli	1	4.2
Total protozoa	16	66.7
A. lumbricoides	2	8.3
Hookworm	2	8.3
Taenia spp.	4	16.7
Total helminths	8	33.3
Total parasites	**24**	**100**

Gender-wise distribution of parasitic infection

A total 194 stool samples were collected from 105 (54.1%) females and 89 (45.9%) males for the detection of intestinal parasites. Among the positive 24 samples, female had higher prevalence rate of parasitic infection (70.8%, 17/24) than male (29.2% 7/24) without statistical significant difference (P> 0.05).

Table 2: Gender-wise distribution of parasitic infection

Gender	Total samples N (%)	Positive cases (N)	Percentage	P-value
Male	89 (45.9)	7	29.2	P> 0.05
Female	105 (54.1)	17	70.8	
Total	**194 (100**	**24**	**100**	

Age-wise distribution of parasitic infection

In this study, parasitic infection was highest among children of age group 9-11 years (58.3%, 14/24) followed by 12-14 years (25.0%, 6/24) and 6-8 years (16.7%, 4/24). It was found that, there was no significant difference between parasitic infection and age group.

Table 3: Age-wise distribution of parasitic infection

Age group	Total samples (N)	Positive cases (N)	Percentage	P-value
6-8	53	4	16.7	
9-11	101	14	58.3	P> 0.05
12-14	40	6	25	
Total	**194**	**24**	**100**	

Parasitic infections in relation to dietary status of patients

Among 24 positive stool samples, parasitic infection was high among non-vegetarian children (83.3%, 20/24) than vegetarian (16.7%, 4/24). There was no significant difference between vegetarian and non-vegetarian diet and parasitic infection.

Table 4: Dietary-wise distribution of parasitic infection

Veg/Non-veg diet	Total samples (N)	Positive cases (N)	Percentage	P-value
Vegetarian	41	4	16.7	P>0.05
Non-vegetarian	153	20	83.3	
Total	194	24	100	

Distribution of parasitic infection with sources of drinking water

In this study, out of 24 positive samples, children using direct tap water had highest prevalence of parasitic infection (45.9%, 11/24) followed by direct jar water (20.8%, 5/24) and other treated water. The source of drinking water was significantly associated with parasitic infection.

Table 5: Distribution of parasitic infection with sources of drinking water

Sources of drinking water	Total samples (N)	Positive cases(N)	Percentage	P-value
Direct Tap water	32	11	45.9	
Boiled Tap water	23	2	8.3	
Direct Jar water	92	5	20.8	P <0.05
Boiled Jar water	25	1	4.2	
Boiled Pump water	11	2	8.3	
Boiled Well water	11	3	12.5	
Total	**194**	**24**	**100**	

Distribution of parasitic infection with type of school

Among 24 intestinal parasites positive samples, parasitic infection was found higher in students studying in public school (66.7%, 16/24) compared with private school (33.3%, 8/24) with no statistical significance difference.

Table 6: Distribution of parasitic infection with type of school

Type of school	Total samples (N)	Positive Cases (N)	Percentage (%)	P-value
Public	100	16	66.7	
Private	94	8	33.3	P>0.05
Total	**194**	**24**	**100**	

Distribution of parasitic infection with hand washing habit with soap

Among the total of 24 intestinal parasites positive samples, parasitic infection was found higher in students who don't wash hands with soap before meal (87.5%, 21/24) than who wash hands before meal (12.5%, 3/24) with no statistical significant difference.

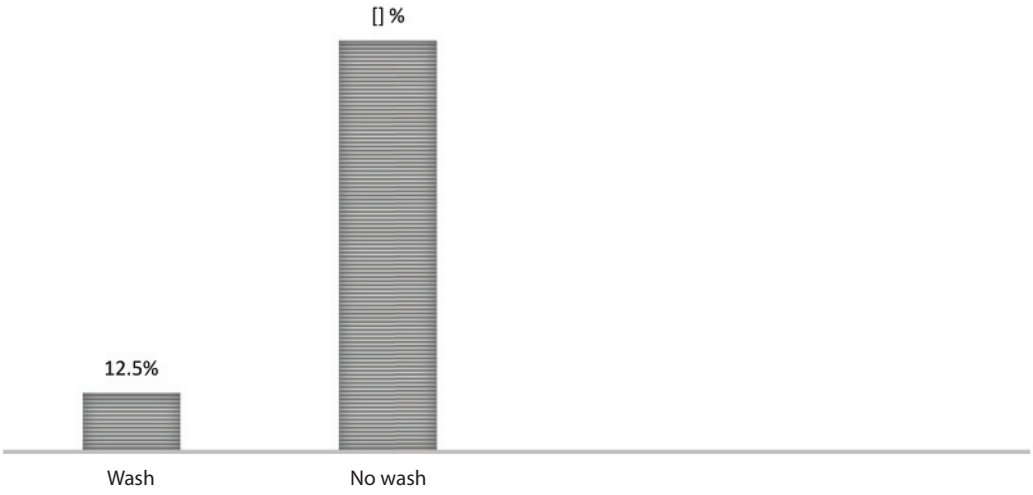

Figure 1: Distribution of parasitic infection with hand washing habit with soap

Distribution of parasitic infection with clinical symptoms

Clinical symptoms of gastroenteritis include: fever, vomiting, nausea. Out of 24 positive samples, parasitic infection was seen highest among symptomatic cases (66.7%, 16/24) than asymptomatic cases (33.3%, 8/24). The significant association of clinical symptoms with parasitic infection was observed.

Table 8: Distribution of parasitic infection with clinical symptoms

Clinical symptoms	Total samples (N)	Positive cases	Percentage (%)	P-value
Symptomatic	22	16	66.7	
Asymptomatic	172	8	33.3	P <0.05
Total	**194**	**24**	**100**	

Distribution of parasitic infection with anti-helminthic drugs

In this study, the parasitic infection was found to be higher in children who didnot taking anti helminthic drugs (95.8%, 23/24) than children taking anti-helminthic drugs (4.2%, 1/24 with no statistical significant difference.

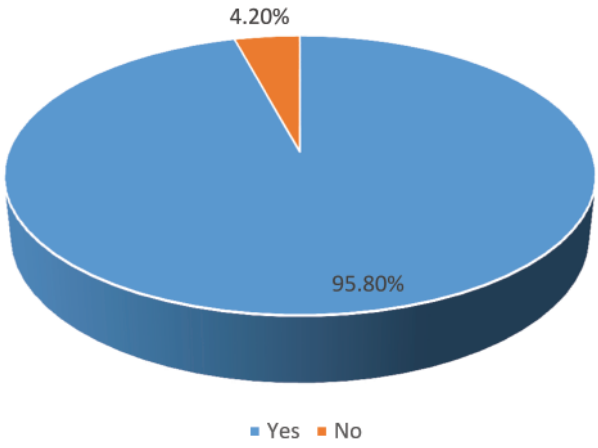

Figure 2: Distribution of parasitic infection with anti-helminthic drugs

DISCUSSION

In this study, the intestinal parasites positive was found to be 12.4 % (24/194) among the school children of Kathmandu valley. The finding was also in agreement with the study done by Shakya et al. (2012) as 13.9%. Similarly, the study done by Pandey et al. (2015) reported 15% of the intestinal parasitosis among school going children in Northern Kathmandu. However, a bit higher prevalence rate has been reported from different parts of Nepal were 17.6% by Khanal et al. (2016); and 16.5% by Tandukar et al. (2015). The higher prevalence rates were reported as 31.7% and 31.13 % (Kidane et al. (2014); Tiwari et al. 2013). Among recent study, the highest prevalence rate of intestional parasites was reported as 60% among school going children of Rupandehi districts (Khanal 2016). Similarly the study done in Durg, Chhattisgar, India reported 31.2 % of intestinal parasites (Chandi and Lakhani 2018). These differences might be due to environmental, geographical, climatic conditions of the study place and the technique used for detection of parasites. The lower prevalence in this study may be due to the improved hygiene habits of children and also anti-helminthic drugs given to the children.

The number of protozoan parasites was found to be higher (66.7%, 16/24) as compared to helminthic parasites (33.3%, 8/24). Other reports from Nepal have also shown the higher prevalence of protozoan infection than the helminthic infection by Tandukar et al. (2013) as 81.5% and Pradhan et al. (2014) as 73.9%. The most common protozoan and helminth parasite detected in this study was *E. histolytica* (33.3% 8/24) and *Taenia* spp. (16.7%, 4/24) respectively. Similarly, Pandey et al. (2015) reported the most common parasite was *E. histolytica* (33.3%) among protozoan infection but *A. lumbricoides* (20.0%) were the most helminth. In the study done by Chandi and Lakhani (2018) from India, helminthes was dominating by Protozoa which reported *E. histolytica* (38.5%) and *A. lumbricoides* (19.2%) were commonest intestional parasites. However the study done by Tiwari et al. (2013) reported *H. nana* (46.56%) and *G. lamblia* (7.47%) were the most common protozoa and helminth respectively. The study done in Rupandehi, Nepal, Khanal et al. (2016) reported the highest number of parasites were *A. lumbricoides* (105/130). The higher rate of protozoal infection may be due to the presence of farming land contaminated with fecal matter resulted due to open defecation, lack of public awareness and use of contaminated drinking water and resistant to chlorine by the cyst form of the protozoal parasites. Low prevalence of helminths in this study can be attributed to the nationwide bi-annual integrated deworming as well as vitamin A supplementation programme and implementation of mass drug administration in which single dose of albendazole is given.

Among the positive 24 samples, female had higher prevalence rate of parasitic infection (70.8%, 17/24) than male (29.2%, 7/24).The study was in support with the study done by Kidane et al. (2014) (male 58.2%, female=62.8%) and Chandi and Lakhani 2018 (male=

28.75%, female = (35.6%)). The finding was found to be against some study done by Yadav et al. (2016) (male=61.8%, female 53.8%). However, Khanal et al. (2016) showed the equal prevalence among boys and girls. These differences indicated that the association of gender with parasitic infection differ from one community to another and might to socio-behavioral activities (Khanal et al. 2016).

Intestinal parasitic infection was found to be highest among children of age group 9-11 years (58.3%, 14/24) followed by 12-14 years (25.0%, 6/24) and 6-8 years (16.7%, 4/24) with no statistical significant difference. In the study done by Yadav et al. (2016), the highest number of parasitic infection was seen between age group 6 -10 years (62.8%) followed by age group below 6 years (60.1%) and was found to be statistically significant. The highest number of cases belonged to age group of 11-15 years (42.8%) and 13-15 years (70%) were reported by Tandukar et al. (2013) and Khanal et al. (2016). The higher prevalence among 9-11 years age group might be due to the carelessness of the children towards their personal hygiene and engagement of this age group in different types of games in polluted environment. Most children of this age group are fascinated towards street food and drinks which may be important predisposing factors for high prevalence of parasitic infection in this age group (Khanal et al. 2016).

According to types of food consumption, the intestinal parasitic infection was high among non-vegetarian children (83.3%, 20/24) than vegetarian (16.7%, 4/24) with no statistical significant difference. Further, *Taenia* spp. was found to be higher among the helminths in non-vegetarian group. A study conducted by Sah et al. (2013) among the school children of Itahari, Nepal reported the intestinal protozoan parasites was found significantly higher among vegetarian group (36%) than non-vegetarian group (16%) with was contrast to the present study. The higher prevalence of parasitic infection in non-vegetarian might be due to properly unwashed and uncooked meat and meat products whereas the consumption of unwashed fruits and vegetables appeared to be the source of infection for vegetarian.

The highest infection rate of intestinal parasites was reported in children using direct tap water (45.9%, 11/24) followed by using of direct jar water (20.8%, 5/24). Sources of drinking water was significantly associated with parasitic infection. The finding was in agreement with the study done by Tandukar et al. (2013; 2015) where the rate of infection was significantly higher (29.4%) in children using unboiled (direct tap) water for drinking purpose. The higher infection in direct tap water cases might be due to the sewage contamination in the pipelines of the tap due to the leakage in pipelines with contain parasites leading to infection. Further, water and sewage pipelines in Kathmandu valley are placed parallel which creates high risk on contamination of sewage to drinking water pipelines ((Adhakari et al. 2007) Jar water being pre-treated helps in preventing the transmission of the infection. However, improper treatment of jar water may lead to entry of parasites in the body.

The sanitary condition and surrounding environment of school play an important role for parasitic infection among student. The public school (66.7%, 16/24) showed higher intestinal parasitic infection compared with private school (33.3%, 8/24) with no statistical significance difference. In the study done by Tandukar et al. (2013), intestinal parasites were found more common in the children of public school (73.3%) and lower in private school (7.7%) and moderate in community school (19.0%). The higher positive rate among public school children might be due to low socio-economic status, poor hygienic habits and lack of sanitation prevailing in the school.

The personal hygiene practices are important for protection from many diseases. The parasitic infection was found higher in students who don't wash hands with soap before meal (87.5%, 21/24) than who wash hands before meal (12.5%, 3/24) with no statistical significant difference. Similar findings was obtained from the study done by Tandukar et al. (2013), the intestinal parasitic infection was found higher in those children who did not follow hand washing practice (47.5%). Children playing in outdoor environment get in contact with parasites and not washing hands before meal leads to the entry of parasites in the body.

The intestinal parasitic infection was seen highest in symptomatic cases (66.7%, 16/24) than asymptomatic cases (33.3%, 8/24). The significant association of clinical symptoms with parasitic infection was observed. This finding was in agreement with the study done by Yadav et al. (2016) which revealed that the occurrence

of parasitic infection in symptomatic children was 98.16% and in asymptomatic children was 47.98% and found statistically significant. This may be due to the symptoms such as nausea, abdominal discomfort, diarrhea and fever are the prime indicator of parasitic infestation. For the treatment of helminthic infection, anti-helminthic drug is used. So, in this study, the parasitic infection in children in relation of taking anti helminthic drugs within six months was studied and found more infection in children not taking anti helminthic drugs (95.8%, 23/24) than children taking anti-helminthic drugs (4.2%, 1/24) with no statistical significant difference. This showed the importance of periodic administration of anti-helminthic drug used by children is effective.

CONCLUSION

Intestinal parasitic infection is still major public health problem. Although, the study showed the decreasing trend of helminthes but protozoan still remain severe infection causing intestinal parasites. The parasitic infection among school children was found closely related to their health hygiene, sanitary condition, water consumption and other activities. So, it is necessary to develop the effective prevention and control strategies of parasitic infections in different populations.

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