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Prevalence of intestinal parasites among school children of Janakpurdham, Nepal

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ABSTRACT

Background: There is considerable variation in the findings over the years of study in the prevalence of school-aged children in different parts of Nepal. Recent progress in the living standards of the citizen may affect the prevalence of intestinal parasitosis.
Objective: This study was aimed to determine the prevalence of different species of gastrointestinal parasites among school children of Janakpurdham, Nepal.
Materials and Methods: A prospective study was carried out by collecting 155 stool samples from 10 randomly selected schools of Janakpurdham. The samples were processed by the formal-ether sedimentation method and then examined microscopically by iodine and wet mount methods.
Results: Of the 155 students, 17(10.96%) had one or more parasites. Eight species of parasites were identified during this study, *Ascaris lumbricoides* was recorded in 5 pupils representing 3.2% of the study population, followed by *Ancylostoma duodenale* 3(1.9%), *Entamoeba histolytica* 2(1.3%), *Enterobius vermicularis* 2(1.3%), *Hymenolepis nana* 2(1.3%), *Giardia lamblia, Taenia* sp. and *Trichuris trichiura* each recorded 1(0.6%) respectively.
Conclusion: Relatively low prevalence of intestinal parasitosis in school children of Janakpur city still requires more aggressive interventional steps and lifestyle changes.

1. Introduction

Parasitic disease is still among the causes of human misery, death, and obstacles to development in the least developed countries.[1,2] Almost 2 billion people (about a quarter of the world's population) are infected with soil-transmitted helminths worldwide.[3] Approximately 270 million preschool children and more than 550 million school-age children live in areas where these parasites are extensively transmitted, with the greatest numbers occurring in sub-Saharan Africa, the Americas, and Asia. The latest estimates indicate that more than 880 million children require treatment for these parasites.[4,5] Intestinal parasitosis is a common and important public health concern in developing countries like Nepal because factors such as poverty, poor sanitation, lack of safe water, and malnutrition that predispose a man to infections prevail.[6,7] Besides, the habit of playing on the ground and sand results in a very wide exposure to soil-transmitted parasites. Eating habits of raw vegetables, fruits, crustaceans, and meat also increase the transmission of helminth infections.[8]

Intestinal worm infection in Nepal ranks sixth in top-ten diseases leading to anemia and other debilitating conditions, impaired learning, poor performance, and absences from school among school children.[9,10] Many studies on intestinal parasite infection among school-aged children in Nepal have shown the prevalence of as low as 15% to as high as 60%. These findings have considerable variation over the years and in different parts of Nepal. Hookworm, *A. lumbricoides*, and *T. trichiura* were the

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most common helminth species infecting Nepalese children recorded in the literature, while *E. histolytica* and *G. intestinali* were the most common intestinal protozoa.[11–13]

Over the years, Nepal has made a big jump towards sanitation and hygiene, along with other achievements in education, health, and the economy. According to the recent survey by the Nepal Living Standard Survey (NLSS), 56% of households have toilets in their own house, compared to 22% in 1995/96. So far 43 districts out of 77 total districts were declared open defecation free districts (ODFs). Various programs like health and nutrition of children, deworming of preschool and school children, midday meals for school children, and vitamin A supplementation for preschool children; and water, sanitation, and hygiene (WASH) program have a significant contribution to reducing the burden.[6,14,15]

Although the global target is to eliminate morbidity due to STH infections in children by 2020,[16] these infections are still huge health problems in Nepal affecting millions of schoolchildren.[17] The distribution and prevalence of various species of intestinal parasites differ from region to region. Although several studies have been conducted on the distribution and prevalence of intestinal parasites in Nepal, the epidemiological information on parasitosis in school children of Janakpur has not yet been established.

To understand the various socioeconomic causes such as sanitary habits, absence of safe and pure drinking water, unmanaged fecal disposal system; and the distribution and transmission dynamics in parasitic infections. Therefore, this study was conducted for the first time to know the occurrence of gastrointestinal parasites in school children of Janakpurdham, Nepal.

2. Materials and Methods

A prospective study was conducted in the schools of the Janakpurdham of province 2 of Nepal from June 2018 to August 2018. Janakpurdham is currently the third-largest city in the Terai of Nepal and the seventh-largest in Nepal. The hand pump serves as the major source of water supply.

The study population included children from 10 randomly selected schools studying under class 10 and within the ages of 5-17 years. A simple ballot system was used for the selection of the schools and the pupils.Children with deworming treatment during the last two weeks before the study were excluded from this study.

2.1. Sample size

The sample size of 171 was determined according to the formula suggested by Sarmukaddam and Garad, 2006[18] using the reported prevalence of 13.9% among children of neareby city of Birgunj by Shakya et al.[19] Out of 171, we were able to collect only 155 samples due to various limitations.

2.2. Collection of the stool samples

Fresh morning stool samples weighing about 5 gm were collected along with a dully fulfilled standard questionnaire containing descriptive information of the children, their parent's education and occupation, family status income, habits of the children and their families, hygienic conditions, health awareness, in addition to information about the source of supply and drinking water, sanitation system other hygienic indicators.

2.3. Processing of the stool specimens

Specimens were brought to the laboratory for formaldehyde preservation (after adding 10 ml formal saline, 10% v/v formaldehyde solution; a 3:1 or 5:1 ratio of preservative to fecal material; a grape-sized formed specimen or about 5 ml of the liquid specimen). Formal-ether concentration technique was used to process the stool samples. The concentrated specimens were examined microscopically by using wet mount and iodine mount methods. Smear examinations were done for Ova, trophozoites, cysts, and larva of intestinal parasites using X10 and X40 objective lens.

2.4. Identification of the parasites

This Identification of the parasites was done using the morphology of the cysts, eggs, and larvae described in District Laboratory Practice in Tropical countries,[20] Medical Parasitology.[21] The Technical staff (technician and technologist) of the laboratory assisted in the identification of the parasites.

2.5. Data analysis

The questionnaire was coded, and a master sheet was constructed to arrange the raw data. Tables were then drowned and descriptive statistics measured.

The Statistical Package for Social Sciences (SPSS) Version 19.0 was used to analyze the results. The prevalence of various intestinal parasites was computed and expressed as a percentage.

3. Results

3.1. Prevalence of gastrointestinal parasites per primary schools

A total of 155 primary school children from eight schools in Janakpur were enrolled in the study.

Among 155 children, 17 pupils representing 10.96% of the study population were found to be infected with gastrointestinal parasites in Janakpur (Table 1).

Table 1: Prevalence of gastrointestinal parasites per primary schools

School	Number examined per school	Positive (%)
S1	22	2 (9.09)
S3	11	2 (18.18)
S4	12	1 (8.3)
S5	41	5 (12.19)
S6	20	2 (10)
S7	12	1 (8.3)
S8	11	1 (9.09)
S9	26	3 (11.53)
Total	155	17 (10.96%)

3.2. Species-specific prevalence

Eight species of parasites were identified during the study, *Ascaris lumbricoides* was recorded in 5 pupils representing 3.2% of the study population, followed by *Ancylostoma duodenale* 3(1.9%), *Entamoeba histolytica* 2(1.3%), *Enterobius vermicularis* 2(1.3%), *Hymenolepis nana* 2(1.3%), *Giardia lamblia, Taenia* sp. and *Trichuris trichiura* each recorded 1(0.6%) respectively (Table 2). The prevalence of Protozoan parasites was found lower (17.7%, 3/17) compared to helminthic parasites (82.35%, 14/17).

Ascaris lumbricoides and Hookworm were the most common infections in the sampled schools in the area. However, another infection was also present in the population. There was no sample with multiple parasite infections. The distribution of parasites among students of different schools is in Table 3.

3.3. Distribution of intestinal parasites with age of pupils

The highest positive rate was found among children of age group 9-11 years and the least among below 8 years of age (9.09 %) (Table 4). It was found that there was no significant difference between parasitic infection and age group (P=0.847>0.05).

3.4. Distribution of intestinal parasites with sex

The prevalence of the parasites in the 155 pupils was higher in males compared to the females. From a total of 120 male and 35 female pupils enrolled for the test, 10(8.3%) males and 7(20%) females were positive for the parasite. There was no statistically significant association between the sexes and prevalence rate (P>0.05) (Table 5).

3.5. Effect of handwashing on intestinal parasitosis

Of the 155 school children selected for the study, only 26(16.77%) were found to wash their hands with soap and water before taking their meal. Among these 26 students, 3(11.54) students were found to be positive for parasites. Among 129 who wash their hands only with water before eating, 14 persons (10.85%) showed the presence of parasites in their stool. P-value showed that there is no association between handwashing with soap and the presence of parasites in the stool (P=0.92>0.05).(Table 6)

4. Discussion

In this study, we attempted to find the prevalence rate of intestinal parasites in school children of Janakpur city for the first time. In this study, an overall prevalence of 10.96% was obtained. The prevalence was low compared to findings by Magar & Bhattachan[22] with 23.3% in at Saktikhor of Chitwan district, Upadhaya et al.[10] with 60% at Rupandehi district; and Yadav & Prakash[23] with 58.77% in Kathmandu valley.

Our finding was similar to the finding of Shakya et al. with 13.9% in Birgunj town, which is close to Janakpur city.[19] The findings were also similar to Dahal et al. with a prevalence rate of 12.4%.[24] However, most of the study findings have a higher prevalence compared to our findings. The differences between these studies might be due to the environmental, geographical, climatic conditions of the study place and the technique used for the detection of parasites. The lower prevalence in this study may be due to increased awareness among the town dwellers regarding hygienic behavior and environmental sanitation and the ban on the practice of open field defecation in the town. It cannot be ignored the efficacy of regular deworming programs conducted during recent years, especially in schools.

The number of helminthic parasites was found to be higher (82.35%, 14/17) as compared to protozoanparasites (17.7%, 3/17). Other reports from Nepal have shown a higher prevalence of protozoan infection than the helminthic infection by Tandukar et al.[13] as 81.5% and by Pradhan et al.[25] as 73.9%.

In this study the commonest parasites were *Ascaris lumbricoides* (3.2%), *Ancyclostoma duodenale* (1.9%) and *Entamoeba histolytica* 2(1.3%), *Enterobius vermicularis* 2(1.3%), *Hymenolepis nana* 2(1.3%), *Giardia lamblia*, *Taenia* sp. and *Trichuris trichiura* each recorded 1(0.6%) respectively. The infection with *A. lumbricoides* (2.8%) is verycommon in the world. It increased in poor sanitation regions, particularly where human feces are used as a fertilizer and where children defecate directly on the ground.[26] *Ancylostoma duodenale* infection (1.5%) is worldwide distribution particularly in the inhabitants who practice poor sanitation, especially concerning proper fecal treatment and disposal. It infects persons who walk barefoot in feces-contaminated soil.[27]

Similarly, Pandey et al. reported the most common parasite was *E. histolytica* (33.3%) among protozoan infection but *A. lumbricoides* (20.0%) were the most helminth which was similar to this study.[28] *A. lumbricoides*(105/130) was also found in the highest

Table 2: Frequency of intestinal parasites detected

Parasites	Frequency	Percentage (%)*	Percentage**
Ancylostoma duodenale	3	1.9	17.65
Ascaris lumbricoides	5	3.2	29.41
Cyst of *Entaomeba hystolytica*	2	1.3	11.76
Cyst of Taenia spp.	1	0.6	5.88
Enterobius vermacularis	2	1.3	11.76
Giardia lamblia	1	0.6	5.88
H. nana	2	1.3	11.76
Trichuris trichuris	1	0.6	5.88
Total	17	10.96	

*Percentage calculated regarding sample size in all groups = 155

Table 3: Distribution of parasites in students of different schools

Schools / Parasites	S1	S3	S4	S5	S6	S7	S8	S9	Total
Ancylostoma duodenale	0	0	0	1	0	1	0	1	3
Ascaris lumbricoides	2	0	1	1	0	0	1	0	5
Cyst of *Entaomeba hystolytica*	0	1	0	0	1	0	0	0	2
Cyst of *Taenia spp.*	0	0	0	1	0	0	0	0	1
Enterobius vermacularis	0	1	0	0	1	0	0	0	2
Giardia lamblia	0	0	0	1	0	0	0	0	1
H. nana	0	0	0	1	0	0	0	1	2
Trichuris trichuris	0	0	0	0	0	0	0	1	1
Total	2	2	1	5	2	1	1	3	17

Table 4: Distribution of parasitic infection in the different age group

Age group	Total	Positive (%)	P-value
Below 8 years	11	1 (9.09) (5.88)	
9 to 11 years	63	8 (12.7) (47.05)	P (0.847)>0.05
12 years and above	81	8 (9.87) (47.05)	
Total	155	17 (10.96)	

Table 5: Distribution of parasitic infection in different genders

Gender	Total	Positive (%)	P-value
Male	120	10 (8.3) (58.82)	
Female	35	7 (20) (41.18)	P = 0.52>0.05
Total	155	17 (10.96)	

Table 6: Distribution of parasites among students hand washing before the meal

Hand Washing	No. of students (%)	Positive for parasites (%) (%*)	P-value
With Soap and water	26 (16.77)	3 (11.54)	
Water only	129 (83.23)	14 (10.85)	P>0.05
Total	155	17 (10.96)	

number of parasites in a study conducted in Rupandehi, Nepal.[29] In another study done by Chandi & Lakhani from India, helminths were dominating by Protozoa which reported *E. histolytica* (38.5%) and *A. lumbricoides* (19.2%) were the commonest intestinal parasites.[30] However, the study done by Magar et al. reported H. nana (46.56%) and *G. lamblia* (7.47%) were the most common protozoa and helminth respectively.[22] 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 resistance to chlorine by the cyst form of the protozoal parasites.

Among the positive 17 samples, males had a higher prevalence rate of parasitic infection (58.8%, 10/17) than females (41.18%, 7/24). The finding was found to be similar (male=61.8%, female 53.8%) with a study done by Yadav & Prakash;

and by Chandi & Lakhani[30] (male= 28.75% and female = 35.6%).

Intestinal parasitic infection was found to be highest among children of age group 9-11 years (47.05%, 8/17) and 12 years and above (47.05%, 8/17) with no statistically significant difference. In the study done by Yadav & Prakash the highest number of parasitic infections was seen between the age group 6 -10 years (62.8%) followed by the age group below 6 years (60.1%) and was found to be statistically significant.[23] The highest number of cases belonged to the age group of 11-15 years (42.8%) and 13-15 years (70%) were reported by Tandukar et al.[13] and Baral et al.[29] The higher prevalence among and above 9-11 years age group might be due to the carelessness of the children towards their hygiene and engagement of this age group in different types of games in a polluted environment. Most children of this age group are fascinated by street food and drinks which may be important predisposing factors for the high prevalence of parasitic infection in this age group.[29]

Of the 155 school children selected for the study, only 26(16.77%) were found to wash their hands with soap and water before taking their meal. Among these 26 students, 3(11.54) students were found to be positive for parasites. Among 129 who wash their hands only with water before eating, 14 persons (10.85%) showed the presence of parasites in their stool. P-value showed that there is no association between handwashing with soap and the presence of parasites in the stool (P=0.92>0.05). Dahal et al. also found a higher percentage of parasites (87.5%, 21/24) among students who do not wash hands with soap and water before meals with no statistically significant difference.[24] In a study done by Upadhaya et al. 58.4% (83/142) of a positive result was found among those washing hands with soap and water and 62.7% (47/75) among those with water only with no statistical association.[10] In a randomized controlled trial study, handwashing with soap at key times significantly decreased intestinal parasite reinfection rates.[31]

5. Conclusion

This study revealed the prevalence rate of 10.96% of intestinal parasites among school children of Janakpur town. However, the result was on the lower side of the decreasing prevalence of intestinal parasites among school children in Nepal. The most commonly infected age group was 9-11 and >12 yrs and males were common. Roundworm and hookworm round were common intestinal parasites.

6. Acknowledgment

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7. Conflicts of Interest

All contributing authors declare no conflicts of interest.

8. Source of Funding

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