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Intestinal parasitic infections among school children of Northern Kathmandu, Nepal

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ABSTRACT

Objective: To find out the prevalence of parasitic infection among school aged children and to make necessary recommendations for preventive measures.**Methods:** The stool samples were examined for evidence of parasitic infections by direct microscopy and confirmed by concentration methods (formal ether sedimentation technique).**Results:** Among 300 samples, 15 (5.00%) were found to be positive for *Entamoeba histolytica* 5 (1.67%) followed by parasite *Giardia lamblia* 4 (1.33%), by parasite *Ascaris lumbricoides* 3 (1.00%) by parasite *Hymenolepis nana* 2 (0.67%), by *Cyclospora* 1 (0.33%).**Conclusions:** Major contributors for the prevalence of parasites were found to be poor personal hygiene and the educational level of the children. This should be regarded as an issue of public health priority and demand for effective school health programs involving periodic health education and screening.

1. Introduction

Intestinal parasitic infections (IPIs) are one of the most common infections world-wide. IPIs are worldwide in particular area and have been described as representing the greatest single globally cause of malady and disease[1,2]. It is estimated that some 3.5 billion people are affected, and 450 million are ill as a result of these infections[3]. The intestinal parasites are protozoan or helminthes living within the body. Mostly these parasites are more common in tropics and subtropics than elsewhere in the world[4]. About one third of the world population, are taint with enteric parasite[4,5]. Approximately 300 million people are severely ill with these worms and of those, at least 50% are school-age children[5]. *Ascaris lumbricoides* (*A. lumbricoides*), *Entamoeba histolytica* (*E. histolytica*)/*dispar*, hookworm, and *Trichuris trichiura* are among the most common parasites in the world[6]. According to the World Health Organization (WHO) estimates, there are 800-1000

million *A. lumbricoides*, 700-900 million hookworm infections, 500 million *Trichuris trichiura*, 200 million *Giardia intestinalis*, and 500 million *E. histolytica/dispar* cases globally[6]. Infection is closely associated with, poor personal hygiene, low income, lack of pure water supply, environmental sanitation, limited access to clean water[7,8]. IPIs, as in many developing countries, are common in Nepal and cause serious public health problems such as malnutrition, anemia and growth retardation as well as higher susceptibility to other infections[8].

Globally, the neglected IPIs such as soil-transmitted helminthes and protozoa infections have been recognized as one of the most significant causes of illnesses and diseases especially among disadvantaged communities[9], particularly in developing countries like Nepal. Intestinal parasites cause significant morbidity and mortality, particularly in developing countries like Nepal[9]. Poor environmental sanitation, irrigation, overcrowding, resettlement, and low altitude were suggested to be responsible for far up prevalence of IPI in Nepal[9-12]. However, IPIs and the possible risk component for IPIs were not illustrated in several localities of Nepal particularly in the study area. Therefore, the purpose of this study was to measure the infection of enteric parasitic infection and related risk component in Dharmasthali Village Development Committee, Kathmandu. We also measured

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knowledge about intestinal parasites and hygienical practices among school children to understand and provide testimonial for the preventive prophylactic measures.

2. Materials and methods

2.1. Study area, design and period

Dharmasthali is a village development committee in Kathmandu District in the Bagmati Zone of central Nepal. At the time of the 2011 Nepal census[10] it had a population of 6530 and had 1421 households in it and consists of 9 wards with major cast are Chettri, Brahmin and Newar. The study was conducted from April to July 2014 in Dharmasthali.

Village development committee, which is located about 7 km from North of Kathmandu town. The village development committee has three primary schools, one high school, one college, and one health center. We choose this location because this place is located at a distant from Kathmandu and lack many resources and the many families live in poverty and are uneducated.

2.2. Sample size and sampling technique

The stool samples ($n = 300$) of school children from different villages/ toles of Dharmasthali, Kathmandu were collected, stool samples were examined by direct microscopy and concentration methods (formal ether sedimentation), to detect eggs, cysts and trophozoites of enteric parasites using direct saline smear and formal-ether concentration technique[11].

Socio-demographic data were collected using standardized question. Stool specimens were collected using clean plastic sheet from all the school going children in Dharmasthali. Before starting the actual work, different procedure was carried out like the samples were patterned for, serial number quantity, and protocol of collection. Furthermore the quality and choice of reagents and device was checked by skilled laboratory technicians. Formal ether concentration techniques were used for examination of intestinal parasites as described by the WHO[12].

This study was approved by Nobel College, ethical review committee. Pokhara university Official letter was submitted to the Nobel College in Sinamangal Kathmandu. Informed verbal agreement was taken from parents/guardians of the students. The intent and the importance of the study were explained and approval was received from the Head of Department of Medical Microbiology at Nobel College, Pokhara University.

2.3. Data collection and laboratory processing and management

The questionnaire was developed with supported on the possible risk factors. Students were interviewed for the validity of this questionnaire. The trained laboratory technologist collected the data for this purpose. To assure the reliability of the information, the children were interviewed using a standard questionnaire. Interview included information such as

age, sex, religion, hands washing habit, ways of transportation, family monthly income playing and swimming habit. All the questionnaires were checked for exactness and completeness.

In falcon tubes labeled with alone identifiers about 2 g of stool were set in 10 mL of 5% formalin. With the help of the wooden spatula samples were exhaustively broken down and homogenized[13]. The formalin-rigid items were reassigned to the medical laboratory of Nobel College (Kathmandu, Nepal) and examined within 21 Days.

With an ether concentration method rigid stool samples were refined [13-16]. Briefly, through a medical gauze the homogenized stool items was separate out into a tube and then centrifuged for 1 min at 500 g. The floating sediment was then cast-off, 7 mL of physiological NaCl-solution and 2-3 mL of diethyl ether was append to the remaining pellet. Tubes were jolted and centrifuged again for 3 min at 500 g[15,16]. The upper three bed were cast-off. The entire deposit was observed by skilled laboratory technicians under a microscope for soil-transmitted helminthes at a magnification of 100 \times , and enteric protozoa at a magnification of 400 \times or 500 \times using oil immersion techniques[16,17]. The data were entered and analyzed using the SPSS statistical software version 16.

3. Results

Out of 300 samples, 15 (5.00 %) found to be positive for IPs, 167 (55.67%) were males and 133 (44.33%) were female (Figure 1). Most predominant *Entamoeba histolytica* 5 (1.7%) followed by parasite *Giardia lamblia* 4 (1.3%), by parasite *A. lumbricoides* 3 (1.0%) by *Hymenolepis nana* 2 (0.7%), by parasite *Cyclospora* 1 (0.3%) (Figure 2). The study was conducted among students from 1-10 class from different schools. Mostly used the source of water as tap water for drinking purpose total 210 (70.00%), followed by jar water 68 (22.67%), by well water 22 (7.33%) (Figure 3). Most of them consume filter water 233 (77.67%), followed by boiling 51 (17.00%), by chemicals (iodine) 26 (8.67%) (Figure 4). Most children used soap and water for washing hands before and after different activities 196 (65.33%), followed by water only 104 (34.67%) (Figure 5). Most of them were non-vegetarians 263 (87.67%), Followed by vegetarians 37 (12.33%) (Figure 6). Anti-parasitic drugs user already taken 204 (68%), followed by not taken 96 (32%) (Figure 7). Knowledge on IPs: Yes 68 (22.7%), No 232 (77.3%) (Figure 8). Figure 9 indicates the map location.

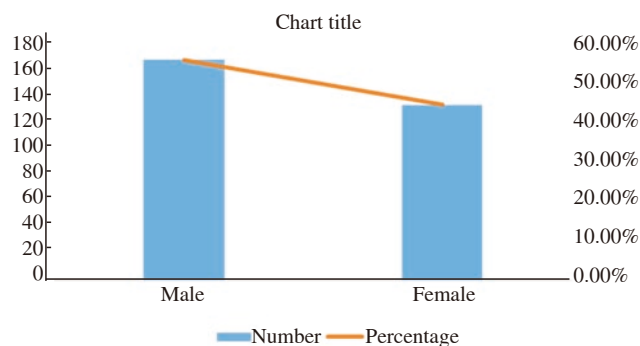


Figure 1. Parasitic infection by gender.

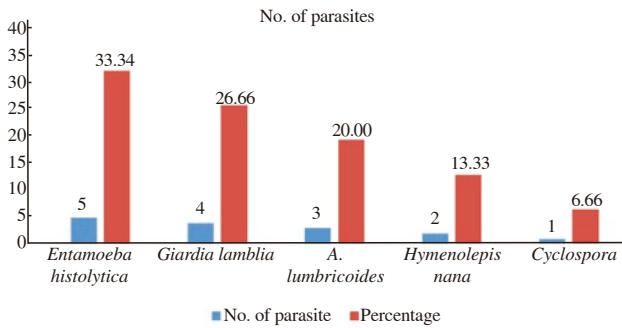


Figure 2. Number of parasitic infection with percentage.

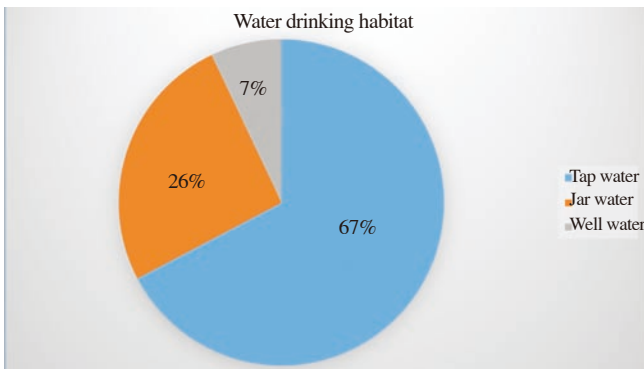


Figure 3. Water drinking habitat percentage.

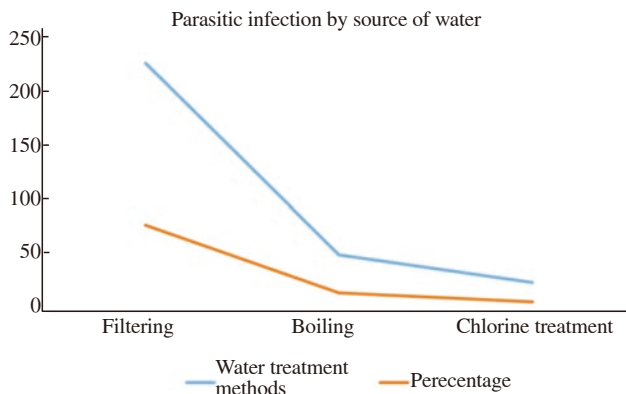


Figure 4. Parasitic infection by source of water.

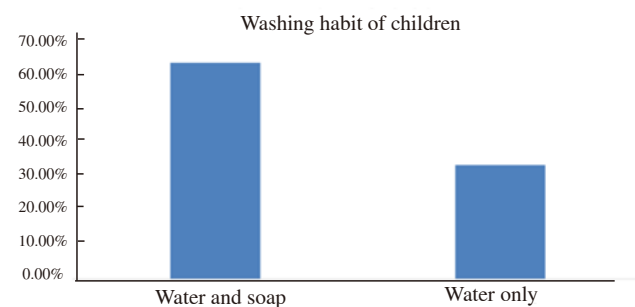


Figure 5. Washing habit of children.

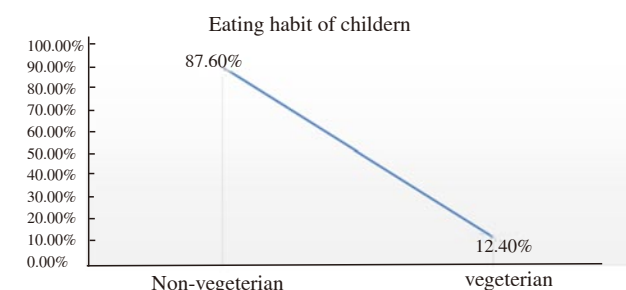


Figure 6. Eating habit of children.

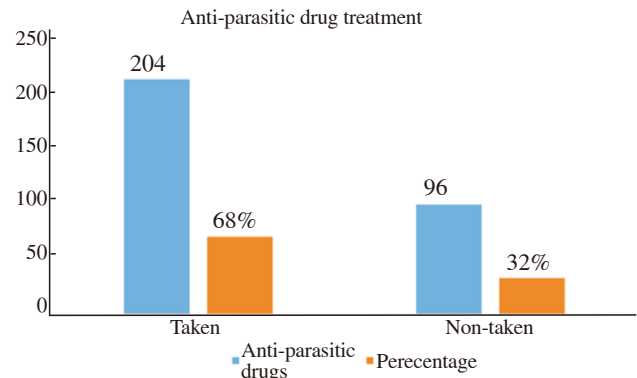


Figure 7. Anti parasitic drug treatment.

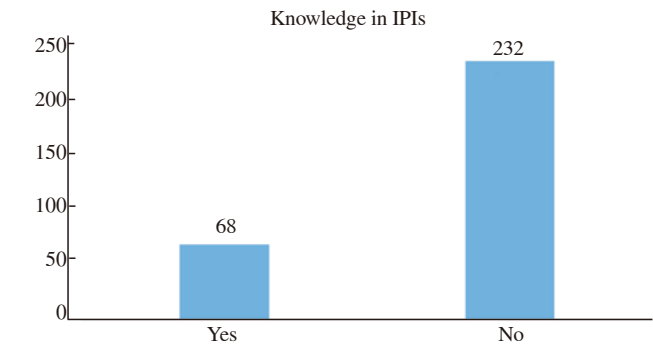


Figure 8. Knowledge regarding IPIs.



Figure 9. Map location.

Larger dotted are indicates more parasitic infection than smaller dotter area.

4. Discussion

The demonstration that there was ratio of intestinal parasitological taint in this study was inconsistent with studies conducted in other regions of the country[17]. For instance, a study conducted among school children in Dharmasthali Kathmandu town showed lower prevalence of IPI than in the present study. In line with this view, an assessment of IPI in high school level students of Birgunj city was carried out. The results of the study showed the occurrence of several intestinal parasites of public health importance among school children[18]. The contradictory report on the prevalence of IPI could be due to variation in awareness regarding transmission and prevention of intestinal parasites between study participants in this study and previous studies[19-21].

Higher level of education in class nine and ten is usually associated with higher level of hygienic practices which might reduce the prevalence and the risk factor of parasitosis. This was not shown in our study, this might be due to the few number of study participants with class nine and ten (2.9%). Furthermore, an important difference was observed in hand washing practice after toilet and absence of toilet with IPI. The different association between hand washing practice after toilet and IPI might be due to the habit of using lone water for washing in the area and improper handling of foods and drinks, without washing their hands using soap and ash.

An important limitation of our study is most likely explained by the lack of sensitivity when analyzing only an individual stool sample with the ether-concentration technique[20]. Hence, in the near future studies, multiple stool samples should be analyzed and subjected to the ether-concentration method or more susceptible molecular method to improve diagnostic accuracy[20,21].

Therefore, it is important and necessary to find out whether anthelmintic and other anti-parasitic drugs have an outcome on resultant enteric protozoan infections. Enteral protozoa often co-occur with intestinal nematodes and Albendazole, for example, was found in a recent meta-analysis to be as efficacious as metronidazole against *Giardia intestinalis*[21].

Conflict of interest statement

We declare that we have no conflict of interest.

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References

- [1] Rai SK, Gurung CK. Intestinal parasitic infection in high school level students of Birgunj City. *J Inst Med* 1986; **8**: 33-7.
- [2] Steketee RW. Pregnancy, nutrition and parasitic diseases. *J Nutr* 2003; **133**(Suppl 2): 1661S-1667S.
- [3] Gelaw A, Anagaw B, Nigussie B, Silesh B, Yirga A, Alem, M, et al. Prevalence of intestinal parasitic infections and risk factors among schoolchildren at the University of Gondar Community School, Northwest Ethiopia: a cross-sectional study. *BMC Public Health* 2013; **13**: 304.
- [4] Wright SG. Protozoan infections of the gastrointestinal tract. *Infect Dis Clin North Am* 2012; **26**: 323-39.
- [5] Alemu A, Atnafu A, Addis Z, Shiferaw Y, Teklu T, Mathewos B, et al. Soil transmitted helminths and *Schistosoma mansoni* infections among school children in Zarima town Northwest Ethiopia. *BMC Infect Dis* 2011; **11**: 189.
- [6] World Health Organization. *Basic laboratory methods in medical parasitology*. Geneva: World Health Organization; 1991, p. 32.
- [7] World Health Organization. *World Health Organization Control of Tropical Diseases*. Geneva: World Health Organization; 1998, p88.
- [8] Mengistu A, Gebre-Selassie S, Kassa T. Prevalence of intestinal parasitic infections among urban dwellers in Southwest Ethiopia. *Ethiop J Health Dev* 2007; **21**: 12-7.
- [9] Tandukar S, Ansari S, Adhikari N, Shrestha A, Gautam J, Sharma B, et al. Intestinal parasitosis in school children of Lalitpur district of Nepal. *BMC Res Notes* 2013; **6**: 449.
- [10] National Population and Housing Census 2011. Government of Nepal National Planning Commission Secretariat Central Bureau of Statistics; 2012. [Online] Available from: http://cbs.gov.np/wp-content/uploads/2012/11/VDC_Municipality.pdf [Accessed on 15th January, 2015]
- [11] Endris M, Lemma W, Akal YB, Moges B, Gelaw A, Angaw B. Prevalence of intestinal parasites and associated risk factors among students of Atse Fasil general elementary school Azezo, Northwestern Ethiopia. *Ethiop J Health Biomed Sci* 2010 ; **3**(1): 25-33.
- [12] World Health Organization. Public health significance of intestinal parasitic infections. WHO Expert Committee. *Bull World Health Organ* 1987; **65**(5): 575-88.
- [13] World Health Organization. Basic laboratory methods in medical parasitology. Geneva: World Health Organization; 1991. [Online] Available from: http://www.who.int/malaria/publications/atoz/9241544104_part1/en/ [Accessed on 15th January, 2015]
- [14] Chan MS. The global burden of intestinal nematode infections-fifty years on. *Parasitol Today* 1997; **13**: 438-43.
- [15] Legesse M, Erko B. Prevalence of intestinal parasites among school children in rural area close to the southeast of Lake Langano, Ethiopia. *Ethiop J Health Dev* 2004; **18**(2): 116-20.
- [16] Ouattara M, N'guéssan NA, Yapi A, N'goran EK. Prevalence and spatial distribution of *Entamoeba histolytica/dispar* and *Giardia lamblia* among schoolchildren in Agboville area (Côte d'Ivoire). *PLoS Negl Trop Dis* 2010; **4**(Suppl 1): e574.
- [17] World Health Organization. Prevention and control of intestinal parasitic infections. Geneva: World Health Organization; 1987. [Online] Available from: http://whqlibdoc.who.int/trs/WHO_TRS_749.pdf [Accessed on 15th January, 2015]
- [18] Utzinger J, Botero-Kleiven S, Castelli F, Chiodini PL, Edwards H, Köhler N, et al. Microscopic diagnosis of sodium acetate-acetic acid-formalin-fixed stool samples for helminths and intestinal protozoa: a comparison among European reference laboratories. *Clin Microbiol Infect* 2010; **16**: 267-73.
- [19] Van Lieshout L, Verweij JJ. Newer diagnostic approaches to intestinal protozoa. *Curr Opin Infect Dis* 2010; **23**: 488-93.
- [20] Schistosomiasis and soil-transmitted helminth infections-preliminary estimates of the number of children treated with albendazole or mebendazole. *Wkly Epidemiol Rec* 2006; **81**: 145-63.
- [21] Steinmann P, Usabalieva J, Imanalieva C, Minbaeva G, Stefiuk K, Jeandron A, et al. Rapid appraisal of human intestinal helminth infections among schoolchildren in Osh oblast, Kyrgyzstan. *Acta Trop* 2010; **116**: 178-84.