Prevalence of Intestinal Parasitic Infections among Schoolchildren of Kapan VDC, Kathmandu

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Abstract
The present study investigated the intestinal parasitic infections in schoolchildren of Kapan VDC, Kathmandu, Nepal. A total of 330 schoolchildren were included in this study. Stool samples collected in clean, dry, screw-capped plastic containers were examined by formal-ether sedimentation technique. A total of 134 samples (40.6%) were positive for some kind of intestinal parasites. The percentage of monoparasitism (67.9%) were higher than multiparasitism (32.1%). Giardia lamblia (17.8%) and Trichuris trichiura (3.6%) were the commonest protozoa and helminthes respectively. Girls were marginally more infected (41.4%) than boys (39.8%) (p>0.05). Children <5 years were more infected (80.0%) than 5-10 years (36.0%) (p=0.001). Prevalence of parasitic infection rate was higher in family size >5 (41.5%) than ≤5 (40.1%) (p=0.82). In ethnic wise distribution, incidence rate of parasites was higher in Dalits (71.4%) and the least in Indo-Aryans (33.1%) (p<0.05). Children drinking water from groundwater source had marginally lower prevalence rate (31.3%) than who used tap water (58.4%) (p<0.001). The higher infection rate (51.3%) was observed in children belonging to labour family and the least in the business family (33.3%) (p=0.032). The children who had taken anti-parasitic drug within past 6 months had lower prevalence rate (25%) than those who had not taken drugs (44.4%) (p=0.005).

Keywords: Intestinal parasites; schoolchildren; Kapan; Nepal.

Introduction
Intestinal parasitosis is one of the major causes of public health problems, resulting socioeconomic problems further in world particularly in developing countries. About twenty five percent of world population has been infected with one or more species of soil transmitted helminthes alone (WHO, 2002). Intestinal parasites are endemic in most tropical and subtropical countries, particularly in developing countries due to deficient life conditions with lack of adequate hygiene and sanitation, illiteracy, overcrowding and low construction level and are one of the major causes of diarrhoeal diseases (Rai et al., 2004).

Intestinal parasitic infections are common in Nepal (Rai and Gurung, 1986; Estevez et al., 1983; Rai et al., 2000). Polyparasitism is common in rural areas (Rai et al., 2001). Intestinal worm infection alone ranks fourth in “top-ten-diseases” in Nepal (MoHP, 2007). Intestinal parasitosis has been associated with different morbidities, malnutrition, anaemia and others particularly in children and pregnant women including mortality. This is attributed to low socio-
economic, educational and poor hygienic conditions of the people (Rai et al., 1998; Rai, 2005; Rai et al., 2001). In this paper, we report the status of intestinal parasitosis among schoolchildren of Kapan VDC, Kathmandu.

Materials and Methods

Subjects and Sample Collections
Schoolchildren studying at private and public schools of Kapan VDC, 330 students (Boys: 161, Girls: 169) were included in this study. A questionnaire on age, sex, family size, ethnic group, predisposing factors etc was filled. Informed consent was obtained from both the teachers and students. Stool samples collected in clean and dry screw capped plastic containers were transported to Shi-Gan Health Foundation/National Institute of Tropical Medicine in Kathmandu and were fixed in equal volume of 10% formal saline for analysis.

Sample Analysis
Stool samples were examined for the parasitic eggs and cysts both microscopically and macroscopically. Microscopic examination was done after formal ether concentration technique. The wet mount prepared from deposit was examined under the microscope. The findings were recorded, stratified and analyzed using SPSS 12. Significant differences were calculated using the Chi-square test.

Results
Of the 330 schoolchildren included, 134 samples were found positive for parasites (40.6%). Altogether ten species of parasites were detected (Table-1). Among protozoans revealed Giardia lamblia (17.8%) was the most common along with Entamoeba histolytica (17.8%) followed by Blastocystis hominis (4.5%), E. coli (4.2%), E. hartmanni (2.4%) and E. nana (1.8%). Among helminthes Trichuris trichiura (3.6%) was most common followed by Ascaris lumbricoides (1.5%), hookworm (0.9%) and Hymenolepis nana (0.8%).

Table 1: Types and frequency of parasites detected in total 330 samples

| Type of parasites | Total | %  |
|-------------------|-------|----|
| Helminthes        |       |    |
| i) T. trichiura   | 12    | 3.6%|
| ii) A. lumbricoides | 5     | 1.5%|
| iii) Hookworm     | 3     | 0.9%|
| iv) H. nana       | 1     | 0.3%|
| Protozoans        | 161   | 48.8%|
| i) G. lamblia     | 59    | 17.8%|
| ii) E. histolytica| 59    | 17.8%|
| iii) B. hominis   | 15    | 4.5%|
| iv) E. coli       | 14    | 4.2%|
| v) E. hartmanni   | 8     | 2.4%|
| vi) E. nana       | 6     | 1.8%|
| Total Parasites   | 182   | 100%

Boys had relatively higher prevalence compared with girls (p>0.05) (Table-2). The occurrence of parasitic infection was significantly higher in age group <5 years (p=0.001) (Table-3).

Table 2: Gender wise prevalence of parasitic infection

| Sex     | Total n | Positive n | %  | p-value |
|---------|---------|------------|----|---------|
| Boys    | 161     | 64         | 39.8| 0.823   |
| Girls   | 169     | 70         | 41.4|         |
| Total   | 330     | 134        | 40.6|         |

Table 3: Age wise distribution of parasitic infection

| Age     | Total n | Positive n | %  | p-value |
|---------|---------|------------|----|---------|
| < 5 years | 20      | 16         | 80.0| 0.001   |
| 5-10 years | 222     | 80         | 36.0|         |
| > 10 years | 88      | 38         | 43.2|         |
| Total   | 330     | 134        | 40.6|         |

Among different ethnic groups, the highest percentage (71.4%) of positive cases were in Dalits whereas 45.8% in Tibeto-Burmans and 33.1% in Indo-Aryans (p<0.05) (Fig. 1).

Fig. 1: Prevalence of intestinal parasitosis according to ethnic group

The prevalence was found slightly lower among the children of family size <5 (p>0.05). The highest prevalence rate of parasitic infection was in children from parents with labour as occupation (51.3%) (Table-4).

The higher prevalence was found in those consuming tap water (58.4%) than those taking ground water (31.3%) (Table-5). The difference between the source of water and occurrence of the parasitic infection was statistically significant (p<0.001). Statistically, there was significant difference between type of water used and the occurrence of parasitic infection (p<0.001) (Table-6). The prevalence of parasitic infection was found low in the people who have hand washing habit (46.1%) than people not washing their hands frequently (30.1%). Statistically there was significant
difference between hand washing habit and occurrence of the parasitic infection (p=0.003) (Table-7). Higher prevalence of parasitic infection was found among children studying at public school (52%) than in private school (28.3%). The difference between type of school and the occurrence of parasitic infection was statistically significant (p<0.001) (Table-8).

**Table-4: Prevalence of parasites according to occupation of parents**

| Occupation | Total n | Positive n | %  | p-value |
|------------|---------|------------|----|---------|
| Service    | 125     | 43         | 34.4 | 0.032 |
| Business   | 39      | 13         | 33.3 |     |
| Labour     | 119     | 61         | 51.3 |     |
| Others     | 47      | 17         | 36.2 |     |
| Total      | 330     | 134        | 40.6 |     |

**Table-5: Prevalence of parasites according to source of water**

| Source of water | Total n | Positive n | %  | p-value |
|-----------------|---------|------------|----|---------|
| Tap water       | 113     | 66         | 58.4 | <0.001 |
| Groundwater     | 217     | 68         | 31.3 |     |
| Total           | 330     | 134        | 40.6 |     |

**Table-6: Prevalence of parasites according to treatment of water**

| Treatment | Total n | Positive n | %  | p-value |
|-----------|---------|------------|----|---------|
| Treated   | 199     | 105        | 52.8 | <0.001 |
| Untreated | 131     | 29         | 22.1 |     |
| Total     | 330     | 134        | 40.6 |     |

**Table-7: Prevalence of parasites according to hand washing habit**

| Hand washing | Total n | Positive n | %  | p-value |
|--------------|---------|------------|----|---------|
| No           | 217     | 100        | 46.1 | 0.003 |
| Yes          | 113     | 34         | 30.1 |     |
| Total        | 330     | 134        | 40.6 |     |

**Table-8: Prevalence of parasites according to type of school**

| School       | Total n | Positive n | %  | p-value |
|--------------|---------|------------|----|---------|
| Public       | 171     | 89         | 52 | <0.001 |
| Private      | 159     | 45         | 28.3 |     |
| Total        | 330     | 134        | 40.6 |     |

There was significant difference in occurrence of the parasitic infection (p=0.013) which reveals that presence of abdominal symptoms is associated with parasitic infection (Table-9). Statistically, there was significant difference between use of anti-helminthic drug and occurrence of the parasitic infection (p=0.005) (Fig-2).

**Table-9: Prevalence of parasites according to presence of associated symptoms**

| Symptoms  | Total n | Positive n | %  | p-value |
|-----------|---------|------------|----|---------|
| Absence   | 183     | 63         | 34.4 |     |
| Presence  | 147     | 71         | 48.3 | 0.013 |
| Total     | 330     | 134        | 40.6 |     |

**Discussion**

The prevalence of parasitic infections was found 40.6%. The finding was in harmony with other previous results (Oda et al., 2002; Yong et al., 2000). Ishiyama et al. (2001), Rai et al., (2002) and Rai et al. (2005) have reported higher positive rates among school children. The prevalence rate found was higher than rates reported by Ishiyama et al. (2003) and Easow et al. (2005). Such variations may be due to over dispersion of parasites, socio-economic conditions of study areas and the detection method used.

The percentage of monoparasitism was higher than multiparasitism in this study which was in agreement with other studies (Yong et al., 2000; Ishiyama et al., 2003; Uga et al., 2004). Low prevalence of mixed parasitic infection might be due to increasing awareness about health and hygiene among the people.

Protozoans were dominant over helminthes. Contamination of land with faecal matter used as manure, open defaecation, lack of public awareness and use of contaminated drinking water are possible factors resulting in higher rate of protozoal infection. Overall 9 species of intestinal parasites were detected, 4 helminthes and 5 protozoans. G. lamblia (17.8%) and E. histolytica (17.8 %) were the most common protozoans detected whereas T. trichiura (3.6%) was the most common helminthes detected. Infection with E. histolytica is common in developing countries; mainly affecting people with low socioeconomic conditions and poor personal hygiene (Braga et al., 1998). Detection of

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intestinal parasites such as *G. lamblia* and *E. histolytica* infecting the children implies the fact that children are exposed to faecally contaminated surroundings. Practicing good hygiene (e.g. washing hands thoroughly with soap and water) and avoiding use of contaminated water and food are the important preventive measure of common intestinal infections.

*T. trichiura* has been reported as most common parasite in previous studies from Nepal (Ishiyama et al., 2001; Uga et al., 2004; Rai et al., 2005a; Sharma et al., 2004). In this study also *T. trichiura* is most common helminthes but the prevalence is less than reported previously. It could be due to ineffective deworming with single dose of anti helminthic drug. The higher prevalence of *T. trichiura* in comparison to other helminthes is because of its special mode of attachment to intestinal mucosa, longer life span of parasites and its refractory reaction to most antihelminthic drugs then remains in intestine causing chronic infection.

The overall positive rate is nearly similar in both boys and girls. This result implies that there is equal chance of infection for all, which might be due to over dispersion of parasites and poor sanitary conditions in the community (Rai et al., 2005). Ishiyama et al. (2001) also reported the equal positive rates between sexes in Western Nepal.

The infection rate was found highest among children under age of five. Prevalence of parasite might be associated with their unhygienic habits and also due to difference between the study populations.

Higher positive rates in Dalits have been reported earlier (Rai et al., 2002; Rai et al., 2005; Shrestha et al., 2001). In this study also Dalits have seen to have highest prevalence of parasites. This may be due to small sampling size and low socioeconomic status, poverty, illiteracy, lack of awareness of Dalits, as compared to other castes. The significantly higher rate has been reported in children of parents involved in farming or working as labors as their family members are more prone to get infection through the soil, contaminated with parasites. Hygienic practice like proper hand washing and drinking safe water as well as good sanitation can reduce the transmission of helmint infections. The type of drinking water (treated vs. untreated) was also found significantly associated with parasitic infections (Ishiyama et al., 2001; Oda and Sherchand, 2002). In this study the parasitic infection is more than double in children drinking untreated water. It may be due to direct drinking of contaminated water as water sources of Kathmandu Valley are heavily contaminated.

In present study, the parasitic infection was significantly higher in public school than in private school. Different studies had also reported the high prevalence of parasitic infection in public school (Rai et al., 1986; Ishiyama et al., 2001; Rai et al., 2005; Sharma et al., 2004). This difference was due to poor sanitary environment, unhygienic condition, drinking contaminated water, immunity level of children and low socioeconomic level of the family (Rai et al., 2000; Rai et al., 1998).

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