PREVALENCE OF INTESTINAL PARASITIC INFESTATION IN SCHOOLCHILDREN IN THE NORTHEASTERN PART OF KATHMANDU VALLEY, NEPAL

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Abstract. This paper presents the status of intestinal parasitosis in public schoolchildren (1 to 10 classes) in a rural area of the Kathmandu Valley, Nepal. A total of 533 schoolchildren (269 girls and 264 boys, aged 4 to 19 years) were included in this study. A questionnaire was filled out regarding hygienic and other habits, including factors predisposing to parasitic infections. Fecal samples from the children were examined by formol-ether concentration technique. The overall prevalence of parasitosis was 66.6% (395/533) with no significant difference between boys and girls ($p > 0.05$). *Tibeto*-Burman children had a non-significant higher prevalence, compared with Indo-Aryan and Dalit children ($p>0.05$). Half (53.8%; 191/355) of the children had multiple parasitic infections. Altogether, nine types of parasites were recovered. The recovery rate of helminths was higher (76.9%) than protozoa (23.1%). *Trichuris trichiura* was the most common helminth detected, followed by hookworm, *Ascaris lumbricoides* and others. *Entamoeba coli* was the most common protozoan parasite, followed by *E. histolytica*, *Giardia lamblia* and others.

INTRODUCTION

Intestinal parasitosis still constitutes one of the major causes of public health problems in the world, particularly in developing countries. It is estimated to affect around 3.5 billion people globally and 450 million are ill as a result of these infections, the majority being children (WHO, 2000). In some tropical areas, the prevalence reaches nearly 100% (Estevez *et al*, 1983; Rai and Gurung, 1986).

Nepal is a small, impoverished country located in South Asia with infectious diseases, including intestinal parasitosis, being highly prevalent (Rai *et al*, 2001; 2002). The reported prevalence of intestinal parasitosis varies considerably from one study to another (Nepal and Palfy, 1980; Reily, 1980; Rai and Gurung, 1986; Gianotti 1990; Rai *et al*, 1995, 2001, 2002; Ishiyama *et al*, 2001) with nearly 100% in some rural areas (Nepal and Palfy, 1980; Reily, 1980; Estevez *et al*, 1983; Rai and Gurung, 1986). Polyparasitism is common in some areas (Estevez *et al*, 1983; Rai *et al*, 2001). High prevalence is attributed to poor sanitation, poverty and lack of health education, (Matsumura *et al*, 1998; Rai *et al*, 2002), and water contamination (Adhikari *et al*, 1986; Ono *et al*, 2001). In addition, emerging parasites have also been reported (Sherchand *et al*, 1996; Ono *et al*, 2001). In this paper, we report the status of intestinal parasitosis among schoolchildren in the northeastern part of the Kathmandu Valley, Nepal. We have chosen schoolchildren because of their great impact on intestinal parasite control in the future, as has been shown elsewhere (Yokogawa *et al*, 1993).

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MATERIALS AND METHODS

Subjects and sample collection

Schoolchildren studying at public schools in a village setting in the northeastern part of the Kathmandu Valley, Nepal were included in this study. Out of a total of 562 students initially enrolled, with the distribution of a clean, dry, screw capped and properly labeled plastic container, 533 schoolchildren (class 1 to 10; aged 4 to 19 years;

boys: 269 and girls: 264) were included in this study. A questionnaire on age, sex, family size, ethnic group etc was filled. Informed consent was obtained from both the teachers and students.

Parasitic examination

Fecal samples were examined for the presence of parasites both macroscopically and microscopically. Microscopic examination was done by formol-ether concentration technique. The wet preparation prepared from the deposit was examined under the microscope for intestinal parasites.

Data analysis

The findings were stratified by age, sex, ethnic groups, and others using EP Info 2000. Significant differences were calculated using the chi-square test.

RESULTS

Of the 533 schoolchildren included, 355 (66.6%) had some kind of parasitic infection (either helminth, protozoa or both). Boys had a prevalence (68.6%) not statistically different ($p>0.05$) from girls (64.7%) (Table 1). The positive rates were 59.2%, 71.0% and 65.6% among children aged 4-10, 11-14 and 15-19 years, respectively (Fig 1) with a significant difference between the groups aged 4-10 and 11-14 years ($p<0.05$). Ethnically, Tibeto-Burman had a prevalence of 69.7%, Indo-Aryans of 64.6%, and Dalits (the lower caste people) of 51.9%, with no statistically significant differences ($p>0.05$) (Table 2).

Nine species of parasites, five species of protozoa and four species of helminthes, were detected (Table 3). *Trichuris trichiura* was the most common parasite (34.6%). Among the helminths, *T. trichiura* (34.6%) was followed by hookworms (23.7%), *Ascaris lumbricoides* (13.8%) and *Vampirolepis nana* (4.9%). Of the protozoan parasites, *Entamoeba coli* (6.4%) topped the list, followed by *E. histolytica* (6.1%), *Giardia lamblia*

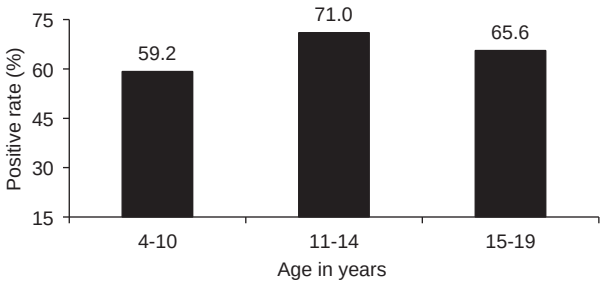

Fig 1–Prevalence of intestinal parasites among schoolchildren of different age-groups.

Table 1
Prevalence of intestinal parasites among schoolchildren in a village setting in Kathmandu Valley, Nepal.

Sex	Total no.	Positive no.	%	p-value
Boys (M)	264	181	68.6	0.5267
Girls (F)	269	174	64.7	
Total	533	355	66.6	

Table 2
Prevalence of intestinal parasites among schoolchildren of different ethnic groups.

Ethnic group	Total no.	Positive no.	%	p-value
Tibeto-Burman	277	193	69.7	0.2755
Indo-Aryan	229	148	64.6	
Dalit	27	14	51.9	
Total	533	355	66.6	

Table 3
Types of intestinal parasites detected from schoolchildren.

Types of parasites	Total no.	%
Protozoa	145	23.1
Entamoeba coli	40	6.4
E. histolytica	38	6.1
Giardia lamblia	36	5.7
E. hartmani	30	4.8
Iodamoeba butschilii	1	0.2
Helminths	485	76.9
Trichuris trichiura	218	34.6
Hookworms	149	23.7
Ascaris lumbricoides	87	13.8
Vampirolepis nana	31	4.9
Total	630	100

Table 4
Types of intestinal parasitic infections in schoolchildren.

Types of infection	Total no.	%
Single parasite	164	46.2
Protozoa	42	25.6
Helminths	122	74.4
Multiple parasites	191	53.8
Protozoa	7	3.7
Helminths	112	58.6
Protozoa + Helminths	72	37.7
Total	355	100

(5.7%), *E. hartmani* (4.8%) and *Iodamoeba butschilii* (0.2%). More than half (53.8%) the children had mixed parasitic infections (mixed helminthes: 58.6%, protozoa and helminth: 37.7%, and mixed protozoa: 3.7%). Of the single parasitic infections (46.2%), about three-fourths (74.4%) were helminths and the remaining one-forth (25.6%) were protozoa (Table 4).

DISCUSSION

In this study, two-thirds of public schoolchildren were infected with some kind of intestinal parasite. This was close to the findings reported in public schoolchildren in the northern part of the Kathmandu Valley (Ishiyama *et al*, 2001), other reports from Nepal (Rai and Gurung, 1986; Rai *et al*, 2001), and elsewhere (Rajeswari *et al*, 1994).

Infection rates were similar between boys and girls, indicating an equal opportunity for acquiring parasitic infections. Ishiyama *et al* (2001) reported similar findings among schoolchildren living in almost identical conditions. Equal positive rates between the sexes have been reported from the western hilly area of Nepal (Rai *et al*, 2001). Investigators from elsewhere have reported higher prevalences either in females (Rajeswari *et al*, 1994; Kightlinger *et al*, 1995) or males (Agi, 1995). Present findings together with previous ones indicated that intestinal parasites are dispersed throughout the environment, including Kathmandu Valley, where the capital city is located.

The significantly higher prevalence (71.0%) among children in the group aged 11-14 years appears to be associated with their activities. Children in this age group usually move around over a wider territory, increasing the possibility of acquiring infections from contaminated environment.

Dalits in Nepal have a relatively low literacy rate, unhygienic habits, and a low socio-economic status (NPC, 2002). Recently, Rai *et al* (2002) reported a higher positive rate among Dalits compared with others in a rural hilly community. Earlier, Rajeswari *et al* (1994) showed an association between a higher prevalence of intestinal parasitosis and socio-economic status, family size, sanitary disposal, and water supply in Malaysia. In spite of relatively low literacy rates, unhygienic habits and the low socio-economic status of Dalits, no significant differences in parasite positive rates were observed. This further supports the wide distribution of intestinal parasites in this study area.

Helminths dominating protozoan parasites is in agreement with previous reports from Nepal (Nepal and Palfy, 1980; Estevez *et al*, 1983; Rai and Gurung, 1986; Rai *et al*, 1995; Sherchand *et al*, 1996; Rai *et al*, 2000; 2001). All helminth parasites detected in this study were soil-transmitted helminths. This is in agreement with the rate of soil contamination with helminth parasite eggs in the Kathmandu Valley (Rai *et al*, 1994; 2000).

Most studies in Nepal have shown *A. lumbricoides* as the most common helminth (Nepal and Palfy, 1980; Estevez *et al*, 1983; Rai and Gurung 1986; Rai *et al*, 1995; 1998; 2000; 2001; Sherchand *et al*, 1996). *T. trichiura* topping the list of helminths, as well as the total parasites detected in this study, is not in agreement with previous reports from Nepal, but with the findings reported by Ishiyama *et al* (2001). Similar findings have been reported from elsewhere (Kasuya *et al*, 1989; Rajeswari *et al*, 1994). This appears to be due to the difficulty of complete removal of this parasite with a single dose of antihelminthic drug, particularly in those with heavy infection (Albonico *et al*, 1999).

E. coli detected as the most common protozoa is in agreement with a previous report (Rai *et*

al, 2001). It is not in agreement with many other reports from Nepal (Estevez *et al*, 1983; Rai and Gurung, 1986; Sherchand *et al*, 1996; Ishiyama *et al*, 2001) or elsewhere in the world (Kasuya *et al*, 1989; Rajeswari *et al*, 1994; Sethi *et al*, 2000*)*. In those studies, *G. lamblia* topped the list of protozoa.

Some reports from Nepal (Estevez *et al*, 1983; Rai *et al*, 2001) and elsewhere in the world (Kasuya *et al*, 1989; Rajeswari *et al*, 1994) have shown high levels of multiple parasitic infections. In this study, more than half the children had polyparasitic infections. This is a clear indication of large numbers of various species of parasites in the local community.

Keeping in mind the significant increase in households having a pit latrine and improvements in sanitation and hygiene in eastern Nepal (Rai *et al*, 1997) and the great success achieved in Japan (Yokogawa *et al*, 1993) and subsequently in Korea (Chai and Lee, 1993) and Taiwan (Chen *et al*, 1993), all stool positive subjects were treated with respective anti-parasitic drugs. In addition, basic preventive measures against intestinal parasitic infections were discussed with schoolteachers and students.

Our findings, together with those reported by Ishiyama *et al* (2001), show that intestinal parasitic infections remain highly endemic in the vicinity of the capital city and appear to be due to the poor sewerage system, and fecal contamination of drinking water (Adhikari *et al*, 1986; Ono *et al*, 2001). These findings strongly indicate a need for a comprehensive program to combat intestinal parasites associated with morbidity and mortality in Nepal.

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