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Prevalence and distribution of intestinal parasitic infestations among school children in Kaski District, Western Nepal

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ABSTRACT

This study was conducted to estimate the prevalence of intestinal parasitic infestations among school children in Kaski District of Western Nepal. A total of 2091 stool samples were collected from school children selected from 11 rural and eight urban schools. The stool samples were examined for evidence of parasitic infections by direct microscopic examination. Prevalence of intestinal parasites was 21.3%. There was a significant difference in prevalence between urban (18.7%) and rural (24.1%) school samples. *Giardia lamblia* (13.2%), *Ascaris lumbricoides* (2.1%) and *Entamoeba histolytica* (1.7%) were the commonest parasites isolated. The results indicate that intestinal parasitic infestation among school children in the study area is mainly water-borne. The burden of parasitic infestations among the school children, coupled with the poor sanitary conditions in the schools, should be regarded as an issue of public health priority. This strongly supports the need for school health programmes that will involve periodic deworming, health education and improvement of school sanitation.

INTRODUCTION

The World Health Organization (WHO) estimates that over one billion of the world's population is chronically infested with soil-transmitted helminths and 200 million are infested with schistosomes.[1] The high prevalence of these infestations is closely correlated to poverty, poor environmental hygiene and impoverished health services.[1,2] Intestinal helminth infestations are the most common infestations among school age children, and they tend to occur in high intensity in this age group.[2,3] Also, helminthic infestations lead to nutritional deficiency and impaired physical development, which will have negative consequences on cognitive function and learning ability.[4,5]

Like other developing countries, intestinal parasitic infestation is a major health problem in Nepal. A study on the prevalence of intestinal parasites among school children

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conducted in two rural villages of Chitwan District estimated a prevalence of 44.0%.[6] Similar results were reported from different parts of Nepal.[7,8] Such epidemiological surveys on the intestinal parasitic infestations among school children are important in this country since they reflect the sanitary conditions of schools and generate data that are essential to formulate strategies for the control of intestinal parasitic infestations among school children. Kaski District is one of the 14 districts in Western Development Region of Nepal. The district has a land area of 2017km^2 and a population of 380,527. Kaski District has 43 villages and Pokhara municipality, whose population is 156,312.[9] Data on the prevalence and distribution of intestinal parasitosis among school children is not available for Kaski District. Hence, we undertook the present study to estimate the prevalence of intestinal parasitic infestations among school children in Kaski District of Western Nepal.

METHODS

The present survey was conducted from January to June 2004 in Pokhara City and its surrounding 43 villages of Kaski District of Western Nepal. The survey involved 192 schools (both primary and secondary), 108 of which were located in the 43 villages and 84 in Pokhara City. Ten per cent of the schools from Pokhara City and villages were selected by systematic random sampling method after listing schools from Pokhara City and the villages separately. Thus, a total of 19 schools – 11 from the rural areas and eight from Pokhara City – were selected for the study. Schools in the municipal corporation limits of Pokhara City were considered as urban while those outside the limits were considered as rural.

All children present in school on the day of the survey were enrolled for the study. The purpose of the study and the procedure for stool sample collection were explained to school teachers, children and their parents in each school. Plastic containers with identification numbers and names were distributed to all the children, which were used to collect stool sample from each child. Information about name, sex, age, school grade and the result of stool examination for each child was recorded on the stool examination forms by the field workers. Stool samples were examined within 12 hours for the cysts and ova of intestinal parasites by direct microscopic examination at the Manipal Teaching Hospital. The data were entered into the computer using SPSS version 7.5 and analysed. The results were expressed as rates and proportions. Chi square test of statistical significance was applied to study the association between prevalence of intestinal parasites and the demographic factors. P value <0.05 was considered as significant.

RESULTS

A total of 2091 stool samples were examined. The mean age of the school children was 8.8 years (SD 3.1). A majority (50.6%) of them were in the 6–10 years age group (Table 1). The prevalence of intestinal parasites was 21.3%. There was no significant difference in the prevalence of intestinal parasites according to age and gender of the school children. Prevalence was highest in the 6–10 years age group (22.7%), while prevalence was 21.5% and 21.04% among male and female children respectively. Prevalence of infestation was higher in rural (24.1%) than urban (18.7%) schools and the difference was statistically significant (Table 2).

The cyst positive rate of intestinal protozoal infestation was 15.3%, while the egg positive rate of intestinal helminthic infestation was 7.1%, and 0.7% had mixed infestations. The cyst positive rate of intestinal protozoal infestation was 13.2% for *Giardia lamblia* and 1.7% for *Entamoeba histolytica*. The egg positive rates for

Table 1 **Distribution of school children according to age, gender and school location (urban/rural)**

Characteristic	Age group (years)				Total
	≤ 5	6–10	11–15	≥ 16	
Gender					
Male	211 (18.5)	581 (51.1)	326 (28.7)	18 (1.6)	1136 (54.3)
Female	181 (18.9)	478 (50.0)	280 (29.3)	16 (1.7)	955 (45.6)
Location					
Urban	244 (22.3)	544 (49.7)	292 (26.7)	14 (1.2)	1094 (52.3)
Rural	148 (14.8)	515 (51.6)	314 (31.5)	20 (2.0)	997 (47.7)
Total	392 (18.7)	1059 (50.6)	606 (28.9)	34 (1.6)	2091

Table 2 **Prevalence of intestinal parasites according to age, gender and location of school (urban/rural)**

	Number examined	Number positive	Percentage
Age group(years)			
≤ 5	392	71	18.1
6–10	1059	241	22.7
11–15	606	127	20.9
≥ 16	34	7	20.5
Gender			
Male	1136	245	21.5
Female	955	201	21.0
*Location of school**			
Urban	1094	205	18.7
Rural	997	241	24.1
Total	2091	446	21.3

**Chi square test was significant ($p < 0.05$)*

helminthic infestation were 2.1%, 1.6%, 1.3%, 0.4% for *Ascaris lumbricoides, Hymenolepis nana, Trichuris trichura* and *Necator americanus* respectively. Eggs of *Strongyloides stercoralis* were isolated from two samples and *Enterobius vermicularis* from only one sample (Table 3).

DISCUSSION

The prevalence of intestinal parasites in the present study was 21.3%. There was a significant difference in the prevalence between urban and rural schools. *Giardia lamblia* (13.2%) and *Ascaris lumbricoides* (2.1%) were the most common organisms detected. There was no significant difference in prevalence of intestinal parasites according to age and gender of the school children. The prevalence of intestinal parasitic infections estimated in this study was less than in a previous study conducted in two villages of Chitwan District. Studies from other countries, namely, Philippines, Cambodia and Turkey, have reported a higher prevalence of intestinal parasites among school children.[10-12] This could be attributed to the different geographical location and time of the survey, i.e., summer (January to June), which is a low transmission season. Also, the direct microscopic examination method used for detection of parasites has a low rate of parasite

Table 3 Intestinal parasites isolated according to age, gender and location of school (Urban/Rural)

	Age group (years)				Gender		Location of school*		Total
Parasite	**≤ 5**	**6–10**	**11–15**	**≥ 16**	**Male**	**Female**	**Urban**	**Rural**	
Giardia lamblia	52 (13.2)	154 (14.5)	70(11.5)	1(2.9)	156 (13.7)	121 (12.6)	135 (12.3)	142 (14.2)	277(13.2)
Ascaris lumbricoides	9 (2.2)	24 (2.2)	12 (1.9)	–	21 (1.8)	24 (2.5)	15 (1.4)	30 (3.0)	45 (2.1)
Entamoeba histolytica	1 (0.2)	23 (2.2)	11 (1.8)	1(2.9)	15 (1.3)	12 (1.2)	15 (1.3)	21 (2.1)	36 (1.7)
Trichuris trichura	2 (0.5)	17 (1.6)	12 (1.9)	3(8.8)	17 (1.5)	19 (1.9)	11 (1.0)	16 (1.6)	27 (1.3)
Hymenolepis nana	5 (1.2)	13 (1.2)	9 (1.5)	–	18 (1.6)	16 (1.7)	21 (1.9)	13 (1.3)	34 (1.6)
Necator americanus	1 (0.2)	4 (0.4)	2 (0.3)	1(2.9)	5 (0.4)	3 (0.3)	1 (0.0)	7 (0.0)	8 (0.4)
Strongyloides stercoralis	–	–	1 (0.6)	1(2.9)	1(0.0)	1(0.0)	1 (0.0)	1 (0.0)	2(0.0)
Enterobius vermicularis	–	1	–	–	–	1(0.0)	1 (0.0)	–	1 (0.0)
Mixed infections	1 (0.2)	5 (0.5)	10 (1.6)	–	12 (1.0)	4 (0.4)	5 (0.0)	11 (1.1)	16 (0.7)

Figures in parenthesis indicate percentages

detection. It was the only feasible method to examine the stool samples since the study was community-based.

The prevalence of protozoal infection was higher than that of helminths, and *Giardia lamblia* was the commonest intestinal parasite isolated. Similar results have been reported from a previous study in Nepal.[6] This is in contrast to surveys from Philippines and Cambodia, which reported a higher prevalence of helminths.[10,11] This suggests that water-borne parasitic infections are very common among school children in Kaski District of Western Nepal, which reflects the poor sanitary conditions existing in the schools.

Few studies from Nepal have reported *A. lumbricoides* as the most common helminth among school children[8,13,14] while other studies reported hook worm as the most common helminth.[7] This is in contrast to findings from the present study in which *A. lumbricoides* was the commonest. This difference could be as a result of variation in the geographic locations of the areas where the surveys were conducted. The higher prevalence of parasitic infections in rural schools than urban schools could be due to low socio-economic status, poor hygienic habits and lack of sanitation prevailing in the rural schools. However, our study did not assess school sanitation condition. Hook worm eggs were isolated in seven out of 997 samples from the rural schools and only one out of 1094 samples from urban schools. This difference was statistically significant, indicating that hook worm infestation is more prevalent in rural than urban areas. Since hook worm is a soil-borne helminth, rural conditions favour its transmission.

CONCLUSION

The results of this study re-emphasise the fact that intestinal parasitic infestation among school children in the study area is mainly water-borne. The burden of parasitic infestations among the school children,

coupled with the poor sanitary conditions in the schools, should be regarded as an issue of public health priority. This strongly supports the need for school health programmes that will involve periodic deworming, health education and improvement of school sanitation.

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References

1. Montresor A, Crompton DWT, Hall A, Bundy DAP and Savioli L. *Guidelines for the Eevaluation of Soil Transmitted Helminthisiases and Schistosomiasis at Community Level*. Geneva: World Health Organization, WHO/CTC/SIP/98.
2. Albonico M, Crompton DWT and Savioli L. Control strategies for human intestinal helminth infections. *Adv Parasitol* 1999; 42: 276–341.
3. Savioli L, Bundy DAP and Tomkins A. Intestinal parasitic infections: a soluble public health problem. *Trans R Soc Trop Med Hyg* 1992; 86: 353–354.
4. Nokes C and Bundy DAP. Does helminth infection affect mental processing and educational achievement*? Parasitol Today* 1994; 10: 14–18.
5. Simeon DT and Grantham-McGregor S. Nutritional deficiencies and children behaviour and mental development. *Nutr Res Rev* 1990; 3: 1–24.
6. Tai-Soon YONG, Seobo SIM, Jongweon LEE, Heechoul OHRR, Myung-Ho KIM and Hyunsoo KIM. A small-scale survey on the status of intestinal parasite infections in rural villages in Nepal. *Korean J Parasitol* 2000; 38(4): 275–257.
7. Estevez EG, Levine JA and Warren J. Intestinal parasites in a remote village in Nepal. *J Clin Microbiol* 1983; 17: 160–161.
8. Rai SK, Kubo T, Nakanishi M, et al. Status of soil-transmitted helminthic infection in Nepal. *J Japan Assoc Infect Dis* 1994; 68: 625–630.
9. Central Bureau of Statistics, National Planning Commission Secretariat. Population Census 2001. His Majesty Government, Nepal, 2001.
10. Kim BJ, Ock MS, Chung DI, Yong TS and Lee KJ. The intestinal parasite infection status of inhabitants in the Roxas city, The Philippines. *Korean J Parasitol* 2003; 41(2): 113–115.
11. Lee KJ, Bae YT, Kim DH, Deung YK, Ryang YS, Kim HJ, Im KI and Yong TS. Status of intestinal parasites infection among primary school children in Kampongcham, Cambodia. *Korean J Parasitol* 2002; 40(3): 153–155.
12. Ulukanligil M and Seyrek A. Demographic and parasitic infection status of school-children and sanitary conditions of schools in Sanliurfa, Turkey. *BMC Pub Health* 2003; 3(1): 29.
13. Rai SK, Hirai K, Ohno Y and Matsumura T. Village health and sanitary profile from eastern hilly region, Nepal. *Kobe J Med Sci* 1997; 43 (3–4): 121–133.
14. Rai SK, Nakanishi M, Upadhyay MP, et al. Effect of intestinal helminth infection on some nutritional parameters among rural Villagers in Nepal. *Kobe J Med Sci* 1998; 44: 91–98.