STATUS OF *GIARDIA INTESTINALIS* INFECTION AMONG THE CHILDREN ATTENDING KANTI CHILDREN HOSPITAL, NEPAL

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Abstract: The protozoan parasite *Giardia intestinalis* produces diarrhea and malabsorption in its hosts. A total of 301 children (1 to 15 years) were included in this study and stool samples were analyzed by simple wet mount technique. A questionnaire was filled out regarding hygienic and other habits, including factors predisposing to parasitic infections. The *G. intestinalis* infection was found in 12.0% of children. The infection was slightly higher in male (7.3%) than female (4.7%) ($P > 0.05$). The infection was highest in age of 3 to 6 years (15.5%) ($P > 0.05$). The infection was highest (33.3%) in month of May. The infection was highest, (20.0%) in Dalit ($P > 0.5$). The marginally higher (17.6%) infection of *G. intestinalis* was found in poor economic status ($P > 0.05$). The highest infection was found (20.0%) in children with illiterate guardian. Non-vegetarian (12.3%) had higher infection rate than vegetarian (6.3%) ($P > 0.05$). The infection was found marginally higher in non-spoon user during meal (1.2%) ($P > 0.05$). The infection was highest (12.4%) among the children with habit of consuming street food ($P > 0.05$). Children with practice of using slipper in kitchen have highest infection (23.5%) of *G. intestinalis* ($P > 0.05$). Among the different water sources, children consuming water from tap and well were significantly (23.8%) infected of *G. intestinalis* ($P < 0.05$). The infection was marginally higher (14.1%) in the children belongs to family with children number three. The infection of *G. intestinalis* could not be correlated with possession of domestic animals and previous history of travel.

Key words: *Giardia intestinalis*; Gastroenteritis; Children; Pre-disposing Factors.

INTRODUCTION

Worldwide, more than 3 billion people are estimated to be infected with intestinal parasites, leading to increased risks for developmental deficiencies, impaired cognition and death (WHO, 1996). *Giardia intestinalis* is zoonotic protozoan causing gastroenteritis in humans (Fayer, 2000; Monis and Thompson, 2003). Giardiasis is a worldwide prevalent parasitic disease that affects humans, domestic and wild animals (Adam, 2001). Since 1988, WHO has estimated that in Africa, Asia and Latin America there are over 280 million *G. intestinalis* infections yearly. The infection can be symptomatic or asymptomatic; however, independent of the clinical course, *G. intestinalis* trophozoites hinder nutrient absorption and produce different degrees of malabsorption (Astiazarán-García, 2000). In the transmission of human infection, in developing countries, human feces play a fundamental role in water and food contamination. However, this fact does not explain the high prevalence of *G. intestinalis* infection in developed countries; it may include zoonotic transmission as well as fecal contamination from animal sources (Van Keulen *et al.*, 2002; Read et al., 2004). In Nepal, the prevalence of *G. intestinalis* infection was 9.1% (Rai *et al*., 2003). In this study, we demonstrated the current infection rate of *G. intestinalis* at Kanti Children Hospital and pre-disposing factors of giardiasis.

MATERIALS AND METHODS

Study population and sample collection: The study was conducted from May to September 2002. A total of 301, gastroenteritis suspected children (Age 1 to 15 years) attending OPD of Kanti Children Hospital. Among them, 177 were males and 124 were females. Fecal samples were collected in a clean and dry screw capped plastic container. Samples were analyzed at Public Health Research Laboratory (Institute of Medicine). Also a questionnaire was performed with concession of the respondent on age, sex, ethnic groups, and habitual practices of respondents.

Sample analysis: The fecal samples were processed by saline and iodine preparation for microscopic examination of *G. intestinalis*.

Statistical data analysis: Statistical significance was analyzed with entering the data into SPSS 11.0.

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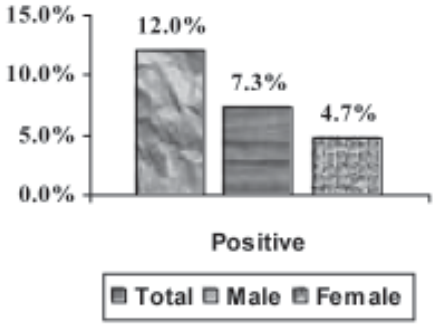

Fig 1: Sex wise distribution of *G. intestinalis.*

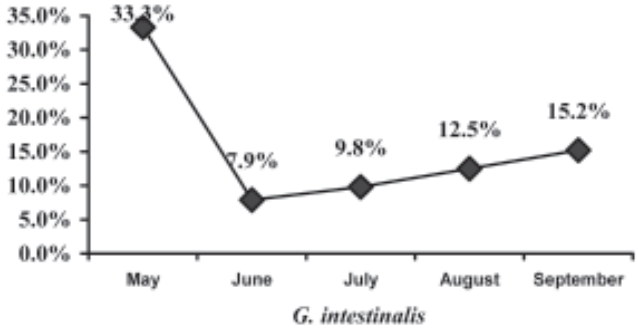

Fig 2: Month wise distribution of *G. intestinalis*

RESULT

Among the 301 children of age 1 to 15 years *G. intestinalis* was detected in 36 (12.0%) cases. Sex wise infection was non-significantly higher in male (7.3%) than female (4.7%) (Fig 1). The infection was higher in age of 3 to 6 years (15.5%) (Table 1). The infection was highest (33.3%) in month of May (Fig 2).

Among the various ethnic groups of Nepal, the distribution of *G. intestinalis* was highest in (20.0%) in *Dalit* (Lower caste in Nepal), but statistically not significant (p >0.5) (Table 2). Among children with guardian different profession, the non-significantly highest (17.6%) prevalence of *G. intestinalis* was found in children of labor with low economic status. The infection was found highest (20.0%) in children of illiterate guardian.

Among the different food habit, non-vegetarian (12.3%) had higher infection of *G. intestinalis* than vegetarian (6.3%) (Table 3). The highest infection was detected in non-spoon user during meal (1.2%) (Table 4).

The infection was highest (12.4%) among the children with habit of consuming street food (Table 6).

Children with practice of using slipper in kitchen were mostly infected (23.5%) with *G. intestinalis*.

Among the different water sources, children consuming water from tap and well had significantly highest (23.8%) infection of *G. intestinalis* (Table 7) (p < 0.05).

The infection of *G. intestinalis* was highest (14.1%) among the children belongs to family with children number three. Among the children possessing domestic

Table 1: Age wise distribution of *G. intestinalis*

Age (Years)	Total	Positive	Percent
0 to 3	89	6	6.7
3 to 6	97	15	15.5
6 to 9	51	6	11.8
9 to 12	50	7	14.0
12 to 15	14	2	14.3
Total	301	36	12.0

Table 2: Ethnic wise distribution of *G. intestinalis*

Ethnic Caste	Total	Positive	Percent
Tibeto-Burman	157	19	12.1
Indo-Aryan	139	16	11.5
Dalit *	5	1	20.0
Total	301	36	12.0

*Dalit is a low caste in Nepal

Table 3: Distribution of *G. intestinalis* among meat eating habit

Eating Meat	Total	Positive	Percent
Vegetarian	16	1	6.3
Non-vegetarian	285	35	12.3
Total	301	36	12.0

Table 4: Distribution of *G. intestinalis* among spoon user during meal

Using Spoon	Total	Positive	Percent
Yes	23	2	0.9
No	278	34	1.2
Total	301	36	1.2

Table 5: Distribution of *G. intestinalis* among same slipper in and out of kitchen

Slipper	Total	Positive	Percent
Yes	34	8	23.5
No	267	28	10.5
Total	301	36	12.0

Table 6: Distribution of *G. intestinalis* among eating street food

Street Food	Total	Positive	Percent
Yes	267	33	12.4
No	34	3	8.8
Total	301	36	12.0

Table 7: Distribution of *G. intestinalis* among different source of water

Water source	Total	Positive	Percent
Tap and Tube well	242	23	9.5
Tap and Well	21	5	23.8
Tap and River	1	0	0.0
Single Source of water	37	8	21.6
Total	301	36	12.0

P value = 0.03

animals, the infection was higher (13.4%) in children without domestic animals. The non-significant higher (12.7%) infection with *G. intestinalis* of was found in children without previous history of traveling out of the city.

DISCUSSION

This study revealed the infection rate and risk factors for giardiasis among children of visiting Kanti Children Hospital. The infection (12.0%) of *G. intestinalis* found marginally less than (14.7%) Rajeswori *et al*., 1994. Male children were highly infected than female; it appears to be associated with more active and outdoor wandering nature of male children (Ishiyama *et al.*, 2001). The children of age between 3 to 6 years were mostly infected than others; it was in agreement with Rinne *et al*., 2005. The infection was found highest in month of May (pre-rainy season) which was inconsistent with Adhikari *et al.*, 1986. This could be due to small sample size.

The infection was highest in Ethnic caste *Dalit*, it was consistent with Rai *et al.*, 2002; Ishiyama *et al*., 2003. The highest prevalence of *G. intestinalis* was found in labor (very low economic status) however it was not significant. The result is consistent with the finding of Goldin *et al.*, 1990. The highest infection was found in children with illiterate guardian, it was in agreement with Mahendraker *et al*., 1991.

The infection of *G. intestinalis* was higher in nonvegetarian; it could be poor cooking and unhealthy feeding habit. Global sourcing of food, coupled with changing consumer vogues, including the consumption of raw vegetables and undercooking to retain the natural taste and preserve heat-labile nutrients, can increase the risk of food-borne transmission (Slifko *et al.*, 2000). The highest infection was detected in

children with practice of using hand during meal, the contamination of water used for hand washing before meals could be the source for the *G. intestinalis* infection Midzi *et al*., 2000.

The infection of *G. intestinalis* was highest among the children with habit of consuming street food that sold at roadways; it could be due to the contamination of street food with pathogenic microorganism which could be gain access to food by pathogen contaminated water or unhygienic handling of food and poor health awareness of street vendors (Jonnalagadda *et al*., 1995; Barro *et al*., 2002).

Children with practice of using slipper in kitchen have highest infection of *G. intestinalis*. The fecal contamination of food could be high when same slipper was used in kitchen and outside kitchen.

Children consuming water from tap and well had significantly higher infection of *G. intestinalis* than the river. It could be due to small sample size.

Among the children belongs to family possessing children number three were more infected with *G. intestinalis*, this finding correlates with the finding of Karrar *et al.*, 1995 who reported overcrowding in family was significantly associated with infection of parasites. Among the children possessing domestic animals, the infection was higher in children without domestic animals. It could not be correlated between the infection of *G. intestinalis* and possession of domestic animals. Children without previous history of traveling outside city had high infection; no association was discovered between previous history of

traveling and infection of *G. intestinalis*. The findings are helpful for understanding risk factors *G. intestinalis* infections and for planning parasite prevention in Nepal. Based on the results of this study, public health efforts should focus on improving health awareness and hygienic behavior in the community.

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REFERENCES

Adam, RD, Biology of *Giardia lamblia*. *Clin. Microbiol. Rev.* 2001; **14:** 447–475

Adhikari, RK, Rai, SK, Pokhrel, BM *et al.*, Bacteriological study of drinking water of Kathmandu valley. *J Inst Med (Nepal)*, 1986; **8**: 313-316

Astiazarán-García, H, Espinoza-Cantellano, M, Castañon, G, Chávez-Mungía, B and Martínez-Palomo, A, *Giardia lamblia*: effect of infection with symptomatic and asymptomatic isolates on the growth of gerbils (*Meriones ungiculatus*). *Exp. Parasitol*, 2000; **95**: 128–135

Barro, N, Ouattara, CA, Nikiema, PA, Ouattara, AS, Traore, AS, Microbial quality assessment of some street food widely consumed in Ouagadougou, Burkina Faso. *Sante (France)*, 2002; **12**: 369-374

Fayer, R, Morgan, U and Upron, SJ, Epidemiology of *Cryptosporidium*: transmission, detection and identification. *Int. J. Parasitol*, 2000; **30**: 1305–1322

Goldin, AJ, Apt, W, Aguilera, X, Zulantay, I, Warhurst, DC, Miles, MA, Efficient diagnosis of giardiasis among nursery and primary school children n Santiago, Chile by capture ELISA for the detection of fecal Giardia antigens. *Am J Trop Med Hyg*, 1990; **42**: 538-45

Ishiyama, S, Ono, K, Rai, CK *et al.* Study of Enteropathogens and Its Pre-disposing Factors in Sub-urban Public School Children in Kathmandu, Nepal. *Nepal Med College J (Nepal)* 2001; **3**: 5-9

Ishiyama, S, Rai, SK, Ono, K and Uga, S, Small-scale study on intestinal parasitosis in a ermote hilly village in Nepal. *Nepal Med College J (Nepal)*, 2003; **5**: 28-30

Jonnalagadda, PR, Bhat, RV, Parasitic contamination of stored water used for drinking/cooking in Hyderabad. *Southeast Asian J Trop Med Public Health*, 1995; **26**: 789-794

Karrar, ZA, Rahim, FA, Prevalence and risk factors of parasitic infections among Sudanese children: a community based study. *East African Med J* 1995; **72**: 103-109

Mahendraker, AG, Dutta, PK, Urmil, AC, Moorthy, TS, A study of medico social profile of under five children suffering from diarrhoeal diseases. *Indian J Matern Child Health*, 1991; **2:** 127-30

Midzi, SM, Tshimanga, M, Siziya, S, Marufu, T, Mabiza, ET, An outbreak of dysentery in a rural district of Zimbabwe: the role of personal hygiene at public gatherings. *Cent Afr J Med*, 2000; **46**: 150-153

Monis, PT and Thompson, RCA, A review. *Cryptosporidium* and *Giardia* zoonoses: fact or fiction, *Infect. Gen. Evol,* 2003; **3**: 233–244

Rai, D, Sharma, BK, Ghimire, P, Bhatta, DR, Rai, SK, Status of Intestinal Protozoan Parasitic Infection in Northern Part of Kathmandu, Nepal. *Nepalese J of Microbiol (Nepal)*, 2003; **1**: 16-20

Rai, SK, Hirai, K, Abe, A *et al.,* Intestinal parasitosis among School Children in a Rural Hilly Area of Dhading District, Nepal. *Nepal Med College J* 2002; **4**: 54-58

Rajeswari, B, Sinniah, B, Hussein, H, Socioeconomic factors associated with intestinal parasites among children living in Gombak, Malaysia. *Asia Pac J Public Health*, 1994; **7**: 21-25

Read, CM, Monis, PT and Thompson, RCA, Discrimination of all genotypes of *Giardia duodenalis* at the glutamate dehydrogenase locus using PCR-RFLP. *Infec. Gen. Evol*, 2004; **4**: 125–130

Rinne, S, Rodas, EJ, Galer-Unti, R, Glickman, N and Glickman, LT, Prevalence and risk factors for protozoan and nematode infections among children in an Ecuadorian highland community. *Trans R Soc Trop Med Hyg*, 2005; **99**: 585-592

Slifko, TR, Smith, HV, Rose, JB, Emerging parasite zoonoses associated with water and food, *Int J Parasitol*, 2000; **30**:1379-1393

Van Keulen, H, Macechko, IT, Wade, S, Shaaf, S, Wallis, PM and Erlandsen, SL, Presence of human *Giardia* in domestic, farm and wild animals, and environmental samples suggest a zoonotic potential for giardiasis. *Vet. Parasitol*, 2002; **108**: 97–107

WHO, A manual for the treatment of diarrhoea. Geneva, 1990

WHO: Fighting Disease, Fostering Development, World Health Organization, Geneva, 1996

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