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Intestinal Parasitic Infection among School Children in Golestan Province, Iran

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Abstract: Infections by intestinal parasites are a major public health problem worldwide, especially among children in developing countries. It causes nutritional deficiencies and anaemia. As, the prevalence of parasitic infection is different among various population, there is a need for periodical prevalence evaluation to an appropriate control strategy. The goal in this study was to determine the prevalence of intestinal parasitic infections in primary school children living in Gorgan, north of Iran. A cross-sectional survey was conducted on 800 schoolchildren aged 8-12 years of Gorgan city, capital of Golestan province, located in the north of Iran in 2011. Three stool specimens were collected from each student. Specimens were examined with direct wet and formalin ethyl acetate method. Data were analyzed with SPSS version 16 software. A total of 800 schoolchildren were screened. Nearly one third of students (28.8%) were infected with one or more intestinal parasites. The most common parasite were *Giardia intestinalis* (9.9%; 79/800) and *H. nana* (1.5% ; 12/800), respectively. The data showed that Children living in crowded family (≥3) were more susceptible to infection also take care of animals in house helps to transmission of parasite infections as there was a significant association between that and rates of parasite infections (p-value<0.05). The prevalence of infection was also much more common in those students whose parents were less educated. A high percentage of school children were infected to intestinal parasites, so, intervention programs including health education and environmental sanitation are required.

Key words: Schoolchildren, intestinal parasite, prevalence, Gorgan, Iran

INTRODUCTION

Infections by intestinal parasites are a major public health problem worldwide, especially among children in developing countries. WHO estimated that approximately 3.5 billion people are infected by intestinal parasites and about 450 million children are ill due to these infections WHO, 2000: Warunee *et al*., 2007). Infections with intestinal parasites may have important health consequences and cause iron deficiency anemia, growth retardation in children and other physical problems" (Scolari *et al*., 2000; Nasiri *et al*., 2009). The type of infection is much different depending on the behavioral factors and the geographical regions.

It is necessary to conduct periodic studies for information of intestinal parasitic infections in the general population. There are previous studies that has reported different prevalence rates of parasitic infection in various areas of Islamic Republic of Iran (Sayyari *et al*., 2005). Although, there have been a few reports of infection rates of intestinal parasites in some local areas of Golestan province (Saebi, 1998), no extensive epidemiological survey in the area has been conducted. The objective of this investigation was to study intestinal parasitic infections in primary school children living in Gorgan to estimate their prevalence, their association with socio-economic characteristics and the influence of simple and primary hygienic measures in reducing their frequency.

MATERIALS AND METHODS

Study group: A cross-sectional survey was conducted in 18 primary schools of Gorgan city, capital of Golestan province, located in the north of Iran. This survey was performed between October 2010 and March 2011. The sample size was calculated according to the prevalence of 27%, based on the results of previous studies Daryani and Ettehad, 2005, at precision of 0.07 and at 0.05 significant levels. 800 school children from both boys and girls ranging from 8 to 12 years old were conducted to this study.

Study design: Parents of the participating children filled out a questionnaire on common risk factors for parasite infections, as described in literature questions on

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environmental risk factors were related to living background; those on sanitary risk factors to water supply (piped water); those on socioeconomic risk factor to household income (6 000 000 Rial/month or less) (Ostan *et al*., 2007) and education level of the parents (less than 12 grades or higher). Behavioral factors were eating with unwashed hands (yes or no), eating unwashed/raw vegetables (yes or no), eating unpeeled/unwashed fruit (yes or no), biting fingernails/sucking thumb (yes or no) (Herrstrom *et al*., 1997; Rai *et al*., 2005; Asaolu *et al*., 2002).

Intestinal parasitic examinations: An oral description and specific instructions for handling and contamination avoidance of the stool specimen were given to all the children. All stool specimens were preserved in 10% formalin before examination at the department of Parasitology, Faculty of Medicine, Golestan University of Medical Sciences. In the Parasitology lab, stool samples were examined macroscopically for visible proglottides or adult helminths. Then each sample concentrated using formalin-ether sedimentation technique for microscopic examination. Protozoan parasites were examined by staining with logul's iodine solution using light microscopy at high (400 X) magnification. Ova of helminth parasites were examined by direct wet-mount observation at low (100 X) magnification.

Ethical considerations: The present study was approved by the Ethics Committee of the Faculty of Medicine at Golestan University of Medical Sciences and all students and their parents were aware from the study objective and were content to participate in this survey.

Statistical analysis: For statistical computations, SPSS (Chicago, IL, USA) program for Windows, version 16 were used. Statistical differences of the data were analyzed by Chi-square tests or Fisher's Exact test where appropriated at 0.05 significant level. Consent forms were signed by the parents of participating schoolchildren.

RESULTS AND DISCUSSION

A total of 800 schoolchildren were screened. The participating children were 482 (60.25%) boys and 318 (39.75%) girls. The mean age of the participants was 8.5 years. The response rate to the questionnaires was 100%. The overall prevalence of parasite infection among the participants was 28.8% (230/800). *Giardia intestinalis* and *Hymenolepis nana* were the most common protozoa and helminth infections, respectively.

No statistically significant difference was observed between the prevalence rate of intestinal infection across gender ($p = 0.22$) and age (grade of education) ($p = 0.80$). Prevalence was highest in the 8-11 years age group (34.1-32.1%) children, respectively.

The prevalence of parasitic infection increased by family size including 39.1% (27/69), among the families having ≥3 children ($p<0.05$). There was no significant relation between prevalence of parasitic infection and parent's education level (Table 2). The prevalence rate of infection was lower in those students (28.2%) whose fathers were employer (673/190) and more among those students (31.4%) whose fathers were not employer (127/40).

The most common intestinal pathogenic and nonpathogenic parasite were *Giardia intestinalis* (9.9%; 79/800) and *Blastocystis* sp. (15.2%; 122/800), respectively. The rate of contamination with protozoa was 26.1 and 3.6% for intestinal helminthes. The prevalence rates of *Hymenolepis nana*, *Ascaris lumbricoides*, *Enterobius vermicularis*, *Entamoeba histolytica/dispar* and hook worms among participants were 1.5, 0.5, 1.2, 1 and 0.4, respectively. 10.5% of boys and 8.8% of girls were infected to intestinal parasites.

The frequency distribution and Prevalence of intestinal parasites infection among the schoolchildren are indicated in Table 1. Table 2 describes the distribution of environmental, socioeconomic, sanitary and behavioral risk factors among the children in the respective areas and municipalities. Significant associations were found between infections and take care of animals in house as well as brother, sister number (p-value<0.05) (Table 2). No statistically significant relationship found between rate of intestinal parasite infection and education levels of parents, household income, using pipe water, biting fingernails/sucking thumb, eating unpeeled/unwashed fruit/vegetables and washing hands before eating or after toilets

Nearly one third of students (28.8%) aged 8- 12 years in North of Iran, Golestan Province were infected with intestinal parasites. Recent reports in Iran, showed a prevalence rate of intestinal parasites ranging from 18.4 to 29.75% in general populations (Nematian *et al*., 2008; Sayyari *et al*., 2005). There are many epidemiological studies of intestinal parasites throughout the Iran, reported similar results including 30% in Kerman in 1991 (Valian and Sharifi, 1993); 37.3% in Islamshahr in 1992 (Godarzi, 1993); 59.4% in Tehran in 1994 (Rohanni, 1994); 30.5% in Zabol in 1997 (Baraoe and Sharifi, 1996); 48.2% in Isfahan in 1998 (Baghaie *et al*., 1999); 56.6% in Qazvin in 2000 (Mahyar *et al*., 2000); 39.4% in Mashhad in 2001

Table 1: Frequency distribution and prevalence of intestinal parasites in school children of Gorgan city according to gender

		Entamoeba histolytica/diaspar		*Giardia lambilia*		*Entrobius vermicularis*		*Ascaris lumbricoides*		*Blastocystis* sp.		Hymenolepis nana		Hook worms	
Variable	No.	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Sex															
Boys	482	2	0.41	51	10.5	2	0.41	4	0.82	75	15.5	8	1.65	2	0.41
Girls	318	6	1.88	28	8.8	8	2.5	2	0.62	47	14.7	4	1.25	1	0.31
p-value*			0.064		0.46		0.017		0.156		0.841		0.772		1.000
OR (95% CI)		4.615(0.926, 23.012)		0.816 (0.503, 1.325)		6.194 (1.307, 29.358)		0.922(0.984, 1.000)		0.941(0.634, 1.398)		0.755(0.225, 0.528)		0.757(0.068, 8.384)	

OR: Odd ratio, CI: Confidence interval

Table 2: Distribution of environmental, socioeconomic, sanitary and behavioural risk factors among the school children of Gorgan city

Variables	No.	%	No.	%	p-value	Parasite infection OR (95% CI)
Education level father ≥12 grades	744	93.00	211	28.3	0.36	0.771 (0.433, 1.371)
Education level mother ≥12 grades	718	89.70	201	27.9	0.19	0.711 (0.439, 1.150)
Household income >6.10^6 Rial/month	673	84.10	190	28.2	0.45	0.856 (0.568, 1.290)
Water from pipe	767	95.80	222	28.9	0.69	0.786 (0.349, 1.768)
Biting fingernails/sucking thumb	611	76.30	173	28.3	0.64	1.093 (0.765, 1.562)
Eating unpeeled/unwashed fruit/vegetables	657	82.12	190	28.9	0.91	0.955 (0.638, 1.427)
Washing hands before eating	743	92.80	217	29.2	0.36	0.716 (0.378, 1.356)
Washing hands after toilet	793	99.10	228	28.7	1.00	0.991 (0.191, 5.146)
Washing vegetables and fruits	548	68.50	156	28.4	0.80	1.045 (0.752, 1.451)
Having Sign of parasitic infection	675	84.30	199	29.4	0.33	0.789 (0.509, 1.223)
Take care of Animals in house	759	94.90	224	29.5	0.02	0.409 (0.170, 987)
Brother, sister number ≥3	69	8.60	27	39.1	0.03	1.672 (1.004, 2.784)
Brother, sister number ≥3	731	91.30	203	27.7	0.03	1.672 (1.004, 2.784)

*Statistically significant differences, OR: Odd ratio, CI: Confidence interval

(Salehabadi, 1990); 28.5% in Babol in 2001 (Ghahramanloo *et al*., 2001); 49.6% in Robatkarim in 2005 (Soheil Azad *et al*., 2005); 13.7% in school children in Semnan Province in 2005 (Atashnafas *et al*., 2006); 13.7% in Jahroom in 2007 (Davami *et al*., 2008). However, there are national Study in Islamic Republic of Iran that reported the prevalence of parasite infection 19.3% in general population and 25.5% in the children aged less than 15 years (Taheri *et al*., 2011). The results of the present study revealed that the prevalence of intestinal infection was higher than that reported in comparison.

Giardia intestinalis and *Blastocystis hominis*, the first and second most common protozoa in the present study, both can be transmitted orally through drinking water. Concerning polyparasitism, our results are comparable to those of Keiser *et al*., (2002) obtained in western Cote d'Ivoire. The observed multiple infections could be explained by the facts that many species of protozoa have the same mode of transmission and that hygiene is poor in these areas. *Blastocystiss* sp. and *G. lamblia* were found in samples from all the localities studied.

Because there are no reports of parasites from Gorgan so we could not compare our results with previous data. It should be mention that in most of the surveys performed in Iran and in other countries, *G. intestinalis* was the most common intestinal protozoa among the residents of rehabilitation centers as well as normal populations, that are in concordance with the present study. For example The prevalence rate of *G. intestinalis* was 37.4% in students of southwest of Tehran in 1985 (Garoz, 1985); 25.3% in Kerman's students in 1991 (Valian and Sharifi, 1993); 19% in children of north of Tehran in 1992 (Nazari, 1992);14.2% in Islamshahr in 1992 (Godarzi, 1993); 17.2% in Lahijan in 1997 (Saraei and Rezaian, 1997); 40% in elementary school of Yazd in 1998 (Saebi, 1998); 29.8% in Mobarakeh in 2001 (Atashnafas *et al*., 2006); 24.1% in primary school students of Babol in 2001 (Ghahramanloo *et al*., 2001); 38.1% in Birjand in 2002 (Taheri *et al*., 2004); 18.5% in Robat karim in 2005 (Soheil Azad *et al*., 2005); 8.4% in Semnan in 2005 (Atashnafas *et al*., 2006); 8.1% in Jahrom in 2007 (Davami *et al*., 2008); 18.5% in Gorgan in 2008 (Touhidi and Mostafa, 2009); and 28.7% in South Khorasan Province in 2011 (Taheri *et al*., 2011).

One of the important risk factor for the parasite infection is water supply. Giardiasis outbreaks have occurred from the contamination of drinking water supplies (Wilson, 1998). Giardia spp. as a cause of water-borne disease of human has been increasingly recognized over the past 10 years (Zuckerman *et al*., 1999). Also In water supplies of different parts from the world the cyst of Giardia spp. have been isolated (Okyay *et al*., 2004).

In our findings, the prevalence of *H. nana* was 1.5%. *H. nana* has detected from many part of Iran especially in western areas. The prevalence of this parasite was reported 20% in Bandar Abbas and Minab (Saebi, 1998), 14.7% in Zahedan (Fazaeli *et al*., 1997), 13% in Khozestan and Gonbad Kavous (Saebi, 1998), 3.9% in Kerman (Ziya Ali and Masuod, 1997), 3.8% in children of Birjand (Taheri *et al*., 2004).

In previous studies (Sayyari *et al*., 2005), ascariasis was high prevalency in most area of Iran for example 83% in Khozestan; 81% in Tabriz; 78% in Kermanshah; 72-97% in Isfahan; and 14-60% in Mazandaran; but 1-4% in Sistan and Bandar Abbas. According to the results of this study, the prevalence of ascariasis was 0.55% such as the results of mentioned study in various parts of Iran (Sayyari *et al*., 2005; Valian and Sharifi, 1993; Godarzi, 1993; Soheil Azad *et al*., 2005; Taheri *et al*., 2011). These data declare that prevalence of ascariasis has been decreased a lot between the last 10-15 years. It means that the public health knowledge about the ascariasis disease has increased in different populations.

In this study The prevalence of *E. vermicularis* was 1.2%. In other studies that use non specific stool examination method for *E. vermicularis* detection, the prevalence of this parasite was 0.2% in Kerman (Nasiri *et al*., 2009), 0.4% in Jahrom (Davami *et al*., 2008), 0.7% in Zabol (Baraoe and Sharifi, 1996) and 2.9% in Islamshahr (Valian and Sharifi, 1993). In other studies with specific examination method (Scoth test), *E. vermicularis* was prevalent. For example the prevalence was 22.1% in Birjand in 2002, 54.1% in Ramsar in 1990, respectively (Sayyari *et al*., 2005).

Many studies on the prevalence of intestinal parasitic infections have been performed in developing countries, due to their wide diffusion in this continent, reported the same results. In most of these areas, *G. lamblia* was the most dominant infection. The prevalence rate of the intestinal parasitic infections in mentally retarded individuals in the world, were 76.67% in Egypt (Mohamed *et al*., 1991), 66.4% in northeastern part of Nepal (Sharma *et al*., 2004); and 54.2% in Combodia of Korea (Lee *et al*., 2002); 46.7% in Srinaga of India (Wani *et al*., 2007); 31.8% in Aydinca, west of Turkey (Okyay *et al*., 2004); 30% in Abha, Saudi Arabia (Omar *et al*., 1991), 14.6% in Tripoli of Libya (Ben Musa *et al*., 2007).

We did the study among schoolchildren because they were one of age groups the most exposed to intestinal parasites and were generally accessible.

The data of the study showed no significant difference between sex of children and intestinal parasitic infection Even though gender was not a significant risk factor for the prevalence of intestinal parasitic infections, males were more likely to be infected (10.5%) than females (8.8%) in the present study, which is consistent with other reports (Kim *et al*., 2003; Noor Azian *et al*., 2007; Arani *et al*., 2008). Children living in crowded family (≥3) were more susceptible to infection. The data also showed that take care of animals in house helps to transmission of parasite infections as there was a significant association between that and rates of parasite infections (p-value<0.05).

The correlation between children health status and parents' education is well known (Zuckerman *et al*., 1999). However in this study, the degree of parents' education was not significantly associated to rates of infection, as were other factors such as hand washing and washing vegetables and fruits.

In conclusion, the study showed that intestinal parasites are remarkable among school children in Gorgan, thus, intervention programs including health education and environmental sanitation are required.

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