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Intestinal Parasitic Infection among School Children in South Khorasan Province, Iran

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ABSTRACT

Background: Intestinal parasitic infection is one of the major public health problems in developing countries. Children are more vulnerable to these infections. In addition, the prevalence of infection is different among various communities; hence, there is a need for the periodical prevalence evaluation. This study was performed to define the prevalence of intestinal parasitic infection among the students of South Khorasan Province, eastern Iran in 2007.

Methods: A cross-sectional study was performed on 2169 students aged 6-11 years in six cities of South Khorasan Province in 2007. 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 15 software.

Results: From a total 2169 students, 47.7% were infected with one or more intestinal parasites. Almost 33.4% were pathogen parasites. The most common parasite was *Giardia* (28.7%). The prevalence rate of infection was significantly higher in rural area than that of urban area ($P=0.001$). The prevalence of infection was also much more common in those students whose parents were less educated.

Conclusion: Prevalence of intestinal parasitic infection in this region is remarkable. Public health education and using healthy water are recommended.

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Introduction

Intestinal parasitic infection is one of the major public health problems in developing countries. "Approximately 3.5 billion people are infected by intestinal parasites and about 450 million children are ill due to these infections"^{1,2}. "These infections are regarded as serious public cause iron deficiency anemia, growth retardation in children and other physical problems"^{3,4}. The high prevalence rate of intestinal infection in children is attributed to

many factors, particularly environmental and personal hygiene².

For an appropriate control strategy, it is necessary to conduct periodic surveys to estimate status of intestinal parasitic infections in the general population. Previous studies reported different prevalence rates of parasitic infection in various areas of Islamic Republic of Iran.

The objective of the current study was to determine the prevalence of intestinal parasitic infection in South Khorasan Province among 6-11 years old school children and its relationship with demographic factors.

Methods

The data for present study was collected from the primary schools in six cities of South Khorasan Province, in northwest of Iran. This cross-sectional study was conducted in 2007. The sample size was calculated according to the prevalence of 40%, based on the results of previous studies⁴⁻⁶, at precision of 0.07, and at 0.05 significant levels.

A design effect of two was used to allow for multistage sampling. The calculated sample size for each city was 392 and the total sample size for six cities of the province was 2352. The study was conducted in elementary schools of the whole province including urban and rural areas. First, all the elementary schools in urban and rural areas were divided into two strata including girl and boy schools. Then, three schools were randomly selected from each city. Students from each grade were selected in proportion to the main sample by systematic random sampling.

The questionnaire contained socio-demographic data including age, education, and occupation of parents, number of family mem-

bers and birth order of the student and their residential area. Educated nurse were employed to fill in the questionnaires. An Instruction about the study was prepared for the participants including how to supply a stool specimen. Three labeled plastic vials were given to each student in order to take stool specimens in three consecutive days. The specimens were transported to the Emam reza Hospital Laboratory of Birjand Medical Sciences, within four hours after collection and examined with direct wet mount and with formalin ether techniques. From 2352 students enrolled in this study, 183 were dropped out due to non-compliance or unsuitable specimen.

The SPSS ver.15 statistical software was used for data analysis. The chi-squared test was used for analytic assessment at 0.05 significant level.

This research was conducted in accordance with ethical principles on clinical specimens and all students and their parents were aware from the study objective and were content to participate in this survey.

Results

A total of 2169 students participated in this survey, including 996 (45.9%) boys and 1173 (54.1%) girls, 1550 (71.5%) from urban and 619 (28.5%) from rural areas. The mean age of the participants was 8.4 yr (95% CI: 8.3, 8.44)

Table 1: The frequency distribution and prevalence of intestinal infection in schoolchildren by city, Chi² test (P<0.001)

| City | Frequency of infection | Prevalence (%) | Sample size |
|-----------|------------------------|----------------|-------------|
| Birjand | 352 | 38.4 | 916 |
| Qayn | 240 | 50.6 | 474 |
| Sarayan | 64 | 44.1 | 145 |
| Darmian | 166 | 61.9 | 268 |
| Sarbishe | 51 | 43.6 | 117 |
| Nehbandan | 161 | 64.7 | 249 |
| Total | 1034 | 47.7 | 2169 |

Almost 47.7% (1034/2169) students were infected with one or more intestinal parasites. About 33.4% of the subjects were infected with intestinal pathogenic parasites (Table 1).

The frequency distribution of the parasites by type is shown in Table 2. *Giardia intestinalis* and *Hymenolepis nana* were among 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) ($P=0.80$). However, the prevalence of intestinal parasites were significantly higher in the rural areas than in the urban areas ($P=0.006$).

The prevalence of parasitic infection increased by family size including 38.6%, 50.1% and 53.3% among the families having 1-2, 3-4

and ≥ 5 children respectively ($P<0.001$). There was a significant relation between prevalence of parasitic infection and parent's education level ($P<0.001$) (Table 3). The prevalence rate of infection was the least in those students whose fathers were employer (36.7%) and the highest among those students whose fathers were farmer (61.4%) ($P<0.001$).

Table 2: The Absolute and relative frequency distribution of parasites in schoolchildren by type of parasite and gender

| Parasites | Female (%) | Male (%) | Total (%) ^b |
|--|------------|------------|------------------------|
| <i>Enreriobius vermicularis</i> | 9 (0.77) | 2 (0.2) | 11 (0.51) |
| <i>Hymonleptis nana</i> | 81 (6.9) | 64 (6.4) | 145 (6.7) |
| <i>Ascaris lumbricoides</i> | 6 (0.5) | 6 (0.6) | 12 (0.55) |
| <i>Giardia intestinalis</i> | 335 (28.6) | 287 (28.8) | 622 (28.7) |
| <i>Chilomastix mesnili</i> ^a | 110 (9.4) | 75 (7.5) | 185 (8.5) |
| <i>Trichomonas intestinalis</i> ^a | 0 (0.0) | 3 (0.3) | 3 (0.14) |
| <i>Entamoeba coli</i> ^a | 194 (16.5) | 171 (17.2) | 365 (16.8) |

^a Non pathogen protozoa

^b Some subjects were infected with more than one parasite, hence the total percent is higher than 100%.

Table 3: The absolute and relative frequency distribution of intestinal infection in schoolchildren by demographic variables

| Variables | Subgroups | Infected (%) | Non-infected (%) | Chi ² test |
|-----------------------------|--------------------|--------------|------------------|-----------------------|
| Sex | Male | 489 (49.1) | 507 (50.9) | $P=0.220$ |
| | Female | 54 (46.5) | 628 (53.5) | |
| Area | Rural | 324 (52.3) | 295 (47.7) | $P=0.006$ |
| | urban | 710 (48.5) | 840 (54.2) | |
| Number of Children | 1-2 children | 257 (38.6) | 409 (61.4) | $P<0.001$ |
| | 3-4 children | 460 (50.1) | 458 (49.9) | |
| | ≥ 5 children | 253(53.3) | 222(46.7) | |
| Level of father's education | Illiterate | 210(61.6) | 131(38.4) | $P<0.001$ |
| | Primary school | 440(51.0) | 423(49.0) | |
| | Middle school | 153(41.5) | 216(58.5) | |
| | High school | 108(35.3) | 198(64.7) | |
| | Academic education | 68(36.8) | 117(63.2) | |
| Level of mother's education | Illiterate | 328(58.5) | 233(41.5) | $P<0.001$ |
| | Primary school | 459(47.7) | 504(52.3) | |
| | Middle school | 93(40.8) | 135(59.2) | |
| | High school | 79(31.6) | 171(68.4) | |
| | Academic | 34(35.8) | 61(64.21) | |

Discussion

Nearly half of students (47.7%) aged 6-11 years in South Khorasan Province were infected with intestinal parasites. Several studies

conducted in different parts of Iran, reported similar results including 30% in Kerman in 1991⁵; 37.3% in Islamshahr in 1992⁶; 39.4% in Mashhad in 2001⁷; 48.2% in Isfahan in 1998

⁸; 30.5% in Zabol in 1997 ⁹; and 28.5% in Babol in 2001 ¹⁰. The current studies conducted close to the time of our study, reported similar findings including 13.7% in Jahroom in 2007 ¹¹; 49.6% in Robatkarim in 2005 ¹²; and 13.7% in school children in Semnan Province in 2005 ¹³. However, a national survey in Islamic Republic of Iran reported the prevalence of parasite infection 19.3% in general population and 25.5% in the children aged less than 15 years. The results of the present study revealed that the prevalence of intestinal infection was much higher than that reported by all previous studies but one ⁸.

Giardia intestinalis and *Entamoeba coli*, the first and the second most common protozoa in the present study, both can be transmitted orally through drinking water. The most frequently observed parasites reported by previous studies were also *G. intestinalis* and the least common was helminth infection specially ascariasis ¹⁴. The prevalence rate of *G. intestinalis* was 25.3% in Kerman's students in 1991 ⁵; 29.8% in Mobarakeh in 2001 ¹³; 14.2% in Islamshahr in 1992 ⁶; 38.1% in Birjand in 2002 ¹⁵; 37.4% in students of southwest of Tehran in 1985 ¹⁶; 19% in children of north of Tehran in 1992 ¹⁷; 40% in elementary school of Yazd in 1998 ¹⁸; 24.1% in primary school students of Babol in 2001 ¹⁰; 8.1% in Jahrom in 2007 ¹¹; 18.5% in Robat karim in 2005 ¹²; and 8.4% in Semnan in 2005 ¹³.

Water supply is really an important risk factor for the giardiasis. Several large giardiasis outbreaks have occurred from the contamination of drinking water supplies by human sewage ¹⁹. The problem is greater in rural areas where drinking water network or sewage system is less accessible ²⁰. Contamination of drinking water with *Giardia* spp. has been increasingly recognized over the past 10 years as a cause of water-borne disease of human ²¹. *Giardia* cysts have been isolated from water supplies in different parts of the world ²².

Base on our findings, the prevalence of *H. nana* was 6.7%. This parasite has been isolated from different areas of Iran especially in western areas. The prevalence of this parasite was reported 13% in rural area of Khozestan and Gonbad Kavous, 20% in Bandar Abbas and

Minab ²³, 3.8% in six years old children of Birjand ¹⁵.

Based on the results of previous studies ²³, the prevalence of ascariasis was high in most parts of Iran including 72-97% in Isfahan; 78% in Kermanshah; 83% in Khozestan; 74% in outskirts of Mashhad, 81% in outskirts of Tabriz; 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 less common (0.55%) and similar to the results of current studies conducted in various parts of Iran in that year ^{5,6,12-14}. These findings indicate that prevalence of ascariasis has been decreased a lot within the last 10-15 years. It seems that decrease in ascariasis is due to not using of human fertilizer and increased level of knowledge of people.

Based on this study, prevalence of infection was 0.51% for *E. vermicularis*. In other studies with similar non specific stool examination method for this parasite, the prevalence was, i.g., 0.7% in Babol ⁹, 0.2% in Kerman ⁴, and 2.9% in Islamshahr ⁵. Nonetheless in other studies with specific examination method (Scotch test), The prevalence of infection was high. For example in studies of Birjand 2002, Ramsar 1990, the prevalence was 22.1% and 54.1% respectively ¹⁴.

Similar studies, which investigated intestinal infections in developing countries, reported the same results. In most of these areas, *G. lamblia* was the most dominant infection. For example, the prevalence of intestinal parasitic infection was reported 31.8% in Aydinca, west of Turkey ²²; 66.4% in northeastern part of Nepal ²⁴; 14.6% in Tripoli of Libya ²⁵; 46.7% in Srinaga of India ²⁶; and 54.2% in Combodia of Korea ²⁷.

The relation between educational level of the students' parents and the prevalence of parasitic infection reported by previous studies was similar to the results of the present study ^{21,28}. The correlation between children health status and parents education is well known ²¹. However, the relation between prevalence of parasitic infection and father's occupation may be confounded by socio-economic factors.

Conclusion

The prevalence of intestinal parasitic infection in the region is remarkable and public health education and using healthy water are recommended.

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Conflict of interest statement

The authors declare that they have no conflicts of interest.

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