



Prevalence of Enterobiasis Among the Kindergarten Children of Sabzevar, Northeast of Iran

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Abstract

Background: Enterobiasis is a common parasitic disease at all age groups, especially children. It results in perianal itching, insomnia, abdominal pain, diarrhea, and rarely appendicitis and fallopian tube inflammation in the affected patients. The prevalence of enterobiasis varies in different parts of Iran. However, the status of the enterobiasis prevalence among Sabzevar children remains unknown. Hence, this study aimed to investigate the prevalence of enterobiasis among the kindergarten children of Sabzevar, Razavi Khorasan province, the northeast of Iran.

Methods: In this cross-sectional analytical-descriptive study, sampling was carried out on children aged below 7 years using the Scotch-tape technique in the kindergartens of Sabzevar in 2019. The samples were then examined by a light microscope. Finally, the data were recorded in a questionnaire and analyzed using SPSS software and Fisher exact test.

Results: Based on the results, 6 (3.49%) out of 172 collected samples were found to be infected with enterobiasis. There was no significant association between gender and infection. Eventually, no significant relationship was found between the geographical living area and enterobiasis.

Conclusions: These findings indicated that the overall prevalence of enterobiasis among Sabzevar kindergarten children was lower than that of many parts of Iran. However, educational programs for parents and kindergarten staff regarding enterobiasis infection and the transmission routes should be conducted to reduce the infection rate.

Keywords: Enterobiasis, Prevalence, Kindergarten, Preschool, Iran

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Background

Enterobiasis is considered as a common parasitic disease among children caused by *Enterobius vermicularis*, which is also called *Oxyuriasis vermicularis* or pinworm. Adult male and female pinworms are 2-5 and 8-13 mm long, respectively. They live in the human large intestine, and fertile female worms migrate out of the anus at nights to lay their eggs on the folds of the rectum (1). Due to the movement of the worm and the eggs laid around the anus, it can cause allergy in the anus which is occasionally highly severe and is usually experienced at nights. Itching in the anus, inflammation in the intestine, invasion to appendix, and neurological complications such as restlessness, anger, fatigue, insomnia, and nocturnal enuresis are reported in the affected individuals (1,2). In rare cases, infection with pinworm can cause intestinal problems and ectopic infections such as vaginitis and appendicitis (3,4).

The transmission of enterobiasis is facilitated by several factors such as poor hygiene and overcrowding in kindergartens, schools, and orphanages (5). The parasite can be directly transmitted via the anus-to-mouth route or indirectly through infected objects such as toys,

class desks, chairs, and the ground (6). Children are typically infected by various methods such as eating food contaminated with parasitic eggs, contaminated fingers, inhalation of the suspended eggs in the dust, and reverse migration of the larvae released from eggs around the anus into the colon (1).

The definitive diagnosis of enterobiasis relies on the finding of the egg or the parasite itself. Based on a fecal test, its diagnosis is less than 5%. Hence, the Scotch-tape test or Graham's test is the best technique for diagnosing enterobiasis. This test is still the gold standard for enterobiasis diagnosis which can be simply done at home. In this method, using a glass tape or cellophane, a sample is taken from around the anus and then observed under a light microscope for *E. vermicularis* eggs. To enhance the chance of diagnosis, it is recommended to do sampling in the morning and before defecation or bathing (1).

The prevalence of enterobiasis is about 200 million people worldwide. Meanwhile, 30% of cases are children aged 5-10 years (7). Enterobiasis is prevalent in different parts of the world, especially countries with a temperate climate. In addition, its prevalence rate is about 30-50%

in the United States and parts of Europe (5), 22.4% in the Marshall Islands (7, 8), 6.85% in Chongqing of China (9), and 10.5% in the Gimhae-si of Korea (10).

Further, the prevalence of enterobiasis differs in different parts of Iran. For instance, its prevalence is 22.2% in Babol (11) and 7.1% in Amol (12) in the northern parts. This value is 2.1% in Shahroud in the central parts (13). In the southern and western parts, the prevalence is 24.1% and 14.7% in Khash (14) and Kermanshah (15), respectively. However, the status of enterobiasis prevalence among Sabzevar children remains unknown. Accordingly, this study sought to evaluate the prevalence of enterobiasis among the kindergarten children of Sabzevar, Razavi Khorasan province, the northeast of Iran.

Methods

Study Area

Sabzevar (36°12'45"N 57°40'55"E) is a city in Razavi Khorasan province, the northeast of Iran (Figure 1). Its population is around 243,700 and has a cold semi-arid climate (The statistical center of Iran, <https://www.amar.org.ir/english>).

Sampling and Parasitological Examination

In this cross-sectional analytical-descriptive study, 172 kindergarten children (3-7 years old) were randomly examined for enterobiasis infection using the Scotch-tape technique in June 2019. Both male and female children from the northern and southern parts of the city were included in the study. Their parents were instructed and asked to collect a specimen from the perianal surface of the children before defecation in the morning using a piece of clear adhesive tape. The samples were then received on the next day. Ultimately, the samples were transferred to the parasitology laboratory at Sabzevar University of Medical Sciences and examined by an expert parasitologist under a light microscope using $\times 100$ and $\times 400$ magnification. Furthermore, demographic variables (i.e., gender and the living area) were collected using a researcher-designed questionnaire.

Statistical Analysis

The data were analyzed using SPSS software, version 22. Eventually, Fisher exact test was used to determine the possible association between gender, geographical living



Figure 1. Geographical Location of the Studied Area, Sabzevar, Razavi Khorasan Province.

area, and enterobiasis, and a P value less than 0.05 was considered statistically significant.

Results

Out of 172 samples, 6 (3.49%) cases were positive for the *E. vermicularis* egg. In addition, 2 (1.16%) out of 6 samples were detected in girls and the remaining 4 cases (2.3%) belonged to boys. Further, 72 and 100 samples were collected from the northern and southern parts of the city, respectively. Furthermore, 2 (2.8%) and 4 (2.3%) samples out of the collected samples from the northern and southern areas were positive for enterobiasis, respectively. Although the infection rate was slightly higher in boys (4.25%) compared to girls (2.6%), no significant association was found between gender and enterobiasis. In addition, there was no significant relationship between the geographical living area and the infection ($P > 0.05$), the details of which are presented in Table 1.

Discussion

The aim of this study was to investigate the prevalence of *E. vermicularis* infection among the kindergarten children of Sabzevar, Iran. According to the results, the overall prevalence of enterobiasis among the studied children was 3.49%. This infection rate was considerably lower than most of those reported in other parts of the

Table 1. Prevalence of Enterobiasis Among Sabzevar Kindergarten Children Regarding Gender and the Geographical Living Area

Variable	Frequency		Enterobiasis		P Value	
	No. of Cases	%	No. of Positive Cases (%)	No. of Negative Cases (%)		
Gender	Boy	94	54.6	4 (4.25)	0.69	
	Girl	78	45.4	2 (2.6)		76 (97.4)
Living area	Northern area	72	41.9	2 (2.78)	70 (97.22)	0.97
	Southern area	100	58.1	4 (4)	96 (96)	

country, including 22.2% in Babol (11), 7.1% in Amol (12), 24.1% in Khash (14), and 14.7% in Kermanshah (15). However, the prevalence of enterobiasis was higher in Sabzevar compared to some parts of the country, including 2.38 % in Isfahan (8) and 0.028% in Karaj (16). The results of our study indicated that enterobiasis was less prevalent in Sabzevar than those reported in other parts of the world, including 22.4%, 6.85%, 10.5%, 17.67%, 10.1%, and 34.05% in the Marshall Islands (7), Chongqing city of China (9), Gimhae-si of Korea (10), Sidi-bel-Abbes of Algeria (17), north-eastern Poland (18), and district Mardan of Pakistan (19), respectively. These contradictions in infection rates may be due to differences in culture, climate, lifestyle, and especially personal and collective hygiene in different parts of the world. *E. vermicularis* eggs are sensitive to high temperatures and dry weather, and hence, they cannot survive outside the host's body for a long time. On the other hand, a cool and humid weather favor conditions for the eggs. Sabzevar has a high temperature and dry climate in the summer. Thus, the lower rate of enterobiasis in Sabzevar may be at least partly due to these factors when compared with the northern cities of Iran (e.g., Babol and Amol) and other parts of the world which have a temperate and humid weather in this season. Moreover, the samples were collected once by the children's parents. To increase the chance of enterobiasis diagnosis, samples should be collected three times by the researcher his/herself. However, due to the poor collaboration of children's parents, we could not collect the samples more than once. Therefore, the findings of the present study may underestimate enterobiasis prevalence in Sabzevar.

We also found that the infection rate in boys was slightly higher compared to girls. However, there was no significant association between gender and enterobiasis ($P > 0.05$), which is in line with the findings of previous studies reporting no significant difference in enterobiasis prevalence by gender (7,12). In contrast, Wu et al in Chongqing, China reported that enterobiasis was significantly more prevalent in girls compared to boys (9). In general, it seems that there is no explicit association between gender and enterobiasis prevalence.

Based on the finding of our study, no significant relationship was observed between the geographical living area and enterobiasis, which is in accordance with the results of Motevalli Haghi et al showing no significant relationship between parasitic infection and the geographical area of the studied children (20). However, several studies reported differences in enterobiasis prevalence regarding the geographical living area (10,18). Generally, enterobiasis is more prevalent in rural areas compared with the urban area due to poor hygiene and low socio-economic status.

Conclusions

Overall, although the overall prevalence of enterobiasis among Sabzevar kindergarten children was lower than that of many parts of Iran, the educational programs for parents and kindergarten staff regarding enterobiasis infection and transmission routes should be conducted to reduce the infection rate.

Conflict of Interests

The authors declare that they have no conflict of interests.

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Ethical Approval

This work was reviewed and approved by the Ethics Committee of Sabzevar University of Medical Sciences (Ethical code: IR.MEDSAB.REC.1393.21). The children's parents were also asked to sign an informed consent form in order to allow their children to take part in this study.

Authors' Contributions

HE: Conceptualization, methodology, funding acquisition, and statistical analysis; RG: Data collection, methodology, and original draft preparation; MSM: Supervision, statistical analysis, and writing, reviewing, and editing the final manuscript. All authors read and approved the final manuscript.

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