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Original Article

Prevalence of *Strongyloides stercoralis* and Other Intestinal Parasites among Institutionalized Mentally Disabled Individuals in Rasht, Northern Iran

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Abstract

Background: We aimed to determine the status of strongyloidiasis in mentally disabled population in the institutional places in Rasht City, the capital of Guilan Province, northern Iran.

Methods: This cross-sectional study was conducted in 8 institutions for mentally retarded population in Rasht in 2013. Before collecting the samples, a questionnaire was filled out for each participant by an expert person. A single stool sample was obtained from each of the 173 subjects and examined using direct wet mount, formalin-ether concentration technique and agar plate culture method.

Results: A total of 173 mentally disabled individuals aged 2-57 (25.69±11.56) yr old were studied. Stool examination showed that 51 (29.5%) cases were infected with at least one parasite. Of 173 studied cases only 10 (5.8%) individuals were infected with pathogenic parasites, of which 2 (1.2%) cases were infected with *Strongyloides stercoralis* and 8 (4.6%) with *Giardia lamblia*. On the other hand, 42 (24.3%) of the studied population were infected with non-pathogenic intestinal protozoa such as *Blastocystis hominis* (n=29, 16.8%), *Entamoeba coli* (n=16, 9.2%) and *Endolimax nana* (n=4, 2.3%). Mixed protozoal infections were observed in 8 (4.6%) individuals.

Conclusion: The prevalence rate of *S. stercoralis* in mentally disabled individuals in Rasht was somewhat higher than those of normal population of the province. The same picture was seen when the prevalence of *G. lamblia* and non-pathogenic protozoa in normal and mentally disabled populations were compared.

Introduction

Prevalence of parasitic infections in a particular region depends not only on bioenvironmental situation, but also on social, economic, and cultural conditions. In developing countries mainly situated in tropical areas, lack of access to health services, malnutrition, and poor sanitation, increase vulnerability to the infection (1, 2). *Strongyloides stercoralis* is a nematode with an endogenous cycle that infects humans for many years without requiring further exposure to contaminated soil, a situation characterized by few or no symptoms, and which therefore may go unnoticed (3). Although *S. stercoralis* is often considered a disease of tropical and subtropical areas, endemic foci are also seen in temperate regions (4, 5). Low socioeconomic status (5), alcoholism (6), white race (7) and male gender (5) have been associated with higher prevalences of the parasite.

Clusters of cases in institutionalized individuals with mental retardation suggest that nosocomial transmission can occur (8-10). Occupations such as farming (11-12) and coal mining (5, 13), which increase contact with contaminated soil, increase the risk of infection. Swimming in or drinking contaminated water has not been proven to be a significant source of transmission, perhaps because larvae do not thrive when immersed in water (14, 15).

Strongyloidiasis in immunocompetent individuals is usually an indolent disease, while in immunocompromised persons it can result in hyperinfection syndrome and disseminated disease with fatal consequences (16). It is among the most difficult parasitic infections to diagnose and effective treatment consists of total parasite eradication before fatal complications develop (17). Circumstances of institutional places can lead to less ventilation and increase the risk of transmission of the disease (20).

There are several reports on the prevalence of parasitic infections among different groups

of people in Iran; however, the epidemiological data in mentally disabled individuals are rare, especially in northern Iran. Because of the importance of the infection in mentally disabled community and dangerous nature of strongyloidiasis as a lifelong threat, especially in immunocompromised persons, we decided to carry out this study in institutes keeping mentally disabled individuals in Rasht.

Materials and Methods

This cross-sectional study was conducted in 8 institutions for mentally disabled population in Rasht City of Guilan Province from January to December 2013. The province is located at the littoral of Caspian Sea, northern Iran, in a temperate zone with high humidity and a sultry climate. All of the institutes were affiliated to welfare organization and the mentally disabled individuals kept in these institutes were from different parts of the province.

This study was approved by Ethical Committee of Guilan University of Medical Sciences. The nature of the study was explained to officials of the institutes and written consents were obtained from parents or institute managers.

The demographic details of the respondents and data relating to risk factors associated with *S. stercoralis* infection including the ability of participants to meet self-hygiene, history of soil contact and raw vegetables consuming, presence of clinical manifestations such as urticaria and larva currens rashes, pulmonary symptoms such as cough and tracheal irritation, gastrointestinal symptoms (diarrhea, constipation, anorexia, abdominal pain) and hygienic status of the institutes were recorded.

A single stool sample was obtained from each of the 173 subjects and taken to Research Center for Fascioliasis and Parasitic Diseases of Guilan University of Medical Sciences. The specimens were examined using formalin-

ether concentration technique and agar plate culture method. Direct wet smear was used when dealing with diarrheic samples.

Statistical analysis was done by Chi-square and Binary Logistic Regression tests using SPSS software version 18, and $P < 0.05$ was considered significant.

Results

One hundred seventy three institutionalized individuals aged 2-57 (25.69 ± 11.56) yr old were studied. Results showed that 51 (29.5%) participants were infected with pathogenic and non-pathogenic parasites, of which 43 cases (24.9%) showed single infection and 8 (4.6%) double infection, while 122 (70.5%) individuals were negative. Of 173 studied people 2

(1.2%) individuals (a male and a female) were infected with *S. stercoralis*. The positive cases were among 20-30 and 40-50 age groups. Both patients were illiterate, had history of consuming uncooked vegetables and a medium level of self-hygiene. No clinical symptoms including skin manifestations were seen in the positive cases.

The most prevalent parasite was *Blastocystis hominis* which were seen in 29 (16.8%) of the cases followed by *Entamoeba coli* with 16 (9.2%) infected individuals. *Giardia lamblia* was the most prevalent pathogenic protozoa in studied population with 8 (4.6%) infected cases (Table 1). *B. hominis* causes clinical symptoms in some infected individuals, so it could be regarded as a pathogenic protozoon as well.

Table 1: Prevalence of intestinal parasites in institutionalized mentally disabled individuals in Rasht (2013)

Intestinal parasite	Frequency	Prevalence (%)
<i>Strongyloides stercoralis</i>	2	1.2
<i>Giardia lamblia</i>	7	4.0
<i>Blastocystis hominis</i>	22	12.7
<i>Entamoeba coli</i>	10	5.7
<i>Endolimax nana</i>	2	1.2
<i>Blastocystis hominis</i> + <i>Giardia lamblia</i>	1	0.6
<i>Blastocystis hominis</i> + <i>Entamoeba coli</i>	5	2.9
<i>Blastocystis hominis</i> + <i>Endolimax nana</i>	1	0.6
<i>Entamoeba coli</i> + <i>Endolimax nana</i>	1	0.6
Infected	51	29.5%
No infection	122	70.5%
Total	173	100.0

The infection rates in males and females were 35 (68.6%) and 16 (31.4%) respectively. There was no correlation between gender and existence of intestinal parasitic infections ($P < 0.389$) or type of the infections ($P < 0.177$). Age distribution of the infections is shown in Table 2. The most infected age group was 20-30 years old. Statistical analysis showed no significant difference between age groups and intestinal parasitic infections ($P < 0.526$).

The correlation between some risk factors and intestinal parasites are shown in Table 3. There was no significant difference between parasitic infections and ability to do self-hygiene, contact with soil and status of hygiene in the institutes. On the other hand, a statistically significant difference was observed between consuming raw vegetables and parasitic infections in general ($P < 0.019$).

Table 2: Age distribution of intestinal parasitic infections in institutionalized mentally disabled individuals in Rasht (2013)

Age groups (yr)	Frequency	Percentage (%)
<10	6	11.8
10-20	8	15.7
20-30	20	39.2
30-40	8	15.7
40-50	7	13.7
>50	2	3.9
Total	51	100

Discussion

S. stercoralis is a pathogenic parasitic nematode well recognized for its complicate life cycle and adverse effects on immunocompromised infected individuals by producing hyperinfection and disseminated disease (16).

The parasite life cycle alternate between parasitic (direct) and free-living (indirect) cycles while it has also the potential for autoinfection and multiplication within the host. Autoinfection is one of the important features of strongyloidiasis, resulting in a lifelong infection, which only can be resolved after an effective treatment (15). These important features of the parasite, verify the need to study the different aspects of strongyloidiasis in endemic areas.

Very high prevalences and incidences of parasitic infections have been reported in different parts of Iran during the 60s and 70s and more than 50% of populations in different parts of the country, especially in western and northern parts, were infected with pathogenic roundworms (21).

Table 3: Factors related to intestinal parasitic infections in institutionalized mentally disabled individuals in Rasht (2013)

Factors related to intestinal parasites		Infected (%)	Non-infected (%)	P-value
Ability to do self-hygiene	Good	14 (8.1)	32 (18.5)	$P<0.453$
	Moderate	9 (5.2)	12 (6.9)	
	Weak	4 (2.3)	14 (8.1)	
	Lack of ability	24 (13.9)	64 (37)	
Consumption of raw vegetables	Yes	31 (17.9)	53 (30.6)	$P<0.019$
	No	20 (11.6)	69 (39.9)	
Contact with soil	Yes	19 (11)	34 (19.7)	$P<0.178$
	No	32 (18.5)	88 (50.9)	
Status of hygiene in institute	Moderate	45 (26)	106 (61.3)	$P<0.489$
	Weak	6 (3.5)	16 (9.2)	
Clinical Symptoms	Yes	0	0	
	No	51 (29.5)	122 (70.5)	

However, in recent decades due to improvement in hygienic standards, health education, sanitary measures of health authorities and public awareness, a significant decrease in prevalences of these infections has occurred so that most of them are no longer considered as a health problem. Currently, the prevalence of the majority of pathogenic roundworms is less than 1% in the country (21-23).

Although the incidence of roundworm infections has substantially decreased in Guilan province, the same as the rest of the country, however cases of strongyloidiasis is frequently reported (23-25). Prevalence of *S. stercoralis* in normal population of Guilan has been studied by various researchers in the past decades. The infection rates of 0.6%-11.7% have been reported in different parts of the province (23, 26, 27). Guilan province has also been recog-

nized as the most important focus of human fascioliasis in Asia with the largest ever outbreaks of human disease affecting more than 15000 individuals (28). At the time of the first outbreak of fascioliasis in the province and a few years later, due to lack of appropriate diagnostic tests, high eosinophilia in local population living in the endemic areas was considered as an important diagnostic criterion by local physicians. However, recent studies have showed *S. stercoralis* as the most prevalent parasitic cause of eosinophilia in Guilan province (29). This issue reflects the importance of strongyloidiasis in the province, hence this parasitic disease should be considered in differential diagnosis with other parasitic infections causing eosinophilia.

Our results showed that intestinal parasitic infections (pathogenic and non-pathogenic) were prevalent in institutionalized mentally disabled individuals in Rasht. It seems that, the prevalence rate of *S. stercoralis* in mentally disabled individuals in the area was higher than those reported in normal population of Guilan in recent years (1.2% versus 0.9%) (22-24).

The same picture was seen when the prevalence of *G. lamblia* and non-pathogenic protozoa in normal and mentally disabled populations were compared. The rates of infection for these parasitic infections in mentally disabled individuals were almost twice as high as those in normal communities (4.6% versus 2.1% for *G. lamblia*, 16.8% versus 6.4% for *B. hominis* and 9.2% versus 3.9% for *E. coli*). Several factors such as unhygienic environment, poor health behavior, crowdedness and pica and mental handicap are considered to be implicated for this condition. Our findings is also in agreement with that of Sirivichayakul et al (30), which indicated higher prevalences of intestinal parasites in institutionalized mentally handicapped people in comparison with non-institutionalized individuals.

Prevalence of *S. stercoralis* has also been investigated in other provinces of Iran. The rates of infection in northern provinces of

Mazandaran and Golestan located at eastern part of Guilan Province were 0.74% (31) and 0.4% (32) respectively, while it was 0.3% in Karaj, Alborz Province (33) and 2% in Shiraz, Fars Province (34). However, few studies have been performed on residents of mentally disabled institutions in the country for determining the prevalence of parasitic infections (2, 35-38). *S. stercoralis* infection was only proved in two studies (35, 36). The findings of present study is close to the infection rate of strongyloidiasis in Kashan (0.4%) (35), while very lower than that of Hormozgan Province in southern Iran (17.3%) (36).

When comparing our results with those of other countries the same picture is seen. Our findings is similar to that of Schupf et al. (1.2%) (39) and Sirivichayakul et al. (30) while different from the studies of Braun and Lynch (10.9%) (8), Proctor et al. 28% (9), Brook et al. (24%) (40) and Panaitescu et al. (9.9%) (41).

Conclusion

Our results indicated high prevalences of non-pathogenic protozoa in studied population. This rate of infection could be regarded as an indicator for poor personal hygiene and inappropriate hygienic condition of studied institutions.

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