

Demographic status and prevalence of intestinal parasitic infections in schoolchildren in İzmir, Turkey

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SUMMARY: Aksoy Ü, Akısü Ç, Bayram-Delibası S, Özkoç S, Şahin S, Usluca S. Demographic status and prevalence of intestinal parasitic infections in schoolchildren in İzmir, Turkey. Turk J Pediatr 2007; 49: 278-282.

Thirteen primary schools from nine areas were randomly selected in the shantytown and apartment districts in İzmir. Fecal specimens were evaluated with native-lugol, formalin-ethyl-acetate sedimentation and with trichrome staining for protozoa and helminths and with cellophane tape for *Enterobius vermicularis*. Of the study group, 33.4% had one or more parasites. The most common parasite was *Blastocystis hominis* (14.6%) followed by *Enterobius vermicularis* (10.1%) and *Giardia intestinalis* (7.8%). When parasitic distribution was evaluated in association with demographic features, a significant relation was found between the income level and parasitic infection prevalence. Multiple parasitic infections were more prevalent in crowded families (either extended or with many children). When parasitic infection prevalences in the 9-10 and 11-12 years of age groups were compared, the probability in the shantytown primary school group was significantly higher than in the apartment group ($p < 0.05$).

Key words: intestinal parasite, prevalence, demographic status.

Infection due to intestinal parasites, which are so common in developing countries, is an important public health problem, particularly in childhood¹. Studies have shown that parasitic infection prevalence varies in different regions of the same country and the determined parasites differ according to geographic status of the region and nutritional attitudes and lifestyles of the population, and that frequency of these infections are higher in crowded places such as schools, military recruit camps and dormitories. Improved sanitation conditions and school-based health programs are as important as personal preventive measures to avoid intestinal parasites².

In recent years, parasite incidence was found to be decreased in patients who referred to our Training Hospital laboratories. It was emphasized that this reflected change in the public needs to be further investigated with epidemiological studies³. Determination of this change is particularly important in primary schoolchildren. For this purpose, information is needed about demographic features and

parasitic infection status of schoolchildren and sanitary conditions of the schools in İzmir. Hence, in this study, we aimed to determine the intestinal parasite prevalence and evaluated the effects of demographic features on infection frequency in different areas of İzmir, the third largest city in Turkey.

Material and Methods

The study was conducted in Dokuz Eylül University Faculty of Medicine, Department of Parasitology between February-May 2003. It was a cross-sectional research. Necessary permissions for the study were obtained from Dokuz Eylül University Faculty of Medicine's Commission of Ethics for Clinical and Laboratory Research (resolution date 15 July 2002 and number 7906).

Study Area

Average temperature is high in İzmir, and the highest is seen in July, with an average degree of 27.6°C. The lowest temperature is measured

in January, and the average temperature is 8.6°C. According to 60 years' measurements, average annual rainfall is 691 mm³. The highest rainfalls are seen in December (average 154.3 mm³) and January (average 132.6 mm³). The drought months are July and August, with an average rainfall of 2 mm^{3,4}.

Features of the School

In this study, we investigated intestinal parasites in 13 primary schools from nine different areas of İzmir. Schools were selected randomly to correctly reflect the socioeconomic status. According to number of inhabitants, one or two schools were selected from each area. During evaluation, it was taken into account whether the data were from central or shantytown areas.

Sociodemographic Features

A questionnaire was completed for each student, including name, gender, age, school grade, type of family, number of siblings, educational level of parents, income level and parasitic infections. Children were divided into four age groups (7-8, 9-10, 11-12 and 13-14 years). The questionnaire was completed with student-teacher cooperation.

Fecal Specimens

Students were educated about usage of plastic sample containers with tight-fitting lids. One fecal sample from each of 1,127 students was collected 24 hours later and in addition cellophane tape method for *Enterobius vermicularis* (*E. vermicularis*) eggs was performed in all of them.

As soon as possible, stool samples were examined using wet mounts, formalin-ethyl acetate sedimentation and permanent stain (trichrome staining) microscopically for presence of intestinal protozoa and helminths⁵.

At least six slides were prepared and examined for each stool sample. In the preparation of wet mounts, small portions of stool were mixed with a drop of normal saline (fresh mount - native) and a drop of 2% iodine solution (lugol) on clean slides and cover slips were placed on the preparations. Result for *Blastocystis* was reported if there were five or more organisms at x40 magnification with wet mounts⁶. Two slides were also prepared for each patient after

formalin-ethyl acetate concentration method using the native-lugol method and examined under X40 magnification. The remaining two slides were stained with trichrome and examined under X100 magnification.

Each stool and cellophane tape slides were evaluated by two experienced investigators. Sample was accepted as positive if at least one method showed the parasite.

Statistical Analysis

We used χ^2 test, regression analysis and Mann-Whitney U test to evaluate the relation between the parasitic infection frequency and demographic data.

Results

Sanitation Status of the Schools

Tap water was available only two or three days per week in shantytown schools. They had canteens, but non-hygienic food products were also found around the schools. Particularly in shantytown schools, toilet sanitation was poor and soap was not always available in toilets.

The distribution of all students in the study according to area and parasite presence is shown in Figure 1. Multiple parasitic infection prevalence was highest in area 1 (14.4%) and lowest in area 8 (1.5%). Area 1 is a shantytown region with dense migration from eastern parts of Turkey.

Demographic Features

Sociodemographic profiles of the groups are shown in Table I. When the relation between the sociodemographic profile and parasitic infection prevalence was evaluated, it was found that multiple parasitic infections were more frequent in large (extended) families and in families with many children. The evaluation of the relation between the familial income level and parasite species showed that *E. vermicularis*, *Giardia intestinalis*, and *Hymenolepis nana* (*H. nana*) infections were more frequent in families with low income level. There was an inverse relation between the mother's education level and the prevalence of *E. vermicularis* and *Blastocystis hominis* (*B. hominis*).

The prevalence of intestinal parasitic infections in apartment and shantytown schoolchildren is shown in Table II. According to our results,

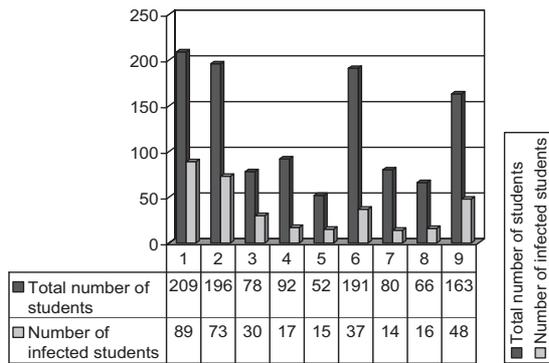


Fig. 1. The number of infected children in Izmir according to area.

Table II. Prevalence of Intestinal Parasitic Infections in Schoolchildren According to Apartment and Shantytown Dwellings

	Shantytown		Apartment	
	Number	(%)	Number	(%)
No parasite	397	66.8	393	73.8
Single parasite	141	23.7	111	20.8
Multiple parasites	56*	9.5	29	5.4
Total	594	100	533	100

* p < 0.05, x² test.

Table I. Sociodemographic Profile of Infected and Non-Infected Children

	Infected		Non-infected		Total	
	n	%	n	%	n	%
Sex						
Female	157	27.9	406	72.1	563	49.9
Male	179	31.8	385	68.2	564	50.1
Type of family						
Nuclear	256	28.6	638	71.4	894	83.0
Extended	48	33.8	94	66.2	142	13.3
Divorced	8	20.0	32	80.0	40	3.7
Number of siblings*						
0	28	19.6	115	80.4	143	12.9
1	130	27.0	352	73.0	482	43.5
2	78	32.1	165	67.9	243	21.9
≥ 3	94	39.1	147	60.9	241	21.7
Educational level of father**						
Not educated	34	42.5	46	57.5	80	7.3
Primary school	249	31.8	535	68.2	784	71.7
High school and university	43	18.5	185	81.5	228	21.0
Educational level of mother**						
Not educated	84	43.1	111	56.9	195	17.8
Primary school	218	28.5	547	71.5	765	69.7
High school and university	25	18.0	112	82.0	137	12.5
Father's employment***						
Yes	244	27.8	634	72.2	878	81.1
No	78	38.0	127	62.0	205	18.9
Mother's employment						
Yes	57	27.8	148	72.2	205	19.3
No	255	29.7	604	80.3	859	80.7
Financial status****						
Low	152	36.3	266	63.7	418	40.4
Medium	131	23.7	421	76.3	552	53.3
High	20	30.8	45	69.2	65	6.3

* p < 0.01, x² test and with regression analysis R=0.133 and R² =0.018.

** p < 0.01, x² test.

*** p < 0.05, x² test.

**** p < 0.01, x² test when low and medium financial status were compared. The family income was classified according to expenses.

multiple parasitic infection prevalence was higher in shantytown areas when compared with apartment areas ($p < 0.05$).

When students were compared according to age groups, parasitic infection prevalence was significantly higher in 9-10 and 11-12 age groups in shantytown areas ($p < 0.05$).

Parasitic Features

Of the 1,127 students, 337 (33.4%) had one or more parasites. Distributions of these cases were as follows: 252 had one, 70 had two, and 15 had three or more species of parasites. When all areas were taken into account, the most frequent parasite was *B. hominis* (14.6%) followed by *E. vermicularis* (10.1%) and *G. intestinalis* (7.8%). Other parasite prevalence rates were 2.5% for *Entamoeba coli*, 1.25% for *H. nana*, 1.15% for *Endolimax nana*, 0.57% for *Entamoeba hartmanni*, 0.28% for *Iodamoeba butschlii*, 0.19% for *Entamoeba histolytica* and 0.19% for others.

Discussion

Climate and geographic conditions of the country are important factors in the variety of parasitic infections during childhood⁷. İzmir is on the west coast of Turkey and has a Mediterranean climate. Animal breeding areas are small, so parasitic infections due to animal sources are rare.

Others factors affecting the prevalence of parasitic infections are socioeconomic status and the density of immigrants. The studies held in different countries showed that many infections, particularly the parasitic ones, could be seen in the regions with low socioeconomic status and mostly among immigrants^{8,9}. It was reported that poor nutrition due to bad socioeconomic status increases the parasitic infection frequency¹⁰. In our study, we found that parasitic infections are more prevalent in area 1, where the majority of the population are immigrants from eastern parts of Turkey.

Regarding the parasite prevalences in this study, the most frequent parasite was found as *B. hominis* (14.6%), which is accepted as an extremely common parasite with a worldwide distribution. The ease of transmission by fecal-oral route and also water-borne, food-borne and person-to-person transmissions can explain this high prevalence¹¹. This prevalence was also

in accordance with previous reports, which investigated the epidemiology of intestinal parasites in children in İzmir^{12,13}. As our aim in this study was only to determine the intestinal parasite prevalence and demographic features affecting them, the association of *B. hominis* with human disease was not evaluated.

Another issue observed in the results of this study was the low frequency of *E. histolytica* (0.19%), which is in fact consistent with other reports carried out in İzmir^{13,14}. In another study investigating intestinal parasites of schoolchildren in İzmir³, *E. histolytica* was not even detected. We believe that the association of various techniques (native, lugol and trichrome staining) for differentiation of *E. histolytica* from non-pathogenic *Entamoeba* like *E. hartmanni* and *E. nana*, might have contributed to the low prevalence rate in our study.

When we tried to find an association between demographic features and parasite prevalence, it was not surprising to find that multiple parasitic infections were common in large families and families with many children. This result confirms that crowded and unhygienic conditions increase the parasitic infection prevalence with similar contamination cycles. Education of the family, especially of the mother, has an important role in preventing parasitic infections¹⁵. In our study, there was an inverse relation between the mother's education level and the most frequent parasitic infection with *B. hominis* and *G. intestinalis*. Prevention of intestinal parasites, which are transmitted by fecal-oral contamination, is taught by the mother, such as by washing hands before and after meals and after using the toilet, not consuming unhygienic food, and properly storing food in the refrigerator and in covered boxes at home. If this education is strengthened at school by the teacher, it can be better implemented.

In the same city, comparison of parasitic infection prevalence in schools of socioeconomically good and poor regions is important, because this reflects the real substructure of the region. Many studies held in our country showed different parasitic infection prevalence in various regions with different socioeconomic levels¹⁵⁻¹⁷. In our study, the prevalence of multiple parasitic infections was the highest in area 1, which is one of the regions dense

in immigrants from eastern cities. It reflects the heterogeneous structure of the population. The environment must be improved regarding sociocultural attitudes. Low life quality, improper hygienic conditions and poor nutrition due to unsystematic city-planning are important factors for intestinal parasite frequencies. In addition, the probability of contamination of tap water with sewage increases the negative conditions. We found that parasitic infection prevalence was increased in the 9-10 and 11-12 age groups of shantytown schoolchildren. It is not surprising because they frequently buy the cheap, dirty and unpacked food from peddlers.

In a previous study carried out five years ago in area 1, the prevalence of intestinal parasitic infections was found as 65%¹⁴, whereas this rate in the same area was 42.5% in our study. This was the highest rate when all areas were taken into account. These rates indicate that the environmental conditions and lifestyle in this area must be improved.

The high prevalence of parasitic infection (33.4%) in İzmir, the third largest city in Turkey, is a serious problem. We believe that preventive medical service for both students and families, and improving both sanitary conditions via urbanization and quality of life would decrease the prevalence of intestinal parasitic infections in this city.

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