

A Retrospective Evaluation of the Prevalence of Intestinal Parasites in Istanbul, Turkey

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SUMMARY: The aim of this study is to estimate the prevalence of intestinal parasites, in comparison to previous studies in Istanbul and different geographic regions of Turkey. Between January 1999-December 2009, a total of 27664 stool samples from patients with suspicious intestinal parasitic infections who were admitted to İstanbul University Cerrahpaşa Medical School Hospital were examined for intestinal parasites by using native lugol and formalin-ethyl acetate concentration technique, in addition to the scotch cellophane tape that was adapted to 1423 children to investigate the *Enterobius vermicularis* infection. Intestinal parasites were found in 1114 (4%) out of 27664 stool samples examined. The prevalence of intestinal parasites is as follows: *Blastocystis hominis* in 2.1%, *Giardia intestinalis* in 1.4%, *Taenia saginata* in 0.2%, *Entamoeba histolytica/dispar* in 0.05% and *Ascaris lumbricoides* in 0.03%. *Hymenolepis nana* (6), *Trichuris trichiura* (3), *Strongyloides stercoralis* (2), *Fasciola hepatica* (1), *Dicrocoelium dendriticum* (1) and *Isoospora belli* (1) were found in small numbers. Furthermore *Entamoeba coli* (119), *Iodamoeba bütschlii* (5), *Trichomonas hominis* (2), *Chilomastix mesnili* (1), parasites which exist as commensals in the intestines were also determined. *Enterobius vermicularis* was detected in 129 (9%) out of 1423 cellophane tape samples. This study showed that the intestinal parasites are still an important public health problem in Istanbul.

Key Words: Intestinal parasites, distribution, prevalence, Istanbul, Turkey

İstanbul'da Bağırsak Parazitlerinin Sıklığı Bakımından Retrospektif Bir Değerlendirme

ÖZET: Bu çalışmanın amacı bağırsak parazitlerinin prevalansını değerlendirmek ve ayrıca İstanbul'da ve Türkiye'nin farklı coğrafik bölgelerinde daha önce yapılmış olan çalışmalarla bir karşılaştırmasını yapmaktır. Ocak 1999-Aralık 2009 yılları arasında bağırsak parazit enfeksiyonu şüphesiyle İstanbul Üniversitesi Cerrahpaşa Tıp Fakültesi hastanesine başvuran hastalardan alınan 27664 dışkı örneği native lugol ve formol-etil asetat konsantrasyon teknikleri ile bağırsak parazitleri bakımından incelendi. Ayrıca *Enterobius vermicularis*'i araştırmak için 1423 çocuğa selofan bant uygulandı. Muayene edilen 27664 dışkı örneğinin 1114 (%4)'ünde bağırsak parazitleri tespit edildi. Bunların %2,1'i *Blastocystis hominis*, %1,4'ü *Giardia intestinalis*, %0,2'si *Taenia saginata*, 15 (%1)'i *Entamoeba histolytica/dispar* ve 10 (%0,8)'u *Ascaris lumbricoides*'di. *Hymenolepis nana* (6), *Trichuris trichiura* (3), *Strongyloides stercoralis* (2), *Fasciola hepatica* (1), *Dicrocoelium dendriticum* (1) and *Isoospora belli* (1) daha az sayıda bulundu. Ayrıca bağırsakta kommensal olarak bulunan 119 *Entamoeba coli*, 5 *Iodamoeba bütschlii*, 2 *Trichomonas hominis* ve 1 *Chilomastix mesnili* tespit edildi. *Enterobius vermicularis* 1423 selofan bant örneğinin 129 (%9)'unda bulundu. Bu çalışma bağırsak parazitlerinin İstanbul'da geçmişten günümüze büyük ölçüde azalmış olmasına rağmen hala önemli bir halk sağlığı problemi olduğunu göstermektedir.

Anahtar Sözcükler: Bağırsak parazitleri, dağılım, prevalans, İstanbul, Türkiye

INTRODUCTION

Intestinal parasitic infections are among the most common infections throughout the world. About 3.5 billion of people are infected with some kind of intestinal parasite in the according to WHO (67, 68). Parasitic infections are re-

garded as a serious public health problem because they cause malnutrition, iron deficiency anemia, growth retardation in children and other physical and mental problems (34, 53). The prevalence of intestinal parasitic infections depends on the socio-economic level of the society, social practices and traditions, poor sanitary and environmental conditions, inadequate personal hygiene, absence of safe drinking water supplies and climatic factors (40). During the last decades, the major improvements in the field of sanitation have been eventuated in Istanbul, located in Marmara region, in north-west Turkey, and important

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developments have been achieved to save the public health, especially to prevent the diseases that spread via contaminated drinking water. However, each year, a large number of people migrate permanently to Istanbul from rural areas. Therefore, the aim of this study is to determine the prevalence of intestinal parasites and to make a comparison with previous studies in Istanbul and different geographic regions of Turkey.

MATERIALS AND METHODS

Between January 1999 and December 2009, a total of 27664 stool samples from patients (13779 males and 13885 females, aged 1-60 years) with suspicious intestinal parasitic infections referred to Parasitology Laboratory from various health care facilities and out-patient clinics of İstanbul University Cerrahpasa Medical School Hospital were examined for intestinal parasites by using native lugol and formalin-ethyl acetate concentration technique. *Blastocystis hominis* was accepted to study if more than 5 organisms are present in every 40x magnification field (58). Furthermore scotch cellophane tape was adapted to 1423 children (717 boys and 706 girls) aged 1–15 years to investigate the infection of *Enterobius vermicularis*. Fecal antigen detection method (ELISA) was used for the identification of *Entamoeba histolytica/dispar*. The statistical analyses were performed using chi square test or the 2-tailed Fisher exact test.

RESULTS

Intestinal parasites were found in 1114 (4%) stool samples of patients (564 male and 550 females). The prevalence and distribution of intestinal parasites was shown in Figure 1 and Table 1. The prevalence of intestinal parasites according to years was shown in Figure 2. *Blastocystis hominis* (54%) was the most common intestinal parasite. Majority of patients with *B. hominis* were aged between 19-40 years. Second prevalent parasite was *Giardia intestinalis* (37%). It was higher in 5-14 years age group (55% =226/411) ($p<0.001$), and followed by 17-47 years age group (20%=82/411) and 49-60 years age group (24.5%=101/411). However, there was no significant difference in prevalence of intestinal protozoa between males and females. The frequency rate of *Taenia saginata* was 5% and it was higher in adults (80% =48/60) ($p<0.001$). The rate of *Entamoeba histolytica/dispar* (1%) was found much lower. Furthermore in 127 stool samples, we were determined *Entamoeba coli* (119), *Iodamoeba bütschlii* (5), *Trichomonas hominis* (2) and *Chilomastix mesnili* (1), which may be exist as commensal in intestine. *Enterobius vermicularis* was detected in 129 (9%) cellophane tape samples from children (69 boys and 60 girls).

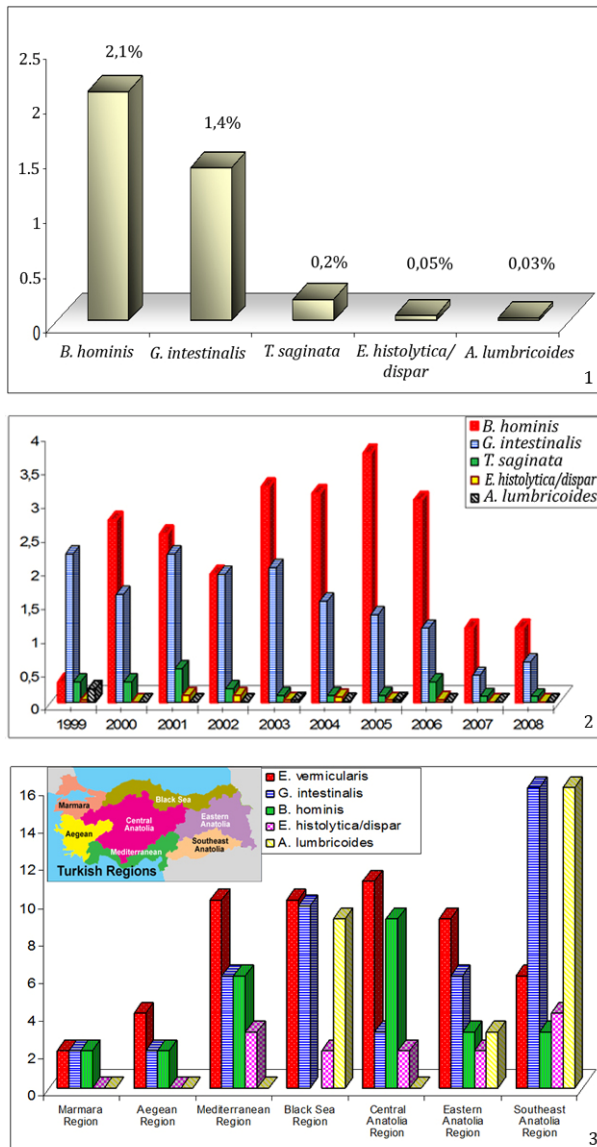
Table 1. Distribution of intestinal parasites according to species in positive stool samples (1114/27664)

Parasites	N	%
<i>Blastocystis hominis</i>	604	54
<i>Giardia intestinalis</i>	411	37
<i>Taenia saginata</i>	60	5
<i>Entamoeba histolytica/dispar</i>	15	1
<i>Ascaris lumbricoides</i>	10	0,8
<i>Hymenolepis nana</i>	6	0,5
<i>Trichuris trichiura</i>	3	0,2
<i>Strongyloides stercoralis</i>	2	0,17
<i>Fasciola hepatica</i>	1	0,1
<i>Dicrocoelium dendriticum</i>	1	0,08
<i>Isospora belli</i>	1	0,08
Total	1114	-

DISCUSSION

In this study, prevalence of intestinal parasites was determined to be 4% (1114/27664) in stool samples from patients in Istanbul. Our findings resemble those of results of other researches conducted in recent years in same city (47, 48). However, previous studies in Istanbul have reported a high prevalence rate of intestinal parasites, 31% in 1971-1987 (64) and 9 % in 1985-1995 (46). These evidences clearly have showed that the prevalence of intestinal parasites is significantly low compared to those previous decades in Istanbul ($p<0.001$). *B. hominis* (54%) was found the most common intestinal parasite in the present study and majority of the patients was between 19-40 years. Prevalence of *B. hominis* was determined to be 2.1%. Unfortunately, in the previous reports released in Istanbul could not be found enough information about prevalence of *B. hominis*. Several studies conducted in different regions of Turkey have shown that the prevalence of *B. hominis* varies from 2% to 9% (1-5, 8, 10, 11, 14, 16-32, 35-39, 41, 42, 44, 45, 47-50, 55, 56, 59, 61-63, 65, 66, 72-74).

Many studies have observed that *B. hominis* was the most common human intestinal protozoa worldwide and related to intestinal disturbance, although its pathogenesis is unclear (17, 33, 51, 69, 70, 71). Basualdo *et al.* (13) showed that *B. hominis* would have a direct mechanism of transmission because of its low detection in water and its absence in the soil. In our study, the second most frequent parasite was *G. intestinalis* (37%) and its prevalence was 1.8%. In previous reviews in Istanbul, prevalence of *G. intestinalis* has been reported to be 1-15% (46, 64). *G. intestinalis* has gradually decreased since 2004 (Figure 2). In different regions of Turkey, the prevalence rate of *G. intestinalis* varies between 2% to 16% (1-5, 8, 10, 11, 14, 16-32, 35-39, 41, 42, 44, 45, 47-50, 55, 56, 59, 61-63, 65, 66, 72-74).



Figures 1. Frequency of intestinal parasites detected in stool samples examined (27664); **2.** Prevalence of intestinal parasites according to years; **3.** Prevalence of the intestinal parasites in different geographic regions of Turkey

In the present study, the infection rate caused by *G. intestinalis* was higher in 5-14 years age group (63%) compared to other age groups ($p < 0.001$). However, there was no significant difference between males and females. Similar results were found in some studies (43, 45). Tang *et al.* (60) reported that the prevalence rate in females was higher than in males, although Arani *et al.* (7) suggest that susceptibility to parasitic infections is greater in males. This protozoan caused of disease outbreak is widespread worldwide. Their prevalence varies between 2-5% in developed countries, but 20-30% in developing countries (43). In our study, frequency and prevalence rate of *E.*

histolytica/dispar were 1% and 0.05%, respectively. We did not detect a change in prevalence of *E. histolytica/dispar* compared to previous years in Istanbul. However, prevalence of *E. histolytica/dispar* has been declared between 0.1%-7% in different regions of Turkey (1-5, 8, 10, 11, 14, 16-32, 35-39, 41, 42, 44, 45, 47-50, 55, 56, 59, 61-63, 65, 66, 72-74). Our findings showed that *Taenia saginata* (5%) was the most frequent intestinal helminth, and it was higher in adults (80%) ($p < 0.001$). Prevalence of *T. saginata* was 0.2%. Too much information could not find about real prevalence of *T. saginata* relating to previous year in Istanbul and other regions of Turkey. Actually, *T. saginata* infection is a significant public health problem in our country. Many people have also eating raw meatball habits in Istanbul, although tradition raw meatball consumption is common in Eastern and Southeastern regions. The patients recognize the gravid proglottids of *T. saginata* and know also the treatment without visit a general practitioner. Therefore, it is difficult to determine a real prevalence rate of *T. saginata*. Prevalence of the other intestinal helminthes (*Ascaris lumbricoides*, *Hymenolepis nana*, *Trichuris trichiura*, *Strongyloides stercoralis*, *Fasciola hepatica* and *Dicrocoelium dendriticum*) was very low in the present study. In previous reviews in Istanbul, *A. lumbricoides* (0.1-8%) and *T. trichiura* (0.02-3%) were the more prevalent intestinal helminthes (46, 64). The prevalence rate of *A. lumbricoides* in different regions of Turkey was between 0.01% to 16%. *E. vermicularis* was detected in 129 (9%) cellophane tape samples from children in the present study. Its frequency in boys was 9.6% and 8.4% in girls. Prevalence rate of *E. vermicularis* has been reported between 2% to 11% in different regions of Turkey (1-5, 8, 10, 11, 14, 16-32, 35-39, 41, 42, 44, 45, 47-50, 55, 56, 59, 61-63, 65, 66, 72-74). The higher prevalence of *E. vermicularis* could also be explained by the highly infectious nature of the parasites. This parasite leads to high infection rates especially in children living or studying in a large group, such as schools, kindergartens, and orphanages worldwide (75). For this reason, the routine cellophane tape method is usually used only in children. Also there are not too much studies conducted as the routine cellophane tape method in Turkey. Therefore, it is difficult to determine a real prevalence rate of *E. vermicularis*.

A large number of epidemiological studies carried out in different countries and in our country have shown that the prevalence and epidemiologic features of intestinal parasites vary in different parts of the world, even in different regions of the same country. The socio-economic level of the society, geographic, sanitary/hygienic, cultural and nutritional factors may affect the incidence of intestinal parasites (6, 7, 9, 11, 12, 15, 16, 27, 52, 54, 57, 60, 63).

The different prevalence rates of parasites have been reported from the same regions in Turkey. These prevalence differences may be attributed to sample size/specific demographic population and methodology used to collect the data. Therefore, we collected the data reported from 7 different regions and calculated the cumulative rates of intestinal parasites in these regions (Figure 3). These findings showed that, the cumulative prevalence rate of intestinal parasites vary in different geographical regions of Turkey, with 3.5%, 3.8%, 15%, 23%, 13, 16%, 41% reported from Marmara, Aegean, Mediterranean, Black Sea, Central Anatolia, *Eastern Anatolia* and Southeast Anatolia regions, respectively. Marmara region where Istanbul is situated and Aegean region are better than other region of Turkey. These cumulative results suggested that *E. vermicularis*, *G. intestinalis* and *B. hominis* take place in first tree rank in Marmara, Aegean, Mediterranean and Central Anatolia regions, but *A. lumbricoides* was determined in *Eastern Anatolia* (3%), Southeast Anatolia (16%) and Black Sea (9%) regions. Also, in *Eastern Anatolia*, Southeast Anatolia (16%), Central Anatolia, Black Sea and Mediterranean regions, the prevalence of *E. vermicularis* (9%, 6%, 11%, 10% and 10% respectively) and *G. intestinalis* (6%,16%, 3%, 9.7% and 6% respectively) were higher than Marmara (*E. vermicularis* 2% and *G. intestinalis* 2%) and Aegean (*E. vermicularis* 4% and *G. intestinalis* 2%) regions. Prevalence of *E. histolytica/dispar* in Mediterranean (3%), Black Sea (2%), Eastern Anatolia (2%) and Southeast Anatolia (4%) regions was higher than Marmara (0.1%) and Aegean regions (0.3%) (Figure 3). The reason for high prevalence of intestinal parasites in Eastern, Southeast Anatolia and Black Sea regions might be due to the socioeconomic and environmental conditions lower than other regions and traditional life habits.

In conclusion, our results showed that prevalence of intestinal parasites considerably decreased in the last decade in Istanbul. The explanation is that, general improvement in sanitary/hygienic conditions such as infrastructure of city, sanitary installations of *buildings* where *people live and pure* water that is of sufficiently high-quality. It can be seen that Istanbul is luckier than eastern provinces. However, *G. intestinalis* (1.8%) and *E. vermicularis* (9%) are still a major public health challenge although soil-transmitted helminths do not exist in Istanbul.

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