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Assessment of the Distribution of Intestinal Parasites Detected in the Parasitology Laboratory of Çukurova University Faculty of Medicine Between 2017 and 2021

Çukurova Üniversitesi Tıp Fakültesi Parazitoloji Laboratuvarı'nda 2017-2021 Yılları Arasında Saptanan Bağırsak Parazitleri Dağılımının Değerlendirilmesi

Mehtap Demirkazık, Eylem Akdur Öztürk, Fatih Köksal

Çukurova University Faculty of Medicine, Department of Medical Parasitology, Adana, Türkiye

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ABSTRACT

Objective: It is known that protozoa and helminths that cause intestinal infections adversely affect human life. Changing climate and demographic and socio-economic factors worldwide necessitate the determination and updating of the incidence of these parasites. Our study aimed to retrospectively examine the distribution of intestinal parasites detected in the Parasitology Laboratory of Çukurova University Faculty of Medicine between 2017 and 2021.

Methods: Parasitological examinations were performed using the native-lugol and formol-ether condensation method. Staining method (Modified Ziehl-Neelsen) and cellophane tape method were then applied to evaluate the specimens considered necessary.

Results: One or more parasites were detected in 33 of 373 patients (8.8%) evaluated in the study. These were *Giardia intestinalis* at a rate of 30.5% (11/36), *Enterobius vermicularis* at a rate of 27.7% (10/36), *Blastocystis* sp. at a rate of 19.4% (7/36), *Entamoeba coli* at a rate of 11.1% (4/36), *Cryptosporidium* spp. at a rate of 8.3% (3/36) and *Taenia saginata* at a rate of 2.7% (1/36). It was determined that two patients were coinfected by *Entamoeba coli* and *Blastocystis* sp. while one patient was coinfected by *Entamoeba coli* and *Giardia intestinalis*.

Conclusion: It is thought that determining the incidence of intestinal parasites, which are an important public health problem, may help guide studies for preventive health services. Although the five-year laboratory data obtained from the study do not reflect our region, it is thought that intestinal parasites maintain their importance

Keywords: Intestinal parasites, Çukurova, Adana

ÖZ

Amaç: Bağırsak enfeksiyonuna neden olan protozoon ve helmintlerin insanlarda yaşamı olumsuz etkilediği bilinmektedir. Tüm dünyada değişen iklim, demografik ve sosyo-ekonomik faktörler, bu parazitlerin görülme oranlarının belirlenmesini ve güncellenmesini zorunlu kılmaktadır. Çalışmamızda Çukurova Üniversitesi Tıp Fakültesi Parazitoloji Laboratuvarı'nda 2017-2021 yılları arasında saptanan bağırsak parazitleri dağılımının retrospektif irdelenmesi amaçlanmıştır.

Yöntemler: Parazitolojik incelemeler nativ-lugol ve formol-eter yoğunlaştırma yöntemi kullanılarak yapılmıştır. Ayrıca gerek görülen örneklere boyama (Modifiye-Ziehl Nielsen) yöntemi ve selofan bant yöntemi uygulanmıştır.

Bulgular: Çalışmada değerlendirilen 373 hastanın 33'ünde (%8,8) bir veya birden fazla parazit saptanmış olup tanımlanan parazitler arasında %30,5 (11/36) oranında *Giardia intestinalis*, %27,7 (10/36) oranında *Enterobius vermicularis*, %19,4 (7/36) oranında *Blastocystis* sp., %11,1 (4/36) oranında *Entamoeba coli*, %8,3 (3/36) oranında *Cryptosporidium* spp., ve %2,7 (1/36) oranında *Taenia saginata* saptanmıştır. İki hastanın *Entamoeba coli* ve *Blastocystis* sp. ile ve bir hastanın ise *Entamoeba coli* ve *Giardia intestinalis* ile koenfekte olduğu tespit edilmiştir.

Sonuç: Önemli bir halk sağlığı sorunu olan bağırsak parazitlerinin çalışmamızda görülme sıklığının belirlenmesi korunmaya yönelik yapılacak çalışmalara yol gösterici olabileceği düşünülmektedir. Çalışmadan elde edilen beş yıllık laboratuvar verileri her ne kadar bölgemizi yansıtmasa da bağırsak parazitlerinin önemini koruduğu düşünülebilir.

Anahtar Kelimeler: Bağırsak parazitleri, Çukurova, Adana

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Address for Correspondence/Yazar Adresi: Mehtap Demirkazık, Çukurova University Faculty of Medicine, Department of Medical Parasitology, Adana, Türkiye
Phone/Tel: +90 533 772 27 33 **E-mail/E-Posta:** mdemirkazik@cu.edu.tr **ORCID ID:** orcid.org/0000-0003-3158-4937

Türkiye PARAZİTOLOJİ Dergisi

INTRODUCTION

It is known that intestinal parasites have infected humans since prehistoric times. Intestinal parasiticinfections are observed at high prevalence in many regions around the world. Intestinal parasites cause significant health problems in underdeveloped and developing countries, whereas waterborne epidemics have also been encountered in developed industrial countries. The morbidity and mortality rates of intestinal parasitic infections in endemic countries are noteworthy (1,2). Numerous factors, such as appropriate climate and geographical structure, duration of environmental resistance (especially higher resistance of oocysts and nematode eggs), presence of intermediate hosts and vectors, regional social habits, personal hygiene awareness, and education level, play a role in the distribution of parasites in the world. Moreover, people from endemic regions visit areas where parasites are not encountered or contaminated vegetables and fruits are transported to regions where parasites are not observed due to fast and easy transportation, which also affects the distribution of parasites on the earth (1,2). While intestinal parasites spend their obligatory parasitic period in the intestine during their life cycle, they can lead to clinical conditions, such as malnutrition, iron deficiency anemia, and vitamin and mineral deficiency. They adversely affect the quality of life and working strength. Particularly in preschool and school-age children, they can cause mental and physical development retardation due to vitamin and mineral deficiency (3). Furthermore, they can result in significant economic losses due to expenditures on treatment and protection (2,4).

Soil-borne helminths infect one-sixth of the world's population. Consumption of vegetables and fruits in their raw form without sufficiently cleaning them with clean water increases the incidence of helminths. Helminths and protozoa constitute 1/4 of the etiological agents that cause human infection (3). According to the 2008 global distribution map of soil- transmitted helminths of the World Health Organization, Türkiye is among the countries (with a low prevalence (<20%) of soil-transmitted helminths (5).

Since socio-economic and climatic changes are closely related to public health, updating the incidence rates of intestinal parasitic infections (local, countrywide, and worldwide) is of great importance for future studies for preventive health services (2,5).

The present study aimed to examine the distribution of intestinal parasites detected between January 2017 and December 2021 in specimens sent from different outpatient clinics and clinics of Çukurova University Faculty of Medicine Balcalı Hospital to the Department of Parasitology Laboratory due to digestive system complaints.

METHODS

Stool and cellophane tape specimens of 373 patients sent to the department of parasitology laboratory. The cellophane tape method was used to detect *Enterobius vermicularis* (*E. vermicularis*) eggs in 37 of 373 clinically suspected patients.

Procedure

After the stool specimens sent to the laboratory were examined macroscopically, they were examined under a light microscope (x20 and x40) with the saline and Lugol (native-Lugol) methods. Afterward, the formol-ether condensation method was applied to these specimens (6). 1-1.5 g stool specimens were mixed in 15 mL tubes with the help of a baguette, and the suspension was filtered through two layers of gauze into a new tube. Centrifugation was done at 3000 rpm for 3 min. The sample taken from the lowest part was examined under a light microscope (x20 and x40) with Lugol.

The stool specimen required to detect *Cryptosporidium* spp. was stained by the modified Erlich Ziehl-Neelsen (MEZN) staining method (7). The stool specimens spread on the slide were stained with carbol fuchsin, Destain with acid alcohol, stained with methylene blue, and washed. After drying, they were examined under the light microscope (x100) in immersion objective. Cellophane tape preparations were assessed under the light microscope (x20 and x40) for *E. vermicularis* eggs.

Statistical Analysis

The data obtained from the laboratory recording system were analyzed and statistically evaluated via the chi-square test in the SPSS 20.0 software. In all statistical analyses, $p<0.05$ was considered significant.

Ethics committee approval was obtained for our study from Çukurova University Non-Interventional Clinical Research Ethics Committee (decision no: 65, dated: 04.02.2023).

RESULTS

One or more parasites were detected in 33 (8.8%) of 373 patients who presented to the Laboratory of the Parasitology Department of Çukurova University Faculty of Medicine, and a total of 36 parasites were identified in these patients. These patients samples from different outpatient clinics and clinics such as the department of child health and diseases, department of infectious diseases and clinical microbiology, and department of internal medicine were examined for intestinal parasites in a five-year period between January 2017 and December 2021. After the examination, the most common parasite was *G. intestinalis* (*Giardia intestinalis*) at a rate of 30.5% (11/36), whereas other parasites were *E. vermicularis* at a rate of 27.7% (10/36), *Blastocystis* sp. at a rate of 19.4% (3/36), *Entamoeba coli (E. coli)* at a rate of 11.1% (4/36), *Cryptosporidium* spp. at a rate of 8.3% (3/36) and *Taenia saginata* (*T. saginata*) at a rate of 2.7% (1/36). Of the 373 patients included in the study, 155 (41.6%) were female, and 218 (58.4%) were male. Of the patients with parasites, 51.5% (17/33) were female, and 48.5% (16/33) were male. A cellophane tape test was carried out only on 37 patients with suspected clinical symptoms. While a significant (p=0.042) difference was determined in the distribution of the genders of the patients who presented to the laboratory by year (Table 1), no difference was revealed in the distribution of the parasite detection

Table 1. Distribution of patients admitted by years by gender

Years	Female, n (%)	Male, n (%)	Total, n (%)
2017	51 (13.6)	46 (12.3)	**97 (26%)**
2018	43 (11.5)	77 (20.6)	**120 (32.1%)**
2019	39 (10.4)	47 (12.6)	**86 (23%)**
2020	12 (3.2)	26 (6.9)	**38 (10.1%)**
2021	10 (2.6)	22 (5.8)	**32 (8.5%)**
Total	**155 (41.6%)**	**218 (58.4%)**	**373**

rates by gender (p=0.303). *Blastocystis* sp. and *E. coli* were identified in two patients, and the co-infection of *G. intestinalis* and *E. coli* was identified in one patient. Concerning the distribution of parasite detection rates by year, positivity was determined at a rate of 8.2% (8/97) in 2017, at a rate of 11.6% (14/120) in 2018, at a rate of 11.6% (10% 86) in 2019, at a rate of 5.2% (2/38) in 2020, and at a rate of 6.2% (2/32) in 2021. The highest parasite rates were observed in 2018 and 2019 (Figure 1). *G. intestinalis* and *E. vermicularis* were the most common parasites (Figure 2). March and October were the months with the highest number of parasites (Figure 3).

DISCUSSION

In the developing world, insufficient water resources and sanitation, crowded environments, difficulty accessing health services, living and eating habits, and low education levels

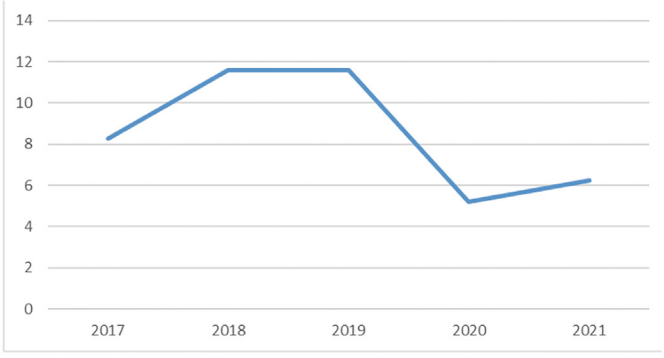

Figure 1. Parasite detection rate by years (%)

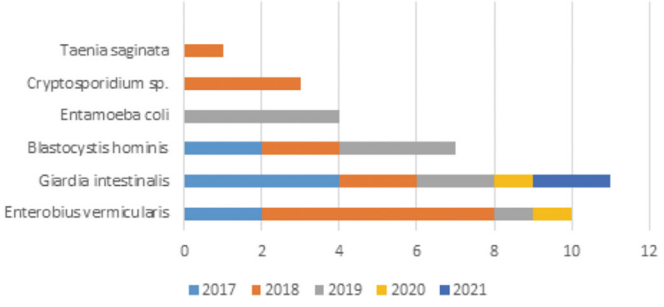

Figure 2. Distribution of detected parasite species by years

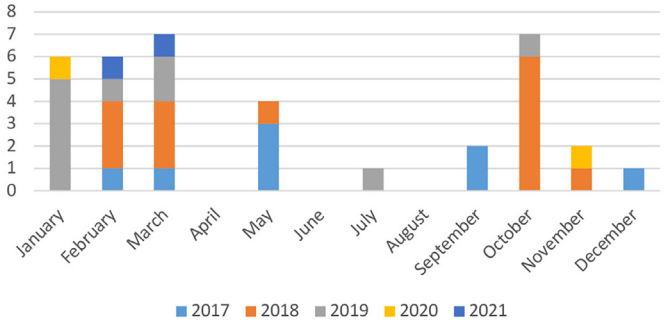

Figure 3. Distribution of parasite species detected between 2017-2021 by months

increase susceptibility to infectious diseases, including intestinal parasites (8).

Numerous studies have been conducted on intestinal parasites in patients who present to parasitology laboratories of medical faculties of universities and health institutions in Türkiye. The distribution of parasites in these studies varies by region and year. In İstanbul, Özyurt et al. (9) detected intestinal parasites at a rate of 5.9% in a training hospital within the four years between 2003 and 2006. Polat et al. (10) detected intestinal parasites in 2.96% of 20,948 patients who presented to the Parasitology Laboratory of İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine between 2012 and 2018. Uzun et al. (11) researched intestinal parasites in five primary schools in the city center of Diyarbakır in 2004. They reported that 490 (52.51%) of 933 stool specimens had parasites and the rate of parasite detection was higher in schools in the region with a low socio-economic level (11). Akpolat et al. (12) examined the distribution of intestinal parasites in patients who presented to Dicle University Faculty of Medicine between 2011 and 2020 and detected parasites in 5.99% of 60.501 stool specimens. A study conducted on children aged 7-14 in Aydın stated that one or more intestinal parasites were detected in 31.8%. The incidence of multiple intestinal parasites was determined to be 29% (13). A study carried out between 2003 and 2012 in the Parasitology Laboratory of Hacettepe University Hospital reported that 3.681 (4.2%) specimens had parasites (14). In the retsrospective results from the Parasitology Laboratory of Hacettepe University Faculty of Medicine, for the period between 2014 and 2019, 7.5% of intestinal parasites were detected in 67.069 specimens (15). Alver et al. (16) reported that one or more parasites were detected in 195 (7.3%) of 2.686 stool specimens at the Parasitology Laboratory of Bursa Uludağ University Health Application and Research Center between 2009 and 2010. Studies conducted in our region stated that parasites were encountered at a rate of 33.08% in a primary school in 1998 (17). In 2003, the prevalence of intestinal parasites was investigated among children in a primary school in Adana, which was located in a region with a low socio-economic level, and one or more parasites were identified in 234 (48.55%) of 482 students whose stool and cellophane tape specimens were examined (18). Before our study, the detection rate of intestinal parasites was reported to be 8.06% in the study conducted in our laboratory between 2003 and 2007 (19). In our current study, one or more parasites were identified in 33 (8.8%) of 373 patients during the five years between 2017 and 2021.

In the study by Okyay et al. (13), the most common parasites were *E. vermicularis* (13%) and *G. intestinalis* (6.1%), and more parasites were observed in individuals living in rural areas compared to those living in urban areas and in individuals without handwashing habits. While studies on intestinal parasites conducted in the same region in different years reported higher rates of parasite density in previous research, Alver et al. (16) stated that the rate of intestinal parasite positivity in stool and cellophane tape examinations of individuals who presented to the Parasitology Laboratory of Bursa Uludağ University Health Application and Research Center between 2009 and 2010 increased compared to the rate of positivity in intestinal parasite examinations performed at the same center in previous years.

In a study carried out by Tanrıverdi and Özcan (17). in a primary school in our region in 1998, *B. hominis* was the most common

parasite at a rate of 13.16%. Aktaş et al. (18) reported parasite distribution by species as *E. vermicularis* at 37.97%, *B. hominis* sp. at 9.33%, *G. intestinalis* at 7.67%, *E. coli* at 4.77%, and *Hymenolepis nana* (*H. nana*) at 0.62%. In the study performed in our laboratory between 2003 and 2007, *G. intestinalis* (19.04%) was the most common parasite, followed by *Cryptosporidium* spp. (11.9%) (17). *G. intestinalis* (30.5%) and *E. vermicularis* (27.7%) were the most common parasites in our study. In the last two years, 2020 and 2021, the number of patients with suspected intestinal parasites or those who presented to the hospital for general check-ups decreased with the measures taken during the severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) pandemic. In our laboratory, the number of intestinal parasites decreased in parallel with the decreased number of patients in 2020 and 2021. It is thought that parasites could have been detected at a higher rate than in the previous study conducted in our laboratory if the number of patient presentations in previous years had been reached in these years.

In our current study, parasites were detected at the highest rates in 2018 and 2019 (11.6%), whereas the least (5.5%) were detected in 2020 and 2021.

In the study, the decreased detection rates of parasites in 2020 and 2021 covering the SARS-CoV-2 pandemic period can be associated with the decreased number of patients presenting to the hospital with intestinal parasitic infection complaints during this period. This can also be explained by the fact that people presenting to the hospital during this period paid more attention to personal hygiene rules and were less likely to carry the risks for intestinal parasites.

When the incidence of parasites was assessed statistically according to gender, some publications reported no statistically significant difference in the distribution by gender (20). However, other publications found the incidence of parasites to be statistically significant in female patients (10,21). Some researchers also stated that the incidence of parasites was statistically significant in male patients (12,16). In this study, 51.5% of the patients with parasites were female, and 48.5% were male. No statistically significant correlation was found in the distribution by gender.

When the protozoa and helminth rates among the parasites detected in our study were examined, protozoa were detected at a rate of 97.2%, and helminths were identified at a rate of 2.7%. Polat et al. (10) reported that 84.19% of the parasites identified were protozoa, and 15.81% were helminths. Alver et al. (16) stated that 87.9% of the parasites detected in their study were protozoa, and 12.1% were helminths. Publications suggesting that protozoa are more common in studies conducted in Türkiye are similar to our study (12,15).

Upon evaluating the months or seasons with the highest distribution of intestinal parasites, Usluca et al. (22) expressed that the highest positive parasite incidence in their two-year assessments was observed in summer and autumn. Gürbüz et al. (23) reported that the positive incidence rate increased after spring and reached the highest level in summer. On the other hand, Alver et al. (16) reported that the highest number of parasites was detected in spring and autumn. Polat et al. (10) stated that the month with the highest parasite detection was May, and the month with the lowest parasite detection was July. When the incidence of parasites was assessed by month in our study, March and October were the months with the highest incidence of parasites. It can be thought that digestive system infections are more common in these months since people visit rural areas more often due to air temperature; thus, contamination through water and food sources or contact with sick people is easier.

CONCLUSION

As a result, our retrospective study, which assessed the incidence of intestinal parasites in the Department of Parasitology Laboratory of Çukurova University Faculty of Medicine between 2017 and 2021, showed that intestinal parasites are still important due to their incidence. Hence it is still essential to inform society about an organized infrastructure, access to clean, safe water, eating habits, personal hygiene awareness, and sanitation. We believe that updating the detection rates of intestinal parasites will guide the studies to be conducted on treating intestinal parasitic infections and their prevention.

The male and female percentages given in Table 1 were calculated as the total number.

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*Ethics

Ethics Committee Approval: Ethics committee approval was obtained for our study from Çukurova University Non-Interventional Clinical Research Ethics Committee (decision no: 65, dated: 04.02.2023).

Informed Consent: Retrospective study.

*Authorship Contributions

Concept: M.D., Design: M.D., E.A.Ö., F.K., Data Collection or Processing: M.D., E.A.Ö., F.K., Analysis or Interpretation: M.D., E.A.Ö., F.K., Literature Search: M.D., E.A.Ö., Writing: M.D., F.K.

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