

Frequency of Intestinal Parasites in Patients Admitted to the Microbiology Laboratory of Siirt Training and Research Hospital

Siirt Eğitim ve Araştırma Hastanesi Mikrobiyoloji Laboratuvarına Başvuran Hastalarda Bağırsak Parazitlerinin Sıklığı

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ABSTRACT

Objective: The aim of this study was to determine the frequency of intestinal parasites in patients admitted to the Microbiology Laboratory of Siirt Training and Research Hospital.

Methods: The study was conducted between 19.04.2021 and 30.11.2021 with a total of 300 patients (150 children and 150 adults) between the ages of 1-90 years who were referred to the Microbiology Laboratory with a request for stool sample analysis and who admitted to Siirt Training and Research Hospital with different complaints. The samples were evaluated by nativ-Lugol, formol-ethyl acetate concentration and modified acid-fast staining methods. The samples in which *Entamoeba* spp. eggs were detected were evaluated for *Entamoeba histolytica*/*Entamoeba dispar* antigen using *Entamoeba* antigen cassette test.

Results: In this study, one or more than one type of intestinal parasite was found in 21.3% of 150 pediatric patients, 24% of 150 adult patients and 22.7% of 300 patients. The highest rate was *Blastocystis* (18%) and the lowest rate was *Ascaris lumbricoides* (0.7%). Although intestinal parasites were found at a higher rate in adults (24%) compared to pediatric age group (21.3%), there was no significant difference between the age groups in terms of parasite frequency in the statistical evaluation. There was a statistically significant difference between diarrhea ($p=0.022$) and anorexia ($p=0.014$) and intestinal parasite positivity.

Conclusion: It was concluded that it would be appropriate to evaluate patients admitted to hospitals with complaints such as diarrhea and loss of appetite in terms of intestinal parasites. Although this study gives an idea about the prevalence of intestinal parasites in Siirt Region, there is a need for larger scale studies in the region including more people.

Keywords: Intestinal parasites, prevalence, Siirt

ÖZ

Amaç: Bu çalışmanın amacı, Siirt Eğitim ve Araştırma Hastanesi Mikrobiyoloji Laboratuvarına başvuran hastalarda bağırsak parazitlerinin sıklığını belirlemektir.

Yöntemler: Çalışmaya, 19.04.2021-30.11.2021 tarihleri arasında, Siirt Eğitim ve Araştırma Hastanesi'ne farklı şikayetlerle başvurup dışkı istemiyle mikrobiyoloji laboratuvarına yönlendirilen ve 1-90 yaş aralığında olan toplam 300 hasta (150 çocuk ve 150 erişkin) dahil edildi. Örnekler nativ-Lugol, formol-etil asetat konsantrasyon ve modifiye asit-fast boyama yöntemi ile değerlendirildi. *Entamoeba* spp. yumurtası saptanan örnekler *Entamoeba* antijen kaset testi kullanılarak *Entamoeba histolytica*/*Entamoeba dispar* antijeni yönünden değerlendirildi.

Bulgular: Bu çalışmada dışkı örnekleri incelenen 150 çocuk hastanın %21,3'ünde, 150 erişkin hastanın %24'ünde, toplam 300 hastanın %22,7'sinde bir ya da birden fazla türde bağırsak parazite rastlandı. En yüksek oranda *Blastocystis* (%18), en düşük oranda *Ascaris lumbricoides*'e (%0,7) rastlandı. Erişkinlerde (%24), çocuk yaş grubuna (%21,3) göre daha yüksek oranda intestinal parazitlere rastlansa da yapılan istatistiksel değerlendirmede parazit sıklığı bakımından yaş grupları arasında anlamlı bir fark belirlenmedi. Hastalarda görülen semptomlardan ishal ($p=0,022$) ve iştahsızlık ($p=0,014$) ile intestinal parazit pozitifliği arasında istatistiksel olarak anlamlı fark belirlendi.

Sonuç: Özellikle ishal ve iştahsızlık gibi şikayetler ile hastanelere başvuran hastaların intestinal parazitler yönünden de değerlendirilmesinin uygun olacağı kanaatine varılmıştır. Bu çalışma Siirt Bölgesi'nde intestinal parazit sıklığı ile ilgili olarak bir fikir vermekle beraber, yörede çok daha fazla kişinin dahil edileceği, daha büyük çapta çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: İntestinal parazitler, prevalans, Siirt

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INTRODUCTION

Intestinal parasites are broadly classified into protozoa and helminths. Among the pathogenic intestinal protozoan infections, *Cryptosporidium* spp., *Giardia intestinalis* and *Entamoeba histolytica* are of major public health importance (1). *Blastocystis* is the most common intestinal protozoan parasite in humans (2). Among intestinal helminths, especially soil-transmitted helminths such as *Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale* and *Necator americanus* are in the category of neglected tropical diseases. (3). *Enterobius vermicularis* is the most common intestinal helminth in middle- and high-income countries, especially in school-age children (4).

Intestinal parasite infections can be asymptomatic or cause clinical findings such as malnutrition, malabsorption, anemia, growth retardation, learning disabilities and diarrhea (5). According to the global health estimates of the World Health Organization, diarrheal diseases, including intestinal parasitic diseases, rank eighth among the causes of mortality (3). The problems caused by these infections depend on factors such as the type of parasite, the severity of the infection, and the socio-economic characteristics of societies (5).

Intestinal parasite infections affect more than two billion people worldwide, mainly in low- and middle-income countries (6). There are differences in the prevalence, species distribution and spread dynamics of intestinal parasites between countries and regions (3). The prevalence of intestinal parasites in a community is associated with factors such as inadequate infrastructure and clean water supply, malnutrition, lack of hygiene, high population density, illiteracy, political instability, civil unrest and climate changes (7). It is also predicted that there may be an increase in the prevalence of parasitic diseases in developed countries due to many reasons such as climate change and mass migration (1).

The aim of this study was to determine the frequency of intestinal parasites in patients admitted to the Microbiology Laboratory of Siirt Training and Research Hospital.

METHODS

The study was conducted between 19.04.2021 and 30.11.2021 with a total of 300 patients (150 children and 150 adults) between the ages of 1-90 years who applied to Siirt Training and Research Hospital with different complaints and were referred to the microbiology laboratory with a request for stool sample analysis. For the study, the leftover stool samples collected from the patients were used. The samples were analyzed in the microbiology laboratory of the hospital where they were collected and in the Parasitology Research Laboratory of Van Yüzüncü Yıl University Faculty of Medicine.

Non-Interventional Clinical Research Ethics Committee of Van Yüzüncü Yıl University approved the study protocol (decision number: 2021/05-20, date: 16.04.2021).

Stool samples were examined within one hour after collection. After macroscopic examination, the samples were evaluated by nativ-Lugol, formol-ethyl acetate concentration and modified acid-fast staining methods. The preparations prepared by nativ-Lugol method were examined at X100 and X400 magnification and the stained preparations were examined at X1000 magnification under a light microscope (8). If the number of *Blastocystis* forms in each microscope field was 5 or more, "abundant *Blastocystis*" was considered (9). The samples in which *Entamoeba* spp. eggs were detected were evaluated for *E. histolytica*/*Entamoeba dispar* antigen using *Entamoeba* antigen cassette test (True Line, China). The collected stool samples were stored in the refrigerator at +4 °C.

Statistical Analysis

Z (t) test and Fisher's exact test were used to compare the rates for categorical variables. In addition, chi-square test was performed to determine the relationship between categorical variables. Statistical significance level was taken as 5% and SPSS (ver:26) statistical package program was used for calculations.

Table 1. Parasite positivity according to age groups

| Parasite type | Child (1-18 age) (N=150) | Adult (19-90 age) (N=150) | Total (N=300) | p |
|--|-----------------------------|------------------------------|-------------------|-------|
| | Positive n (%) | Positive n (%) | Positive n (%) | |
| <i>Blastocystis</i> (≤ 4) | 19 (12.7) | 12 (8.0) | 31 (10.3) | 0.183 |
| Abundant <i>Blastocystis</i> (≥ 5) | 6 (4.0) | 17 (11.3) | 23 (7.7) | 0.016 |
| <i>Blastocystis</i> (all positive) | 25 (16.7) | 29 (19.3) | 54 (18) | 0.548 |
| <i>E. histolytica</i> / <i>E. dispar</i> * | 3 (2.6) | 3 (9.4) | 6 (4.1) | 0.99 |
| <i>E. coli</i> | 2 (1.3) | 7 (4.7) | 9 (3.0) | 0.089 |
| <i>G. intestinalis</i> | 2 (1.3) | 4 (2.7) | 6 (2.0) | 0.409 |
| <i>H. nana</i> | 2 (1.3) | 2 (1.3) | 4 (1.3) | 0.99 |
| <i>A. lumbricoides</i> | - | 2 (1.3) | 2 (0.7) | 0.498 |
| Total | 32 (21.3) | 36 (24) | 68 (22.7) | 0.581 |

N: Total number of patients, n: Number of positive patients, p: Significance value, *: by *Entamoeba* antigen cassette test, N: 146 (114 children, 32 adults)

RESULTS

In this study, one or more than one type of intestinal parasite was found in 32 (21.3%) of 150 pediatric patients, 36 (24%) of 150 adult patients and 68 (22.7%) of a total of 300 patients. Six different parasite species were detected in 68 positive patients. In our study, *Blastocystis* (18%) and *A. lumbricoides* (0.7%) were detected at the highest and lowest rates, respectively, and *E. histolytica*/*E. dispar* (4.1%), *G. intestinalis* (2%), *E. coli* (3%) and *Hymenolepis nana* (1.3%) were also found (Table 1).

Of the 68 positive patients, eight (11.8%) had two species and two (2.9%) had three species of parasites. Although multiple intestinal parasites were found at a higher rate in adults (5.3%) than in the paediatric age group (1.3%), there was no significant difference in the frequency of multiple parasites between the age groups on statistical analysis (Table 2).

Although intestinal parasites were found at a higher rate in adults (24%) compared to pediatric age group (21.3%), there was no significant difference between the age groups in terms of parasite frequency in the statistical evaluation. When the age groups were compared in terms of parasite positivity, there was a statistically significant difference only in the frequency of abundant *Blastocystis* ($p=0.016$; Table 1).

In our study, parasites were found in 20.7% of females and 24.5% of males and no statistically significant relationship was found between gender and parasite frequency (Table 3). There was a statistically significant difference between diarrhea ($p=0.022$) and anorexia ($p=0.014$) among the symptoms observed in our patients and intestinal parasite positivity (Table 4).

DISCUSSION

Siirt province, located in the Southeast of Türkiye, is one of the provinces with the lowest socio-economic development level in Türkiye (10). In 2022, in the socio-economic development ranking survey of the districts conducted by the Ministry of Industry and Technology, it was determined that five of the seven districts of Siirt were among the least developed districts (11). Since socio-economic development affects the prevalence of intestinal parasites, a high prevalence of intestinal parasites in Siirt is an expected result. In this study, 22.7% intestinal parasites were detected. This rate is not representative of the prevalence in Siirt province. However, since the sample of the studies on the prevalence of parasites in provinces in Türkiye generally consists of patients admitted to hospitals, the 22.7% rate found in this study helps to compare the prevalence of parasites in Siirt province with other provinces. In studies investigating the prevalence of parasites in patients admitted to hospitals in different provinces in Türkiye, it was determined that the rate was 3.6% in Ankara (5); 2.96% in İstanbul (12), 2020, 6% in İzmir (13); 12.3% in Mardin (14), 16.8% in Niğde, 10.8% in Sivas, 11.43% in Van [pre Coronavirus disease-2019 (COVID-19) + COVID-19 process] (7). When the studies are compared, it is seen that the prevalence of parasites in Siirt province is higher than in other provinces.

G. intestinalis and *E. histolytica* are the most common protozoa causing gastroenteritis worldwide. *Blastocystis*, another intestinal protozoan, is currently the most common parasite in the gastrointestinal tract of humans and its pathogenicity is controversial, as reported in numerous epidemiologic studies (2). In this study, *Blastocystis* was found to be the most common intestinal parasite in Siirt Region.

Table 2. Distribution of multiple parasitism by age groups

| Parasite types | Child (1-18 age) (n=150) | Adult (19-90 age) (n=150) |
|--|-----------------------------|------------------------------|
| <i>E. histolytica</i> / <i>E. dispar</i> + <i>Blastocystis</i> | - | 2 |
| <i>G. intestinalis</i> + <i>Blastocystis</i> | 1 | 1 |
| <i>E. coli</i> + <i>Blastocystis</i> | 1 | 2 |
| <i>A. lumbricoides</i> + <i>Blastocystis</i> | | 1 |
| <i>G. intestinalis</i> + <i>H. nana</i> + <i>E. coli</i> | | 1 |
| <i>G. intestinalis</i> + <i>Blastocystis</i> + <i>E. coli</i> | | 1 |
| Total* | 2 (1.3%) | 8 (5.3%) |

*: According to Fisher's exact test, the difference between the two groups was not significant ($p=0.130$)

Table 3. Parasite positivity according to gender

| Parasite type | Female (N=145) n (%) | Male (N=155) n (%) | Total (N=300) n (%) | p |
|--|-------------------------|-----------------------|------------------------|-------|
| <i>Blastocystis</i> (≤ 4) | 10 (6.9) | 21 (13.5) | 31 (10.3) | 0.055 |
| Abundant <i>Blastocystis</i> (≥ 5) | 14 (9.7) | 9 (5.8) | 23 (7.7) | 0.213 |
| <i>Blastocystis</i> (all positive) | 24 (16.6) | 30 (19.4) | 54 (18.0) | 0.527 |
| <i>E. histolytica</i> / <i>E. dispar</i> * | 3 (4.2) | 3 (4.1) | 6 (4.1) | 0.934 |
| <i>E. coli</i> | 5 (3.4) | 4 (2.6) | 9 (3.0) | 0.661 |
| <i>G. intestinalis</i> | 3 (2.1) | 3 (1.9) | 6 (2.0) | 0.934 |
| <i>H. nana</i> | 3 (2.1) | 1 (0.6) | 4 (1.3) | 0.290 |
| <i>A. lumbricoides</i> | 2 (1.4) | - | 2 (0.7) | 0.233 |
| Total | 30 (20.7) | 38 (24.5) | 68 (22.7) | 0.428 |

N: Total number of patients, n: Number of positive patients, p: Significance value, *: by *Entamoeba* antigen cassette test, N: 146 (72 females, 74 males)

Table 4. Parasite positivity according to patients' symptoms

| Symptoms | Features | Intestinal parasite | | p |
|---------------------|-------------|-----------------------------|------------------------------|-------|
| | | Positive number (%) n=68 | Negative number (%) n=232 | |
| Abdominal pain | Yes (n=152) | 33 (21.7) | 119 (78.3) | 0.689 |
| | No (n=148) | 35 (23.6) | 113 (76.4) | |
| Diarrhea | Yes (n=94) | 29 (30.9) | 65 (69.1) | 0.022 |
| | No (n=206) | 39 (18.9) | 167 (81.1) | |
| Constipation | Yes (n=5) | 1 (20.0) | 4 (80.0) | 0.886 |
| | No (n=295) | 67 (22.7) | 228 (77.3) | |
| Nausea | Yes (n=37) | 6 (16.2) | 31 (83.8) | 0.317 |
| | No (n=263) | 62 (23.6) | 201 (76.4) | |
| Vomiting | Yes (n=7) | 1 (14.3) | 6 (85.7) | 0.592 |
| | No (n=293) | 67 (22.9) | 226 (77.1) | |
| Loss of appetite | Yes (n=27) | 1 (3.7) | 26 (96.3) | 0.014 |
| | No (n=273) | 67 (24.5) | 206 (75.5) | |
| Weight loss | Yes (n=4) | 2 (50.0) | 2 (50.0) | 0.222 |
| | No (n=296) | 66 (22.3) | 230 (77.7) | |
| Developmental delay | Yes (n=9) | 2 (22.2) | 7 (77.8) | 0.974 |
| | No (n=291) | 66 (22.7) | 225 (77.3) | |
| Fever | Yes (n=14) | 3 (21.4) | 11 (78.6) | 0.910 |
| | No (n=286) | 65 (22.7) | 221 (77.3) | |

With advancing age, the frequency of intestinal parasites generally decreases due to factors such as increased hygiene awareness and the development of a certain degree of immunity against some parasites. In the studies (15-17) in which this criterion was considered, it was found that the prevalence of intestinal parasites generally decreased with increasing age. However, the prevalence of some parasites such as *Blastocystis* was reported to be higher in adults than in children (18,19). In this study, parasite positivity was higher in people older than 18 years (24%) than in those younger than 18 years (21.3%), but there was no statistically significant relationship between the age groups in terms of the frequency of parasite detection.

The most common symptoms in intestinal parasitosis are gastrointestinal symptoms such as diarrhea, nausea/vomiting and abdominal pain. In a study, it was reported that 63.2% of patients infected with intestinal parasites were symptomatic and a significant association was found between intestinal parasites and diarrhea, abdominal pain and fever (20). In another study, a statistically significant difference was found between abdominal pain and nausea and the incidence of intestinal parasites (21). In this study, a statistically significant difference was found between diarrhea and anorexia and the incidence of intestinal parasites.

CONCLUSION

In this study, intestinal parasites were found at a rate of 22.7% and pathogenic parasites other than *Blastocystis* were found at

low rates. The reason for this may be that both physicians in primary health care institutions provide symptomatic treatment to patients and people pay more attention to hygiene rules due to the COVID-19 pandemic process. As a result, it was concluded that it would be appropriate to evaluate patients admitted to hospitals with complaints such as diarrhea and loss of appetite in terms of intestinal parasites. Although this study gives an idea about the prevalence of intestinal parasites in Siirt Region, there is a need for larger-scale studies in the region, including many more people. The protozoan and helminth parasites detected in this study are usually transmitted via fecal-oral route. Therefore, it is of great importance to comply with hygiene rules sufficiently. Considering that both the drinking water and the foodstuffs consumed may contain infective forms of parasites, the use of safe water sources and taking care to wash foodstuffs thoroughly or cooking them if risky will be effective in reducing the parasitosis rate in Siirt Region.

***Information:** The results of the present study are summarized from L.G.'s master's thesis.

*Ethics

Ethics Committee Approval: Non-Interventional Clinical Research Ethics Committee of Van Yüzüncü Yıl University approved the study protocol (decision number: 2021/05-20, date: 16.04.2021).

Informed Consent: Written informed consent was obtained from the patient who participated in this study.

Footnotes

*Authorship Contributions

Concept: L.G., Z.T.C., Design: L.G., Z.T.C., Data Collection or Processing: L.G., Z.T.C., S.A., H.Y., Analysis or Interpretation: L.G., Z.T.C., S.A., H.Y., Literature Search: L.G., S.A., Writing: L.G., S.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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