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Evaluation of Amoebiosis, Giardiosis, and Blastocystosis Infections in Patients over 18 Years of Age Followed-up with a Diagnosis of Gastroenteritis

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ABSTRACT

This study was conducted to evaluate amoebiosis, giardiosis, and blastocystosis infections in patients over 18 years of age followed-up with the diagnosis of gastroenteritis. The study included 3848 patients with a diagnosis of gastroenteritis who were admitted to the SBU Van Training and Research Hospital with the complaint of diarrhea between 2016 and 2019 and were hospitalized. Of the 3848 patients included in the study, *Entamoeba histolytica* was found in 6.8% (3848/262), *Giardia intestinalis* was found in 3.6% (3848/137), and *Blastocystis* spp. was found in 3% (3848/117). When the incidence of parasites according to the age groups of the patients was examined, it was determined that *Giardia intestinalis* and *Entamoeba histolytica* were mostly seen in the age range of 50–65 years, and the difference in the incidence of *Entamoeba histolytica* was statistically significant ($p = 0.026$). It was determined that the incidence of *Blastocystis* spp. increased with age ($p = 0.001$). A statistically significant correlation was found between *Entamoeba histolytica* and the presence of leukocytes and erythrocytes in the stool. It was concluded that *Giardia intestinalis* and *Entamoeba histolytica* are the leading parasitic infections that are still important and need to be combated in the Van region, and that the increase in the frequency of *Blastocystis* spp. over the years should not be ignored.
Keywords: *Blastocystis* spp., *Entamoeba histolytica*, Gastroenteritis, *Giardia intestinalis*

Introduction

Gastroenteritis is the inflammation of the stomach, small intestine, or large intestine accompanied by clinical signs such as abdominal pain, nausea, vomiting, and watery or bloody diarrhea. Gastroenteritis diarrhea is examined in two types, as acute and chronic, according to their duration. Acute gastroenteritis is considered as diarrhea that lasts less than 14 days, while diarrhea that lasts longer than 14 days is considered as chronic gastroenteritis (1-3). Norovirus, Rotavirus, and Adenovirus serotypes 40 and 41 in viruses, *Shigella*, *Salmonella*, *Campylobacter* and *Escherichia coli* in bacteria, and *Giardia intestinalis*, *Entamoeba histolytica*, and *Cryptosporidium* spp. in parasites are the most common causative agents of acute gastroenteritis (1,4). Among the causes of chronic gastroenteritis, diseases such as parasitic infections, drugs, inflammatory bowel diseases, irritable bowel syndrome, eosinophilic gastroenteritis, celiac disease, lactose intolerance, and colorectal cancer can be counted. *G. intestinalis* and *Crytosporidium* spp. may cause chronic gastroenteritis (1).

Giardia intestinalis and *E. histolytica*, which are enteritis parasites, are the most important protozoans causing diarrhea worldwide. In addition, according to the World Health Organization reports; the first protozoan that causes the most common mortality and morbidity worldwide is *E. histolytica*, and the second is *G. intestinalis*. *E. histolytica* can cause different clinical symptoms such as colitis, bloody dysentery, and intestinal perforation. Apart from the intestine, it can cause disease by settling in the liver, lungs, brain, and skin. *G. intestinalis* can cause malabsorption by disrupting the absorption of fat and fat-soluble vitamins from the duodenum, as well as cause gastrointestinal symptoms, such as acute or chronic diarrhea, abdominal pain, nausea, and vomiting. *Blastocystis* spp., one of the other common protozoans, usually shows an asymptomatic course. It causes gastrointestinal complaints in symptomatic cases (5-9).

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In the diagnosis of gastroenteritis, it is very difficult to distinguish the agents according to the history and clinical features. Laboratory tests are needed for differential diagnosis. Laboratory tests include microscopy, culture, antigen detection and molecular methods. Direct stained and unstained microscopic examination is generally used in stool parasite examination. In addition, methods such as culture, histopathological examination, and investigation of antibodies and parasite antigens are used in the diagnosis of parasites (4,10).

This study was conducted to evaluate amoebiosis, giardiasis, and blastocystosis infections in patients aged 18 years and older with acute or chronic gastroenteritis.

Materials and methods

The study was approved by the SBU Van Training and Research Hospital Clinical Research Ethics Committee (20/10/2021-2021/19). Retrospectively analyzed, between January 2016 and December 2019, were 3848 patients with a diagnosis of gastroenteritis, who were admitted to the SBU Van Training and Research Hospital with the complaint of diarrhea and were hospitalized. It is stated that the parasites investigated in the literature are frequently seen in the pediatric age group. However, to emphasize the importance of these parasites in individuals over the age of 18, only individuals over the age of 18 were included in the study. Demographic characteristics of the patients and stool examination results were obtained from the hospital automation system. The stool samples were examined under a light microscope with the native-Lugol method in the microbiology laboratory, and the *E. histolytica* suspected samples were evaluated *E. histolytica*-specific adhesin antigen with ELISA methods.

Statistical Analysis: Categorical variables from the features emphasized were expressed as numbers and percentages. For the categorical variables, the two-ratio Z test of the ratios and chi square test were used. Statistical significance was considered as 5% in the calculations and SPSS 26.0 and MINITAB 14.0 statistical package programs were used for the calculations.

Results

Of the 3848 stool samples, *E. histolytica* was found in 6.8% (3848/262), *G. intestinalis* was found in 3.6% (3848/137), and *Blastocystis* spp. was found in 3% (3848/117). It was determined that the incidence of *Blastocystis* spp. increased every year (R^2= 0.8895, p= 0.011), and there was no change in the frequency of *G. intestinalis* and E. *histolytica* according to year (Table 1) (Figure 1).

Considering the incidence of parasites according to the age groups of the patients, it was determined that *G. intestinalis* and *E. histolytica* were mostly seen in the age range of 50–65 years, and the difference in the incidence of *E. histolytica* was statistically significant (p = 0.026), but the difference in the incidence of *G. intestinalis* was not significant (p = 0.594). The incidence of *Blastocystis* spp. increased with age (p = 0.001) (Table 1).

In the microscopic examination of the stool samples, of the 137 *G. intestinalis*-positive patients, 14 (10.2%) had leukocytes and three (2.2%) had erythrocytes; 202 (77.1%) of the 262 *E. histolytica*-positive patients had leukocytes and 176 (67.2%) were erythrocytes; and 18 (15.4%) of the 117 *Blastocystis* spp.-positive patients had leukocytes and five (4.3%) had erythrocytes. A statistically significant correlation was found between the *E. histolytica* and fecal leukocytes and erythrocytes. In addition, while no statistically significant relationship was found with *Blastocystis* spp., a statistically significant relationship was found with *G. intestinalis* (Table 1).

Discussion

Giardia intestinalis and *E. histolytica* are protozoans that are common worldwide and cause gastroenteritis. *Blastocystis* spp., on the other hand, is quite common in both healthy individuals and patients with gastrointestinal symptoms. These parasitic agents that cause gastroenteritis can be transmitted with contaminated food and beverages, usually due to poor hygiene conditions (4,6,11).

The prevalence of intestinal protozoa causing gastroenteritis varies according to the socioeconomic and cultural level of the societies, demographic characteristics, dietary habits, and geographical conditions. The prevalence of parasitic infections varies according to countries, regions, and even the year (12,13). In a total of 24651 stool samples taken from patients in various age groups with gastrointestinal complaints in İzmir (14), *E. histolytica* was detected in 12.9% and *G. intestinalis* was detected in 11.4%. In a total of 9421 stool samples taken from patients who applied for digestive system complaints in

Table 1. Investigation of The Positivity Rates of *G. intestinalis*, *E. histolytica*, and *Blastocystis* spp. According To Year, Gender, Age, and The Presence Of Leukocytes and Erythrocytes in The Stool

Group		Total number of patients	*G. intestinalis*		*E. histolytica*		*Blastocystis* spp.	
			Number of positive patients (%)	p.	Number of positive patients (%)	p.	Number of positive patients (%)	p.
Year	2016	773	36 (4.6)	0.082	52 (6.7)	0.535	16 (2.1)	0.011
	2017	975	31 (3.2)		57 (5.8)		23 (2.4)	
	2018	1100	29 (2.6)		80 (7.3)		33 (3.0)	
	2019	1000	41 (4.1)		73 (7.3)		45 (4.5)	
Gender	Female	1808	61 (3.4)	0.556	122 (6.7)	0.888	56 (3.1)	0.847
	Male	2040	76 (3.7)		140 (6.8)		61 (3.0)	
Age	18-33	1801	66 (3.7)	0.594	120 (6.7)a	0.026	36 (2.0)	0.001
	34-49	1041	36 (3.5)		57 (5.5)a		29 (2.8)	
	50-65	733	29 (3.9)		67 (9.1)b		28 (3.8)	
	>66	273	6 (2.2)		18 (6.6)a		24 (8.8)	
Leukocytes in the Stool	Yes	718	14 (1.9)	0.010*	202 (28.1)	0.001	18 (2.5)	0.356
	No	3130	123 (3.9)		60 (1.9)		99 (3.2)	
Erythrocytes in the Stool	Yes	325	3 (0.9)	0.007*	176 (54.2)	0.001	5 (1.5)	0.099
	No	3523	134 (3.8)		86 (2.4)		112 (3.2)	
Total		3848	137 (3.6)		262 (6.8)		117 (3.0)	

*Statistically Significant but Not Leukocytes or Erythrocytes Have Higher *G. intestinalis* Positivity

Hatay (15) between 2006 and 2010, *B. hominis* was detected in 51%, *G. intestinalis* was detected in 18.1%, *E. coli* was detected in 15.5% and *E. histolytica/dispar* was detected in 7.5%. The stool samples of 4957 patients who were admitted to a university hospital in Northern Cyprus (13) with gastrointestinal complaints between 2016 and 2019 were examined and the most common parasites were *B. hominis* (76.2%) and *G. intestinalis* (12.1%). In a study conducted in Konya (16) between 2010 and 2012, a total of 41967 patients who applied to the parasitology laboratory were found to have *B. hominis* at a rate of 59.9%, *Entamoeba* spp. at a rate of 25% and, *G. intestinalis* at a rate of 13.7%. In a study in which the stool samples of 1218 patients in Elazig (17) were examined, 26.7% had *B. hominis*, 24.8% had *G. intestinalis*, and 3.3% had *E. histolytica/dispar*. In a study in which a total of 60501 stool samples were examined between 2011 and 2020 in Diyarbakır (18), 57.6% had *Blastocystis* spp., 31.9% had *G. intestinalis*, and 3.75% had *E. histolytica/dispar* positivity. In another study conducted in Van (19), *E. histolytica/dispar* positivity was found in 6.2% and *G. intestinalis* positivity was found in 4.7% of 9911 stool samples. Studies have shown that *Blastocystis* spp. is more common than other protozoa (13,15-18). In this study, *E. histolytica* was detected in 6.8% and *G. intestinalis* was detected in 3.6%, similar to the study (19) conducted in the Van regions. Although the rate of *Blastocystis* spp. %3 was lower than those of *E. histolytica* and *G. intestinalis* in the study, the increase in the rate over the years increases the importance of the parasite. In addition, it is thought that many factors, such as personal hygiene, cultural habits, socio-economic conditions, education level, the immunity level of individuals, and environmental factors, are effective in the prevalence differences between provinces.

Giardia intestinalis, which has a cosmopolitan distribution, causes endemic and epidemic diarrhea. *G. intestinalis*, which can be seen in all age groups, is more common in clinical or subclinical cases, especially in children. The patients' age is considered a risk factor for giardiasis, and many studies have found a higher prevalence of giardiasis in children (5,20-23). In a study examining the distribution of *G. intestinalis* positivity according to different age groups, it was observed that 29.4% of *G. intestinalis* antigen-positive patients were in the 25–34 age group, followed by the 35–44 age group with 17.2% (7). In another study, *G. intestinalis* positivity was found in 55% of patients aged 5–14 years and in 25.5% of patients aged 49–60 years (24). In a similar study, it was reported that *G. intestinalis* positivity was

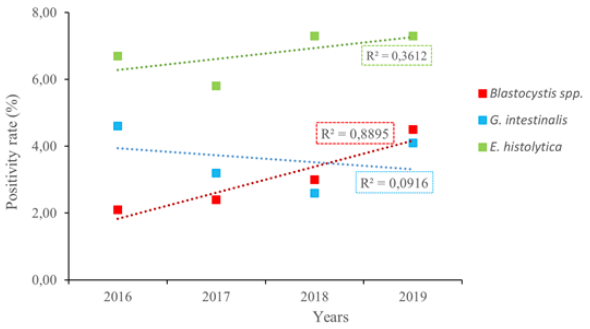

Fig. 1. Change of the Positivity Rates of *G. intestinalis*, *E. histolytica*, and *Blastocystis* spp. According to Year

mostly seen in the 30–39 (26.6%) age group (25). In this study, when the age groups and the incidence of parasites were compared, it was determined that *G. intestinalis* was most common in the age range of 50–65 years, but the difference in the incidence of *G. intestinalis* was not significant (p = 0.594).

E. histolytica is one of the most common parasites with a cosmopolitan distribution. It is known that approximately 10% of the world's population is infected with *E. histolytica* (7). In studies on the distribution of *E. histolytica*-positive patients by age group, it was observed that the incidence of the parasite varied in different age groups (7,26,27). In another study examining the distribution of *E. histolytica* positivity by age group, it was determined that *E. histolytica* seropositivity was most common in patients aged 50 years (5.41%) and above, and there was a statistically significant correlation between age and *E. histolytica* seropositivity (7,26,28). In this study, it was determined that *E. histolytica* was most common in the age range of 50–65 years and the difference in the incidence of *E. histolytica* was statistically significant (p = 0.026).

In studies evaluating the distribution of *Blastocystis* spp. according to age group, there are studies reporting that the prevalence is higher in the adult age group (6,29-30), as well as studies reporting that it is higher in childhood (31,32). In this study, which included patients aged 18 and over, it was determined that the incidence of *Blastocystis* spp. increased with age (p = 0.001).

In the current study, it was determined that the incidence of all three parasites increased with age. This is thought to be due to the increase in the possibility of encountering parasites and the risk of chronic diseases with age, and the weakening of cellular and humoral immunity.

Giardia intestinalis and *E. histolytica* are the most common enteritis parasitic agents that cause leukocyte positivity in stool (33). In one study, the microscopic examination of stool samples of 539 patients with *E. histolytica* detected erythrocytes in 5%, leukocytes in 20%, and erythrocytes and leukocytes in 6% of 343 samples with *G. intestinalis* (7). In another study, abundant erythrocytes and leukocytes were found in 24.6%, only leukocytes in 3%, and only erythrocytes in 9.2% in stool samples of 65 patients who were found to be positive for *E. histolytica* (34). The detection of leukocytes in the stool indicates the presence of an infection or inflammatory condition irritating the intestinal mucosa. There are also studies on the increase in leukocyte cells in the presence of *Blastocystis* spp. (34-36). In this study, of the 137 *G. intestinalis*-positive patients, 14 had leukocytes and three had erythrocytes; 202 of the 262 *E. histolytica*-positive patients had leukocytes and 176 were erythrocytes; and 18 of the 117 *Blastocystis* spp.-positive patients had leukocytes and five had erythrocytes. It was concluded that enteritis protozoa should be evaluated as a risk factor in the increase of leukocytes and erythrocytes in the stool, and that parasitic factors, especially *E. histolytica*, should be considered in the presence of leukocytes and erythrocytes in the stool.

Giardia intestinalis and *E. histolytica*, which are enteritis parasites, can cause acute or chronic diarrhea. These parasites, transmitted by fecal-oral route, education conditions, economic levels, insufficient infrastructure, and the lack of sufficient knowledge about these parasitic diseases, are among the main reasons for the prevalence of parasitic infections. It is thought that parasitic infections are common due to the crowded family structure, insufficient socio-economic level, inadequate infrastructure systems, and sanitation in Van. As a result, it was concluded that *G. intestinalis* and *E. histolytica* are the leading parasitic infections that are still important and need to be combated in the Van region, and that the increase in *Blastocystis* spp. frequency over the years should not be ignored.

Ethics Committee Approval: SBU Van Training and Research Hospital Clinical Research Ethics Committee approved the study protocol (20/10/2021-2021/19).

Conflict of Interest: The authors declare that they have no conflict of interest

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