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Determination of the prevalence of opportunistic intestinal parasites in children with diarrhea

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ABSTRACT

The aim of this study is to determine the most frequent opportunistic intestinal parasites in children and demonstrate its importance. Study was conducted on patients between the ages 0 and 16. The study consisted of a total of 150 children, 66 girls and 84 boys. 44 of the girls and 56 of the boys (100 in total) had diarrhea. Evaluation was done by native-Lugol, flotation in saturated zinc sulfate, and modified acid-fast staining. Intestinal parasites were detected in 38% of 150 examined stool samples. Among them 41% of those with diarrhea and 32% of those without diarrhea were positive. The highest observed parasite species was detected as *Blastocystis hominis* (14.7%); and the lowest were *Ascaris lumbricoides* and *Hymenolepis nana* (0.7%). It was concluded that all children with gastro-intestinal complaints should be evaluated for intestinal parasites, mainly opportunistic ones, without preliminary screening whether the patient is diarrhea or not.

Key words: Child, opportunist parasites, diarrhea, Van

Introduction

Diarrheal diseases are one of the most important health problems affecting children (1). Although several bacterial, viral and parasitic agents are causing diarrhea, among them parasites play an important role. *Entamoeba histolytica, Giardia intestinalis, Cryptosporidium* spp., *Cyclospora cayetanensis, Cystoisospora belli, Microsporidia* spp. and *Blastocystis* spp. are often emerge as diarrhea-related enteric protozoa (2, 3).

Intestinal parasitic infections are very common in all over the world (4). It is known that at least 25% of the world population is chronically infected by enteric parasites and most of these patients live in underdeveloped and developing countries (5). The prevalence of these infections is closely related to personal hygiene, living in crowded places such as dormitories and nurseries, lack of control of feces and sewage systems, lack of clean drinking water and low level of education (6,7).

Although diarrhea is one of the most common clinical symptom in intestinal parasitic infections, different clinical signs such as abdominal pain, constipation, nausea, vomiting, appetite deviation, tooth creaking, itching around the anus, oral salivation, weight loss, skin rash, allergic reactions, symptoms could be seen. They can also cause physical and mental disorders by forming malnutrition, especially in children (6-9).

The aim of this study is determine the most frequent opportunistic intestinal parasites in the children and demonstrate the importance.

Materials and Methods

This study was conducted on pediatric patients referred to the University Research Hospital Pediatrics Clinic and directed to the Parasitology Laboratory.

A total of 150 children, 66 girls and 84 boys, were employed in the study. Patient consent and ethical approval from all the patients participating in the study were obtained. The study participants were divided into three age groups: 0-1, 2-6 and 7-16 years.

The stool specimens were evaluated for intestinal parasites firstly by native-Lugol and saturated zinc sulfate floatation method, and then modified acid-fast method was used to evaluate specially for *Cryptosporidium* spp., and *C. cayetanensis* (7).

The dark red color painted on the blue floor, round-oval constructions of 4-7 µm in diameter with multiple black and non-uniform granules were Cryptosporidium spp. oocysts; The dark red or pinkish rounded structures having 8-10 µm in

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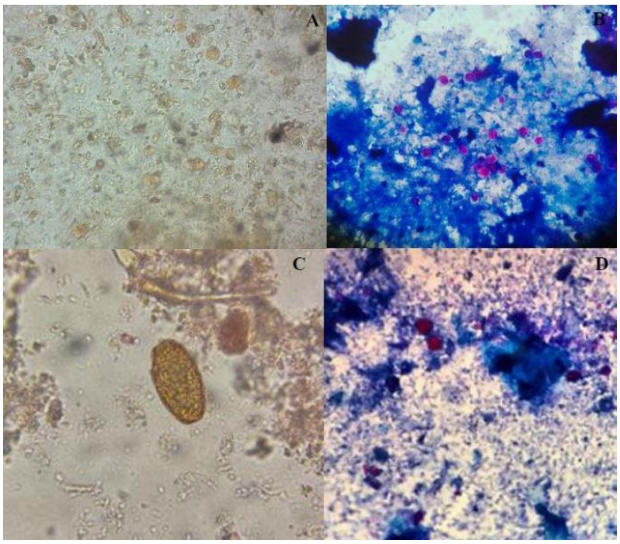

Fig. 1. *B. hominis* (Nativ-Lugol) (a), *Cryptosporidium* spp. (Modified Acid-Fast) (b), *A. lumbricoides* (Nativ-Lugol) (c), *C. cayetanensis* (Modified Acid-Fast) (d)

length were *C. cayetanensis*; and dyed blue-green and larger structures were considered as fungi.

In statistical analysis, parasite incidence according to the related categorical variables was expressed as number and percentage, and the relationship between categorical variables was determined by the Chi-square (χ^2) test. The frequency rates and the calculations were done in the statistical package program (MINITAB, ver: 14).

Results

In this study, a total of 150 specimens were examined; 46 from the 0-1 age group, 49 from the 2-6 age group and 55 from the 7-16 age group.

Intestinal parasite was detected in 38% of the children (57/150). Parasite positivity was found in 41% of 100 children with diarrhea and in 32% of 50 children without diarrhea (p=0.284). In the study, *B. hominis* (14.7%) was found highest and *A. lumbricoides* and *H. nana* (0.7%) were encountered as the lowest. *Cryptosporidium* spp. 10%; *C. cayetanensis* was seen in 4% of the children. A total of seven parasite species, five protozoans and two helminthes were identified in the study (Figure 1). No statistically significant difference was found between the two groups in the frequency of the seven parasite species (p> 0.05).

Furthermore, when the frequency of each parasite in all positivity is taken into account the frequencies are; *B. hominis* 38%, *Cryptosporidium* spp. 26.3%, *G. intestinalis* 12.3%, *C. cayetanensis* 10.5%, *E. coli* 8.8%, *A. lumbricoide*s and *H. nana* 1.8%.

In the study, 31.8% of the females and 42.9% of the males were found to be infected with intestinal parasites (Table 1). There was no statistically significant difference between parasite positivity and gender (p>0.05). Among all values, only the presence of *B. hominis* in males was found to be significantly higher than females (p<0.05).

Considering the settlements where the patients live, the parasites were found higher in the rural area (48.1%) than in the urban area (35.8%). However, there was no statistically significant difference between the rural and urban regions (p> 0.05; Table 2).

Parasites were observed in 5 patients (10.9%) in the 0-1 age group, 13 patients (26.5%) in the 2-6 year group and 30 patients (54.5%) in the 7-16 year old group. More than one parasites were detected in a total of 7 patients. The most common parasites are Cryptosporidium spp. in the 0-1 and 2-6 age groups, and *B. hominis* in the 7-16 age group. Except for *B. hominis* (p> 0.05), parasite positivity among the age groups was not found statistically significant (p = 0.001) (Table 3).

Discussion

Especially in tropical and underdeveloped countries, parasitic diseases which are one of the important causes of childhood deaths under the age of five, cause clinical symptoms such as abdominal pain, diarrhea and vomiting as well as inadequate and unbalanced nutrition in children and disorders of mental and physical development (6,7,10).

Different rates have been determined in our country to determine the intestinal parasites conducted on the child age group. Balcı et al. (11) found 10.2% of 2518 children, İnceboz et al. (12) reported 19.3% of 7703 children, Özçelik et al. (13) found 46% of 1215 children, Turhan et al. (14) reported 49.2% Yıldız Zeyrek et al. (15) found 62% of 948 children, Yilmaz et al. (10) found intestinal parasites in 77.47% of 293 students. In our study, 38% of 150 children were found positive for intestinal parasites.

In some studies, conducted on children, the age limits were determined and groups were formed. Daldal et al. conducted a study on the 0-18-year-old group and the highest intestinal parasite rates found in the 7-12 year-old group (55%) (16). Demirel et al. evaluated the results according to age and the intestinal parasites were detected in

Table 1. Parasite positivities according to gender

Species	Female		Male		Total		X^2	P
	n=66	%	n=84	%	n=150	%		
B. hominis	5	7,6	17	20,2	22	14,7	0.030	4,735
Cryptosporidium spp.	5	7,6	10	11,9	15	10	0.380	0,770
G. intestinalis	5	7,6	2	2,4	7	4,7	0.134	2,242
C. cayetanensis	3	4,5	3	3,6	6	4	0.763	0,091
E. coli	3	4,5	2	2,4	5	3,3	0.464	0,537
A. lumbricoides	0	0,0	1	1,2	1	0,7	1.000	0,791
H. nana	0	0,0	1	1,2	1	0,7	1.000	0,791
Total	21	31,8	36	42,9	57	38	0.167	1,912

n: number of patients, P: statistical significance value, X^2: chi-square

Table 2. Parasite positivities according to rural and urban settlements

Species	Rural area		Urban area		X^2	P
	n=27	%	n=123	%		
B. hominis	7	25,9	15	12,2	0.068	3,335
Cryptosporidium spp.	4	14,8	11	8,9	0.357	0,848
C. cayetanensis	--	--	6	4,9	0.592	1,372
G. intestinalis	1	3,7	6	4,9	1.000	0,069
E. coli	--	--	5	4,1	0.586	1,135
A. lumbricoides	--	--	1	0,8	1.000	0,221
H. nana	--	--	1	0,8	1.000	0,221
Total	13	48,1	44	35,8	0.230	1,439

n: number of patients, P: statistical significance value, X^2: chi-square

Table 3. Parasite positivity according to age groups

		0-1 Age	2-6 Age	7-16 Age	Total	X^2	P
Parasite	(+)	5 (10.9%)	13 (26.5%)	30 (54.5%)	48	0,001	21,102
	(-)	41	36	25	102		
B. hominis	(+)	0	3	19	22	0,001	19,573
	(-)	46	46	36	128		
G. intestinalis	(+)	0	4	3	7	0,108	2,586
	(-)	46	45	52	143		
E. coli	(+)	0	1	4	5	0,062	3,483
	(-)	46	48	51	145		
A. lumbricoides	(+)	0	0	1	1	0,367	0,845
	(-)	46	49	54	149		
H. nana	(+)	0	1	0	1	0,327	0,830
	(-)	46	48	55	149		
Cryptosporidium spp.	(+)	3	5	7	15	0,315	1,010
	(-)	42	44	48	135		
C. cayetanensis	(+)	2	1	3	6	0,798	0,065
	(-)	44	48	52	144		
Total		46	49	55	150		

P: statistical significance value, X^2: chi-square

23.5% of the 0-1 age group, 3.5% of the 0-1 age, 14.2% of the 2-5 age, 23.8% of the 6-7 age, 23.9% of the 8-10 age and 26.9% of the 11-15 age group in their study (17). In our study, parasites were detected in the highest proportion (54.5%) in the 7-16-year-old group parallel to these studies.

Some studies addressed the importance of gender on the presence of intestinal parasites in children. Turhan et al. examined 103 male and 74 female patients and found positivity as 41.7% and 59.5%, indicating at least one intestinal parasite respectively (18). In another study intestinal parasites were found in 42.9% of 107 male and 31.6% of 120 female children and there was no significant relationship between parasite positivity and gender (16). Demirel et al. detected parasites in 18.4% of females and 18.7% of males (17). It has been determined that our results are similar with these studies since gender has no effect on parasite positivity.

In some previous studies, different species of parasites were found to be more common. Among the primary school students in İzmir, *Entamoeba* coli was detected in 19.18% and *G. intestinalis* was detected in 1.76% (18). In Hatay, *Enterobius vermicularis* was found in 32.2%, G. intestinalis 7.9%, *A. lumbricoides* 6.2% and *T. saginata* 2.8%. In children in Sanliurfa, *A. lumbricoides* was found in 68.7%, *G. intestinalis* in 13.2%, *H. nana* in 8.5%, *E. histolytica* in 3.4% and *T. trichiura* in 1.02% (15).

In the 7-15 years age group of children in Van Ercis*, A. lumbricoides* was found in 48,12%, E. coli 33.78%, *G. intestinalis* 15.35*%, Iodamoeba butschlii* 11.94%, *H. nana* 9.55%, *T. trichiura* 4,43% and *B. hominis* 1.70% (10). In other studies, conducted in Van, *B. hominis* was found in 0.54% of the 50,185 patients (19) and *Entamoeba* spp. was detected in 8.5% of 998 patients (20).

In this study, a total of 7 parasite species were identified, including five protozoans and two helminthes. In some studies, some parasites identified like *Taenia saginata, E. coli, I. butschlii, E. vermicularis* and *E. histolytica*, were not detected in this study (12,14,15,17). The lack of formalin-ethyl acetate precipitation and trichrome staining methods is thought to be a missing aspect of this work.

The most common parasitic infection in children was found to be *B. hominis* (14.7%), followed by *Cryptosporidium* spp. (10%), *G. intestinalis* (4.7%), *C. cayetanensis* (4%), *E. coli* (3.3%), and *A. lumbricoides* (0.7%) (7).

It is seen that the total intestinal parasite rate is lower than some studies and higher than the others. It is thought that these differences are related to the socio-economic structure of the place, the methods used in study and not including diarrheal patients in the study group. Also, the low rates found in our study may be attributed to patients' attitude to apply directly to first-degree health care institutions to obtain antiparasitic/antibiotic treatment.

As a result, it is known that the child age group is at risk for intestinal parasites. Despite the fact that the diarrhea is one of the leading manifestations of parasitic infections, it should not be forgotten that this complaint is not always in the foreground in every patient infected with parasites. Considering the results of our study, it has been understood that all children admitted to the hospital with gastro-intestinal complaints should be assessed for intestinal parasitic infections, mainly opportunistic parasites, without pre-screening whether the patient has diarrhea.

In addition, we believe that preparation of leaflets containing hygiene rules and methods of protection from parasites for prevention of the transmission of these parasites and to raise awareness and their transportation to families by schools and Family Physician Centers will be beneficial. In addition, publication of public spots on TVs related to this subject will be useful.

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