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## PARASITOLOGICAL STOOL EXAMINATION FROM CHILDREN WITHOUT THE TYPICAL SYMPTOMS OF PARASITIC DISEASE

### BADANIA PARAZYTOLOGICZNE KAŁU DZIECI BEZ TYPOWYCH OBJAWÓW CHOROÓB PASOŻYTNICZYCH

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#### STRESZCZENIE

Inwazje pasożytów jelitowych u ludzi mają najczęściej przebieg podkliniczny i w związku z tym są rzadko rozpoznawane. Szereg nieswoistych objawów towarzyszących inwazji często przypisywane jest innym jednostkom chorobowym. Wykonane w ramach doświadczenia badanie parazytologiczne kału wykazało obecność pasożytów jelitowych w 21,64% prób. U osób zgłaszających współwystępowanie 6 różnych objawów chorobowych odsetek prób dodatnich parazytologicznie wyniósł 80%. Wynik ten wskazuje na celowość wykonywania badania koproskopowego w przypadkach diagnostycznie niejasnych, szczególnie u pacjentów pediatrycznych. Inwazje pasożytnicze kojarzone są z rezerwuarem zwierzęcym i zoonozami, co było punktem wyjścia dla zestawienia wyników badania prób pochodzących od osób utrzymujących w gospodarstwie domowym zwierzęta z wynikami badania prób od osób nieposiadających zwierząt. Uzyskany wynik wskazuje na brak bezpośredniej korelacji między stałą stycznością ze zwierzętami w domu, a częstotliwością występowania inwazji pasożytniczej.

**Słowa kluczowe:** *inwazje pasożytnicze, badanie parazytologiczne, objawy ogólne*

#### ABSTRACT

Most parasitic intestinal infestations in humans are sub-clinical and, therefore, they are rarely diagnosed. A number of general, non-specific symptoms of parasitic invasions are often attributed to other diseases. A parasitological examination of feces performed as part of this study confirmed the presence of intestinal parasites in 21.6% of samples. Among the patients who reported 6 different symptoms, the percentage of parasite-positive samples reached 80%. The obtained results suggest that coproscopic tests may establish the diagnosis in unclear cases, particularly in children. Many parasitic invasions are zoonoses and pets owe a reservoir. In view of the above, the results for pet owners and non-pet owners were compared in the study. There was no direct correlation between pet ownership and the incidence of parasitic infections.

**Key words:** *parasitic infections, parasitological examinations, general symptoms*

#### INTRODUCTION

Gastrointestinal parasites are organisms that colonize the human body and cause damage by depriving the host of intestinal proteins, secreting poisonous metabolic waste and leading to irritations. Most intestinal infestations are sub-clinical, therefore, they are rarely diagnosed. General symptoms of parasitic invasions, noted primarily in children, are often attributed to allergic or metabolic factors, or nutritional deficiencies. The aim of the study was to examine fecal samples from healthy children as well as children showing various nonspecific symptoms and to determine the percentage of associated parasitic infections.

Children are more likely to fall victim to parasitic invasions because their immune mechanisms are not yet fully developed, they are characterized by greater mobility than adults, they come into frequent contact with peers in preschool institutions and schools and they have poor hygiene habits. (1, 2) Other risk factors include contacts with pets, including in playgrounds. (1, 3)

Parasitic infections have more serious consequences for children than for adults. The most common manifestations include the inhibition of psychological and physical development (1, 4, 5), gastro-intestinal disorders, allergies (6), skin lesions (7), deterioration of general well-being, which often translates into poor

school performance and lower chances of success in adulthood. (2, 5, 8)

Parents and caregivers are not fully aware of the risks stemming from children's contacts with pets and their droppings. Negligent practices such as failure to clean up dog excrement or letting dogs loose in parks, squares and in the vicinity of playgrounds or public swimming pools contribute to parasitic contaminations and raise the overall risk of human infection (3, 8, 9, 10). Parasitic infections are often accompanied by nonspecific symptoms, therefore, they may be difficult to diagnose during routine clinical examinations. Testing human or animal feces for parasites is simple and noninvasive. It may be an effective diagnostic tool which supports the determination of the most effective course of treatment. Stool tests should be carried out more frequently in children suffering from chronic gastrointestinal disorders, suspected allergies, chronic or recurrent cough, in particular in patients who have had contact with animals and their excretions.

## MATERIALS AND METHODS

The study was performed in 2010 on a material derived from patients of the Regional Specialized Children's Hospital in Olsztyn and hospital specialist outpatient clinics and cooperating pediatric and family ambulatories from the city Olsztyn. Patients were treated for various diseases, not directly related to suspicion of parasitic infestations. Participation in the study was voluntary and not associated with pre-qualification. Patients or their caregivers signed consent to the execution of parasitological examination, and anonymous use of the results for scientific and statistical purposes. Criterion for assigning subjects to different research groups was the presence of the pet animal in the household.

The study material consisted of 998 fecal samples from 488 girls and 510 boys aged 9 months to 17 years. Each sample was accompanied by a questionnaire investigating the subject's age, gender, place of residence (urban/rural), school attendance, play areas, household pets, hygiene habits and symptoms indicative of a parasitic invasion, such as skin lesions, nocturnal restlessness, excessive excitability, genital and anal itching, dark circles under the eyes, sallow complexion, anemia, digestive disorders, abnormal stools, shortness of breath and cough of unknown origin.

Stool samples were collected in plastic containers and stored at 6°C until general parasitological examination. The samples were analyzed on the day of collection or on the following day.

2 g of the sampled material was analyzed by Fülleborn's floatation, and a direct smear test was performed. The sampled material was passed through a sieve

and mixed with Darling's liquid (saturated salt and glycerol solution). The suspension was centrifuged at 2000 rpm for 5 minutes, and the samples were set aside for 10 minutes. A drop of supernatant was transferred onto a glass slide and examined under a microscope at 400x magnification.

Fecal smears were stained with Lugol's liquid and, after drying, examined under a microscope at 400 x magnification. Samples containing at least one dispersive form of parasites were regarded as positive.

## RESULTS

Out of the total 998 samples tested, 216 (21.64%) were found to contain dispersive forms of parasites. Mixed infestation samples were determined as positive, and the identified parasite species were specified.

In 35 children *Giargia intestinalis* cysts were found to be present, 57% of which (20 cases) involved children having daily contact with animals. Pinworm infection (*Enterobius vermicularius*) was found in 13 children (respectively 8 in the group of non-pet-owners, and 5 in pet owners group). 6 cases of infection with *Trichuris trichura* was diagnosed among not-pet-owner children, two of which were family infection - two and three siblings affected. In the five stool samples roundworm eggs were found (*Ascaris lumbricoides*). Pathogenic protozoa cysts *Cystoisospora* and *Isoospora belli* was found in samples derived from 8 patients.

Conditionally pathogenic protozoa of the genus *Blastocystis hominis* and *Entamoeba coli* were found respectively in 108 and 98 stool samples examined. The

Table I. Prevalence of intestinal parasites in fecal samples  
Tabela I. Pasożyty przewodu pokarmowego wykryte w próbach kału badanych dzieci- liczba dodatnich próbek i odsetek

Determined species	Number of positive samples total (n=998)		Number of positive samples in the group of non-pet owners (n=523)		Number of positive samples in the group of pet owners (n=475)	
	n	%	n	%	n	%
strictly pathogenic						
<i>Giargia intestinalis</i>	35	3.5	15	2.8	20	4.2
<i>Enterobius vermicularis</i>	13	1.3	8	1.5	5	1.05
<i>Trichuris trichura</i>	6	0.6	6	1.14	0	0
<i>Ascaris lumbricoides</i>	5	0.5	2	0.38	3	0.63
<i>Cystoisospora</i>	2	0.2	0	0	2	0.42
<i>Isoospora belli</i>	6	0.6	4	0.76	2	0.42
conditionally pathogenic						
<i>Blastocystis hominis</i>	107	10.7	53	10.13	54	11.36
<i>Entamoeba coli</i>	98	9.8	34	6.5	64	13.47

cysts of *Entamoeba coli* occurred more often in children having constant contact with animals at home.

Detailed results are presented in tables I and II.

Table II. Determined mixed infestations

Tabela II. Stwierdzone inwazje mieszane w badanych próbkach kału- liczba dodatnich próbek i odsetek (n=998)

Determined species	Number of samples (n=998)	
	n	%
<i>Giargia intestinalis</i> + <i>Enterobius vermicularis</i>	5	0.5
<i>Ascaris lumbricoides</i> + <i>Blastocystis hominis</i>	5	0.5
<i>Isospora belli</i> + <i>Entamoeba coli</i>	6	0.6
<i>Cystoisospora</i> + <i>Entamoeba coli</i>	2	0.2
<i>Enterobius vermicularis</i> + <i>Blastocystis hominis</i>	8	0.8
<i>Giargia intestinalis</i> + <i>Blastocystis hominis</i>	25	2.5

In the questionnaires, 347 patients did not report any symptoms of parasitic infestation, 255 persons reported one symptom, 160 subjects noted two symptoms, 95 people listed three, 81 – four, 40 – five, and 20 patients – 6 symptoms. The most common symptom was nocturnal restlessness, followed by skin lesions. In 45 patients who had not reported any symptoms in the questionnaire, the presence of *Entamoeba coli* cysts (12 patients), *Blastocystis hominis* cysts (24 subjects) and *Giargia lamblia* dispersive forms (9 patients) (mixed invasion of *G.intestinalis* + *B. hominis* in 5 patients) was found.

Table III. Frequency of reported symptoms

Tabela III. Częstotliwość zgłaszania poszczególnych objawów ogólnych przez badane dzieci

Symptom	Number of applications (n=998)	
	n	%
Digestive disorders	110	11.02
Skin lesions	225	22.54
Nocturnal restlessness	270	27.05
Dark circles under eyes	180	18.03
Earthy complexion	112	11.22
Excessive excitability	172	17.23
Shortness of breath and a cough	130	13.02
Anemia	77	7.71
Abnormal stools	164	16.43
Genital and anal itching	145	14.53

The survey revealed that 475 patients owned pets (dogs – 51.2%, cats – 31.7%, rabbits – 6.3% hamsters – 4.9%, turtles – 1.6%, mice – 1.6%, degus – 0.9%, chinchillas – 0.9%, parrots – 0.9%). Of these, 315 subjects (66.3%) reported the presence of at least one symptom suggestive of a parasitic infection. In the group of pet owners, positive results were obtained in 113 cases

(23.8%), whereas the average for non-pet owners was 19.7% (103 cases). Both groups were characterized by a similar composition of parasite species. Detailed results for pet owners and non-owners are presented in tables IV and V.

Table IV. Correlation between the percentage of positive samples and the number of symptoms reported by non-pet owners

Tabela IV. Odsetek prób dodatnich w stosunku do liczby zgłaszanych objawów u osób nieposiadających zwierząt w domu

Non-pet owners	Number of reports	Number of positive samples	
		n	%
no symptoms reported	187	25	13.4
1 symptom reported	155	25	16.1
2 symptoms reported	85	18	21.1
3 symptoms reported	25	9	36
4 symptoms reported	41	15	36.5
5 symptoms reported	25	7	28
6 symptoms reported	5	4	80

Table V. Correlation between the percentage of positive samples and the number of symptoms reported by pet owners

Tabela V. Odsetek prób dodatnich w stosunku do liczby zgłaszanych objawów u osób posiadających zwierzęta w domu

Pet owners	Number of reports	Number of positive samples	
		n	%
no symptoms reported	160	20	12.5
1 symptom reported	100	21	21
2 symptoms reported	75	15	20
3 symptoms reported	70	17	24.3
4 symptoms reported	40	18	45
5 symptoms reported	15	10	66.6
6 symptoms reported	15	12	80

## DISCUSSION

Parasitic infections represent approximately 25% of all infectious diseases worldwide (1, 8, 9, 10) but are conveniently associated with countries of relatively low levels of hygiene and warm climate, such as sub-Saharan Africa, Asia and South America. Prevalence of parasitic infections in Europe and North America is estimated at 1,5% to 25% depending on region and examined population (1, 11, 12). The situation in Poland does not differ from the European average, and is dependent on a selected group of subjects. (13, 14, 15)

In the present study the presence of parasites was determined in 21.6% of examined children. Protozoan infections accounted for 97.3% of all infestations, including mixed infections, whereas only helminths

(*Trichuris* spp.) had a mere 2.7% share of positive samples. It is believed that gastrointestinal colonization by protozoa *Entamoeba coli* and *Blastocystis hominis* is conditionally pathogenic and does not require treatment in children who do not demonstrate gastrointestinal symptoms (16, 17, 18) When the above cases were subtracted from the total number of infections, the remaining 67 children (6.7%) were diagnosed with parasitic infections that required treatment. The noted values are below the results reported by *Bitkowska et al.* (2004) in a study of 7-year-olds in the region of Warmia-Mazury (29.6%). The noted differences can be largely attributed to an absence of perianal smear tests that are far more effective in diagnosing pinworm infestations than coproscopic tests. The presence of adult forms of *Enterobius vermicularis* (5 cases) and its eggs (8 cases) suggest a high level of infestation in the studied patients.

*Nowak et al* (2007) estimated the incidence of parasitic infection in children in Krakow on 6.15% to 10.2% depending on the year of the study, stressing however, that the prevalence of some species in this region is lower than in other parts of Poland.

The percentage of positive results was insignificantly higher in the group of pet owners. The vast majority of the observed protozoa were considered non-pathogenic or conditionally pathogenic (16, 17, 19, 20). The number of parasitic infestations requiring treatment was similar in both groups, pointing to an absence of a direct correlation between pet ownership and the risk of parasitic infection. There is no scientific evidence to suggest that pets are a reservoir for protozoa of the genus *Blastocystis hominis* and *Entamoeba coli*, nonetheless, this possibility cannot be ruled out. Coproscopic studies do not support the identification of other zoonoses such as toxocarosis, toxoplasmosis, echinococcosis and cysticercosis that are diseases of proven animal origin.

## CONCLUSIONS

1. Not typical general symptoms such as digestive disorders, hyperactivity, skin lesions, genital and anal itching, nocturnal restlessness, earthy complexion, shortness of breath or chronic cough, in particular when they coexist, may suggest a parasitic infection and should be an indication for a parasitological examination.
2. Pets may be a reservoir or a vector of protozoan infestations that are conditionally pathogenic for humans.

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