



INTESTINAL PARASITIC INFECTIONS AMONG UKRAINIAN CHILD WAR REFUGEES LIVING IN WARSAW

Zarażenia pasożytami jelitowymi u dzieci ukraińskich – uchodźców wojennych mieszkających w Warszawie



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Abstract

Introduction and objective: The war and the humanitarian crisis in Ukraine have resulted in a mass migration of millions of Ukrainians into the EU countries. According to the data obtained from Statistics Poland, a governmental agency collecting and publishing the country's statistical data, the number of Ukrainian children currently living in Poland is approximately 500,000. The massive influx of immigrants into Poland poses a considerable challenge to the national health care sector. The aim of this study was to assess the prevalence of intestinal parasitic infections among Ukrainian child war refugees living in Warsaw. **Material and methods:** The study involved a total of 25 Ukrainian children, patients of the Clinic of Paediatrics, Nephrology and Paediatric Allergology at the Military Institute of Medicine – National Research Institute in Warsaw. Parasitological diagnostic work-up was carried out in October 2023 at the Department of Epidemiology and Tropical Medicine, the Military Institute of Medicine – National Research Institute in Gdynia. Stool tests for the presence of intestinal parasites were conducted by light microscopy using three different methods (direct smear in Lugol's solution, decantation with distilled water, Fülleborn's flotation). **Results:** A total of 20% of the children studied (5/25) were found to be infected with potentially pathogenic stramenopile *Blastocystis* spp. In addition, two of the children were also infected with non-pathogenic *Endolimax nana* and *Entamoeba coli* protozoa. There were no infections with nematodes, cestodes or trematodes among the study participants. **Conclusions:** The confirmation of potentially pathogenic *Blastocystis* spp. in stool samples collected from Ukrainian children, war refugees living in Warsaw, justifies the necessity to re-introduce a large-scale routine screening for intestinal parasites in the paediatric population in Poland.

Streszczenie

Wstęp i cel: Wojna i kryzys humanitarny w Ukrainie wywołały masową migrację milionów Ukraińców do krajów Unii Europejskiej. Z danych polskiego Głównego Urzędu Statystycznego – organu administracji rządowej odpowiedzialnego za prowadzenie badań statystycznych – wynika, że aktualnie na terytorium Polski przebywa około 500 000 ukraińskich dzieci. Masowy napływ imigrantów do Polski stanowi spore wyzwanie dla krajowego systemu ochrony zdrowia. Celem pracy była ocena częstości występowania zarażeń pasożytami jelitowymi wśród mieszkających w Warszawie ukraińskich dzieci – uchodźców wojennych. **Materiał i metody:** Do badania włączono 25 ukraińskich dzieci, pacjentów Kliniki Pediatrii, Nefrologii i Alergologii Dziecięcej Wojskowego Instytutu Medycznego – Państwowego Instytutu Badawczego w Warszawie. Diagnostykę parazytologiczną przeprowadzono w październiku 2023 r. w Zakładzie Epidemiologii i Medycyny Tropikalnej Wojskowego Instytutu Medycznego – Państwowego Instytutu Badawczego w Gdyni. Badania kału na obecność pasożytów jelitowych wykonano w mikroskopii świetlnej z wykorzystaniem trzech różnych metod (rozsmazu bezpośredniego w płynie Lugola, dekantacji w wodzie destylowanej, flotacji metodą Fülleborna). **Wyniki:** U 20% (5/25) dzieci z badanej grupy stwierdzono zarażenie potencjalnie patogennymi stramenopilami z rodzaju *Blastocystis* spp. Dwoje dzieci było zarażonych także niepatogennymi pierwotniakami *Endolimax nana* i *Entamoeba coli*. Wśród uczestników badania nie stwierdzono przypadków zarażeń nicieniami, tasiemcami ani przywrami. **Wnioski:** Potwierdzenie obecności potencjalnie chorobotwórczych organizmów z rodzaju *Blastocystis* spp. w próbkach kału pobranych od mieszkających w Warszawie dzieci ukraińskich – uchodźców wojennych wskazuje na potrzebę ponownego wprowadzenia szeroko zakrojonych rutynowych badań przesiewowych na obecność pasożytów jelitowych w populacji pediatrycznej w Polsce.

Keywords: children; intestinal parasites; Ukraine; war refugees

Słowa kluczowe: dzieci; pasożyty jelitowe; Ukraina; uchodźcy wojenni

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Introduction

The war and the humanitarian crisis in Ukraine have resulted in a mass migration of millions of Ukrainians into the EU countries, mainly to Poland. More than three million Ukrainian war refugees crossed to Polish border in the early days of the Russian invasion. A year and a half after the invasion, more than one million Ukrainians remain in Poland, enjoying temporary protection. According to the data made available by Statistics Poland, half of those refugees are children [1]. The massive influx of immigrants into Poland poses a considerable challenge to the national public health care sector [2]. The hardships associated with travel and dislocation, coupled with migration-related stress, poor sanitation, immunodeficiency, and insufficient vaccination coverage among Ukrainian children, are the major factors contributing to the risk of transmission of infectious diseases [3]. A study carried out in a group of child war refugees found that the key health issues included tuberculosis, hepatitis A, B and C, and parasitic diseases [4]. It is currently impossible to determine the epidemiological status of parasitic infections in Ukraine (except for giardiasis and cryptosporidiosis), as there is no obligation to notify the state's authorities of new cases of most intestinal parasitic diseases. The situation is similar in Poland. The reports published by the Ministry of Health of Ukraine include information on the infection rates of the two above-mentioned protozoan diseases only, without providing any information on the prevalence of other intestinal parasites. Findings from the last two years demonstrate a sharp increase in the number of cases of intestinal protozoan infections in Ukraine, from 2,396 cases reported in 2022 to as many as 3,836 cases reported in the first nine months of 2023 [5]. The data may, however, be significantly under-reported because of the limited diagnostic capacity of the laboratories operating in Ukraine (which is associated with the ongoing war). A massive influx of war refugees from Ukraine into Poland justifies the introduction of a health assessment programme for Ukrainian refugees, especially the paediatric population. The aim of this study was to determine the prevalence of intestinal parasitic infections among Ukrainian child war refugees living in Warsaw.

Materials and methods

The study involved a total of 25 Ukrainian children, patients of the Clinic of Paediatrics, Nephrology and Paediatric Allergology at the Military Institute of Medicine – National Research Institute in Warsaw. Medical history of the patients was obtained by a consulting physician.

The medical history included information on the patients' age, sex, place of residence in Ukraine, a history of any gastrointestinal symptoms, and the use of any antibiotics or antiparasitic drugs during the three months before the visit. Three stool samples were collected from each study participants at intervals of 2–3 days. The samples were fixed with SAF (sodium acetate – acetic acid – formalin) and transported to the Department of Epidemiology and Tropical Medicine at the Military Institute of Medicine – National Research Institute in Gdynia for parasitological examination. The samples were tested by three different light microscopy methods (direct smear in Lugol's solution, decantation in distilled water, and Fülleborn's flotation) [6, 7]:

Direct smear in Lugol's solution

Approximately 2 mg of stool was collected with a glass rod and applied onto a slide. A drop of Lugol's solution was added, and the material was smeared over a 4 cm² surface. Next, a cover slide was placed on top of the preparation, and the specimen was examined microscopically at ×20 magnification.

Decantation with distilled water

Approximately 2 ml of stool sample was mixed thoroughly with a small amount of water in a test tube. Next, water was added to the top of the tube and mixed again. After 30 minutes, the supernatant was decanted, and another portion of water was added. This procedure was repeated until clear supernatant was obtained, usually three to four times. The sediment was then placed on a slide, stained with Lugol's solution, and examined microscopically at ×40 magnification.

Fülleborn's flotation

Approximately 2 ml of stool specimen was mixed with saturated NaCl solution in a test tube. Next, NaCl solution was added to the top of the tube. A cover slide was placed on the top of the tube and in contact with the suspension. After 30 minutes, the cover slide was gently removed with tweezers and placed the wet side down on a slide. The preparation was thus ready for microscopic examination at ×10 magnification.

Ethical considerations

Each parent/legal guardian submitted an informed written consent for their child to participate in the study and

to be screened for intestinal parasites by researchers from the Clinic of Paediatrics, Nephrology and Paediatric Allergology at the Military Institute of Medicine – National Research Institute in Warsaw, Poland. They were also requested to provide their child's personal details and medical history. The information clause on personal data processing by the Military Institute of Medicine – National Research Institute, Warsaw, Poland was drawn up pursuant to Article 14 (1) and (2) of the Regulation 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, hereinafter referred to as General Data Protection Regulation (GDPR).

Results

Intestinal parasites were found in five out of 25 Ukrainian children living in Warsaw. All infections were caused by potentially pathogenic stramenopile *Blastocystis* spp. There were two cases of co-infection with non-pathogenic *Entamoeba coli* and *Endolimax nana*; no infections with nematodes, cestodes or trematodes were detected (Tab. 1).

The information obtained during the initial visit by a consulting paediatrician demonstrated that 60% of the infected children had reported gastrointestinal symptoms, including abdominal pain, nausea, vomiting, weight loss, diarrhoea or constipation. Positive cases were most common among girls (4/5) of the primary school age (6–13 years old) and in children coming from Western Ukraine (4/5). Of all the examined children, three were taking antimicrobial or antiparasitic drugs during the three months preceding the enrolment in the study, with one child diagnosed with a *Blastocystis* spp. infection (Tab. 2).

Discussion

According to the UN reports, the total number of child migrants globally is approximately 31 million, including 13 million child refugees or asylum seekers. Children are at a particularly high risk of developing intestinal parasite infections due to poor personal hygiene practices and a tendency to geophagia. This, coupled with migration-related stress and difficulties experienced while travelling from one country to another, significantly increases the risk of an infection in the paediatric population [8, 9].

Table 1. Intestinal parasitic infections in Ukrainian children living in Warsaw (n = 25)

Intestinal parasitic infections	n	%
Negative (-)	20	80
Positive (+)	5	20
<i>Blastocystis</i> spp.	3	12
<i>Blastocystis</i> spp. + <i>Entamoeba coli</i>	1	4
<i>Blastocystis</i> spp. + <i>Endolimax nana</i>	1	4
Nematodes	-	-
Cestodes	-	-
Trematodes	-	-

According to the data from the American Academy of Paediatrics, stool tests for ova and parasites give positive results in 15–35% child-migrants, depending on the country of origin and the age of the child [10]. In the present study, the overall infection rate with parasites was 20%, which is in line with the findings published by Bustamente et al. [11] and Manganelli et al. [12]. Both studies focused on child-migrants whose parents were of European descent. The infection rate reported by the two authors was 25% and 14.9%, respectively. There were no cases of helminth infections in any of the two study groups, which is similar to the findings of the study which involved of a group Ukrainian children adopted abroad [13]. The present study found that all the infections (100%) were caused by *Blastocystis* spp. There were two cases of co-infection with *Blastocystis* spp. and non-pathogenic *Entamoeba coli* or *Endolimax nana* protozoa. The parasites found in the samples collected from the study participants are quite common in Poland [14–16]. A number of studies which involved European children confirm the fact that most parasitic infections seen in Europe are caused by protozoa [17–19]. According to the data from the Ministry of Health of Ukraine, there was a considerable decrease in the number of infections caused by intestinal parasites (especially helminthiasis) in Ukraine between 1984 and 2020. The reduction in the number of parasitic infections among Ukrainians was largely due to the widespread use of anti-parasitic drugs in the country, but it could also be associated with limited diagnostic capabilities of the laboratories operating in Ukraine (between 1984 and 2020, the number of stool tests fell by around 20 million) [5]. The findings of the studies carried out between 1995 and 2016 at the Institute of Epidemiology and Infectious Diseases at the National Academy of Medical Sciences of Ukraine suggest that the rate of intestinal infections caused by potentially

Table 2. Intestinal parasitic infections in Ukrainian children living in Warsaw (n = 25)

Ukrainian children	n	Parasitic infections (+) positive	Parasitic infections (-) negative
	25 (100%)	5 (20%)	20 (80%)
Sex			
Female	16 (64%)	4 (16%)	12 (48%)
Male	9 (36%)	1 (4%)	8 (32%)
Age			
<6	9 (36%)	1 (4%)	8 (32%)
6–13	9 (36%)	3 (12%)	6 (24%)
>13	7 (28%)	1 (4%)	6 (24%)
Region of Ukraine			
West	7 (28%)	4 (16%)	3 (12%)
East	9 (36%)	1 (4%)	8 (32%)
North	5 (20%)	0	5 (20%)
South	4 (16%)	0	4 (16%)
Gastrointestinal symptoms (last 3 months)			
Yes	10 (40%)	3 (12%)	7 (28%)
No	15 (60%)	2 (8%)	13 (52%)
Antibiotic or antiparasitic drugs (last 3 months)			
Yes	3 (12%)	1 (4%)	2 (8%)
No	22 (88%)	4 (16%)	18 (72%)

pathogenic parasites continues to grow in Ukraine [20, 21]. A similar trend has been observed by Lebanese researchers, who found that the detection rates of *Blastocystis* spp. in stool samples increased from 0% in 1997–1998 to 17% in 2007–2008 [22]. A total of 60% of the children enrolled in the present study reported gastrointestinal symptoms. The pathogenic role of *Blastocystis* spp. is not yet fully understood. Although it is widely regarded as a commensal parasite [23, 24], there have been reports suggesting that *Blastocystis* spp. infection may be responsible for symptoms such as nausea, flatulence, abdominal pain, acute or chronic diarrhoea [25–27]. What is more, Zaman et al. [28] observed a significant correlation between the presence of asymptomatic *Blastocystis* spp. infestation and the risk of dwarfism in children. This observation should prompt routine stool testing in the paediatric population in order to prevent the possible long-term effects of the asymptomatic carriage of *Blastocystis* spp. The present study showed that parasitic infections were most common among school-age children, which is consistent with the observations made by other authors [29, 30]. The reason for increased rates of parasitic infections in this age group may include poor toilet and food hygiene. Since pre-school children are normally supervised by their parents/guardians while using the toilet or eating, the risk of exposure to parasitic infections in this age group is usually lower. The present study also found that parasitic infections were more common in girls compared to boys, although other researchers have not observed or reported of a correlation between gender and the rate of infections with intestinal parasites [27, 31]. The limitation of the present study was its small sample size ($n = 25$), which made it difficult to analyse the correlation between variables such as age and sex of the participants or the presence/absence of clinical signs. However, despite the relatively small number of participants, the study results clearly showed the predominance of infections with *Blastocystis* spp. Due to the possible negative long-term effects of asymptomatic *Blastocystis* spp. carriage, it is recommended to introduce regular screening of the paediatric population for parasites. In Poland, there is no obligation to report new cases of most intestinal parasitic diseases. In addition, Poland no longer conducts regular childhood screening for parasitic diseases, which makes it extremely difficult to determine the actual rates of parasitic diseases. The epidemiological situation in Ukraine is, in fact, very similar to the one in Poland. In both countries, giardiasis and cryptosporidiosis are the only notifiable gastrointestinal parasitic diseases [6, 16]. The reports confirming a high prevalence of *Blastocystis* spp. infections among European children justify the need to re-introduce routine screening for intestinal parasites in Poland.

Conclusions

The confirmation of potentially pathogenic *Blastocystis* spp. in stool samples collected from Ukrainian children, war refugees living in Warsaw, justifies the necessity to re-introduce a large-scale routine screening programme for intestinal parasites in the paediatric population in Poland.

Conflict of interest statement

Authors declare no conflict of interest in relation to this article.

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