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Syrian Refugee Children and Intestinal Parasitoses - Experience of the Moroccan Field Hospital in the Zaatari Camp, Jordan

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Abstract **Original Research Article**

This prospective study, conducted at the Moroccan field hospital in the Zaatari refugee camp, Jordan, established under the high directives of His Majesty King Mohammed VI, aimed to assess the prevalence of intestinal parasitic infections among Syrian refugee children. Between June and November 2014, stool samples from 372 children under 15 years were analyzed using standard parasitological techniques. The overall prevalence of intestinal parasitosis was 63.71%, peaking at 67.3% among children aged 4-10 years. Protozoa were predominant (59.32%), with Giardia intestinalis and Entamoeba histolytica being the most common species. Helminthic infections accounted for 30.37% of cases, mainly due to Enterobius vermicularis. Polyparasitism was observed in three children. These findings underscore the precarious living conditions in refugee camps and highlight the necessity for effective public health interventions.

Keywords: intestinal parasites, syrian refugee children, moroccan field hospital in the zaatari camp, entamoeba histolytica, giardia intestinalis.

INTRODUCTION

The Syrian conflict, which began in 2011, has precipitated a major humanitarian crisis, forcing millions of Syrians to flee their homes and seek refuge in neighboring countries. Jordan, as one of the primary host countries, has faced immense pressure on its infrastructure and healthcare system due to the massive influx of Syrian refugees. Established in 2012, the Zaatari camp has become one of the largest refugee camps globally, hosting hundreds of thousands of individuals in precarious living conditions.

Children, particularly vulnerable during humanitarian crises, are at heightened risk of infectious and parasitic diseases. Poor sanitation, lack of potable water, and inadequate hygiene facilities significantly contribute to the transmission of intestinal parasites, which are associated with morbidity and malnutrition in children.

In response to this crisis, under the high directives of His Majesty King Mohammed VI, the Moroccan medical-surgical field hospital was deployed to the Zaatari camp to provide essential healthcare services to Syrian refugees. This royal initiative underscores Morocco's solidarity with the Syrian people and its commitment to alleviating the suffering of refugees. This study, conducted in the hospital's laboratory, aimed to determine the prevalence of intestinal parasitosis in Syrian refugee children and contribute to a better understanding of the camp's health challenges.

PATIENTS AND METHODS

This retrospective study was conducted over five months (June to November 2014) at the Moroccan field hospital in the Zaatari camp. All children under 15 years visiting the hospital, whether as patients or companions, were included. Parental consent was obtained, and each child was provided with three stool collection containers for samples on days 1, 3, and 5. Sample collection was conducted within the hospital premises to ensure freshness.

Parasitological stool examination comprised: Macroscopic and fresh microscopic examinations with Lugol staining; Concentration techniques (Bailenger and MIF) using the Copro-Duo 2x12 kit; Graham's adhesive tape test for pinworm eggs in cases of clinical suspicion.

RESULTS

The study included 372 children (238 boys and 134 girls), with a mean age of 5.5 years (range: 0-15 years) and a male-to-female ratio of 1.77. A total of 1,946 stool examinations were performed, with 237 positive cases, yielding an overall prevalence of 63.71%. Prevalence was highest in children aged 4-10 years 67.3%. The results are mentioned in Table 1.

Among infected children, 93 soit 39.24% presented with clinical symptoms indicative of parasitic infection, primarily diarrhea, nocturnal anal itching, and abdominal pain. Protozoa were predominant, with *Giardia intestinalis* (59 cases) and *Entamoeba histolytica* (43 cases) being the most frequent. Other protozoa included *Chilomastix mesnili* (31 cases) and *Pentatrichomonas intestinalis* (3 cases). Helminthic infections were dominated by *Enterobius vermicularis* (71 cases) and *Ascaris lumbricoides* (3 cases). Cestodes, represented by *Hymenolepis nana*, were detected in 27 children. The results are mentioned in Table 2.

Polyparasitism, primarily protozoa-helminth co-infections, was observed in three children referred from the pediatric unit for geophagy-related iron deficiency anemia and growth retardation. The results are mentioned in Table 3.

Table 1: Prevalence of Parasitic Infections Based on the Age Group of Refugee Children

Age groups (years old)	0 – 4	4 – 10	10– 15
Number of parasitized refugee children	13	148	76
Number of examined refugee children	33	220	119
Prevalence	39,4%	67,3%	63,9%

Table 2: Distribution and Prevalence of Different Parasites Isolated from Stool Samples

Parasitic species		Prévalence
Amoebae	Entamoeba histolytica	18,14%
Flagellates	Giardia intestinalis	24,9%
	Chilomastix mesnilli	13%
	Pentatrichomonas intestinalis	1,1 %
Nematodes	Enterobius vermicularis	29,95 %
	Ascaris lumbricoides	1.1%
Cestodes	Hymenopesis nana	11,39%

Table 3: Parasitic Associations Identified between Protozoa and Helminths

Parasites	Boy (4ans)	Boy (6ans)	Girl (5ans)
Entamoeba histolytica	X		X
Giardia intestinalis	X	X	X
Chilomastix mesnilli	X		X
Pentatrichomonas intestinalis	X		
Entamoeaba coli		X	
Ascaris lumbricoides			
Hymenopesis nana	X	X	X

DISCUSSION

First, a contrast was observed between the number of camp inhabitants, the number of hospital visitors, and the number of positive cases. The concept of medical phobia, which exists in Syrian culture, discouraged many parents from participating in the explanation of our objectives, due to concerns about medication costs. The number of children consulting at the hospital was around 80 children per day, while only 372 children were included in the study.

Our study revealed a high prevalence of digestive parasitic infections of 63.71%. Nearly two out of three Syrian refugee children were infected, reflecting a high parasitic incidence. These results were compared with those of other studies conducted in school-aged children, associating poor hygiene and close living conditions as risk factors. The prevalence observed in our study was higher than that reported in studies conducted in Tiflet 57.1% [1] and Salé 61.7% [2]. Similar studies in Mauritania [3] and Tunisia [4] reported lower prevalences of 33.4% and 25.09%, respectively. This difference could be explained by the precarious living conditions and the high density in refugee camps, which facilitate the transmission of intestinal parasites.

Giardia intestinalis and Entamoeba histolytica were ranked first and second among pathogenic protozoa, with prevalences of 24.9% and 18.14%,

respectively. The predominance of protozoa was mainly due to environmental risk factors, in addition to fecal-oral transmission. Indeed, the Moroccan field hospital was set up in a humanitarian crisis caused by the Syrian civil war. The Zaatari camp was initially planned to accommodate about 25,000 refugees, but within a few months, it housed more than 250,000. Consequently, overcrowding was a significant factor in parasitic transmission. Moreover, the living conditions of the refugees were, at best, inadequate for long-term stay: dusty, hot, and dry atmosphere, communal sanitation facilities, water supply delivered by tanker trucks and stored in large cisterns, lack of sewage systems (replaced in the camp by septic tanks with manual cleaning), and disposal of wastewater and waste sometimes in the public space, forming mud patches that became playgrounds for children.

Nematodoses were dominated by Enterobius vermicularis (29.95%) and cestodoses by Hymenolepis nana (11.39%). These results highlight the need to strengthen individual and collective hygiene measures, such as handwashing with soap and access to adequate sanitation facilities. Studies have shown the effectiveness of these interventions in reducing the prevalence of intestinal parasitic infections [5, 6].

It is important to note that the prevalence of digestive parasitoses varied by age, with a peak observed in children aged 4 to 10 years. This age group corresponds to a period when children explore their environment more and are more likely to be exposed to the risk of multi-parasitism [7].

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