Prevalence of Intestinal Parasites among Displaced People Living In Displacement Camps in Duhok Province/Iraq

A O Hassan, W M Mero

Citation

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Abstract

Aim: Displaced people living in camps are at risk of infection with different types of pathogens, including parasites. Parasitic infection is not only considered to be a public health hazard but also causes significant morbidity and mortality in children and adults. To estimate the prevalence of intestinal parasites (protozoa and helminths) among displaced people living in the displacement camps.

Materials and Methods: In this study, a total of 3925 stool samples were taken from displaced people of both sex and different ages after receiving permission from the camps' health authorities and verbal consent from the enrolled people. The study covered five camps of internally displaced people (IDPs) in Duhok governorate/Iraqi Kurdistan between August 2016 and May 2017. The prevalence rates of protozoa and helminths were presented in number and percentage.

Results: The study showed that out of the total 3925 persons, 229 individuals (5.83%) were infected by intestinal parasites, including protozoa (95.20%) and helminths (4.80%). The recorded parasites and their prevalence rates were: *Entamoeba histolytica* (69.87%), *Giardia lamblia* (17.47%), *Blastocyst hominis* (7.86%), *E. vermicularis* (3.49%), *H. nana* (0.44%), and Egg of *Taenia* spp. (0.87%). The prevalence rate with various intestinal parasites was higher among males, and it was inversely proportional to age. Furthermore, people with a low level of education showed a higher prevalence rate.

Conclusions: The present study suggests that the IDPs in camps are at risk of intestinal parasites infections regardless of sex and age.

INTRODUCTION

Intestinal parasitic infections have a worldwide distribution, particularly in developing countries. World Health Organization (WHO) estimated that 1.5 billion people are infected with soil-transmitted helminths worldwide. The infections are widely spread in tropical and subtropical areas. Over 267 million preschool-age children, and over 568 million school-age children live in places where these parasites are intensively transmitted. This population needs treatment and preventive interventions (World Health Organization, 2020). However, children are more vulnerable to severe consequences of these infections, due to the negative effect on growth and development (Mordi & Ngwodo, 2007; Saboyá, Catalá, Ault, & Nicholls, 2011). Overcrowding, lack of clean water due to the fecal contamination of water and vegetables, poor personal hygiene with weak nutritional status in children are known risk factors (Alum, Rubino, & Ijaz, 2010; Tiwari et al., 2013). The intestinal parasitic diseases account for a worldwide health burden in several developing countries, mainly due to the contamination of water and food through the fecal route (Mordi & Ngwodo, 2007).There is variation in the prevalence rate of parasitic infection from one region to another due to economic and social factors, such as malnutrition, personal hygiene, crowding, unsafe drinking water, low level of education, and poor sanitary conditions (Mohammad, Mohammad, Abu El-Nour, Saad, & Timsah, 2012).

Few studies have been carried out in Duhok dealing with parasitic infections, and most of them concentrated on the prevalence of these parasites in infants and children (Farhan, 2012; Kadir & Salman, 1999; Mero & Hussein, 2013). One of these studies (Mero & Hussein, 2013) reported that the prevalence of intestinal parasites is 27.1%.The following

parasites were reported in adults as well; *G. lamblia; E. histolytica; E. vermicularis; A. lumbricoides; T. trichura; H. nana; and T. saginata* (Al-Joudi & Ghazal, 2005).

During June – August 2014, more than 500,000 people were displaced from Ninewa governorate, included Mosul city, Ninewa plain, Zummar, and Sinjar areas toward Duhok governorate due to the conflict, violence and area occupation by ISIS (Islamic State in Iraq and Syria). The percentage of IDPs (internally displaced peoples) in Duhok is equal to 63% of the total number of displaced people in the Kurdistan Region, estimated to be 800,000 people. The refugees are those who left their homes due to civil war in Syria (Board of Relief and Humanitarian Affairs, 2015).Displaced people living in camps are at risk of infection with different types of pathogens, including parasites due to the living conditions in addition to differentiation within and among camps, such as large family size in a single tent or caravan. Therefore, overcrowding is the most important cause of spreading diseases among them in addition to the lack of clean water and poor personal hygiene with weak nutritional status, especially for children.

Therefore, the present study aimed to investigate the prevalence of intestinal parasites among the displaced people living in camps in Duhok governorate and their relation to sex and age.

MATERIALS AND METHODS

Study design and sampling:

In this cross-sectional study, a total of 3925 stool samples were collected from both sexes of different ages 8 months-60 years old) from five IDPs camps after taking permission from the camp's health authorities and consents forms from enrolled people. We restricted to the age range of 8 months to 60 years old only to avoid the large number of cases, since we had limited budget. The persons who attended the health centers of the camps were undergone physical and clinical examinations for medical issues. The suspected cases who were diagnosed by the physicians were examined for intestinal parasites. The IDP and refugee camps included in this study were Kabarto 1, Kabarto 2, Domiz 1, Domiz 2, and Shariya in Duhok governorate.

The data collection was performed between August 2016 and May 2017.

People were enrolled in this study following ethical approval of the protocol form the local health ethics committee. The study was approved by the College of Medicine, the University of Duhok registered as 613 on 24 July 2016, and BRHA (Board of Relief and Humanitarian Affairs) registered as 1304/1 on 24 July 2016.

Inclusion and Exclusion Criteria

The subjects who were aged two months to 60 years, of both genders were eligible to include in this study. The subjects were included in the study regardless of the socio-demographic aspects. Those persons that were not available during data collection or had other chronic diseases (except for parasitic diseases) were excluded from the study.

Measures and Materials

The information required for the study were collected through the direct interview with the subjects. The information was sex and age and education level.

Stool samples: A stool sample was taken from each patient and was kept in a clean, closed, and labeled container for parasite investigation.

The examination of intestinal parasites was performed by the following methods:

Macroscopical Examination: The examination of samples was performed macroscopically by observing color, consistency, texture, and presence of adults or segments of helminths, blood, mucus, and helminths parts we can see by single eyes macroscopical examination. (Fig 1)

Microscopic examination: A small fleck from the specimen was taken and placed in a drop of normal saline on the center of a clean slide and a drop of diluted iodine was added to it, and they were mixed thoroughly by a wooden stick, then they were covered with a coverslip and examined by a light microscope, firstly with 10x, 40x and then 100x to look for the parasite elements cyst or trophozoite, pus cells, RBC, Epthial cells. From each sample, three slides were prepared from different parts of the sample, and the detected organisms were recorded.

Solutions and stains used in the microscopic examination were normal saline solution 0.85%, Lugal's iodine solution (Stock solution), and Zink sulfate (ZnSO4.7H2O) (331gm/1000ml).

Concentration technique (Zinc sulfate floatation): This method (Inês et al., 2016) was used to detect protozoan

cysts, helminth ova, and larva, in which about 2 grams from each stool sample was mixed with 10-12 ml of normal saline. The mixture was strained through two layers of wet surgical gauze and accordingly was centrifuged for two minutes at 1500-2000 rpm (round per minute). The supernatant fluid was decanted, and the sediment was re-suspended in normal saline and centrifuged again, this process was repeated for three times. A centrifuge tube was filled with zinc sulfate close to the rim and covered with a cover slide and centrifuged again at 2500 rpm for one minute. The cover slide was transferred to a slide containing one drop of lugal's iodine, then was examined under10x&40x, and the detected organisms were recorded in a predesigned questionnaire.

Study tool

The information of the subjects was recorded in a predesigned questionnaire. The questionnaire had two parts. The general information was recorded in the first part, included age, gender, camp name, and education. The results of macroscopic and microscopic examinations were recorded in the second part.

Statistical Analysis

The prevalence rate of infection by different types of parasites is presented in frequency and percentage. The difference in the prevalence of intestinal parasites among the subjects with different age groups, sexes, and education levels was examined in the Pearson Chi-squared and Fishers' exact tests. The significant difference in the prevalence of intestinal parasites was determined in a P-value of less than 0.05. The statistical calculations were perfumed using the Statistical Package for Social Sciences version 25:00 (SPSS 25:00 IBM).

RESULTS

Out of the total 3925 stool samples examined, 229 of them (5.83%) were infected with different kinds of intestinal parasites. The infected persons had under high school education (80.78%) followed by high school and above (19.20%). Most of the infected persons were in age group of 8 months-10 years old (67.25%) flowed by 11-20 years (17.90%), as presented in Table 1. In addition, the most infected camps were Kabarto 1 (2.42%) and Domiz 1 (1.43%), followed by Kabarto 2 (1.22%), Shariya (0.43%), and Domiz 2 (0.33%) as shown in Table 2.

The overall analysis of positive cases revealed that the highest prevalence rate (95.20%) was with protozoa, with a higher overall prevalence rate (59.63%) among males versus females (40.37%). Regarding helminths, the prevalence rate was lower (4.8%), but also the rate was higher in males than females (63.64% vs. 36.36%, respectively).The most prevalent protozoa were *E.histolytica* (160, 69.87%) in both males (90, 56.25%) and females (70, 43.75%) followed by *G. lamblia* (40, 17.47%) higher in males (28, 70%) than females (12, 30%). Regarding helminths, the study showed that *E.vermicularis* was the most prevalent in total cases (3.49%), higher in males than females (62.5 vs. 37.5%), as shown in Table 2. The prevalence rates of protozoa and helminths were not significantly different between males and females (p=0.232 and p=0.691, respectively), as shown in Table 3.

The distribution of intestinal parasites across camp showed that *E. histolytica* was the most prevalent parasite in all five camps, with nearly equal prevalence rates followed by *G. lamblia* as indicated in Table 4.

The study showed that intestinal parasites were more prevalent among the age groups 8 months – 10 years (67.25%) followed by 11-20 years (17.90%). On the other hand, the lowest prevalence rate (1.75%) was among the age group 51-60 years. Furthermore, in general, males hada higher prevalence rate than females (57.79% vs. 42.20%). Even along with each age group separately, the prevalence rate was higher among males than females. The study did not find a significant difference in the general prevalence of intestinal parasites between male and female persons (Table 5).

The study showed that in subjects with under high school education level; the intestinal parasites were more prevalent in males compared to females (66.47% vs. 33.51%, respectively). However, in subjects with high school and above; the infection was significantly more prevalent in females compared to males (68.18% vs. 31.8%), respectively) (Table 5).

Table 1

General characteristics of infected persons by intestinal parasites

Characteristics of infected subjects (n=229)	Statistics	
	Number	Percentage
Education		
Under High School	185	80.78
High School and Above	44	19.20
Age Group (Year)		
8 months-10	154	67.25
11-20	41	17.90
21-30	15	6.55
31-40	8	3.49
41-50	7	3.06
51-60	4	1.75

Table 2

The prevalence rate of different intestinal parasites among displaced people in the studied camps

IDP/Refugee Camps	Statistics		
	No. Examined	No. Infected	%. Infected
Kabarto 1	850	95	2.42
Kabarto 2	550	48	1.22
Domiz 1	1600	56	1.43
Domiz 2	400	13	0.33
Shariya	525	17	0.43
Total	3925	229	5.83

Table 3

Total no. of infections with intestinal parasites among camps inhabitants

Type of parasite	Infected person f(%)		Infected Males f(%)		Infected Females f(%)		P-Value (Two-Sided)
Protozoa							
Entamoebahistolytica	160	**69.87**	90	**56.25**	70	**43.75**	
Giardia lamblia	40	**17.47**	28	**70**	12	**30**	
Blastocyst hominas	18	7.86	12	66.67	6	33.33	p=0.232*
Subtotal	218	95.20	130	59.63	88	40.37	
Helminthes							
E. vermicularis	8	**3.49**	5	**62.5**	3	**37.5**	
H.nana	1	0.44	1	100	0	0.00	
Egg of *Taenia*	2	0.87	1	50	1	50	p=0.997**
Subtotal	11	4.80	7	63.64	4	36.36	
Total	229	100%	137	59.8	92	40.2	

The bold numbers show the most prevalent parasites.

*Pearson Chi-squared and **Fishers' exact tests were performed for statistical analyses.

Table 4

The distribution of endoparasites cases among camps inhabitants (No. = 229)

Distribution of Intestinal parasites f(%)										
Parasites	**Kabarto 1**		**Kabarto 2**		**Domiz. 1**		**Domiz. 2**		**Sharya**	
Entamoebahistolytica	67	**70.53**	33	**68.75**	40	**71.43**	8	**61.54**	12	**70.59**
Giard.lamblia	18	18.95	9	18.75	8	14.29	2	15.38	3	17.65
Blastocyst. Hominis	6	6.32	3	6.25	5	8.93	2	15.38	2	11.76
Enterobiusvermicularis	2	2.11	3	6.25	2	3.57	1	7.69	0	0.00
Hymenolepis nana egg	1	1.05	0	0	0	0.00	0	0.00	0	0.00
Taeniasaginata egg	1	1.05	0	0	1	1.79	0	0.00	0	0.00
Total	95	100	48	100	56	100	13	100	17	100

The bold numbers show the most prevalent parasites.

Table 5

Distributing of endoparasites among different age groups and education levels

Age and education (n=229)	Intestinal parasites f(%)						P-Value
	Total		Males		Females		
Age Group (Year)							
8 months-10	154	**67.25**	89	**57.79**	65	**42.20**	
11-20	41	17.90	26	**63.41**	15	36.58	
21-30	15	6.55	9	60	6	40	
31-40	8	3.49	6	75	2	25	p=0.981**
41-50	7	3.06	4	57.14	3	42.85	
51-60	4	1.75	3	75	1	25	
Total	229	100	137	59.82	92	40.17	
Education							
Under High School	185	80.78	123	66.47	62	33.51	
High School and Above	44	19.20	14	31.81	30	68.18	p<0.01*
Total	229	100	137	59.83	92	40.17	

*Pearson Chi-squared and **Fishers' exact tests were performed for statistical analyses.
The bold numbers show the most prevalent parasites.

Table 6

Prevalence of intestinal parasites in Iraqi provinces and Middle Eastern countries

Study	Intestinal Parasite Type	Iraqi Province	Statistics % (Prevalence)		
			Male	Female	Total
Al-Taie (2009)	Protozoa	Baghdad City			0.19
	Helminthes				2.45
	All intestinal parasite		0.44	0.29	
Hussein and Meerkhan (2019)	All intestinal parasite (Children)	Duhok	63.98	36.02	22.27
	Protozoa				84.67
	Helminthes				18.01
	Protozoa and Helminthes				4.98
Al-Joudi and Ghazal (2005)	All intestinal parasite	Ramadi			34.50
Al Saeed and Issa (2006)	Giardia lamblia	Duhok			38.50
Study	**Intestinal Parasite Type**	**Country**	**Male**	**Female**	**Total**
Al-Shawa (2006)	All intestinal parasite	Palestine	Refugee: 20.0	Community: 15.0	19.07
Zaglool et al. (2011)	All intestinal parasite	Saudi Arabia			6.20
	Entamoeba histolytica				4.70
	Giardia lamblia				1.30
Daryani et al. (2012)	All intestinal parasite (Chilren)	Iran	32.60	34.20	33.3
Ashtiani et al. (2011)	All intestinal parasite (Chilren)		60.54	39.46	0.78
	Protozoa				95.33
	Intestinal worms				4.87
	Pathogenic protozoa				0.50
Doni, Gurses, Simsek, and Zeyrek (2015)	All intestinal parasite (Children)	Turkey			44.6
	G. intestinalis				47.97
	E. vermicularis				37.84
	T. saginata				27.03
	H. nana				12.16
	A. lumbricoides				7.43
Mezeid, Shaldoum, Al-Hindi, Mohamed, and Darwish (2014)	Entamoeba histolytic	Palestine	26.00	31.00	28.5
	Giardia lamblia		11.00	8.00	9.50
Abahussain and Abahussain (2005)	All intestinal parasite	Saudi Arabia			31.40

DISCUSSION

The present study showed 5.83% of the subjects living in camps and were by endoparasites. A study conducted in host communities in this region reported the higher prevalence rate of endoparasites; 22.27% (Mero & Hussein, 2013). The current study found that Entamoeba histolytica was the most prevalent intestinal parasite in both sexes in similarity with the previously findings reported in this region (Mero & Hussein, 2013). Al-Joudi and Ghazal (2005) investigated in parasitic intestinal infection in Ramadi, Iraq, between 1992 and 1997. They included 9330 cases in the study and found that Giardia lamblia has a higher incidence rate during hot seasons. Al Saeed and Issa (2006) investigated 1261 stool specimens in children in Duhok city in 2006. They reported that the prevalence of Giardia lamblia was 31.3%. They reported that the highest rate was in orphan care centers (48.1%) and lowest in the pediatric hospital (31.3%). In addition, the age group 10-12 had the highest rate of infection (81.2%), and 7-9 years of age group had the lowest rate (22.95). In agreement with the present study, Al Saeed and Issa (2006) reported that males had a significantly higher rate of infection compared to females. Some other detected parasites reported in their study were Hymenolepis nana, Blastocystishominis, Entamoebahistolytica and Iodamoebabuetschlii (see the table 6 for the comparison of endo-parasite among governorates of Iraq).

The prevalence of endoparasites has been investigated in other parts of the Middle East region. For example, Agha Rodina and Teodorescu (2002) examined the prevalence of intestinal parasites in urban, rural, and refugee camps in three localities in Gaza Governorate in Palestine. They found a higher prevalence of intestinal parasites in rural areas (53.3%) and refugee camp (48.0%) compared to urban locations (33.0%). In similarity with this study, we found that the eggs of H.nana had the lowest prevalence rate (0.44%). In Saudi Arabia, a retrospective study was conducted in expatriate workers in Al-Khobar in the Eastern province in 1,019 subjects. They reported that the prevalence of parasitic infection was 31.4%, included a single infection (22.3%) and multiple infections (9.1%) (Abahussain & Abahussain, 2005).

Another study was conducted in the Gaza governorate at UNRWA (United Nations Relief and Works Agency) health centers among 58206 stool specimens in eight refugee camps in 2004 (Al-Shawa, 2006). The author found that 10,472 were positive (19.07%). Eight types of parasites were determined included three protozoan (E, histolytica, Giardia, and E.coli) and five helminths (Ascaris, Trichuris, Strongyloides, Enterobiusvermicularis and Hymenolepis nana). The high prevalence of intestinal parasites was in Rafah camp (20.0%), and Khan Yonis (18.96%) and the low prevalence was in Gaza (15.05%).

A similar study was conducted in ID camps in Nigeria in Maiduguri, Borno state, to identify the common intestinal parasites. They examined the samples of 220 subjects by both wet preparation and concentration methods. They found that 48 persons were infected by one or more of the intestinal parasites, given the incidence rate of 21.8%. However, in disagreement with the present study study, they found that Hymenolepis Nana was the most prevalent type of helminths (11.4%), followed by Ascaris lumbricoides with the incidence of 12(5.5%), Hookworm with the incidence of 7(3.2%). The prevalence of Giardia lamblia in the present study was 12.62%, while it was 0.9% in their study. The lowest prevalence of the parasites was Trichuristrichiura and Strongyloides stercoralis (0.5%). (Yassin, Shubair, Al-Hindi, & Jadallah, 1999). See table 6 for comparing of intestinal parasites among some Middle-eastern countries.

The prevalence rates of the parasites are different across the geographic locations; however, it must be taken into account that the IDPs who are infected with these infections could experience in serious diseases and complications in particular in children. (Yassin et al., 1999).

The previous studies conducted in the Middle East region have shown that lack of adequate sanitation, environmental or personal hygiene, and the camp overcrowding and habits of children in contaminated areas have the main role in the prevalence of these parasites (Yassin et al., 1999).

Geltman, Cochran, and Hedgecock (2003)analyzed the prevalence of intestinal parasites after arrival into the United States in African refugees. The study found that 56% had intestinal parasites, including 14% with helminths, and 2% with multiple helminths, 52% with protozoans, and 25% with multiple protozoans. They reported that the Giardia lamblia (14%) and Trichuristrichiura(9%) were the most common pathogens.

World Health Organization has suggested that the refugees be treated periodically with albendazole or mebendazole for treatment of soil-transmitted helminths(World Health Organization, 2015). In addition, the subsequent therapy with mectin (for Strongyloides) and praziquantal (for schistosomiasis) among school-aged children or for entire communities at risk in endemic areas are also suggested(Knopp, Steinmann, Keiser, & Utzinger, 2012).Muennig, Pallin, Sell, and Chan (1999)compared the costs and benefits of no preventive intervention with those of taking presumptive treatment with 400 mg of albendazole per day for a five day period in Saudi Arabia. The study showed that presumptive therapy for the immigrants at risk for parasitosis could avert at least 870 DALYs (disability-adjusted life-year), prevent at least 33 deaths, and 374 hospitalizations. In addition, it saves $4.2 million per year.

The United States and Australia have provided pre-departure anti-parasitic treatment for refugees from high-risk countries. A study conducted in 27000 African and Southeast Asian refugees documented that treatment with single-dose albendazole substantially decreased the prevalence of any soil-transmitted helminth from 20.8% to 4.7%. The prevalence of nematode infections (ascariasis and hookworm) was reduced by 77%, but it had little impact against (Giardia), S. stercoralis, Schistosoma spp. or tapeworms (Centers for Disease Control Prevention, 2013; Swanson et al., 2012). Briefly, the prevalence rate of intestinal parasites was low in the investigated IDPs and refugees in the region. These IDPs and Syrian refugees are settled for close to six years (by 2020) in the camps. The low rate of intestinal parasites in the present study may back to proving the basic needs and some other required medical care for this population. However, these populations need further education and health care to protect themselves against these infections.

Limitations

The strong point of the study must be traced to the number of persons included in the study. In addition, this is the first large study conducted in refugee/IDP camps in this region. However, the study was not exempt from the limitations. The investigators did not make a link between the parasites and their current and past medical diseases and health conditions. Also, the study did not examine the level of contamination in the mentioned above camps.

CONCLUSIONS

The present study reported a low rate of infection by endoparasites, including protozoa and helminths, and was more prevalent in males and those with a low level of education. The authors of the study strongly recommend that the subjects who are more likely at risk of infection be educated and their current medical conditions be managed promptly and appropriately. The study recommends that the link between personal hygiene and other familial conditions with the parasite prevalence be examined in the next attempts.

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Author Information

Ayman Othman Hassan
Department of Microbiology, College of Medicine, University of Duhok
Kurdistan Region-Iraq

Wijdan M.S. Mero
Department of Biology, College of Science, University of Zakho
Kurdistan Region-Iraq