International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 04, 2020
ISSN: 1475-7192

The Prevalence of Ectoparasites among Displaced People Living in Displacement Camps: Duhok Province, Iraqi Kurdistan

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Abstract--- *Background: Displaced people are susceptible to the same diseases including parasitic diseases. This study was conducted to investigate the prevalence of ectoparasites (scabies and pediculosis) among displaced people living in displacement camps in Duhok, Iraqi Kurdistan.*

Methods: A total of 3,925 displaced people from five camps around the city of Duhok were included in the study. These individuals included males and females ages 8 months–60 years. The subjects were clinically examined in the camps' health centers for the presence of ectoparasites, certain types of skin lesions, and a rash suggestive of scabies. For head lice, screening was performed by examining the scalp for lice and nits. The obtained information was subsequently recorded in a pre-designed anonymous questionnaire.

Results: Out of the 3,925 total subjects who were examined, 672 (17.12%) were found to be infested with ectoparasites: 395 with scabies (10.06%; Females: 210, Males: 185), and 277 with pediculosis (7.05%; Females: 182, Males: 95). The highest rates of infestation, both scabies and pediculosis, were found in Domize1 camp (5.15%; 2.93% for scabies and 2.21% for pediculosis). Females showed a slightly higher prevalence than males (53.25% versus 46.75%, respectively). The highest prevalence of scabies was observed in the age group 11–20 years (27.84%) and of pediculosis in the age group 1–10 years (45.85%). Subjects with a primary school education level had higher prevalence rates of scabies and pediculosis (38.50% and 54.15%, respectively).

Conclusions: This study showed that ecto-parasite in displaced people in prevalent in this region.

Keywords--- *Ectoparasites, Scabies, Pediculosis, Displaced People.*

I. INTRODUCTION

Displaced people are susceptible to the same diseases that their non-displaced counterparts are susceptible to, except they are more likely to contract these diseases for a variety of reasons including relocation, poverty, poor environmental conditions, poor health care, and lack of basic necessities in addition to their actual demography, as most displaced people are women and children (UNHCR, 2009).

Parasitic diseases account for considerable health hazards in humans and animals. Some of the most prevalent parasites among displaced people and refugees are ectoparasites (Albonico et al., 1999). Ectoparasite infestation causes a serious deterioration of health and economy in addition to annoyance, irritation, skin infection, anemia, and tick fever while acting as a vector for various devastating diseases (Yadav et al., 2017). The most prevalent ectoparasites are lice and scabies mites due to their direct transmission, as they can be transmitted by direct skin-to-

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DOI: 10.37200/IJPR/V24I4/PR2020739
Received: 18 Mar 2020 | Revised: 29 Mar 2020 | Accepted: 16 Apr 2020

skin contact for scabies, head-to-head contact for pediculosis, physical contact, or through contact with other objects such as combs, towels, clothing, bedding, bathrooms. The family income, number of family members, or mother's education and occupation have a role in the prevalence of scabies (Chosidow, 2000; Gharsan, Abdelhamed, Elhassan, & Gubara, 2016; Hay, Steer, Chosidow, & Currie, 2013; Moradiasl et al., 2018). These are diseases wrought by overcrowding and poverty rather than poor hygiene (Alsamarai & Alobaidi, 2017; Bhat, Mounsey, Liu, & Walton, 2017; Zayyid, Saadah, Adil, Rohela, & Jamaiah, 2010).

The prevalence of other ectoparasites like fleas, ticks, bed bugs, and mosquitoes depends on the condition of the camps; the presence of rodents and the presence or absence of stagnant water facilitate the prevalence of these temporary ectoparasites (Yadav et al., 2017).

Scabies is a very contagious itching condition of the skin caused by a tiny mite called the human itch mite (*Sarcoptes scabiei var. hominis*). It has been estimated that approximately 300 million people annually develop scabies worldwide resulting in itching dermatitis. The effects of scabies extend beyond itching and sleep disturbance since, in many poor countries (especially in tropical regions), scabies is a major cause of high rates of bacterial skin infections leading to impetigo due to *Streptococcus pyogenes* or *Staphylococcus aureus* (Bhat et al., 2017; World Health Organization, 2015; Zayyid et al., 2010). Adult mites enter the skin, creating serpiginous burrows in the upper layer of the epidermis. The female mite then lays her eggs in the skin burrows. This parasitic disease occurs in both sexes and all ages. Scabies is more prevalent in urban areas, among women and children, and is more common in winter than summer (Chaudhry, Hameed, Naz, Min, & Paolotizzani, 2018).

Head lice (*Pediculus humanus capitis*) are common human ectoparasites. They feed on human blood and are transmitted directly from person to person—especially in large-sized families and sometimes by shared clothes, beds, headgear, and grooming implements. The female louse cements its eggs (nits) firmly to the hair. Pediculosis is diagnosed by finding nits or adult lice on hairs. Prevalence is highest among school-aged girls who keep long hair and gather in crowded classrooms (Al-Zanbagi & Al-Hashdi, 2016). Pediculosis caused by *Pediculus humanus capitis* affects millions of children ages 5–12 years and adults and is considered a public health problem worldwide. Furthermore, pediculosis constitutes a significant hassle for parents, teachers, and school children due to morbidity. It results in sleep disturbances, difficulty concentrating, social distress, stigmatization, discomfort, embarrassment, and often, unnecessary absence from school (Nazari, Fakoorziba, & Shobeiri, 2006).

The prevalence of ectoparasites among displaced people has been investigated on an exceptionally limited scale in this region. There is only one study in Zakho about the prevalence of scabies among displaced people living in the Bersifi1, Bersifi2, and Cham Meshko camps, in which the rate of ectoparasites was 6.16% (Mero & Hassan, 2014).

Regarding pediculosis, a prevalence rate of 1.20% was reported in the Sulaimani governorate among refugees and displaced people (F. M. Ali & Hama, 2018), while a very high rate (42.70%) was reported among displaced secondary school girls in Kirkuk (Kadir, Taher, & Ali, 2017). There is no epidemiological data on the prevalence of ectoparasites among the inhabitants of displacement camps around Duhok. This reason prompted us to adopt this study exploring the distribution of these parasites among displaced people and to correlate the subsequent data with specific demographic factors.

DOI: 10.37200/IJPR/V24I4/PR2020739
Received: 18 Mar 2020 | Revised: 29 Mar 2020 | Accepted: 16 Apr 2020

II. MATERIALS AND METHODS

A total number of 3,925 displaced people from five displacement camps around the city of Duhok were included in this study. The included individuals were of both sexes and varied in age (8 months–60 years). These individuals were selected from those who visited the clinical centers and were examined for the presence of ectoparasites in the camps Kabarto1, Kabarto2, Domize1, Domize2, and Sharya. The suspected persons were thoroughly examined for scabies and head lice. Clinical examination was performed to look for types of skin lesions and an itching rash suggestive of scabies. Verbal consent was obtained from all contributors and their information was recorded in a pre-designed questionnaire. This study was conducted during the period from August 2016 through May 2017.

Inclusion and Exclusion Criteria

Following ethical approval of protocol from the local health ethics committee, the subjects were persons of different ages from 8 months–60 years old. The subjects met eligibility criteria whether they were male or female, without age restriction, and irrespective of their socio-demographic aspects. Those who were unavailable during data collection or had other chronic diseases (except parasitic diseases) were excluded from the study.

Measurements

For head lice, screening was completed by examining the scalp to look for lice and nits on the hair with the aid of a fine-toothed comb. The person was considered positive if there was evidence of head lice or nymphs and the presence of live or dead nits.

For scabies, microscopic examination of skin scrapings was performed and the definitive diagnosis was based on the identification of mites, eggs, and eggshell fragments in these scrapings (e.g., from scabietic papules or from under the fingernails) or by the detection of the mite at the end of its burrow using Indian ink. One or two drops of mineral oil were applied to the lesion, which was then scraped or shaved, and the specimens were examined after clearing in 10% KOH with a light microscope under low power (Chosidow, 2000). The presence of mites or eggs confirmed the diagnosis.

Statistical Analysis

The prevalence of scabies and pediculosis was determined in number and percentage. Pearson's Chi-squared test was used for the comparison of prevalence rates for scabies and pediculosis among male and female individuals of different education levels and age groups. The significant difference in prevalence of scabies and pediculosis was determined by a P-value of less than 0.05. The results were then analyzed using the statistical package for social sciences (SPSS) version 24 (IBM Corp, USA).

III. RESULTS

The study found that 672 (17.12%) of the 3,925 subjects were infected with ectoparasites, including 395 (10.06%) cases of scabies, and 277 (7.05%) cases of pediculosis in the enrolled camps. The highest rates of infestation for both scabies and pediculosis were found in Domize1 camp, which was 2.93% for scabies and 2.21% for pediculosis (5.15% overall), while the lowest rate of 1.20% (0.89% for scabies and 0.30% for pediculosis) was

DOI: 10.37200/IJPR/V24I4/PR2020739
Received: 18 Mar 2020 | Revised: 29 Mar 2020 | Accepted: 16 Apr 2020

recorded in Sharya camp. The overall difference in prevalence of scabies and pediculosis was not statistically significant (Table 1).

Table 1: Distribution of ectoparasites among displaced people

Camps		*Infested Cases*		*Scabies*		*Pediculosis*	
	Examined No.	*Number*	*Percentage*	*Number*	*Percentage*	*Number*	*Percentage*
Kabarto 1	850	175	4.46	95	2.42%	80	2.0%
Kabarto 2	550	140	3.56	82	2.1	58	1.5
Domize 1	1600	202	5.15	115	2.93	87	2.21
Domize 2	400	108	2.75	68	1.73	40	1.0
Sharya	525	47	1.2	35	0.89	12	0.30
Total	3925	672	17.12	395	10.06	277	7.05
P-Value: 0.12; X^2: 7.30							

The distribution of *Sarcoptes scabiei* according to age and sex was shown in Table 2. Both sexes in age groups 8 months–10 years and 11–20 years showed the highest rates of infestation (24.05% and 27.84%, respectively). The rate of infestation decreased with increased age, as the age group 51–60 years showed the lowest rate (6.83%). Regarding sex, females showed a slightly higher rate than males among the same ages, but the overall differences between both sexes were insignificant ($P > 0.05$).

Table 2: Distribution of scabies according to age and sex

Age group (Years)	*Infested*		*Male*		*Female*		
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*P-Value (Two-Sided)*
8 months – 10	95	24.05	42	10.63	53	13.42	P-value: 0.99 X^2: 0.52
11-20	110	27.84	53	13.42	57	14.43	
1-30	70	17.72	33	8.35	37	9.4	
31-40	55	13.92	27	6.83	28	7.1	
41-50	38	9.62	18	4.55	20	5.1	
51-60	27	6.83	12	3.0	15	3.8	
Total	395	100	185	46.75	210	53.25	

The distribution rate of pediculosis among both sexes and different ages was presented in Table 3. The highest rate was recorded among the age groups 1–10 and 11–20 years—45.85% and 39.71%, respectively—with higher rates in females than males and no statistically significant difference between both sexes.

Table 3: Distribution of Pediculosis according to age and sex

	Infested		*Male*		*Female*		
Age group (Years)	*Number*	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*P-Value (Two-Sided)*
1–10	127	45.85	50	18.05	77	27.8	P-Value: 0.19 X^2: 3.28
11-20	110	39.71	35	12.63	75	27.07	
21-30	40	14.44	10	3.61	30	10.83	
Total	277	100	95	34.29	182	65.7	

Regarding education level, the rate of scabies infestation was highest among primary school children and decreased with the increase in education level (Table 4). Regarding sex, in scabies, the prevalence rate was slightly higher in females (Table 4).

DOI: 10.37200/IJPR/V24I4/PR2020739
Received: 18 Mar 2020 | Revised: 29 Mar 2020 | Accepted: 16 Apr 2020

Table 4: The distribution of scabies according to educational level

Education level	*Infested*		*Males*		*Females*		
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*P-Value (Two-Sided)*
Illiterate	18	4.55	8	4.32	10	4.8	
Can read and write	115	29.11	55	29.73	60	28.6	
Primary school	152	38.5	70	37.83	82	39.0	P-Value=0.99
Secondary school	85	21.52	40	21.62	45	21.4	X^2:0.14
Higher education	25	6.32	12	6.5	13	6.2	
Total	395	100	185	100	210	100	

The highest prevalence rate of pediculosis was found among the subjects who had a primary school education (54.15%). Females had a slightly higher prevalence rate of pediculosis, but the overall difference was not statistically significant (Table 5)

Table 5: The distribution of Pediculosis according to educational level

Education level	*Infested*		*Males*		*Females*		*P-Value (Two-Sided)*
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	
Illiterate	27	9.75	10	3.61	17	6.14	
Can read and write	30	10.83	10	3.61	20	7.22	
Primary school	150	54.15	52	18.77	98	35.38	P-Value=0.98
Secondary School	70	25.27	23	8.30	47	16.96	X^2:0.18
Total	277	100	95	34.29	182	65.7	

IV. DISCUSSION

The overall prevalence of scabies and head lice among displaced people living in camps in Duhok was 17.12%, with a higher prevalence rate of scabies (10.06%) versus pediculosis (7.05%). Furthermore, the rate was higher in females and younger subjects up to age 20. The rate of parasites decreased with increasing age. People who had primary school level education showed the highest rate of infestation for both scabies and pediculosis (38.50% and 54.15%, respectively).

This high rate of ectoparasites could be attributed to crowded living conditions, intimate personal contact through sharing infected clothes and bed linens, and lack of personal hygiene (AL-Megrin, 2015).

The prevalence of scabies reported in the current study is higher than that reported among displaced peoples living in the Bersifi1, Bersifi2, and Cham Meshko camps in Zakho city, which was 6.16% (Mero & Hassan, 2014). A lower prevalence of scabies (5.50%) has been reported in another study within this region. They reported the same pattern of scabies prevalence in both sexes and individuals with different education levels. The higher prevalence rate was 20.11% and 20.50% among age groups 1–10 and 11–20 years, respectively. This rate decreased with increasing age. Furthermore, females had slightly higher rates compared to males (53.06% versus 46.94%, respectively). The highest rate (60.53%) was found among illiterate people and decreased with increasing level of education (Mero & Hassan, 2014). Different rates of scabies have been reported across various regions of Iraq such as Kirkuk (Zayyid et al., 2010), Basrah (Al Rubaiy, 2001), Tikrit (Hay et al., 2013), and Baghdad (Mohammad, Ali, & khalaf Ibrahim, 2012): 9.33%, 3.30%, 1.20%, 2.00%, and 1.00%, respectively. The rate of 13.30% has been reported in primary school children in the city of Erbil (K. B. M. Ali, Surchi, & Al-Hadithi, 2010). A very high prevalence of scabies among refugees living in camps has been reported in camps within Sierra Leone, as they

DOI: 10.37200/IJPR/V24I4/PR2020739
Received: 18 Mar 2020 | Revised: 29 Mar 2020 | Accepted: 16 Apr 2020

reported a rate of 86.00% (Terry et al., 2001), and an even a higher rate (99.00%) was reported among Syrian refugees in Berlin camps (Mockenhaupt et al., 2016).

The variation in prevalence of human scabies could be attributed to social, economic, and environmental conditions. Furthermore, such high rates among displaced people may be due to poor living conditions, sharing of clothes, beds, and bathrooms (Mero & Hassan, 2014; Zayyid et al., 2010).

Scabies is most prevalent in young ages—especially the illiterate or those with a primary level of education—among persons of a low socioeconomic level and females. The high rate among illiterate individuals may relate to low income (sleeping outside the home, low standard of living, and poor hygienic conditions) or low education. There is a significant relationship between the infestation rate of scabies and pediculosis and education in preschool children (Ciftci, Karaca, Dogru, Cetinkaya, & Kulac, 2006).

A rate of 7.05% was found for pediculosis in the present study. Higher rates were found in females, young age groups, and those with a primary level of education. A similar pattern was found among refugees and displaced people in the Sulaimani governorate (1.20%). The highest percentage of infestation was among the age group 1–8 years (24.60%), 13.10% of the infested were illiterate, 35.80% completed the primary school, and 16.90% were university graduates (F. M. Ali & Hama, 2018).

A study conducted among 494 school children in Ethiopia showed that, of the children who were infected with scabies, 65.22% had mild, 28.26% had moderate, and 6.50% had severe lesions. Moreover, the study showed that those who lived in a rural area were more likely to have an illiterate father (Adjusted Odds Ratio [AOR]: 5.11), have an education level of grades 1–4 (AOR: 3.91), take infrequent baths (AOR: 3.54), or be more likely to have contact with a person with itching symptoms (AOR: 2.66). In addition, they were also more likely to have a family member with itching symptoms (AOR: 4.76) and more likely to use water only for handwashing (AOR: 4.38) (Dagne, Dessie, Destaw, Yallew, & Gizaw, 2019).

Having a family member with a history of itchy skin lesions or contact with a person with a history of itchy skin lesions has been shown to be associated with scabies infestation (Hegab, Kato, Kabbash, & Dabish, 2015; Hegazy, Darwish, Abdel- Hamid, & Hammad, 1999; Heukelbach, Oliveira, & Feldmeier, 2003). In a family with a history of itchy skin lesions, the family members spend adequate time together for the scabies mite to be transmitted to a healthy member—scabies spreads effectively through direct skin contact (Wendel & Rompalo, 2002). However, not having such history among family members does not mean that scabies is not transmitted.

Frequent hand washing as a significant predictor of scabies in some studies may relate back to education level. We found a slightly higher prevalence of scabies and pediculosis in individuals with a low level of education, but the overall difference was not significant. We relate it to the crowding conditions of the studied camps. We did not examine the handwashing status in this study, but it has been shown that those who wash their hands have a better chance of preventing infestation (Dagne et al., 2019) since sanitizers easily eradicate scabies mites.

Individuals or students in primary school have less control over their personal hygiene and environmental conditions. In addition, those with a low level of education have a higher chance of contact because they spend a

DOI: 10.37200/IJPR/V24I4/PR2020739
Received: 18 Mar 2020 | Revised: 29 Mar 2020 | Accepted: 16 Apr 2020

substantial amount of time playing with their friends. Spreading scabies has been shown to be linked to poor personal hygiene (Andrews, McCarthy, Carapetis, & Currie, 2009; Heukelbach & Feldmeier, 2004). Individuals with lower educational levels are less aware of personal hygiene principles and are more susceptible to infestation.

In this study, we did not find a significant difference in the prevalence of scabies and pediculosis between male and female subjects. The studies have reported different results than the literature (Sambo, Idris, Umar, & Olorukooba, 2012; Yaseen & Hassan, 2013), which could refer to different socio-demographic aspects of each country in which the study has been conducted.

F. M. Ali and Hama (2018) estimated the prevalence of head pediculosis and its related factors in refugees in Sulaimani province in Iraqi Kurdistan. Including 5,056 males and 6,742 females from five camps, they reported 1.12% of head pediculosis, 1.78% and 0.24% in females and males, respectively. They also reported that age has an impact on pediculosis prevalence: a higher rate of pediculosis was found in children ages 1–5 years old. In addition, it was more prevalent in subjects with a low level of education. Family size, hair washing duration, and hair length and type had direct effects on head lice infestation. Similar results were found in this study as well.

V. CONCLUSION

From this study, it is concluded that the rate of infestation with scabies and pediculosis is high among displaced people, especially those of young age groups. Improvement of living and socio-economic conditions and administration of health education programs to these camps will significantly reduce the rate of infestation of these ectoparasites and other infectious agents.

Conflict of interest disclosure: The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

Funding: The authors were only financial supporters of the study.

Data availability: The data file is available upon request of the journal.

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DOI: 10.37200/IJPR/V24I4/PR2020739
Received: 18 Mar 2020 | Revised: 29 Mar 2020 | Accepted: 16 Apr 2020