

# Pediculosis capitis among primary-school children in Mafrq Governorate, Jordan

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## قمل الرأس لدى أطفال المدارس الابتدائية في محافظة المفرق، الأردن

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الخلاصة: يُعدُّ الاحتشار بقمل الرأس مدعاةً للقلق من وجهة نظر الصحة العمومية في جميع أرجاء العالم، ولاسيما لدى أطفال المدارس الابتدائية. وقد أجريت هذه الدراسة المستعرضة في عامي 2009-2010، لاستقصاء معدل انتشار قمل الرأس وبعض عوامل الاحتشار به بين 1550 طفلاً من تلامذة المدارس الابتدائية تمَّ اختيارهم عشوائياً في محافظة المفرق بالأردن؛ وقد بلغ معدل انتشار قمل الرأس 26.6٪، مع وجود فروق يُعتدُّ بها إحصائياً في معدلات الانتشار بين الفتيات (34.7٪)، والفتيان (19.6٪)، وبين سكان الريف (31.2٪)، وسكان المدن (23.5٪)، وبين وجود قصة سابقة احتشار به في السنة الماضية (57.4٪)، وبين عدم وجود مثل تلك السابقة (11.5٪)؛ كما لوحظت فروق بحسب الأعمار المختلفة للأطفال، وحجم الأسرة، ودخلها ( $P > 0.001$ ). كما شوهد ترابط قوي بين الاحتشار وبين كل من زيادة طول الشعر، وفقدان مرافق الاستحمام، ونقص تكرار غسل الشعر والاستحمام، والتشارك في الأدوات (مثل الأمشاط وأغطية الرأس). ( $P > 0.001$ ). وكان معدل الاحتشار أعلى مما أظهرته تقارير سابقة في الأردن (أقل من 14٪). وتمسُّ الحاجة إلى برامج لزيادة التوعية حول قمل الرأس وأهمية النظافة الشخصية الجيدة.

ABSTRACT Pediculosis capitis (head lice infestation) is a worldwide public health concern affecting mostly primary-school children. In a cross-sectional study in 2009/2010, the prevalence of pediculosis capitis and some risk factors for infestation were investigated among 1550 randomly selected primary-school children in Mafrq governorate, Jordan. The prevalence of pediculosis capitis was 26.6%. There were significant differences in the prevalence between girls (34.7%) and boys (19.6%), rural (31.2%) and urban (23.5%) residents, and history of infestation in the previous year (57.4%) versus no history (11.5%), as well as between children of different ages, family size and income ( $P < 0.001$ ). Longer hair length, lack of bathing facilities, low frequency of hair-washing and bathing, and sharing of articles (e.g. combs, scarves) were significantly associated with infestation ( $P < 0.001$ ). The prevalence of infestation was higher than reported in previous studies in Jordan (< 14%). Programmes are needed to increase awareness of pediculosis capitis and the importance of good personal hygiene.

## Pédiculose de la tête chez des écoliers du primaire dans le gouvernorat de Mafrq (Jordanie)

RÉSUMÉ La pédiculose de la tête (infestation de la chevelure par des poux) est une préoccupation de santé publique mondiale affectant principalement les écoliers du primaire. Dans une étude transversale réalisée en 2009-2010, la prévalence de la pédiculose de la tête et certains facteurs de risque de l'infestation ont été évalués auprès de 1550 écoliers du primaire sélectionnés aléatoirement dans le gouvernorat de Mafrq (Jordanie). La prévalence de la pédiculose de la tête était de 26,6 % globalement, mais des différences significatives ont été observées entre les filles (34,7 %) et les garçons (19,6 %), entre les habitants des zones rurales (31,2 %) et des zones urbaines (23,5 %) et entre ceux ayant des antécédents d'infestation dans les douze derniers mois (57,4 %) et les autres (11,5 %), ainsi qu'entre les enfants en fonction de leur âge, de la taille de la famille et du revenu ( $P < 0,001$ ). Avoir les cheveux longs, ne pas disposer d'une salle de bain, ne pas se laver les cheveux ni se doucher souvent, et partager des objets comme les peignes et les écharpes étaient des facteurs fortement associés à une infestation ( $P < 0,001$ ). La prévalence de l'infestation était supérieure à celle rapportée dans les précédentes études effectuées en Jordanie (moins de 14 %). Des programmes sont nécessaires pour sensibiliser à la pédiculose de la tête et à l'importance d'une bonne hygiène personnelle.

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## Introduction

Pediculosis capitis infestation, commonly known as head lice, is the manifestation of the obligate ectoparasite, *Pediculus humanus capitis*, which only affects the human scalp. It is an extremely contagious condition and most common among young children aged 3 to 12 years. It is a worldwide community health problem that affects children in both developed and developing countries [1–3].

Primary-school children aged 6–12 years are most at risk, although adults and children of other ages who have direct or indirect contact with primary-school children are also susceptible [4].

The pattern and prevalence of pediculosis capitis is dependent on many sociodemographic and economic factors such as overcrowding, hair characteristics and poor hygiene [5,6]. Lice infestation may lead to psychological distress and may disrupt learning performance of the children because of the social stigma associated with it [2,3,7,8].

In Jordan, a few studies have been done among schoolchildren. One conducted in Amman (the capital of the country) showed that the prevalence of pediculosis was 11% (1999) [7]. Another conducted in northern Jordan reported a prevalence of 13.4% and that socioeconomic factors were a significant factor in prevalence [8]. However, there are no published data available about the prevalence of head lice in Mafraq governorate in northern Jordan.

Therefore this study was undertaken to determine the prevalence and distribution of *Pediculus humanus capitis* among primary-school children in Mafraq governorate, northern Jordan, and to identify the factors affecting the prevalence.

## Methods

### Place of study

This study was carried out in Mafraq governorate from December 2009 to February 2010. Mafraq governorate has a population of 265 000 with a density of 9.9 per km<sup>2</sup>. It is the second largest governorate in the country, but has the second lowest population density. The total number of children aged 6–11 years enrolled in primary schools at the time of the study was 36 124. Permission to conduct the study was obtained from the Directorate of Education of the Mafraq Governorate (Ministry of Education).

### Study design and sample

This was a school-based analytical cross-sectional study carried out from December 2009 to February 2010. Students were selected from those enrolled in 394 primary schools in Mafraq governorate.

The sample size was estimated by using the following formula:  $n = [z^2 - p(1 - p)]/e^2$  where  $n$  = sample size,  $z$  = is the confidence level at 95%,  $p$  = expected prevalence (0.5%) and  $e$  = precision (margin of error at 5%). Based on this formula, the minimum sample size needed was 385 students; however, the sample size was increased to include all eligible students in the selected schools so as to increase the power and validity of the study.

A total of 8 schools were randomly selected comprising 1638 eligible students in Grades 1 to 6. Four schools from which 932 students were enrolled were located in urban areas (Mafraq city) and 4 schools from which 618 children were enrolled were located in rural areas (Bedouin community) of the Mafraq Governorate.

### Data collection

Data were collected by 5 nursing inspectors who had a bachelor degree in nursing and were trained to do hair examinations.

A day ahead of the examination date, 1638 consent forms were distributed for the children's parents to complete and sign. However we obtained approval from 1550 parents, a response rate of 94.6%.

A suitable room was chosen in every selected school to conduct the hair examination. A detailed questionnaire was completed by the children with the help of the nurses and data on the following variables were recorded: sex, age, place of residence, family size, mothers' employment, family income in Jordanian dinars (JD), bathing facilities, frequency of hair washing, frequency of bathing, sharing of articles in contact with hair (e.g. combs, scarves, pillows etc.) and lice infestations in the past year. Then hair was examined for head lice, as well as for eggs/nits, by full head examination, parting the hair every 3 cm. The scalp was examined for 3–5 minutes with the naked eye, sometimes with the use of a hand lens and a fine-toothed comb. A child was considered infested if lice or eggs/nits were found either live or dead.

### Analysis

Data entry and analysis were conducted using SPSS, version 16 software. The chi-squared test was used compare differences in proportions for the variables included.  $P < 0.05$  was considered statistically significant.

## Results

Of the 1550 children included in the study, 832 were boys and 718 girls. The overall prevalence of pediculosis capitis among the 1550 schoolchildren was 26.6% (Table 1). The prevalence of infestation was significantly higher among girls (34.7%) than boys (19.6%), children with longer hair, those aged 6–8 years, rural rather than urban residents, those living with more than 10 family members (although only 5% lived in such large families), those living in

Table 1 Characteristics of children infested with pediculosis capitis

Characteristic	No. of examinations	No. of infestation	Prevalence (%)	P-value
<b>Sex</b>				< 0.0001
Male	832	163	19.6	
Female	718	249	34.7	
<b>Hair length</b>				< 0.0001
Short, < 3 cm	582	69	11.9	
Medium, > 3 cm to shoulder level	529	173	32.7	
Long, > shoulder level	439	170	38.7	
<b>Age (years)</b>				< 0.0001
6	187	75	40.1	
7	190	79	41.6	
8	210	59	28.1	
9	250	68	27.2	
10	286	33	11.5	
11+	427	98	23.0	
<b>Place of residence</b>				< 0.001
Urban	932	219	23.5	
Rural	618	193	31.2	
<b>Family size (No. of members)</b>				< 0.0001
< 5	370	35	9.5	
5-10	1101	342	31.1	
> 10	79	35	44.3	
<b>Family income (Jordanian dinars)</b>				< 0.0001
< 200	352	190	54.0	
200-500	726	179	24.7	
> 500	472	43	9.1	
<b>Mother's employment</b>				0.204
Employed outside the home	343	82	23.9	
Not employed outside the home	1207	330	27.3	
<b>History of infestation</b>				< 0.0001
Yes	509	292	57.4	
No	1041	120	11.5	
<b>Total</b>	1550			

families with a monthly family income of < 200 JD, and those with a history of infestation in the previous year ( $P < 0.0001$  for all). Mother's employment status was not significantly associated with lice infestation. The highest percentage of pediculosis infestation was among children with a past history of infestation (57.4) and this was a statistically significant finding ( $P < 0.0001$ ).

Table 2 shows the hygiene practices among schoolchildren and the association with lice infestation. The prevalence of head lice infestation was significantly

higher (51.1%) among children with no bathing facilities in their houses than those with such facilities (21.6%) ( $P < 0.0001$ ). Moreover, the prevalence of the infestation was significantly associated with the frequency of both hair washing (50.5% among those washing hair  $\leq 1$  time per week compared with 16.9% among those washing hair  $\geq 3$  times per week) and bathing (42.8% among those bathing  $\leq 1$  time per week compared with 15.7% among those bathing  $\geq 3$  times per week) ( $P < 0.0001$  for both). In addition, the

frequency of lice infestation was significantly higher among children who shared articles such as combs, scarves and towels among the family (38.2%) compared with children who did not share (17.2%) ( $P < 0.0001$ ).

## Discussion

The prevalence of infestation with *Pediculus humanus capitis* in our study was 26.6%, indicating it is a common condition among our primary-school

**Table 2 Association between hygiene facilities and practices and pediculosis capitis infestation**

Hygiene practice	No. of examinations	No. of infestations	Prevalence (%)	P-value
<b>Bathing facilities in the house</b>				
Yes	1288	278	21.6	< 0.0001
No	262	134	51.1	
<b>Frequency of hair washing per week</b>				
≤ 1 time	374	189	50.5	< 0.0001
2 times	680	139	20.4	
≥ 3 times	496	84	16.9	
<b>Frequency of bathing per week</b>				
≤ 1 time	472	202	42.8	< 0.0001
2 times	702	151	21.5	
≥ 3 times	376	59	15.7	
<b>Sharing articles<sup>a</sup></b>				
Yes	693	265	38.2	<0.0001
No	857	147	17.2	

<sup>a</sup>Combs, towels and clothes.

children. This figure is higher than previously reported in other areas in Jordan (Amman, North Jordan) (11.01% and 13.4% respectively) [7,8]. There may be a number of likely explanations for this difference, including lifestyle and environmental issues because water is scarce in the remote areas of the Mafraq governorate in comparison to other rural areas in Jordan, and some of the children come from these remote areas. Furthermore, the surveys were conducted around 10 years before our study, during different seasons and in different governorates with different socioeconomic status and lifestyles. Mafraq Governorate still includes a Bedouin population with a nomadic lifestyle who are only semi-settled.

The rates of lice infestation among schoolchildren vary quite considerably across the world ranging from 5% to 78% [9,10]. Furthermore, there has been a reported increase in worldwide pediculosis prevalence since 1965 [11].

Our figure is similar to some studies in different parts of the world 20.3% in Turkey [12], 21.9% and 28.3% in the United Kingdom [13]. It is lower than the rates observed in other countries, 61.4% in Argentina [14] and 35.5% in Malaysia [15]. However, it is higher

than that detected in other Middle Eastern countries, for example Egypt (5.5%) [16], Turkey (5.1%) [17], Palestine [10], Islamic Republic of Iran (1.8%) [1] and Saudi Arabia (5.2%) [18]. In Jordan, as in other Arab and Islamic countries, the most serious social consequence facing affected schoolchildren is social stigma [1,2].

The prevalence of lice infestation in our study was significantly higher among girls than boys, which concurs with the results of other studies done in Jordan [8], the region [1,2] and worldwide [11,19]. This higher infestation rate among girls can be explained by the difference in hair length, which we showed to be significantly associated with infestation, longer hair increasing the likelihood of infestation. Girls generally have longer hair than boys and also exhibit different behaviour to boys: boys have brief contact during daily playing and sporting activities, while girls tend to have closer, prolonged head contact in small groups [1,20]. Another important cultural factor is that a very high percentage of the girls in Mafraq Governorate wore a head cover because of their Islamic tradition. While covering the head might reduce the transmission of head lice by

reducing hair contact between girls, at the same time covering the head may increase the prevalence of infestation of head lice by raising the scalp temperature and creating greater humidity [1,2]. Furthermore, many Jordanian girls cover their head only outside their home, and therefore transmission can still occur inside the home with their siblings and family members. Moreover, girls often exchange their head scarf with each other which may increase the chances of cross-infestation. The prevalence of lice infestation was very high among those children with long hair as it is more difficult to comb and keep clean it in comparison with short hair. In addition, school policies of enforcement of short hair-cuts among boys are likely to reduce transmission of the parasite.

In agreement with international trends, children aged 6–8 years were the most frequently affected with head lice [1,2,4,7]. This can be explained by behavioural factors whereby children at this age have more direct physical contact with each other. Furthermore, the degree of close contact with friends and family at this age might affect the infestation rate and this contact may decrease as children get older.

Factors that may explain the higher prevalence in the rural areas of the Mafraq Governorate might be attributed to poor personal hygiene among family members because of scarcity of water resources and the semi-nomadic lifestyle, relative difficulty in accessing health services for treatment, and lack of knowledge of basic skin care. Some researchers maintain that lice infestation is found in all socioeconomic classes [11,19], while others have reported that lice infestation is more common in rural areas among lower socioeconomic classes [21,22]. It has been reported in the literature that extreme poverty and overcrowded dwellings are closely related to poor hygiene practices and less concern about head lice infestation [23]. Our study agrees with this finding as our results showed that there were higher infestation rates among schoolchildren with family size > 10 and lower family income (< 200 JD). This may be because children from larger families with less income may not be able to pay attention to hair care and have a higher risk of the parasite being transmitted by their siblings [24].

Kokturk et al. [11] suggested that there was no significant association between head lice infestation and poor hygiene, while according to Mumcuoglu and Miller [25] better hygiene is the key

to pediculosis control among well-off families. Our findings are more in agreement with Mumcuoglu and Miller, who found a strong correlation between lice infestation and the presence of bathing facilities in the home as well as the frequency of hair washing. This reinforces the importance of hair care (washing and brushing) and the frequency of hygiene practices in the prevention of lice infestation. Our findings showed that using shared articles including clothing (hats, scarves, veils), hair care items and accessories (combs, hair brushes, head ribbons) and sleep items (pillows and bed linen) increased the prevalence of head lice; this is in agreement with Heukelbach and Feldmeier [26].

Our study has some limitations. The schoolchildren that answered the questionnaires were enrolled in Grades 1 to 6: their young ages as well as the variation in their age might have resulted in some inaccuracies in their answers. This factor could not be controlled and reflected actual students' perception. In addition, resources were not available to come up with an educational intervention to change students' behaviour with respect to hair hygiene and personal hygiene; we were therefore not able to compare infestation rates before and after such an intervention. Some incidental education was done by the nurses after examination for the infested students.

This is the first community-based study of the prevalence of pediculosis in Mafraq Governorate, which shows a high prevalence of lice infestation which can be explained by the above-mentioned factors. Although educational campaigns by community health nurses and other health-care workers and teachers are expected to be helpful for head lice control, there remains the challenge of scarcity of resources and providers to carry out hair inspections and conduct awareness programmes within the Ministry of Health. Collaboration with the Ministry of Education as well as municipalities to share resources and implement these programmes to increase awareness and educate teachers, parents and the children themselves on the importance of good standards of personal hygiene could significantly reduce the prevalence of pediculosis in this area.

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