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Pediculosis capitis infestation in school children of a low socioeconomic area of the North Gaza Governorate

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Aim: *Pediculus capitis*, or human head lice, infests people worldwide, although it is most often seen in school-aged children. The aim of this study was to estimate the incidence and the epidemiological factors related to *Pediculus capitis* infestation among the selected population.

Materials and methods: A study conducted from January to March 2010 of 318 females and 282 males up to 13 years of age found a prevalence rate for *Pediculus capitis* infestation of 53 (16.8%) in the North Gaza Governorate. The study involved 600 children and used multistage, systematic random sampling.

Results: Male children had a lower rate of infestation (1.7%) than females (15.1%). Children aged 8-9 years were the most frequently affected and there was a significant relationship found between head lice infestation and sex, age, family size, hair length, parents' education, bathing facilities in the home, and frequency of hair-washing; these factors indicate that head lice infestation depends on socioeconomic status and hygienic practices in the home of the family. The severity of infestation was also studied in terms of several different variables. Associated clinical manifestations included impetigo (9.8%), alopecia (5%), fever (3.1%), and scalp pruritus (10.3%).

Conclusion: It is concluded that pediculosis constitutes a health problem among children in the North Gaza Governorate.

Key words: Epidemiology, *Pediculus capitis*, school children, risk factors, North Gaza Governorate

Introduction

Head lice infestation is a condition that has worldwide distribution and is seen in school-aged children in many countries (1). Although the group most at risk is generally those between 6 and 12 years of age, adults and older children who have familial contact with a child or primary school children are also susceptible to infection (2). It is widely accepted that the school environment aids in the spread of the infestation simply because it affords an opportunity for the continual close contact of children. However, the prevalence of infestation and the pattern of transmission are also largely influenced by the family size and the number of school-aged children in the family (3–5). The school environment makes children vulnerable to cross-transmission of communicable skin diseases, which can then be passed on to family members (6). In the United States, 6-12 million persons are infested every year with head lice (7), with an estimated US$100 million being spent annually on treatment (8). In the Middle East, as well, head lice infestation is a public health issue. In Abha, Saudi Arabia, an infestation rate of 19.8% was reported among school boys between 9 and 11 years of age (9). Other studies have indicated that 8% of Lebanese public school children have pediculosis (10), while 78% of school students in Libya are infested (11). In a high socioeconomic area in İzmir, Turkey, 4.2% of the studied population of secondary and elementary school children were infested with eggs and/or adult specimens of *Pediculus capitis* (12). In 2 other studies of Gaza, Palestine, that were

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carried out in the old city of Gaza and the rural village Jabalia, the overall infestation rates were 32.4% and 14.1%, respectively (13,14). The present study was undertaken with the objective of determining the prevalence and distribution of human pediculosis capitis among primary and secondary school children and identifying factors involved in the spread. Such studies help to provide relevant information and impetus for the planning of measures to address the most common infestation among school children and the promotion of health education messages.

Materials and methods

A total of 600 primary and secondary school children from 6 of the government-run schools located in the cities of Beit Lahia and Jabalia, North Gaza Strip, were examined for head lice and associated infections during the educational year of 2010-2011. Each of the children who were enrolled in the study was assigned to 1 of 4 age groups. These groups were divided as follows: 6-7 years of age, 8-9 years of age, 10-11 years of age, and those >12 years old. Infestation was determined by inspecting each child's head with the aid of a magnifying hand lens, if necessary; a student was considered infested if at least one adult, nymph, or egg was present. All of the pupils were examined generally and locally for head lice or nits according to the standard method of Morsy et al. (15).

Collected samples were prepared and mounted, then examined for identification according to the method of Kim and Ludwig (16). For each pupil, a questionnaire was completed during the interview containing data about his/her name, age, sex, family size, the level of education of his or her parents, the frequency of hair-washing, socioeconomic status, the sharing of combs and brushes, and any infestation among family members. All of the children were educated about prevention and control of this infestation. All those found to be infested were treated.

Statistical analysis

Analysis of the data was performed by computer using SPSS. Statistical analyses were performed by chi-square test with a significance cut-off value of 0.05.

Results

A total of 600 primary and secondary school students children from 6 of the government-run schools of North Gaza were interviewed and examined. Of these, 318 (53%) were females and 282 (47%) were males. Demographic data and the prevalence of infestation are shown in Tables 1-3. A total of 53 out of the 600 students (16.8%) were found to be infested with head lice. A significantly higher proportion of girls (20.42%) were found to be infested as compared to boys (1.7%) ($P < 0.0001$). Age group was significantly related to the prevalence of head lice, with girls aged 8-9 years constituting the highest infestation rate (20.5%) and boys aged 6-7 years demonstrating the lowest infestation rate (2.1%) (Table 1). During this study, no cases were observed in children 12 years of age or older. There was no significant difference between the infestation rates of the age groups of 6-7 and 8-9 years ($P < 0.01$). With regards to socioeconomic factors, infestation with head lice in children who were living in large families (>10 family members) was greater (30%) than among others, and the rate of infestation was also greater among

Table 1. The prevalence of *Pediculus capitis* infestation by age group and sex among school children of the North Gaza Governorate.

Age group (years)	Male			Female		
	No.	Infested	Prevalence %	No.	Infested	Prevalence %
6-7	97	2	2.1	134	23	17.1
8-9	89	3	3.4	102	21	20.5
10-11	53	-	-	62	4	6.4
>12	43	-	-	20	-	-
Total	**282**	**5**	**1.7**	**318**	**48**	**15.1**

students whose parents' education level was low. Students with short hair had a lower infestation rate (4.4%) compared to those with longer hair (15.4%).

In terms of hygiene practices, it was found that the infestation rate was greater among children who were living in families with poor socioeconomic conditions and who did not have separate facilities for bathing in their house. In addition, the prevalence of head lice infestation was associated with the frequency of using shampoo and the frequency of hair examination ($P < 0.05$). As the frequency of shampooing increased to using shampoo more than 3 times a week, the number of infested children decreased (2.5%) (Table 2).

Table 2. The effect of a number of variables on the prevalence of *Pediculus capitis* among school children of the North Gaza Governorate.

Variable	No. examined	%	Prevalence of infestation No.	%	P-value
Father's education					
Illiterate	80	13.3	20	25	
Primary	172	28.6	17	9.9	**>0.0001**
Secondary	280	46.6	16	5.7	
University	68	11.3	-	-	
Mother's education					
Illiterate	82	13.7	22	26.8	**>0.05**
Primary	168	28	17	10.1	
Secondary	273	45.5	14	5.1	
University	77	12.8	-	-	
Family size					
>5	340	56.6	20	5.9	**>0.0001**
5-10	220	36.6	21	9.5	
<10	40	6.6	12	30	
Hair length					
Short	360	60	16	4.4	**>0.05**
Long	240	40	37	15.7	
Bathing facilities in the house					
Yes	543	90.5	11	2.02	**>0.05**
No	57	9.5	42	73.6	
No. of hair washes per week					
1	320	53.3	37	11.5	**0.06**
2	210	35	13	6.2	
≥3	70	11.6	3	4.3	
Shampooing per week					
1	471	78.5	47	10.1	**>0.05**
2	89	14.8	5	5.6	
≥3	40	6.7	1	2.5	
Combing					
Using louse comb	121	20.2	8	6.6	**>0.05**
Not using louse comb	479	79.8	45	9.4	
Sharing items	532	87.0	49	9.4	
Not sharing items	77	12.8	4	5.2	

A correlation (9.4%) was also found between lice infestation and sharing items such as combs between children in the same family. It was found that 18.2% of the families used kerosene, 68.3% used louse combs, and 13.5% used pediculicides for the treatment of their children.

Table 3 shows other clinical manifestations possibly associated with *Pediculus capitis* infestations. Although alopecia was associated in 5% and fever in 3.1% of cases, these are considered nonspecific characters. Related clinical manifestations such as impetigo were represented (9.8%) and found to be statistically significant. Scalp pruritus was represented with a highly statistically significant difference (P = 0.0001). Based on chi-squared tests, the relationships between head lice infestation and all of the variables examined were statistically significant.

Discussion

Pediculosis capitis is the most prevalent condition in school- and preschool-aged groups throughout the world, especially in developing countries (17). The present study is the second one to address this important public health problem in the Gaza Strip. The rate of infestation of about 16.8% found in the current study compares favorably to rates reported among a similar population in the Gaza Strip (about 32.4%) (13). In a similar study of 1402 primary school pupils from the Sohag Governorate of Egypt, 16% were infected (18). The prevalence of infestation was reported at 9.4% in 785 primary school children in Turkey (19), whereas studies from Saudi Arabia reported an incidence of 12% (20) and those from Jordan found 13.4% infestation (21).

Overall, 13.4% of students were infected with nits or immature or adult lice in northern Jordan, and girls showed a higher prevalence than boys (21). In the present study, the prevalence of head lice in girls was also greater than in boys. This may be due to girls generally having longer hair as compared to boys, close head contact between girls, and the heightened grooming and combing requirements that accompany longer hair.

The influence of age on infestation rates was seen very prominently in this study, with pupils 10 years of age and older demonstrating the lowest rates of infestation compared to those who were younger. The low infestation rate in children 10 years of age and older observed in the present study may indicate that better personal hygiene practices, including the regular combing and washing of the hair, are probably the main reason for the low head lice infestation rate in this group in comparison with the other, younger groups, made up of students who may need help from their parents in combing and washing their hair. Morsy et al. (22) reported similar findings among primary school pupils in Cairo, where they found that younger pupils (6-8 years) had much higher rates of infestation than older ones. On the other hand, other investigators (23,24) did not find any significant influence of age upon the incidence of infestation.

In this study, a relationship was found between the rate of infestation and parents' education and socioeconomic and sanitary conditions. This is in agreement with the results of a number of previous studies (17,19). The impact of socioeconomic status and family size upon the infestation rate detected in this study agreed with other studies, indicating that large family size (more than 10 members) and low socioeconomic status significantly increased the rate of infestation (23,24). This may be because children in large families have a higher risk of being infested

Table 3. Clinical manifestations associated with pediculosis capitis.

Clinical manifestation	Total	%	No. of infected pupils	%	P-value
Impetigo	163	27.2	16	9.8	>0.01
Alopecia	20	3.3	1	5	<0.1
Fever	96	16	3	3.1	<0.1
Scalp pruritus	321	53.5	33	10.3	>0.001

by their siblings or because members of large families may pay less attention to hair care (25,26). To a significant degree ($P < 0.001$), a negative correlation was found between the frequency of hair washing and head lice infestation, which also agreed with other studies (23,27). A considerable correlation was found between infested children and shampooing the hair in addition to using a louse comb to examine the hair. The infestation rate in children using shared items was high (9.4%), as head lice may be transmitted by sharing infested items.

The associated clinical manifestation of scalp pruritus (10.3%) was found to be present to a statistically significant degree ($P > 0.0001$), and impetigo (9.8%) also occurred to a statistically significant degree ($P > 0.001$). Nada et al. (18) mentioned some of these associated clinical manifestations, such as scalp pruritus in 58.9%, alopecia in 22%, fever in 25.3%, and impetigo in 38%.

Improvements in socioeconomic and cultural conditions may reduce the prevalence of pediculosis capitis because these are factors that affect the rate of infestation. A lower prevalence can be achieved through health education programs for students and parents, particularly with regard to the importance of early detection and effective management strategies. These measures, along with curing infected students and possible cases within the family, will decrease the rate of infestation and lead to greatly improved control.

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