Head lice in Israeli children: Parents' answers to an epidemiological questionnaire

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Accepted for publication 4 May 1992.

ABSTRACT *Background:* The aim was to determine the influence of the socioeconomic status of the family and the hygienic practices in the home on the prevalence of head lice infestation in children.
Methods: The study was carried out by analyzing the answers to a standardized epidemiological questionnaire given to parents of school children aged 4–17 in Bet Shemesh, a medium-sized urban town 25 km from Jerusalem.
Results: Of 3,000 questionnaires distributed, 958 (31.9%) were completed and returned. The majority of the children (72.4%) had been previously infested with lice. Half of them had other family members, mainly brothers and sisters, who had been infested in the past with lice. In 97.5% of the families the mother was responsible for examining the children for lice, and for carrying out treatment when infestation was present. An association was found between presence of lice infestation and mother's education, age of child, and frequency of shampooing, combing, and examination for lice. There was no association between infestation rates and mother's country of origin, crowding in the home, and the sharing of combs, brushes, hats, scarves, towels, and clothes.
Conclusions: There is evidence that the incidence of lice infestation depends on the hygienic practices in the home rather than on the socioeconomic status of the family or sharing of personal articles among family members.
Keywords: Head lice, *Pediculus humanus capitis,* prevalence, socio-economic status, hygienic practices, questionnaire, Israel

INTRODUCTION

The number of cases of lice infestation in humans throughout the world is estimated at hundreds of millions (1). Infestation by head lice (*Pediculus humanus capitis*) has increased worldwide since the middle of the 1960s (2). About six million people were infested with lice in the US in 1975 (3).

Epidemiological studies in Israel have shown that from 1979 to 1981, 11–14% of children 6–13 years of age in Jerusalem were infested with lice (4). In Beer Sheva, in southern Israel, 32.6% of children 6–15 years of age were found to be infested with lice, and another 25%, with nits (5).

During an epidemiological study (6) of kindergarten and school

children carried out in Bet Shemesh, a medium-sized community near Jerusalem, children were examined for head lice infestation, and questionnaires were distributed to their parents.

The aim of this study was to examine the relationship between incidence of head lice infestation, the sociodemographic characteristics of the population, and the practices of parents in relation to washing and grooming of hair.

MATERIALS AND METHODS

Study population

The population consisted of the parents of children aged 4–17 who were being examined for head lice infestation at kindergartens and schools in Bet Shemesh. The population has been described in an earlier publication (6).

Questionnaire

A standardized questionnaire with 40 questions was sent to the parents of 3,000 children who were being examined for infestation with lice. In order not to influence the outcome of the answers, parents were permitted to return the questionnaires with complete anonymity. The questionnaire included questions on (a) number of previous lice infestations of children and family members, (b) mother's education, (c) crowding in the home (number of people per room), (d) washing and grooming habits of the children, and (e) sharing of combs, brushes, and clothing among family members.

Analysis of the data

Data were analyzed by the SPSS-PC program (McGraw-Hill, New York). Chi-square tests were used to compare the reported infestation rates of various groups of childern. Logistic regression analysis was used to study the association between selected independent variables and lice infestation (7).

RESULTS

Of 3,000 questionnaires distributed, 958 (31.9%) were completed and returned.

Most of the children (72.4%) had been previously infested with lice; 51.9%, 1–3 times; 12.9%, 4–6 times, and 7.6%, > 6 times. Half the children (48.9%) had another family member who had been previously infested with lice; brothers (40.7%) and sisters (67.5%) were the most often affected. The percentage of mothers who had been infested was 5.9% and of fathers, 1.8%.

In 97.5% of the families it was the mother who examined the children for lice and carried out treatment when an infestation was found.

Table 1

Percentage of children with lice infestation by mother's education

		Number of infestations		
		None	1–3	>3
Years of education	N	% infestation		
1–8	112	39.3	40.2	20.5
9–12	605	27.4	53.1	19.5
>12	191	22.0	53.9	24.1

$Chi^2 = 12.4$, d.f. = 4, $p < 0.01$.

Table 1 shows that there were significant differences in the percentage of non-infested children in relation to the mothers' education. The percentage of non-infested children *decreased* as the number of years of mother's schooling increased.

The number of children who had been infested during the period of several months prior to distribution of the questionnaire varied according to age of child (Table 2): more children in the age group 6–9 were infested than in other age groups. An association between the frequency of shampooing and the number of lice infestations was

Table 2

Percentage of children with lice infestation by age

Age	N	% Infestation
3–5	87	60
6–9	426	77
>9	284	67

$Chi^2 = 14.4$, d.f. = 2, $p < 0.001$.

Table 3

Percentage of children with lice infestation by frequency of shampooing

		Number of infestations			
Frequency of shampooing per week	N	None	1–3	4–6	>6
		% infestation			
1–2	350	20.6	54.9	16.0	8.5
3–4	363	29.2	51.0	12.9	6.9
5–7	201	36.3	47.8	8.5	7.5

$Chi^2 = 19.8$, d.f. = 6, $p < 0.01$.

found (Table 3): the percentage of non-infested children increased with increased frequency of shampooing. The percentage of children infested with lice was also associated with frequency of hair-combing with a lice comb (Table 4): those children whose hair was not combed at all had the lowest number of infestations. Table 5 shows that there is an association between frequency of examination for lice and the number of infestations: those children who were examined daily were less infested than those checked weekly or monthly.

In order to determine the unique contribution of variables related to hygiene to lice infestation, a logistic regression analysis was carried out including frequency of shampooing, combing, and examination of the hair. Odds ratios between lice infestation and each of the variables were calculated while controlling for all other variables in the analysis

Table 4

Percentage of children with lice infestation by frequency of hair combing with lice comb

Fequency of combing	N	Number of infestations: None	1–3	4–6	>6
		% infestation			
1–3 times a week	383	24.8	52.2	13.8	9.2
4–7 times a week	95	22.1	49.5	16.8	11.6
Twice a month	131	25.2	59.5	10.7	4.6
When lice present	208	18.3	62.0	13.0	6.7
No combing	93	67.7	24.7	4.3	3.3

$Chi^2 = 98.9$, d.f. = 12, $p < 0.001$.

Table 5

Percentage of children with lice infestation by frequency of examination for lice

Frequency of examination	N	Number of infestations: None	1–3	4–6	>6
		% infestation			
Every day	236	33.9	44.1	12.3	9.8
Once a week	497	23.1	54.5	13.9	8.4
Once a month	131	25.2	61.8	10.7	2.3
Never	27	59.3	29.6	7.4	3.7

$Chi^2 = 34.4$, d.f. = 9, $p < 0.0001$.

(Table 6). The frequencies of shampooing and of examination for lice were related to the number of lice infestations with odds ratios of 1.55 and 1.78, respectively. The odds ratio for the frequency of combing and lice infestation was 0.64, indicating that an increase in frequency of combing was associated with an increase in the number of lice infestations.

Table 6

Association of different variables with lice infestation by controlling the influence of other variables

Variable	Sequence	Odds ratio	C.I. (95%)	$p<$
Shampooing	> 3 times a week	1.78	1.3–2.5	0.001
	1–2 times a week	1		
Combing	1–7 times a week	0.64	0.5–0.9	0.01
	< than once a week	1		
Examination for lice	Every day	1.55	1.1–2.2	0.01
	< than once a day	1		

C.I. = confidence interval.

There was no association between infestation rate and the mother's country of origin, crowding in the home, and the sharing of combs, brushes, hats, scarves, towels, and clothes; therefore they were not included in the logistic analysis.

DISCUSSION

The data obtained from the Central Bureau of Statistics about the community was in agreement with that obtained from the questionnaires with regard to the mothers' origin and mothers' years of schooling and indicated that parents who participated in our study were (in these respects) a representative group of this society despite the low response rate. Due to the facts that head lice have been endemic in Israel since the early 1960s and that most of the people had contact with this parasite, we expect that the non-responding parents are not different from those who answered the questionnaire.

Approximately 74% of the children whose parents answered the questionnaires had been infested with lice at least once in the past. Half of the infested children had another member in the family — generally a brother or sister — who had also been infested. This is in agreement with the work of Juranek (8), who found that 59% of infested children in the USA had at least one other infested household member. In our study the percentage of parents who had been infested with lice was

very low.

In developed countries infestation with head lice is mainly a problem of children, although adults can also be infested. In developing countries the percentage of infested adults is much higer (9). Social contacts among children is the most important factor influencing the high infestation rate in this age group. Mothers, who usually have more contact with their children, are more frequently infested than fathers. In our study the ratio of infested mothers to fathers was 3:1. This may be related to the fact that in 97.5% of the families the mother was responsible for examining and treating the children for lice.

Our data showed that the percentage of non-infested children decreased as the number of years of the mother's schooling increased. Rollin in WWII (10) found that prevalence of head lice in the British Women's Auxiliary Air Force was greater among the less intelligent recruits. It is possible that in Israel educated mothers with few children have less time to regularly examine and treat their children for lice. Uneducated parents may be less willing to *admit* to the fact that their children have lice because of the possible stigma attached.

According to the parents, children 6–9 years old have the highest rate of infestation. This is in agreement with our parasitological survey of the same children which found that the prevalence of lice was highest among children 6–10 years old (6).

Frequent shampooing of the hair and frequent examination of the hair for lice were found to be important factors in the prevention of lice infestation. According to Maunder (11), lice prefer clean hair because dirt hinders them in their quest for blood. Despite this it appears that frequent shampooing and brushing of the hair and the use of a lice comb will efficiently eliminate the initial population of small numbers of lice which infest the hair.

In this study we found that the percentage of children infested with lice was inversely related to the frequency of combing hair with a lice comb. This could be explained by the fact that there was a group of 93 children who apparently had not been infested with lice and therefore there had not been a need to use a lice comb on them. This group significantly changed the results of the study. However lice combs are very effective tools in the diagnosis, prevention, and control of head lice infestation.

The mother's country of origin was not a significant factor in the frequency of infestation with lice. This may be explained by the fact that most mothers born overseas came to Israel as young children and were influenced by local customs.

Studies made in Israel and abroad (5,12) showed that crowding is an important factor contributing to the rate of lice infestation. We did not find such a correlation in our study and this is because the majority of the families in Bet Shemesh were young families mainly consisting of 3–5 members.

Using a standardized epidemiological questionnaire, Juranek (13) found that there was no significant association between infestation and sharing of combs, frequency of washing hair, use of an electric hair-dryer, wearing of hats to school, sharing of beds at home, and/or sharing of pillows and blankets with friends. This is partly in agreement with our results, where we did not find any association between infestation and the sharing of combs, brushes, hats, scarves, towels, and clothes. It is generally agreed that direct head-to-head contact is necessary for most lice transfer. The degree personal objects and bedding contribute to infestation is not clear, but we believe that the amount of direct head-to-head contact is the most important factor influencing head lice infestation (14).

ACKNOWLEDGMENTS

The study was supported by a grant (ISR/VBC/001) of WHO-Europe, the Nicholas Fund, and Teva Pharmaceuticals Ltd., Israel. We thank Mrs. Karla Pilpel, Chief-Nurse of Bet Shemesh, and all the district nurses who helped to organize and carry out this study. Ms. Michal Palmon provided the statistical analysis of the data.

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