

PEDICULOSIS CAPITIS: PREVALENCE AND ITS ASSOCIATED FACTORS IN PRIMARY SCHOOL CHILDREN LIVING IN RURAL AND URBAN AREAS IN KAYSERI, TURKEY

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SUMMARY

Objective: The aim of this study was to investigate the prevalence and risk factors of pediculosis capitis in schoolchildren living in rural and urban areas in Kayseri, a city located in central Anatolia in Turkey.

Methods: This cross-sectional school-based study was performed in 24 randomly selected public schools. A total of 8,122 schoolchildren aged 5–16 years, from kindergarten to eighth grade, were examined for the presence of pediculosis capitis. A child was defined as being infested by the presence of live or dead lice or eggs/nits. The results were analyzed using the chi-squared test and logistic regression analysis.

Results: The overall prevalence of head lice infestation was 13.1%. Pediculosis was more frequent in girls (25.2%) than in boys (0.86%) ($p < 0.001$). The prevalence was lower in children aged 5–8 years than in those aged 9–11 or 12–16 years ($p < 0.001$). In multiple regression analyses, the variables demonstrating statistically significant association with pediculosis were: being a girl (OR=40.93; 95% CI=29.06–57.66), being 9–11 years old (OR=1.54; 95% CI=1.25–1.89), residing with ≥ 3 siblings (OR=1.98; 95% CI=1.57–2.50), having a mother with no education (OR=1.73; 95% CI=1.29–2.33), having a father with no education (OR=1.45; 95% CI=1.08–1.94), living in a rural area (OR=2.34; 95% CI=2.02–2.71) and living in a one-room house (OR=2.39; 95% CI=1.41–4.08).

Conclusions: Pediculosis capitis remains a health problem in schoolchildren in Kayseri, Turkey. In addition to improvement in socioeconomic status, collaborative and participation efforts among physicians, nurses, teachers, and parents are necessary to maintain effective epidemiological surveillance and provide treatment.

Key words: pediculosis capitis, prevalence, schoolchildren, Turkey

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INTRODUCTION

The human head louse, *Pediculus humanus capitis*, is a common public health concern, especially in children. It is an obligate holometabolous ectoparasite that spends its complete life cycle in hair on a human head (1). Transmission occurs mainly by direct person-to-person contact or by instruments such as shared combs, pillows and hats. Climate, geography, ethnicity, and hygienic conditions play a role in spreading lice. Head lice are blood-sucking insects that can cause pruritus, excoriation, conjunctivitis, secondary bacterial infection, local post-therapeutic dermatitis, posterior neck adenopathy, unspecific generalized dermatitis, anaemia, and allergic reactions resulting in nasal obstruction and rhinorrhea. Head lice infestation may also lead to psychological distress and may disrupt learning performance in schoolchildren (1–5). In addition, the likelihood of outbreaks of pediculosis in schoolchildren is another concern (6). Therefore, it is essential to obtain epidemiological data from different regions to enable strategic planning for the control and prevention of pediculosis.

Pediculosis capitis is more prevalent in schoolchildren and the rate of head lice infestation shows a wide range (up to 80%)

among various countries worldwide (5). This study aimed to determine the prevalence and risk factors of pediculosis capitis in schoolchildren living in urban and rural areas of Kayseri, Turkey.

MATERIALS AND METHODS

This cross-sectional school-based epidemiological study was conducted in schoolchildren in Kayseri. Kayseri, a city with a total of 139,422 schoolchildren, is located in central Anatolia, which is a geographic and historical term defining the westernmost protrusion of Asia that forms the majority of the Republic of Turkey (Fig. 1). The climate in Kayseri is cold, snowy and wet in winter, but dry and hot in summer. Permission to conduct the study was obtained from the Governorship of Kayseri. This study was approved by the Erciyes University Ethics Committee in Kayseri. Children from 20 schools with kindergarten and four schools without kindergarten (15 urban and 9 rural schools) were evaluated. In Turkey, kindergarten is the first year of education in a primary or elementary school, similar to that in the US. Although not compulsory, parents usually enroll their children

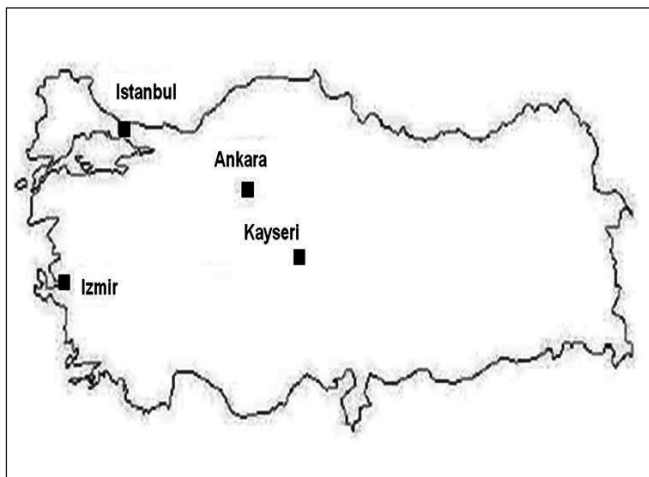


Fig. 1. The location of Kayseri in Turkey.

in kindergarten at five or six years of age by September 1 of the current school year. Using a simple randomized sampling method, a total of 8,122 schoolchildren from kindergarten to eighth grade (4,032 boys – 49.6%; and 4,090 girls – 50.4%), aged 5–16 years were examined for the presence of pediculosis capitis in 24 primary public schools located in rural and urban areas of Kayseri; 5,479 (67.5%) children from the center of Kayseri and 2,643 (32.5%) from rural districts of Kayseri. Each student was examined once for pediculosis by a physician. Hair, neck and areas behind the ears were examined for head lice and/or eggs/nits by full head visual examination using a magnifying lens and fine-toothed comb, if necessary, by separating hair every 3 cm in sufficient daylight for about 5 minutes. A child was defined as being infested by the presence of live or dead lice or eggs/nits (5). The number and position of nits in the scalp, presence of any trophic stages, hair features, and intensity of infestation were not recorded.

Children, teachers and parents were asked to complete a questionnaire to evaluate the influence of risk factors on the prevalence of pediculosis. We collected information regarding the sex and age of the child as well as socioeconomic factors including parents' educational status and occupational characteristics, number of siblings in the home, family income per month (in USD), frequency of bathing, use of cleansing material for hair washing, number of rooms in the house, and residing in an urban versus rural area.

Statistical analysis was conducted using the SPSS software package, version 15.0 (Chicago, IL). Categorical variables were defined as the number and percentage (%) and analyzed using the chi-square test. Multivariable logistic regression (LR) analysis was performed on variables having a significant effect on lice infestation using the Backward LR method. P values less than 0.05 were accepted to indicate statistical significance.

RESULTS

Head lice infestation was detected in 25.2% (1,031/4,090) of girls and 0.86% (35/4,032) of boys. This difference between boys and girls was statistically significant ($p < 0.05$). The prevalence of pediculosis was the lowest in children attending kindergarten (3.5%) and the highest in children attending eighth grade (17.8%). The infestation rate was significantly lower in the kindergarten,

first and second grade group ($p < 0.05$). The infestation rate in the 5–8 year-old group was lower than in the age groups from 9–11 and 12–16 years ($p < 0.05$). Infestation was diagnosed in 9.7% of children in urban schools and 20% of children in rural schools ($p < 0.05$). The prevalence of head lice infestation was higher in children with a lower family income, living in a house with one room, having parents with a low educational level, and living with three or more siblings ($p < 0.05$). The prevalence was 5.7% in children of employed mothers and 13.3% in children of housewives ($p < 0.05$). The prevalence of pediculosis capitis did not differ significantly with respect to fathers' occupation, frequency of bathing, and use of cleansing material for hair washing ($p > 0.05$). Overall, the prevalence of head lice infestation in 20 schools with kindergarten was not significantly different from that measured in four schools with no kindergarten. The socio-demographic characteristics and the prevalence of pediculosis capitis in this study population are shown in Table 1.

According to our multiple logistic regression analysis results, the variables demonstrating statistically significant associations with pediculosis capitis were sex, age, number of siblings, mother's and father's educational levels, the number of rooms in the home, and residence in a rural versus urban setting (Table 2). Pediculosis capitis in girls was found approximately 41-fold more frequently than in boys. Living in a rural district and being in the age groups of 9–11 and 12–16 years was associated with 2.3- and 1.5-fold greater risk of pediculosis capitis, respectively.

DISCUSSION

Pediculosis capitis has been documented since ancient times, and remains a common ectoparasite worldwide. Infestation rates differ according to geography, season, examination technique, reporting of active infestation or presence of nits, and potential introduction of effective pediculicides (7–9). This study reported the overall prevalence of 13.1% in the city of Kayseri, Turkey. Epidemiological studies performed in primary schoolchildren found that the prevalence of pediculosis capitis was 28.8% in England, 1.59% in Poland, 8.9% in Belgium, 15% in France, 9.39% in Spain, 78.6% in Libya, 55% in Israel, 8% in Lebanon, 26.6% in Jordan, 6.85% in Iran, 16.59% in India, 40% in Taiwan, 4.1% in Korea, 33.7% in Australia, 42.7% in Brazil, and 29.7% in Argentina (1, 4, 5, 7, 10–15). The prevalence of head lice in Turkey varied geographically: 9.5% in Eastern Turkey, 2.2% in Western Turkey, 6.8% in Southern Turkey, and 5.4% in Northern Turkey. In Turkey, the highest reported prevalence of pediculosis was 50.8% in girls and 9.8% in boys (4, 16–20). Two studies of pediculosis capitis screening in our region have been published. The first reported that the prevalence of infestation was 20.4% in girls and 2% in boys (21). The second reported an infestation rate of 16.4% in girls and 2.1% in boys (3). Compared to previous reports, we detected a slightly higher prevalence of pediculosis capitis in our region. This higher prevalence might be attributed to the fact that our study population consisted of children attending schools in both urban and rural areas, whereas study populations from urban or rural districts in previous reports were evaluated separately.

In this study, the prevalence of infestation in girls was about 41-fold higher than in boys. Because head-to-head contact is as

Table 1. Socio-demographic features of the study subjects and the prevalence of pediculosis capitis

Features		Total	Pediculosis capitis frequency		p
		n	n	%	
Sex	Boys	4,032	35	0.86	< 0.001
	Girls	4,090	1,031	25.2	
Age (year)	5–8	1,889	177	9.3	< 0.001
	9–11	3,325	444	13.3	
	12+	2,908	445	15.3	
Grade	Kindergarten–2	2,336	240	10.2	< 0.001
	3–5	3,018	411	13.6	
	6–8	2,768	415	14.9	
Number of siblings	1–2	2,376	173	7.2	< 0.001
	3–4	4,291	598	13.9	
	5+	1,455	295	20.2	
Mother's education level	No education	1,534	268	17.4	< 0.001
	Elementary	5,403	703	13.0	
	> Elementary	1,185	95	8.0	
Father's education level	No education	1,565	230	14.6	< 0.001
	Elementary	5,312	740	13.9	
	> Elementary	1,245	96	7.7	
Mother's occupation	Housewife	7,915	1,054	13.3	0.02
	Employed	207	12	5.7	
Father's occupation	Unemployed	2,059	342	16.6	< 0.001
	Employed	6,063	724	11.9	
Family income (per month for each family, in US dollars)	Poor (< \$300)	2,060	342	16.6	< 0.001
	Good (\$300–600)	5,437	672	12.3	
	Fine (> \$600)	625	52	8.3	
Cleansing material for hair washing	Soap	1,354	159	11.7	0.54
	Shampoo	4,104	574	13.9	
	Soap and shampoo	2,664	333	12.5	
Bathing per week	More than once	4,342	601	13.8	0.40
	Once or less	3,780	465	12.3	
Kindergarten included in school	Yes	6,789	882	12.9	0.42
	No	1,333	184	13.8	
Urban versus rural living area	Urban	5,479	536	9.7	< 0.001
	Rural	2,643	530	20.0	
Number of rooms	1	116	27	23.2	< 0.001
	2	979	174	17.7	
	3+	7,027	865	12.3	

important as passive transmission of pediculosis with shared objects like barrettes, combs and towels (3), this difference might be explained by differing behavioural characteristics, such as closer contact between girls than between boys. There are conflicting reports in the literature about the relationship between higher pediculosis rates and long hair in girls (2, 22). The predominance of long-haired girls may provide a reservoir for the survival and reproduction of lice. Unfortunately, we did not evaluate the influence of hair length on head lice prevalence. Skin factors or effects of hormones such as progesterone and prolactin may be

associated with this tendency (1, 7, 10, 11, 15). Low prevalence in boys could be explained by the hypothesis that short hair of boys impedes detection of an infestation (5, 9).

Children in the age group 6–12 years are at the highest risk for pediculosis capitis (12). A study from Jordan reported a higher infestation rate in younger children (<9 years) (5), whereas a survey from Greece showed that risk increased by 15% for every year of age (9). In accordance with Sultana et al. (9), in our study we found an increased prevalence of head lice with increasing age. This may be due to the greater role of parents in taking care

Table 2. Multivariable logistic regression analysis of the relationship between pediculosis capitis infestation and potential risk factors. Variables with insignificant multivariate OR values are not shown in Table 2.

Parameters (reference)		p value	OR	95% CI
Sex	Boy		1	
	Girl	< 0.001	40.93	29.06–57.66
Age	5–8		1	
	9–11	< 0.001	1.54	1.25–1.89
	12–16	< 0.001	1.54	1.25–1.90
Number of siblings	1–2		1	
	3–4	< 0.001	1.55	1.27–1.88
	5+	< 0.001	1.98	1.57–2.50
Mother's education	> Elementary		1	
	Elementary	0.073	1.26	0.98–1.62
	No education	< 0.001	1.73	1.29–2.33
Father's education	> Elementary		1	
	Elementary	0.002	1.48	1.15–1.89
	No education	0.015	1.45	1.08–1.94
Urban vs. rural living area	Urban		1	
	Rural	< 0.001	2.34	2.02–2.71
Number of rooms	3+		1	
	2	< 0.001	1.50	1.23–1.84
	1	0.001	2.39	1.41–4.08

of small children. Additionally, being independent from parents care, participating in closer relationships and more social activities with friends, and the lack of information about pediculosis transmission routes may facilitate infestation of older children.

In this study, low educational levels of parents, low family income, high number of siblings, low number of rooms in the house, and living in a rural district indicated low socioeconomic status. However, head lice infestation occurs in all socioeconomic classes. Studies from Poland, Belgium, and Jordan proposed that improvement in family income and health conditions lowered the prevalence of pediculosis (5, 13, 14). Statistically significant associations between parents' educational level, family income, residential status, and prevalence rate were demonstrated in a village in Turkey (23). One survey found an increased pediculosis prevalence in children of mothers with low educational levels (24). A report from Istanbul, Turkey, showed 20% prevalence in schoolchildren educated in a district in which most houses were in a slum with poorly developed infrastructure compared with 10.48% in children who were educated in a well-developed district (25). Similar to previous reports, our study demonstrated an inversely proportional relationship between head lice prevalence and socioeconomic conditions.

Our results showing an increased pediculosis prevalence in children with more siblings and low residential status – findings confirmed by the previous reports (23, 24). Having more siblings may cause higher infestation rates because parents have less time per a child to perform laundry and personal cleansing. Overcrowding facilitates transmission of pediculosis due to closer contact with siblings in fewer rooms in the house.

Although the pediculosis rate was higher in families of low socioeconomic status, which is closely related to poor hygiene, the

link between poor hygiene of the host and pediculosis is controversial. Better hygiene has been defined as an important component for prevention of pediculosis. A study from Jordan determined a significant association between more frequent hair washing and lower rate of infestation (5). Similarly, a higher pediculosis rate was detected in schoolchildren with a low frequency of bathing (4). On the other hand, another study detected no statistically significant association between head lice infestation and frequency of bathing (7). Some authors have claimed that personal hygiene is important, whereas others have not emphasized the importance of personal cleanliness in pediculosis capitis (5, 7, 26). We did not detect any significant associations among infestation rates and frequency of bathing and use of a cleansing material for hair washing.

Pediculosis was defined as an urban problem in Nigeria (27). However, higher rates of head lice infestation were detected in rural schools in Poland (13) as well as in our study. The lower prevalence in children living in urban areas is probably due to higher living standards. Climate conditions in Kayseri may be another reason. Winter is cold, snowy and icy in Kayseri and the accessibility of urban areas in this period for those living in rural areas is difficult. This may influence access to medical facilities that would allow timely treatment of infested children in urban areas compared to those in rural areas.

Many people in society consider pediculosis capitis as an uncomfortable condition rather than a clinical disease. Moreover, many families do not know how to recognize head lice infestation. Parents may not be aware of active pediculosis capitis infestation in 10% of girls and 23.3% of boys (11). This lack of awareness regarding the seriousness of pediculosis and the resistance to use of pediculosis capitis drugs has perpetuated this condition in school-aged children. Large-scale information campaigns and

more health screening programmes designed to reach the majority of children and families are necessary for effective control of pediculosis. Collaborative efforts among health staff, physicians, nurses, teachers, and parents are necessary to maintain effective epidemiological surveillance and provide the optimal treatment.

Conflict of Interest

None declared

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