

# Assessment of the Prevalence of Head Lice Infestation and Parents' Attitudes Towards Its Management: A School-based Epidemiological Study in İstanbul, Türkiye

*Baş Biti Enfestasyonu Prevalansının ve Ebeveynlerin Tedaviye İlişkin Tutumlarının Değerlendirilmesi: İstanbul'daki Bir Okulda Yürütülen Epidemiyolojik Bir Çalışma*

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## ABSTRACT

**Objective:** Head lice infestation (HLI), caused by *Pediculus humanus capitis*, is an important public health problem worldwide, especially in primary school children. The aim of this study is to investigate HLI level, related factors, and families' knowledge levels and attitudes about HLI in two primary schools in a relatively low socio-economic region in İstanbul.

**Methods:** A questionnaire on HLI was developed initially and delivered to all children and parents in the school. A total of 340 primary school students, aged between 6-12, were enrolled in the study after the consent of their parents. Their hair were examined for HLI with special combs at their schools, and free anti-lice shampoos were given to parents of positive children. A total of 951 completed questionnaires were received and evaluated with chi-square test using the SPSS® 17.0 program, and the differences of  $p < 0.05$  were considered significant.

**Results:** Number of boys in the study was slightly higher than the girls (176 vs. 164). HLI was detected in 32 (9.4%) of 340 children; seven had live adult lice on their hair while 25 had only the nits. HLI was obviously more common in girls (16.4%), compared to boys (2.8%). Analysis of 951 questionnaires revealed a statistically significant difference between HLI and infrequent bathing ( $p < 0.05$ ). The differences between HLI and the education levels of parents, income, the number of siblings and in contact with animals were not found to be significant ( $p > 0.05$ ).

**Conclusion:** HLI is still a common health problem, especially in girls in primary schools. Parents are aware of the relationship between the hygiene and prevention against HLI, but low socio-economic resources seem to be important determinants. Regular combing and training activities in primary schools, in coordination with the local authorities and parents are no doubt useful in reducing the incidence of HLI among the children.

**Keywords:** *Pediculus humanus capitis*, infestation, public health, primary school, questionnaire

## ÖZ

**Amaç:** *Pediculus humanus capitis*'in neden olduğu baş biti enfestasyonu (BBE), dünya çapında, özellikle ilköğretim çağı çocuklarında önemli bir halk sağlığı sorunudur. Bu çalışmanın amacı, İstanbul'da sosyo-ekonomik düzeyi düşük bir bölgeden iki ilköğretim okulunda BBE düzeyini, ilişkili etmenleri ve ailelerin BBE ile ilgili bilgi düzeyleriyle tutumlarını araştırmaktır.

**Yöntemler:** Çalışma öncesi çocuklar ve velilere yönelik bir anket formu oluşturulmuş okuldaki tüm çocukların velilerine ulaştırılmıştır. Çalışmaya katılması ailelerince onaylanan 6 ila 12 yaş arası toplam 340 ilkököl öğrencisi, okullarında özel taraklarla taranarak BBE yönünden incelenmiştir. Cevaplanmış 951 anketeye verilen cevaplar SPSS® 17.0 programı kullanılarak ki-kare testiyle değerlendirilmiş ve  $p < 0,05$  düzeyi farklar anlamlı kabul edilmiştir.

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**Bulgular:** Çalışmaya katılan erkek çocuk sayısı kızlardan biraz daha yüksekti (176'ya 164). Özel taraklarla yapılan incelemede, 340 çocuğun 32'sinde (%9,4) BBE saptandı; bunların 7'sinde erişkin bitler, 25'inde ise sadece yumurtalar tespit edildi. Kızlardaki BBE oranı erkeklerden çok daha yüksek bulundu (%16,4'e karşılık %2,8). Velilerce doldurulup gönderilen toplam 951 anketin analizinde, BBE ile anlamlı fark sadece, ters yönlü olarak, haftalık banyo sayısı arasında saptandı ( $p < 0,05$ ). Anne veya babanın eğitimi, gelir durumu, çocuk sayısı, hayvanlarla temas etme ile saç biti enfestasyonu arasında anlamlı bir fark bulunmadı ( $p > 0,05$ ).

**Sonuç:** BBE, özellikle ilköğretim çağındaki kız çocuklarında halen sık görülen bir sağlık sorunudur. Aileler BBE'nin önlenmesinde hijyenin rolünün farkındalar, ancak düşük sosyo-ekonomik kaynaklar bu konuda önemli birer belirleyici durumundadır. İlköğretim okullarında, yöneticiler ve ailelerle iş birliği yapılarak düzenli aralıklarla gerçekleştirilecek BBE kontrolleri ve eğitim çalışmaları şüphesiz çocuklarda BBE insidansını düşürmekte yararlı olacaktır.

**Anahtar Kelimeler:** *Pediculus humanus capitis*, enfestasyon, toplum sağlığı, ilköğretim, anket

## INTRODUCTION

*Pediculus humanus capitis* (*P. capitis*) is an obligate human ectoparasite which causes persistent and easily communicable infestations, particularly in school-aged children between 5 years and 13 years. *P. capitis* is one of the oldest human parasites, and is a worldwide public health problem that affects mostly the school-aged children. Lice infestation which dates back to 25 million years ago is still prevalent (1). The prevalence of head lice infestation (HLI) is associated with many factors such as the characteristics of the living conditions, socio-economic level, education level of the parents, and environmental conditions (2). This ectoparasite is most often transmitted between these hosts through direct "hair-to-hair" contact. *P. capitis* lives on the scalp surface, which supplies food, warmth, shelter and moisture to the arthropode (3). Papular itchy lesions can be observed on the feeding site, and may end up with excoriations on the skin. Secondary bacterial infections due to *Staphylococcus aureus* and *Streptococcus* spp. may occur on the skin lesions, as well. Local enlargement of cervical lymph nodes has been observed in some patients. Severe and chronic infestation may lead to anemia and alopecia (4). HLI may also be associated with life-threatening conditions, rarely; recently, severe iron deficiency anemia resulting from a massive infestation of head lice was reported as a secondary cause of death, after cardiac arrest in a 12-year-old patient (5).

Prevalences of head lice among primary school children in the world have been reported. Many studies have been carried out in different cities to determine the prevalence of *Pediculus humanus*

*capitis* in Türkiye. Previous studies indicated that it as a prevalent infection among school children in Türkiye, with infestation rates ranging between 0.3-34.1% (2).

*P. capitis* has long been described as an ectoparasite without any correlation with vectorship for infectious agents. However, many studies from different regions of the world were published in the last decade, indicating a firm association between the HLI and their vectorship of various bacteria, including *Borrelia recurrentis*, *Bartonella quintana*, *Yersinia pestis* and *Acinetobacter* spp. (6-10). These bacteria are associated with serious, life-threatening clinical cases; therefore prevention of individual cases and outbreaks, especially in primary schools, is essential against HLI (8).

Despite its potential threats to both individual and public health, HLI is unfortunately still not one of the leading concerns of the health authorities. In addition to its direct effects on the somatic health, HLI is associated with a serious social stigmatization and thus may cause psychological problems, especially in school children (11).

The number of studies on the diagnosis, prevention, transmission of head lice, compliance to treatment, related factors and difficulties should be increased and public health professionals should prioritize this issue. The aim of the present study is to investigate the prevalence of *Pediculus humanus capitis* infestation in two primary schools in İstanbul city centre (Figure 1) and assess parent's attitudes and previous experiences on HLI using a questionnaire.



**Figure 1.** Kadıköy and Sancaktepe districts where HLI research was conducted in İstanbul

HLI: Head lice infestation

## METHODS

Initially, official permission to conduct a school-based study was received from the Ministry of Health's İstanbul Asia Office, where the schools with high HLI were also chosen for the study. In addition, the study was reviewed and approved by the Ethics Board of Acibadem University (2014-1/2) as well. Information booklet and informed consent forms were given to all parents of primary school children over the teachers. School directorate and students were initially informed about the study content and purpose, and school visits were then scheduled in coordination with the school director. Free anti-lice shampoo were given to parents of all *P. capitis*-positive children for treatment, through the teachers after the study.

This study was carried out in two primary school with lower socio-economic status in Kadıköy and Sancaktepe districts (Figure 1). A total of 340 primary school children (164 girls and 176 boys) aged between 6-12 years in two different primary schools were given consent by their parents and enrolled in the study, and examined with specially-designed anti-lice combs for the nits, nymphs or adults of *P. capitis*. Combing was made in a standard fashion for all participants: Combing from the front head to neck three times. Girls were initially combed with regular combs to free their hair before combing with special combs. In addition, a questionnaire was developed for the present study, having questions on personal details of the children such as the age, gender, parents' education level, income of the household, the number of the children in the family and staying in the same room, the number of having bath per week, contact with animals and any previous experience on HLI and questions with "true/false" answers that measure the parents' knowledge and attitudes on HLI. This questionnaire was delivered to all parents of primary school children, on the first visit to school, over the teachers.

### Statistical Analysis

The answers of the parents to the questions in the questionnaire were evaluated by SPSS® 17.0, using chi-square test with a significance cut-off value of 0.05. Frequency distributions and percentages were used as descriptive statistics in summarizing the results.

## RESULTS

A total of 340 children with consents of their parents were enrolled in the study. HLI was detected in 32 (9.4%) of 340 children in the study, after the standard combing protocol. Among these, seven children had live adult lice on their hair while the remaining 25 had only the nits. Almost all girls had long hair, while all boys had short hair, and HLI rate was predominantly higher in girls, compared to boys (16.4% vs. 2.8%).

A total of 951 completed questionnaire forms were received from the parents. Evaluation of the answers revealed statistically non-significant differences between HLI and the parameters below: Education levels of parents; monthly income of the family, number of siblings and contact with animals (Table 1).

Analysis of the answers of the true/false questions in the questionnaire revealed that more than 70% of parents considered HLI in close relationship with poor personal hygiene, and another 70% approved washing the hair of their children with an anti-lice shampoo once a week as an effective prevention against HLI,

without considering the side effects of the shampoo. Indeed almost 9 of 100 parents reported burning oil/kerosene could be used in the treatment of HLI.

The only statistically significant difference identified in the study was as a negative correlation between HLI and the number of baths in a week ( $p=0.013$ ).

## DISCUSSION

This study is one of the biggest field studies on different aspects of HLI in İstanbul, which is one of the biggest cities of the world, with its 18 million population. It aimed to unveil not only the prevalence of HLI in two primary schools in neighborhoods with lower socio-economic status, but also the factors associated with HLI as well the parents' knowledge and attitudes against HLI.

The control of HLI is still a difficult problem due to the uncontrolled modes of transmission of the lice and the relative deficiency of the available treatments to all people with different socio-economic levels (12).

In Türkiye, HLI has been a common public health problem, especially among primary school children. Several studies have been conducted on school children in Türkiye, and the prevalence of HLI has varied within 5.4% and 30.4% in different provinces (13-15). Since girls have long and boys have short hair mostly, it is common to identify HLI predominantly more common among girls; indeed Kaya et al. (15) have found a statistically significant correlation between HLI incidence and gender ( $p=0.000$ ). This has been demonstrated in many other studies as well, where HLI in girls are within the range of 3.1 to 12.0% more common than boys, which is a significant difference ( $p<0.05$ ) (2,16-18). Therefore, treatment of HLI is more difficult and sometimes longer among girls. We found a rate of 9.4% of HLI in the present study, which is concordant with similar studies. Indeed, HLI was found to be almost six times more common among girls in our cohort, as well.

It is well-known that lower hygiene is closely associated with higher HLI levels in people. In a study conducted with primary school students from low ( $n=88$ ) and middle socio-economic status ( $n=126$ ), HLI was found to be five times more common among students from the lower status (17). Our study cohort is comprised predominantly of children from lower socio-economic level families (95.3%), which is also concordant with the findings of similar studies (19,20).

As *P. capitis* is transmitted easily with close contact, family members are at risk, mostly after the child is positive for HLI. In a study from Kocaeli, 414 primary school students and 267 family members were examined, and similar levels of HLI (14.3% and 13.0% for children and families, respectively) were identified. It was also reported that there was a statistically significant difference between HLI prevalence and the education level of the parents, family's proximity to healthcare services, and gender (19).

Parents' education level is a leading indicator that may affect the attitudes and knowledge of children for HLI. Knowing more about the risks of HLI will improve personal attitudes of children and parents, such as more cleaning of hands, hair and body of children; this will no doubt lower the infestation rates in classrooms and all neighborhood. In our study, a significant difference was identified between HLI and low body cleaning activities in children. To keep

**Table 1.** The results obtained from the answers of the parents to the questionnaire

Variable percentage	Did your child experience HLI before?			
	Number of parents	Yes	Percentage	p-value
<b>Father's education level</b>				
No graduate degree	10	1.1	3	30
Primary school	480	54.2	73	15.2
Secondary school	203	22.9	40	19.7
0.204				
High school	162	18.2	21	13
University	30	3.4	7	23.3
<b>Mother's education level</b>				
No graduate degree	25	2.9	3	12
Primary school	557	63.5	87	15.6
Secondary school	157	17.9	25	15.9
0.270				
High school	126	14.4	29	23
University	12	1.4	1	8.3
<b>Monthly income*</b>				
0-1000 TL	524	60	93	17.7
1000-3000 TL	308	35.3	49	15.9
3000-5000 TL	31	3.6	2	6.5
0.358				
5000+ TL	10	1.1	1	10
<b>Any contact with animals (pets, farm animals, etc.)</b>				
Yes	105	12.4	19	18.1
0.371				
No	739	87.6	109	
14.7				
* HLI: Head lice infestation, The monthly income can be read in today's rates as follows: 0-4.250 TL 4.250-7.000 TL 7.000-10.000 TL >10.000 TL				

HLI under control and with lower infestation rates, providing more information to parents and children about more hygienic life style seems to be essential.

In a study from Saudi Arabia, both the prevalence of *P. capitis* and daily hygienic practices of individuals were investigated on the demographic data of 750 participants. Women/girls constituted almost 95% of all participants, which was a remarkable data of the study. A lack of knowledge about HLI was noted especially among participants with no school graduations raised from their socio-economic levels (p-value =0.001). Lice infestation reached higher rates in children aged less than 20 years with itching of the hair scalp. According to the results of the study, every 6 of 10 participants (59.3%) described improvement of personal hygiene and frequent bathing were the best methods to prevent HLI. On the other hand, only 14.3% of participants preferred anti-lice agents for treatment (p-value =0.020), which was an interesting finding (21). In our study, no parents of HLI-positive

children rejected our free anti-lice shampoo; however, almost 9% of the participants reported burning oil/kerosene, which was a hazardous agent for human health, as a treatment choice against HLI.

## CONCLUSION

The results of the present study highlighted many aspects of the HLI problem among school children in İstanbul. Almost every one of 10 children was found to be positive for *P. capitis*, and girls were found to be more vulnerable to HLI, as expected, probably due to their longer hair than the boys. Effective control of HLI requires interdisciplinary approach to the current problem, involving the children, school directorates, teachers and parents, as well. Regular combing of the hair of primary school children with special combs and improvement of personal hygiene are the leading measures to lower HLI rates in public.

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### \* Ethics

**Ethics Committee Approval:** In addition, the study was reviewed and approved by the Ethics Board of Acibadem University (2014-1/2) as well.

**Informed Consent:** Information booklet and informed consent forms were given to all parents of primary school children over the teachers.

**Peer-review:** Internally peer-reviewed.

### \* Authorship Contributions

Concept: Ö.Ö., Ö.K., Design: Ö.Ö., Ö.K., Data Collection or Processing: İ.T., H.E.A., D.Ş., B.G., Ö.K., Analysis or Interpretation: İ.T., H.E.A., D.Ş., B.G., Ö.K., Literature Search: Ö.Ö., İ.T., H.E.A., D.Ş., B.G., Ö.K., Writing: Ö.Ö., İ.T., H.E.A., D.Ş., B.G., Ö.K.

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