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**Original Article**

**A six-year descriptive-analytical study of Pediculosis Capitis in the Southwestern Iran**

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## ABSTRACT

**Objectives:** This study aimed to determine the prevalence of head pediculosis among school children in urban and rural areas of Eastern Ahvaz, southwestern Iran, from 2008 to 2013.

**Design:** Descriptive-analytical study

**Setting:** School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

**Subjects:** A total of 5730 pupils from elementary, middle and high schools were randomly selected by multistep method.

**Intervention:** Data was collected through school screening programs by trained persons using a questionnaire that included the information on the diagnostic result of head lice. The screening method was by inspection. The results and demographic data were analyzed by SPSS software.

**Main outcome measure:** We considered the following demographic and epidemiological parameters: age, gender, educational level, history of infestation, season and geographical area.

**Results:** The infestation of head lice was 5730 cases. Of those affected with pediculosis, 75.6% lived in villages and 24.4% were rural residents. Most of the patients were found in the autumn (60%). Overall, 79.6% of students with pediculosis studied in primary schools, and 17.9% of those infested with pediculosis had a previous history of this infestation. The prevalence of pediculosis was higher in girls than in boys (97.2% vs.2.8%, respectively).

**Conclusion:** Our results on the higher prevalence of head pediculosis in females than in males are in line with many previous researches. Meanwhile, the rate of infested children was different according to the age groups; these differences might be associated with behavioral variations in different genders and age groups.

**KEY WORDS:** epidemiology, head lice, Iran, prevalence

## INTRODUCTION

Lice are wingless arthropods that feed on human blood and can infest head, body and pubic hair. Nits are white hard oval lice eggs that attach to the hair shaft at a 1 - 1.15 cm distance from the scalp and hatch within 8 - 10 days after they are laid<sup>[1]</sup>. Head lice infestation is known as *Pediculus capitis* and is considered a highly contagious condition<sup>[2]</sup>.

Today, due to improved living standards, especially in wealthy communities, body lice infestation has become less common; however, head lice infestation cases are still being reported in almost all parts of the world. Despite their widespread occurrence throughout the world, head lice are often reported in temperate regions and can cause annoyance to humans, which is comparable to that caused by mosquitoes in tropical regions<sup>[3]</sup>.

Head lice can spread by direct contact with the hair of an infected person and sharing of personal items, such as hats, combs, scarves, underclothes, towels, and even mobile phones. Yet, head-to-head contact with someone already infested is the most common way to get head lice<sup>[4]</sup>. Head lice infestation is more prevalent in poorer areas with high population density, where there is lack of personal hygiene and health facilities<sup>[5, 6]</sup>. Previous studies showed that head lice infestation is more prevalent in rural areas than in urban ones<sup>[7]</sup>. During the day, lice suck the hosts' blood several times and with each bite inject their

salivary proteins into their bodies. Their bites can cause allergic reactions, fatigue, insomnia, skin lesions, discomfort and irritation in victims. In some cases, acute allergic reactions such as intense itching occur after several consequent lice salivary protein injections<sup>[8]</sup>.

In developed countries, the prevalence rate of head lice infestation among elementary school children is estimated to be 2 - 10 percent. In the United States, 6 - 12 million people are diagnosed with lice infestation each year, resulting in \$367 million being annually spent on lice infestation control and treatment programs<sup>[9]</sup>. According to the findings of a study conducted in France, 17% of pupils were infested with head lice<sup>[10]</sup>. Head lice infestation is prevalent in all parts of the world, including Iran. It is especially more prevalent in poor areas with high population density and lack of personal hygiene and has a relatively high prevalence rate in rural areas, especially among children<sup>[11]</sup>. In some parts of Iran, head lice infestation prevalence rate is reported to be 6 – 30%<sup>[12]</sup>. Unfortunately, different factors, including excessive population growth, urbanization, the villagers' migration to the cities, marginality and establishment of satellite towns with minimum health and welfare facilities have contributed to the emergence and prevalence of head lice infestation and other communicable diseases in such areas<sup>[11]</sup>. Given its hot and arid climate and high population density, Ahvaz County (southwestern Iran) is considered a favorable environment for lice population growth. The present study aimed at estimating the prevalence rate of head lice infestation among school students in the eastern area of Ahvaz, identifying some of the risk factors along their role and impact probability, and providing health officials with appropriate plans and solutions to control this health problem in this region.

## **SUBJECTS AND METHODS**

Ahvaz is a county with a hot and arid climate located at the center of Khuzestan Province. The statistical population of this descriptive study consisted of all pupils going to schools located in eastern Ahvaz. These school students were examined for lice infestation between 2008 and 2013. Upon obtaining the required authorizations and coordinating with the Health Office at Ahvaz Department of Education and Ahvaz Health Network, all the students with suspected head lice infestation were examined and identified. The process was done with the help of school health educators. Accordingly, standard questionnaires were used to record some demographic and epidemiologic characteristics of students diagnosed with lice infestation. Data such as grade level, gender, place of residence, etc. were collected and each student diagnosed with lice infestation was separately interviewed. In all suspected cases of infestation, head hair on the back of the neck and around the ears was examined with a hand lens and a fine-tooth comb for 2 - 3 minutes, looking for live lice and nits. It should be noted that diagnosis of active lice infestation was based on the available standard (Texas Guide to School Health Services) and confirmed upon finding the parasite at any of its developmental stages or the egg at a 1/4 inch distance from the scalp. In addition, inactive head lice infestation was confirmed in cases where lice eggs were found at intervals more than 1/4 inch from the scalp and no lice were observed even after combing the hair. Informed consent was obtained from the respondents. They were made to understand that participation is voluntary and there was no consequence for non-participation. The college research review committee revised the paper according to the rule and regulation. Accordingly, the study was approved by the Ethics Committees of Ahvaz

Jundishapur University of Medical Sciences. Eastern Ahvaz Health Services Center and the Educational office administrative authorities at district level were informed about the study and their consent was obtained with the letter. All information obtained was kept confidential. The descriptive statistics, including frequency distribution and percentage were used to analyse the data. The analysis was performed using SPSS version 18. For all the analyses, a p-value of less than 0.05 was taken as significant.

## RESULTS

The present study was aimed at epidemiologically investigating head lice infestation among students going to schools located in eastern Ahvaz. Accordingly, students diagnosed with head lice infestation were studied based on different parameters, including gender, place of residence, grade level, *etc.* The present study was conducted on a total of 4,62,431 students studying at different grade levels in schools located in eastern Ahvaz from 2008 academic year to 2013 academic year. From among these students, 5730 (1.2%) were definitely diagnosed with head lice infestation. During the aforementioned period, the frequency of head lice infestation had an increasing and decreasing trend. In other words, in the first academic year (2008-2009), 562 (0.6%) students were diagnosed with head lice infestation, while, in the second, third, fourth and fifth academic years, the number was 751 (1.2%), 663 (0.9%), 493 (0.6%) and 1600 (1.8%), respectively. In the final academic year, the number of students diagnosed with head lice infestation was as reported 1661 (2.5%, Figure 1).

According to the results concerning the gender variable, from among the 3,03,197 female students, 5570 were diagnosed with Pediculosis, while out of 1,59,234 male students, 160 were diagnosed with the same condition. Thus, from among the 5730 infested students, 5570 were female and 160 were male. In other words, the frequency was 97.3% among female students and 2.7% among male students. The statistical analysis showed that the frequency of head lice infestation was significantly different in the two gender groups in the aforementioned period. During all the academic years, the prevalence of head lice infestation was significantly higher in female students than in their male counterparts (Table 1).

In order to investigate the effect of place of residence on head lice infestation prevalence, the students were categorized based on their place of residence. From among the examined students, 3,72,019 students lived in urban areas, 4334 of which were diagnosed with head lice infestation. Thus, the prevalence rate of head lice infestation in urban areas was 1.2%. From the remaining 90,412 students who were rural residents, 1396 subjects were diagnosed with the same condition, indicating a prevalence rate of 1.5%. Thus, out of 5730 diagnosed cases, 75.6% lived in the urban areas and 24.4% were rural residents (Table 1).

In order to study the relationship between grade level and head lice infestation prevalence, students were categorized into three groups, namely, elementary school students, junior high school students, and senior high school students. According to Table 1, the overall head lice infestation prevalence rate among elementary students, junior high school students, and senior high school students was 1.8%, 0.6%, and 0.5%, respectively. From among 5730 students diagnosed with head lice infestation, 79.6% (4561) were elementary students, 11.9% (683) went to junior high school, and 8.5% (486) attended senior high school.

The prevalence rate of head lice infestation was highest in autumn months. Seasonal distribution of head lice infestation prevalence showed that 3437 (60%), 2198 (38.3%), and 95 (1.7%) cases were reported in autumn, winter, and spring, respectively (Table 2).

From among the patients diagnosed with head lice infestation, 4702 (82.1%) cases did not have any previous history of head lice infestation, while 1028 (17.9%) had a previous history of the condition (Table 2).

## DISCUSSION

Head lice are ectoparasites that can infest anyone regardless of age, gender and socioeconomic status. Schools are one of the main environments where head lice infestation is prevalent. During the 6 academic years in question, the frequency of head lice infestation among students going to schools located in eastern Ahvaz had an increasing and decreasing trend. The average head lice infestation prevalence rate among these students was estimated as 1.23%. According to a similar study by Modarresi, the prevalence rate of head lice infestation among school students in the city of Tonekabon (Mazandaran Province) was 5.74%<sup>[13]</sup>. In other studies conducted in elementary schools in the cities of Zabol (Sistan - Baluchestan Province), Sanandaj (Kurdistan Province), and Aran va Bidgol (Isfahan Province), the prevalence rate of head lice infestation was reported as 29.4%<sup>[14]</sup>, 7.7%<sup>[15]</sup> and 0.47%<sup>[16]</sup>, respectively. Several epidemiologic studies conducted at schools in different countries showed that the prevalence rate of head lice infestation in France, South Korea, Australia, Spain, Taiwan, Libya, Lebanon, Northern Jordan, UK, Tanzania and China were 15%, 37.2%, 33.7%, 3.39%, 40%, 87.6%, 8%, 13.4%, 28.3%, 5.3% and 12.8%, respectively<sup>[17-26]</sup>. Head lice infestation is more prevalent among people belonging to social classes with lower economic and cultural resources and less access to health facilities. The high prevalence rate of infestation in some regions might also be attributed to factors such as harsh geographic and climatic conditions. For instance, it has been shown that head lice infestation is more prevalent in tropical regions<sup>[12]</sup>.

As head lice infestation is mainly spread by direct contact, children can get infested while playing with each other (due to frequent head-to-head contact) or sharing personal items, such as scarves, combs, and hats. At the same time, seemingly, the higher prevalence of infestation among female students might be attributed to the behaviors more common among female students which result in longer close physical contact between them<sup>[12]</sup>. In this study, the prevalence of head lice infestation was higher in female students than in boys. Other studies conducted in Iran revealed that the prevalence rate of head lice infestation among elementary students in Shahr-e Qods County (Tehran Province) and Abadeh County (Fars Province) were 2.3% and 0.06%, respectively. In Shahr-e Qods, the infestation prevalence rate among female and male students was 3.3% and 1.3% respectively<sup>[27]</sup>. In Abadeh, although prevalence rate among female students was 0.12%, none of the male students were diagnosed with the condition<sup>[28]</sup>. In Shemiranat County (Tehran Province), head lice infestation was reported to be more prevalent among female students than among their male counterparts<sup>[29]</sup>. In Qazvin County (Qazvin Province), head lice infestation prevalence rate among elementary students was estimated as 1.1% and reported higher among female students<sup>[30]</sup>.

Head lice infestation was more prevalent in autumn. Late autumn weather conditions characterized by regular heavy rainfalls create a fertile ground for the growth and development of several insects including lice. This will significantly contribute to the widespread and intensified prevalence of the infestation within the population. Moreover, in humid and relatively cold weather conditions, most people wear warm cloths and prefer to remain indoors. This is particularly true for school students as they leave their warm clothes on benches or coat racks which will eventually spread the infestation. Thus, given the previously mentioned points and the favorable conditions for both direct and indirect (through clothes and beddings) head lice transmission, high head lice infestation prevalence rate among students and their families can be attributed to students' tendency to leave and stack unwanted clothes on benches, coat racks or swimming pool lockers in schools and to share personal items with family members.

There was also a significant relationship between the current head lice infestation and any previous history of the same infestation. Lice eggs might have remained in the victim's hair from some previous infestation or some family members or acquaintances might have acted as the infestation source needing mass treatment. Additionally, some unhealthy behaviors leading to the previous infestation might still be present and have caused re-infestation. These behaviors could belong to the victims themselves or their family members or acquaintances. This finding confirmed the results of two separate studies conducted by Rafinejad and Farzinnia in Amlash County (Gilan Province) and Qom County (Qom Province), respectively<sup>[3,31]</sup>.

## **CONCLUSION**

Given the significant role of school health educators in increasing students' awareness and performing regular examinations on them, it is recommended that appropriate measures be taken to supply schools with health educators. In cases where there is no possibility of supplying schools with health educators, in-service training programs can be organized for schoolteachers so that they are able to diagnose the infestation in students and proceed with timely treatment measures in order to prevent the spread of infestation. Regular hair-combing as well as hair-washing with warm water and soap reduces the number of nymphs and adult lice infesting the hair. However, these measures are not helpful in eliminating head lice eggs attached to the hair shafts. Thus, metal or plastic fine-tooth combs should be used to remove both lice and nits attached to the hair shafts. Additionally, school health educators should be equipped with louse detector combs. Raising public awareness is another effective measure in preventing head lice infestation in different communities. As a result, by educating students on personal hygiene, school health educators can play a significant role in fighting this highly contagious health problem.

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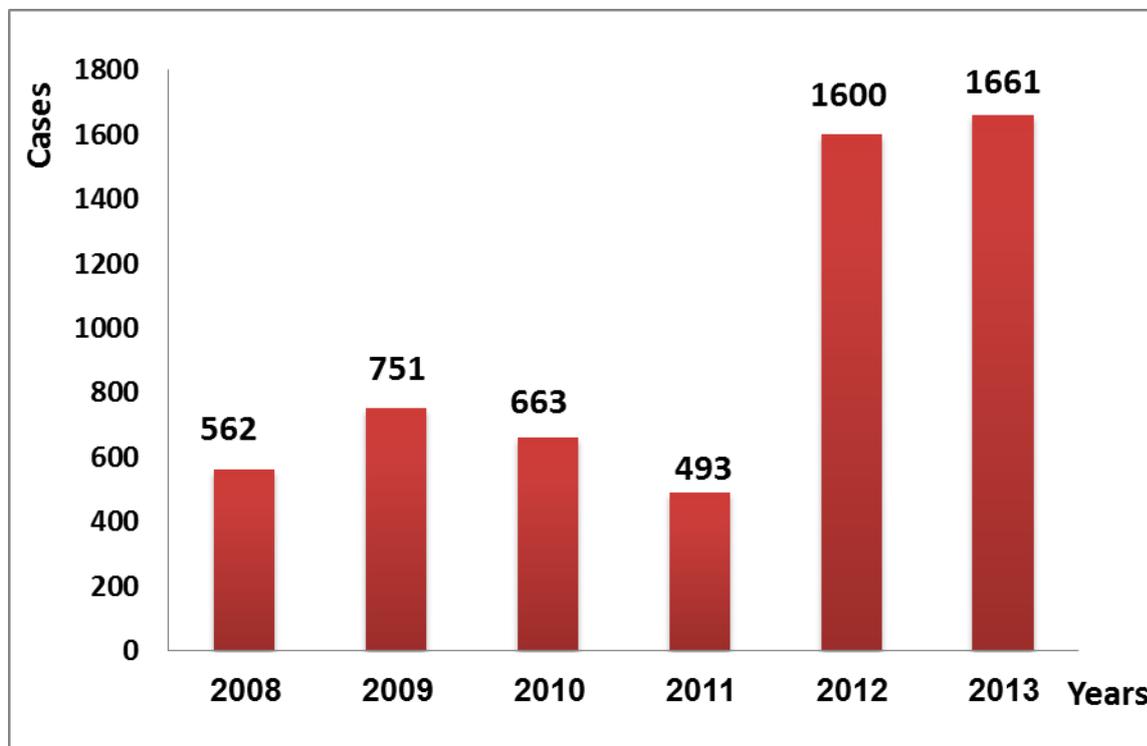
**Conflict of interest statement:** The authors report no conflict of interest.

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**Figure 1:** Frequency distribution of head lice infestation by year in the eastern area of Ahvaz, Southwestern Iran (2008-2013)

**Table 1:** Frequency distribution of head lice infestation in school pupils by sex, geographical area and educational level in the eastern area of Ahvaz, Southwestern Iran (2008-2013)

Year	Sex		Geographical area		Educational level			
	Infested /Examined No. (%)	Male Infested /Examined No. (%)	Female Infested /Examined No. (%)	Rural Infested /Examined No. (%)	Urban Infested /Examined No. (%)	Primary Infested/ Examined No. (%)	Middle Infested/ Examined No. (%)	High Infested/ Examined No. (%)
2008	562/88200 (0.6)	19/31765 (0.1)	543/56435 (0.9)	152/21098 (0.7)	410/67102 (0.6)	504/41392 1.2)	41/26244 (0.2)	17/20564 (0.1)
2009	751/63618 (1.2)	21/20351 (0.1)	730/43267 (1.7)	201/9387 (2.1)	550/542312 (1.0)	621/30762 2.0)	68/19865 (0.3)	62/12991 (0.5)
2010	663/74921 (0.9)	3/30316 (0.01)	660/44785 (1.5)	73/15423 (0.5)	590/59498 (0.9)	528/35721 (1.5)	73/20357 (0.4)	62/18843 (0.3)
2011	493/78546 (0.6)	33/34720 (0.1)	460/43826 (1.1)	413/17872 (2.3)	80/60674 (0.1)	172/40726 (0.4)	212/21938 (1.0)	109/15882 (0.7)
2012	1600/90439 (1.8)	47/24876 (0.2)	1553/65563 (2.4)	480/24072 (2.0)	1120/66367 (1.7)	1368/63133 (2.1)	167/16039 (1.0)	65/11267 (0.6)
2013	1661/66707 (2.5)	37/17368 (0.2)	1624/49321 3.3)	77/2560 (3.0)	1584/64117 (2.5)	1368/41174 (3.3)	122/12005 (1.0)	171/13528 (1.3)
Total	5730/462431 (1.2)	160/159234 (0.1)	5570/303197 (1.8)	1396/90412 (1.5)	4334/372019 (1.2)	4561/252908 (1.8)	683/116448 (0.6)	486/93075 (0.5)

**Table 2:** Frequency distribution of head lice infestation in school pupils by infestation history and season in the eastern area of Ahvaz, Southwestern Iran (2008-2013)

Year	Infestation History		Seasons		
	Yes No. (%)	No No. (%)	Spring Infested/Examined No. (%)	Autumn Infested/Examined No. (%)	Winter Infested/Examined No. (%)
2008	62 (11.0)	500 (89.0)	8/987 (0.8)	362/43785 (0.8)	192/40428 (0.5)
2009	101 (13.4)	650 (86.6)	5/1020 (0.5)	443/31792 (1.4)	303/30806 (1.0)
2010	70 (9.7)	651(90.3)	10/1090 (0.9)	332/52095 (0.6)	321/19736 (1.6)
2011	210 (20.7)	806 (79.3)	19/4712 (0.4)	531/41860 (1.3)	424/28974 (1.5)
2012	305 (23.1)	1014 (76.9)	19/4712 (0.4)	724/45765 (1.6)	576/42439 (1.4)
2013	280 (20.6)	1081(79.4)	34/9571 (0.4)	1045/39939 (2.6)	382/22720 (1.7)
Total	1028 (17.9)	4702 (82.1)	95/22092 (0.4)	3437/255236 (1.3)	2198/185103 (1.2)