



## Head Lice Infestation According to Demographic-Social factors and Its Prevalence in Southwestern Iran: A Descriptive-Analytical Study

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### ABSTRACT

Head lice infestation affects millions of humans each year, particularly children of 5-14 years of entire socioeconomic categories. *Pediculus capitis* especially infest persons with poor hygiene, and it is an important challenge among the vagabond people and in refugee camping sites. The research was designed with the following aims. (a) to study the overall prevalence of pediculosis in people; (b) to study the relationship between age and pediculosis in humans; (c) to study the relationship between sex and pediculosis in humans; (d) to study the relationship between season and pediculosis in humans; (e) to study the relationship between place of residence and pediculosis in humans. The present study was conducted in order to determine the epidemiology of *Pediculus capitis* from 2008 to 2013 in eastern areas of Ahvaz County, southwestern Iran. The gathered head lice were transferred into glass bottles containing 70% alcohol. The hair and scalp of each person was examined for lice or nits by a trained examiner under the supervision of the principal investigator. The age, place of residence, month, sex, history on infestation of the host were recorded. The analysis was performed using SPSS version 18. A total of 5446 infected cases were detected, that 72.1% of them resided in urban areas. The prevalence of head lice was highest (41.2%) in age group of 6-10 years and lowest (6.9%) in age group of less than six years. The majority of cases (49.7%) were detected in winter. Statistically significant relationships were found between head lice infestation, and factors such as residency status, season, and age groups ( $P < 0.05$ ). The prevalence of infestation was significantly higher in girls (94.4%) than in boys 5.6 % ( $P < 0.05$ ). We found a high prevalence rate of head lice infestation in this study. Gender, age group, season and a history of contact with an infected person were the main modifiable risk factors.

**Keywords:** Head Lice, Epidemiology, Prevalence, Iran.

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### INTRODUCTION

Over the last three decades there has been increasing global concern over the public health impacts attributed to environmental pollution, in particular the global burden of disease [1]. And, public health is of particular importance in any society, so that the progress of communities depends on the general health of its people. Insect infestation, especially with external parasites, is one of the most common threats to public health, and despite improvement in health

and medical sciences, it is still a health problem [2, 3]. Lice are external and permanent parasites of blood animals [4], and Lice infestation, especially among elementary school students and their families, is a problem in major cities with poor marginalized areas and very few health facilities. 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 are comparable to that caused by mosquitos in tropical regions [5].

In people with pediculosis, direct effects of lice bite appear as host stimulation, sensitivity, fatigue, pessimism and laziness due to the injection of salivary protein into the host skin. Repeated injection of louse saliva may cause acute allergic reactions such as severe itching. Inhalation of louse fecal dust may result in hay fever-like symptoms. Various diseases can be transmitted by lice to humans, including epidemic relapsing fever, epidemic typhus, and trench fever. Secondary infestation may also occur due to scratching the bite, which results in skin inflammation, impetigo, and other similar conditions [6].

Detection of lice eggs (nits) on head hair is not difficult; fresher eggs are located one and a half centimeters away from the scalp, while older eggs are located far away from the scalp [7]. It is transmitted through two major mechanisms of direct contact from one host to another, or through objects. However, the main way of transferring head lice is through head to head contact [8-10].

The psychological complications of lice infestation outnumber its health aspects, and labeling such people has negative effects on their ability to carry out their livelihood activities. Infestation causes disgust, feelings of hatred, fatigue, pain, anger, fear, disbelief and mockery [11]. Children are more likely to get head lice than adults, and women due to their long and massive head hair than men. Head lice infestation can be seen in the age group of 6-11 years [12]. There is also an increase in the prevalence of head lice infestation among the age group of 24-36 years. Teachers, parents, relatives and nurses of children who have come into contact with infected 5-11 year-old children are more prone to head lice infestation [13].

Khuzestan Province (southwestern Iran) has a good environment for lice population due to its warm and humid climate and high population density. Since lice infestation is a good indication of failure to observe the minimum personal and social hygiene, determination of lice infestation and its prevalence can be a good health index in the area under investigation. Head lice infestation and its relationship with environmental factors can be determined through epidemiological studies. In this study, the prevalence of head lice infestation in people

visiting the rural and urban health centers in the eastern Ahvaz from 2008 to 2013 was determined. In addition, some factors associated with infestation were identified. Finally, some appropriate programs and strategies were suggested to the health authorities to control this health problem in the county.

## MATERIALS AND METHODS

Ahvaz is a county with a hot and arid climate located at the center of Khuzestan Province. Informed consent was obtained from the respondents. They were made to understand that participation is voluntary and there was no consequence for non-participation. All information obtained was kept confidential. 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 administrative authorities at district level were informed about the study and their consent was obtained with the letter.

In the present study, all people suspected of having head lice infestation who visited the urban and rural health centers in the east of Ahvaz County, were investigated from 2008 to 2013. 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. After confirming the diagnosis by health personnel, 5446 people were identified as infected with head lice. A demographic questionnaire was used in this research to collect data affecting head lice infestation. The questionnaire included questions about month, season, gender, place of residence (urban and rural), history of infestation and age group. In addition, the means used for detecting and confirming head lice infestation included white alcohol, flashlight, disposable gloves, slide, cover slip, insect pin, fine-tooth comb, hand lens, white paper and oral mask. The head lice were washed with distilled water to remove the fixative and then placed in 10% KOH to make the parasites transparent. The lice were washed with distilled water in order to remove the alkali. The specimens were dehydrated by placing in 30%, 50%, 70%, 90% and 100% alcohol for 5 minutes

in each. Then the specimens were cleared in xylene and mounted in Canada-Balsam and examined under the microscope for identification [14]. The descriptive statistics, including frequency distribution and percentage were used to analyze the data. The analysis was performed using SPSS version 18. For all the analyses, a *p*-value of less than 0.05 was considered as significant.

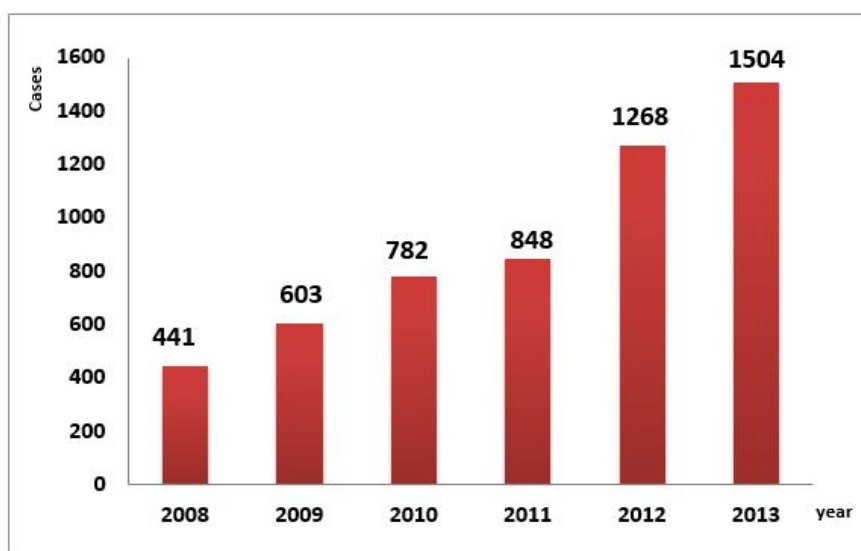
## RESULTS

A total of 5446 cases were definitely diagnosed with head lice infestation during the 6 years of study period. The prevalence of head lice infestation had an increasing trend from 2008 to 2013. The percentage of cases found in the above mentioned years; respectively was 8, 11.1, 14.3, 15.6, 23.3 and 27.6% (Figure 1). The rate of head lice infestation was 5142 (94.4%) in women and 304 (5.6%) in men. The rate of infestation in males in the 6-year period was between 23 and 81 (Table 1). In all years, *t*-test showed a significant difference between head lice infestation and gender ( $P<0.05$ ).

One of the most important variables in this study was the place of residence of patients with pediculosis. The results of this variable showed that 3924 cases (72.1%) lived in urban areas and 1522 (27.9%) in rural areas (Table 1). *T*-test

showed a significant difference between infestation rate and place of residence ( $P<0.05$ ). In this research, the variable of age was divided into four groups of under 6, 6-10, 11-17, and over 18 years. The results revealed that the highest and the lowest frequencies were observed in the age groups 6-10 years (41.2%) and less than 6 years (6.9%), respectively. Approximately 81% of the patients were under 18 years of age. The frequency of infestation in different age groups is depicted in Table 1.

The monthly prevalence of head lice infestation was analyzed. The highest and the lowest incidence of head lice by month were seen in March with 1008 cases (18.5%) and in July with 128 cases (2.4%) (Table 2). Head lice infestation occurred more in the winter. Seasonal distribution of head lice infestation showed that 2702 cases (49.7%) occurred in winter, 1462 (26.8%) in autumn, 438 (8%) in summer and 844 (15.5%) in spring (Table 3). Chi-square test showed a significant relationship between head lice infestation and seasons ( $P<0.05$ ). Regarding the incidence of head lice infestation in relation to the history of previous infection, 4930 cases (90.5%) had no previous history and 516 cases (9.5%) had previous history (Table 3).



**Fig. 1:** Frequency distribution of head lice infestation by year in people with head lice infestation who visited the urban and rural health centers in the east of Ahvaz County, Southwestern Iran (2008-2013)

**Table 1:** Frequency distribution of head lice infestation by sex, geographical area and age group in people with head lice infestation who visited the urban and rural health centers in the east of Ahvaz County, Southwestern Iran (2008-2013)

Year	Frequency No (%)	Sex		Geographical area			Age group		
		Male No. (%)	Female No. (%)	Rural area No. (%)	Urban area No. (%)	< 6 No. (%)	6-10 No. (%)	11-17 No. (%)	≥18 No. (%)
2008	441 (8.0)	36 (8.2)	405 (91.8)	39 (54.2)	202 (45.8)	19(4.3)	92(20.8)	201(45.6)	129(29.3)
2009	603 (11.1)	41 (6.9)	562 (93.1)	360 (59.7)	243 (40.3)	22 (3.7)	73(12.1)	414(68.6)	94(15.6)
2010	782 (14.4)	78 (10.0)	704 (90.0)	162 (20.7)	620 (79.3)	46(5.9)	321(41.1)	221(28.2)	194(24.8)
2011	848 (15.6)	45 (5.3)	803 (94.7)	245 (28.9)	603 (71.1)	72(8.5)	378(44.6)	258(30.4)	140(16.5)
2012	1268 (23.3)	81 (6.4)	1187 (93.6)	425 (33.5)	843 (66.5)	124(9.8)	551(43.4)	327(25.7)	267(21.1)
2013	1504 (27.6)	23 (1.5)	1481 (98.5)	91 (6.0)	1413 (94)	93(6.2)	827(55.0)	381(25.3)	203(13.5)
Total	5446 (100)	304 (5.6)	5142 (94.4)	1522 (27.9)	3924 (72.1)	375(6.9)	2242(41.2)	1802(33.0)	1027(18.9)

**Table 2:** Frequency distribution of head lice infestation by month in people with head lice infestation who visited the urban and rural health centers in the east of Ahvaz County, Southwestern Iran (2008-2013)

Year Month	2008 No. (%)	2009 No. (%)	2110 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)	2008-2013 No. (%)
April	9(2.0)	11(1.8)	23(3.0)	52(6.1)	43(3.4)	65(4.3)	203(3.8)
May	76(17.2)	90(14.9)	91(11.6)	36(4.2)	25(2.0)	125(8.4)	442(8.2)
June	11(2.5)	13(2.1)	31(4.0)	31(3.7)	50(3.9)	62(4.1)	198(3.7)
July	8(1.8)	6(1.0)	10(1.3)	34(4.0)	36(2.8)	34(2.2)	128(2.4)
August	7(1.6)	6(1.0)	20(2.7)	53(6.3)	31(2.5)	37(2.4)	167(3.0)
September	2(0.5)	1(0.2)	19(2.4)	11(1.3)	73(5.8)	50(3.3)	156(2.9)
October	12(2.7)	23(3.8)	28(3.6)	108(12.7)	58(4.6)	77(5.1)	306(5.7)
November	19(4.3)	29 (4.8)	49(6.2)	100(11.8)	236(18.6)	116(7.7)	549(10.0)
December	11(2.5)	10(1.6)	54(6.9)	165(19.5)	218(17.2)	149(9.9)	607(11.1)
January	36(8.2)	16(2.7)	165(21.0)	149(17.5)	132(10.4)	415(27.6)	913(16.8)
February	95(21.5)	57(9.5)	149(19.0)	48(5.7)	237(18.7)	195(13.0)	781(14.3)
March	155(35.2)	341(56.6)	143(18.3)	61(7.2)	129(10.1)	179(12.0)	1008(18.5)
Total	441(100)	603(100)	782(100)	848(100)	1268(100)	1504(100)	5446(100)

**Table 3:** Frequency distribution of head lice infestation by infestation history and season in people with head lice infestation who visited the urban and rural health centers in the east of Ahvaz County, Southwestern Iran (2008-2013)

Year	Infestation history		Seasons			
	Yes No. (%)	No No. (%)	Spring No. (%)	Summer No. (%)	Autumn No. (%)	Winter No. (%)
2008	12(2.7)	9(97.3)	96(21.8)	17(3.8)	38(8.6)	286(64.6)
2009	28(4.6)	575(95.4)	114(18.8)	13(2.2)	62(10.2)	414(68.8)
2010	41(5.2)	741(94.8)	145(18.5)	49(6.2)	131(16.7)	457(58.6)
2011	101(12.0)	747(88)	119(14.0)	98(11.6)	373(44.0)	258(30.4)
2012	205(16.2)	1063(83.8)	118(9.3)	140(11.0)	512(40.4)	498(39.3)
2013	129(8.6)	1375(91.4)	252(16.8)	121(8.0)	342(22.7)	789(52.5)
Total	516(9.5)	4930(90.5)	844(15.5)	438(8.0)	1462(26.8)	2702(49.7)

## DISCUSSION

McCue believes that head lice are endemic around the world, and in the United States, suspected head lice infestation is observed among 10% of school children, resulting in 12-24 million days of absence from classrooms [15]. Mimouni reported over 12 million cases of head lice infestation annually in the US [16]. Szymanek believes that pediculosis is a common parasitic disease and still a major health and social problem despite human progress. It can result in cutaneous ulcers, chronic itch, secondary bacterial infection and cause isolation and social negative reaction among patients. It is also believed that the infestation is ignored in most countries of the world and in poor communities, and since patient recording systems do not include all infected cases, officially reported figures cannot indicate the extent of the problem [17].

During the six years of the study, 5446 cases were definitively infected with head lice. The prevalence of this infestation from 2008 to 2013 has shown a continuous upward trend. This increase in the risk of head lice infestation can be due to the accurate recording of infestation and the consistency of increased prevalence of infestation in Ahvaz with other parts of Iran and the world. The present study showed a significant relationship between head lice infestation and gender, so that the rate of infestation in girls was much higher than that of boys. In Yemen, the overall prevalence of head lice infestation was 13.3%; 18.9% in girls and 8.6% in boys [18]. In Argentina, the overall prevalence of head lice infestation in primary school students was 27.9%, which was significantly higher in girls than in boys [19]. The difference between the two genders can be attributed to short hair in boys and long hair in girls, covering of hair with a scarf in girls, prolonged, intimate and close contacts among girls, and harsh games and very short contacts among boys. The higher prevalence of head lice infestation in girls than in boys has been reported in different studies conducted in Iran and other countries [20].

A total of 72.1% of the infected people lived in urban areas, and a significant relationship was observed between the residential areas and the infection. In a study by Moradi *et al.*, head lice

infestation was more prevalent among urban students in Bahar city, contrary to other national studies [20]. In most studies, the disease was more prevalent in rural areas. According to a study by Heukelbach *et al.* (2005), most children under the age of 15 who live in rural areas are prone to head lice infestation [21], which is not consistent with the results of our study. One of the possible reasons for the difference between the above study and the study by Moradi in Bahar city is the continuous health education in rural areas by rural health workers, which raises the awareness of students and their families. In rural areas, these health workers control students' health status at least once a season, while visit, examination, and training of students are performed once a year in urban areas by school health instructors or health technicians of urban health centers, due to staff shortage. The role of education and health instructors has been well documented in different studies. In a study in Qom County conducted on students, more than 67% of the students had no healthcare instructor at their school, and only 32.8% of infected students were studied in schools with health educators [22]. According to a study by Rafie *et al.* in Ahvaz County has also shown that health educators in schools are key to preventing head lice infestation [23].

The results of the study showed that head lice infestation is observed more in winter than in other seasons. Frequent and high rainfall in winter provides suitable conditions for the growth of insects such as lice; this increases the extent and severity of head lice dissemination in communities in winter. Moreover, in humid and relatively cold weather, people wear hot cloths and reside in closed places; which are more prevalent among schoolchildren who hang their clothes, put them on tables, or leave them in school locker rooms, increasing the risk of head lice transmission [24-27].

## CONCLUSIONS

Head lice infestation is still a major problem in most communities. Several factors contribute to the infestation, including cultural, social and economic issues as well as sanitary level; eliminating of which require the cooperation of various organs such as the Ministry of Health and Medical Education, Ministry of Education

and Welfare organization. It is recommended that sufficient information be provided to elementary school teachers and their abilities be used to educate, screen and follow up students until sufficient numbers of health educators are provided. Furthermore, given the case reports from the head lice treatment failure, it is recommended that further complementary studies on sensitivity of head lice to shampoos and other drugs should be conducted in the region. It seems that referral to dermatologists or infectious disease specialists is useful in suspected cases of lice-related resistance to therapy.

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### Conflict Of Interest Statement

The authors report no conflict of interest.

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