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Research Article

INVESTIGATION OF THE PREVALENCE OF HEAD LICE (*Pediculus capitis*) IN THE WEST OF AHVAZ COUNTY, SOUTHWESTERN IRAN: A DESCRIPTIVE- ANALYTICAL STUDYHamid Kassiri ^{1*}, Reza Farhadinejad ², Masoud Lotfi ³¹ School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.² Student Research Committee, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.³ School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

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Abstract:

Objectives: Head louse (*Pediculus capitis*) is a major health challenge in many parts of the globe. Pediculosis capitis is a serious infestation related to the communities with poor hygiene. The aim of the present research was to determine some epidemiological and demographic features of human head louse in the western area of Ahvaz, Southwestern.

Methods: This descriptive-analytical cross-sectional research was done on the patients with head louse infestation who referred to the western Ahvaz Health Center during 2010- 2014. A patient was defined as being infested by the presence of nits or live lice. Data collection was done by questionnaires and physical examination of the hairs. Analysis was done by Chi-square test, using SPSS software version 18. The significance level was set at $p < 0.05$.

Results: Totally, 21000 children and adolescents were screened and 7148 people (%34) were infected by pediculosis. The overall prevalence of head lice infestation was 2.36 per 1000 population during the five- year period. The most prevalent rate was observed in 2014 (35.2%) and the lowest prevalence rate was observed in 2010 (11.9%). A statistical significant correlation was observed between *Pediculosis capitis* and age, gender, month, history of infestation and residence place ($P < 0.05$). About 18.1% of those infested with pediculosis had a previous history of this infestation. Approximately 1.9% of the males and 98.1% of the females were infested to head lice. *Pediculosis capitis* infestations were highest (60.2%) in subjects aged 6-10 and lowest in those aged less than six (5%). The most prevalent rate of infestation was observed in urban areas (77.4%). The prevalence of pediculosis was higher in the winter (50.3%) than other seasons. Most of the cases were found in March (20.5%) and February (16.2%).

Conclusions: Individuals aged 6-10 years old were most often infested with pediculosis capitis, which could be due to their head to head contact and their age. Meanwhile, girls were 52.9 times more likely to have head lice infestation than boys. The educational system should clarify all of people from all families to play a more effective role to eliminate head louse infestation among populations.

Key words: *Pediculosis capitis*, Epidemiology, Iran.

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INTRODUCTION:

Hygiene and public health are of particular importance in every society to the extent that development of communities depends on them. Infestation with ectoparasites is one of the major health threats to the community. Despite the advancements in medical sciences and the general improvement in the level of hygiene, ectoparasites are still considered a major health problem. According to health organizations, despite the generous budget allocations, many countries have failed to adequately control lice infestation [1,2].

Lice can transmit various diseases such as epidemic relapsing fever, epidemic typhus and trench fever to humans [3]. Lice infestation has been diagnosed in all age groups; however, the highest prevalence rate has been observed in school children [4]. Today, due to improved living standards, body lice infestation has become less common; however, head lice infestation cases are being reported in almost all parts of the world [5]. Lice can spread by direct contact 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 [4]. Pediculosis is associated with different risk factors [6]. It is more prevalent in poorer areas with high population density, where there is lack of personal hygiene and health facilities [5,6]. Additionally, previous studies show that lice infestation is more prevalent in rural areas as compared to urban ones [7].

During the day, lice suck the host's blood several times and with each bite inject their salivary proteins into his/her body. Their bites can cause allergic reactions, fatigue, insomnia, skin lesions, discomfort and irritation in victims. In some cases, acute allergic reactions occur after several consequent lice salivary protein injections [8]. Severe lice infestations contribute to secondary fungal and bacterial infections [6,8].

In developed countries, the prevalence rate of head lice infestation in primary school children is estimated to be 2-10 percent [9]. 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 [7]. According to the findings of a study by Courtiade *et al.* conducted in four different schools in France, 17 percent of students were infested with head lice [10].

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 mainly among children [11]. In some parts of Iran, head lice infestation prevalence rate is reported to be 6-30 percent [12]. Unfortunately, in some parts of Iran, different factors, including excessive population growth, urbanization, 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 epidemic diseases [11].

Given its hot and humid climate and high population density, Khuzestan Province (Iran) is considered a favorable environment for lice population growth. The present study aimed at estimating the prevalence rate of head lice infestation in the patients visiting western Ahvaz health centers from 2010 to 2014, identifying the risk factors along their role and impact probability, and providing health officials with appropriate plans and solutions to control this health problem in the city of Ahvaz.

MATERIALS AND METHODS:

Ahvaz is a city in the southwest of Iran and the capital of Khuzestan Province. The city has a hot and humid climate and is divided into two parts in terms of health service provision, namely, western Ahvaz and eastern Ahvaz. Western Ahvaz Central Health Center is located in Kyanabad District. Urban and rural health centers operating under the supervision of Amanieh health Center provide a population of over 633000 residents with health services.

In the present descriptive-analytical study, upon obtaining the required authorizations and coordinating with directors of the relevant health centers and Western Ahvaz Health Network, all the patients with suspected head lice infestation visiting rural and urban health centers (operating under the supervision of Western Ahvaz Health Center) and diagnosed with the infestation by the health professionals from 2010 to 2014 were examined.

The tools used to collect the required data were a demographic questionnaire recording demographic and epidemiologic characteristics linked to head lice infestation (e.g., age, gender, month, season, infestation history and place of residence), and tools used for diagnosis and confirmation of head lice infestation (i.e., ethanol, flashlights, disposable gloves, microscope cover slips and slides, insect pins, fine-tooth combs, hand lenses, white papers, and oral masks). Each patient diagnosed with head lice infestation was separately interviewed. In all suspected cases of head lice infestation, hair growing

on the head (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 nit at a 1.4-inch distance from the scalp. In addition, previous history infestation to head lice was confirmed in cases where lice nits were found at a distance more than 1.4-inch from the scalp although no lice were observed even after combing the hair (9). All the collected data were recorded and analyzed.

RESULTS:

The present study was conducted on 21000 patients suspected of head lice infestation visiting western Ahvaz health centers from 2010 to 2014. From among these people, 7148 (34%) were definitely diagnosed with head lice infestation. During the aforementioned period, the prevalence rate of head lice infestation had an annual increasing trend. In other words, in the first year, 851 patients were diagnosed with head lice infestation, while the number rose to 2519 in the fifth or last year (Figure 1).

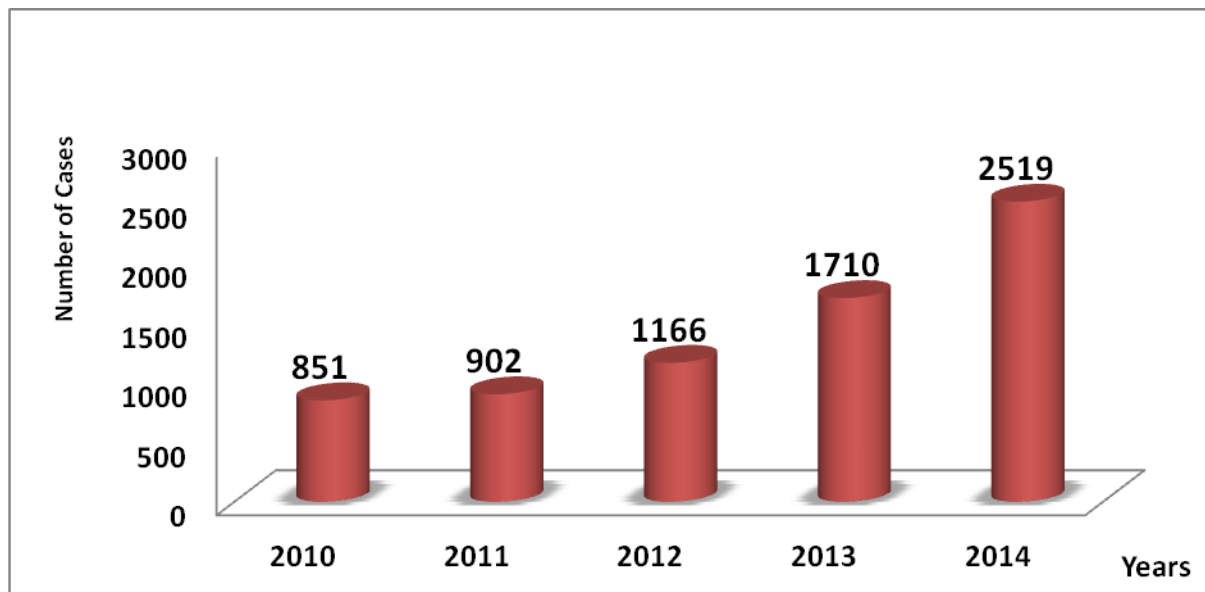


Fig 1: Trend of *Pediculosis capitis* frequency in west of the Ahvaz County, Southwestern Iran (2010-2014)

Table 1: Frequency distribution of *Pediculosis capitis* according to the gender in the west of Ahvaz County, Southwestern Iran (2010-2014)

Gender Years	Male No. (%)	Female No. (%)	Total No. (%)
2010	13 (1.5)	838 (94.5)	851 (100)
2011	42 (4.7)	860 (95.3)	902 (100)
2012	25 (2.1)	1141 (97.9)	1166 (100)
2013	22 (1.3)	1688 (98.7)	1710 (100)
2014	33 (1.3)	2486 (98.7)	2519 (100)
Total	135 (1.9)	7013 (98.1)	7148 (100)

Totally, 7013 female (98.1%) and 135 male patients (1.9%) were diagnosed with head lice infestation. The highest prevalence rate of head lice infestation among female patients occurred in the fifth (last) year (n=2486), while the lowest prevalence rate among the same group was observed in the first year (n=838). The prevalence rate of head lice infestation among

male patients was almost constant during the study's five-year period (Table 1). Head lice infestation frequency was significantly higher in female patients than that in male patients. According to the t-test, the prevalence rate of head lice infestation was significantly different in the two gender groups (male and female) ($p < 0.05$).

Table 2: Frequency distribution of Pediculosis capitis according to the age group in the west of Ahvaz County, Southwestern Iran (2010-2014)

Years Age Groups	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)	2014 No. (%)	Total No. (%)
> 6	15 (1.8)	30 (3.3)	51 (4.4)	135 (7.9)	125 (5.0)	356 (5.0)
6-10	574 (67.4)	579 (64.1)	742 (63.6)	993 (58.0)	1418 (56.3)	4306 (60.2)
11-17	192 (22.6)	234 (26.0)	261 (22.4)	451 (26.4)	792 (31.4)	1930 (27.0)
≥18	70 (8.2)	59 (6.6)	112 (9.6)	131 (7.7)	184 (7.3)	556 (7.8)
Total	851 (100)	902 (100)	1166 (100)	1710 (100)	2519 (100)	7148 (100)

Table 3: Frequency distribution of Pediculosis capitis according to the residential area in the west of Ahvaz County, Southwestern Iran (2010-2014)

Residential Area Years	Village No. (%)	Urban No. (%)	Total No. (%)
2010	225 (26.4)	626 (73.6)	851 (100)
2011	148 (16.4)	754 (83.6)	902 (100)
2012	338 (29.0)	828 (71.0)	1166 (100)
2013	194 (11.3)	1516 (88.7)	1710 (100)
2014	708 (28.1)	1811 (71.9)	2519 (100)
Total	1613 (22.6)	5535 (77.4)	7148 (100)

Table 4: Frequency distribution of Pediculosis capitis according to the month in the west of Ahvaz County, Southwestern Iran (2010-2014)

Years Months	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)	2014 No. (%)	Total No. (%)
April	22 (2.6)	10 (1.1)	99 (8.5)	48 (2.8)	87 (3.4)	266 (3.7)
May	13 (1.5)	9 (1.0)	127 (10.9)	52 (3.1)	173 (6.9)	374 (5.2)
July	17 (2.0)	4 (0.4)	24 (2.1)	19 (1.1)	81 (3.2)	145 (2.0)
June	72 (8.5)	17 (1.9)	38 (3.2)	15 (0.9)	76 (3.1)	218 (3.1)
August	85 (10.0)	7 (0.9)	12 (1.0)	26 (1.6)	61 (2.4)	191 (2.7)
September	74 (8.7)	9 (1.0)	17 (1.4)	18 (1.0)	13 (0.5)	131 (1.8)
October	7 (0.8)	113 (12.5)	101 (8.7)	118 (6.9)	227 (9.0)	566 (7.9)
November	66 (7.8)	150 (16.6)	127 (10.9)	248 (14.5)	106 (4.2)	697 (9.8)
December	41 (4.8)	202 (22.4)	175 (15.0)	382 (22.4)	255 (10.1)	1055 (14.8)
January	120 (14.1)	87 (9.6)	139 (11.9)	228 (13.3)	308 (12.3)	882 (12.3)
February	219 (25.7)	101 (11.2)	128 (11.0)	212 (12.4)	497 (19.7)	1157 (16.2)
March	115 (13.5)	193 (21.4)	179 (15.4)	344 (20.1)	635 (25.2)	1466 (20.5)
Total	851 (100)	902 (100)	1166 (100)	1710 (100)	2519 (100)	7148 (100)

Considering the age variable, the highest infestation frequency was observed in 6-10 year age group (4306 patients – 60.2%). Approximately 92% of patients diagnosed with head lice infestation belonged to the age groups under 18 years of age. Table 2 shows the frequency distribution of infestation cases in different age groups. The results showed that the prevalence rate of head lice infestation was significantly different in different age groups ($p < 0.001$).

In order to investigate the effect of place of residence on head lice infestation prevalence, the patients were categorized based on their place of residence. Totally, 5535 (77.4%) patients lived in urban areas and 1613 (22.6%) were rural residents (Table 3). The results showed that the prevalence rate of head lice infestation was significantly different in different places of residence ($p < 0.05$).

The highest ($n=1466$, 20.5%) and lowest ($n=131$, 1.8%) head lice infestation prevalence rates were

reported in March and September, respectively (Table 4). The prevalence rate of head lice infestation was higher in winter months. Seasonal distribution of head lice infestation prevalence showed that 3505 (49.0%), 2318 (32.4%), 540 (7.6%), and 785 (11.0%) cases were reported in winter, fall, summer, and spring, respectively (Table 5). Chi-square test results showed that there was a significant difference between head lice infestation prevalence rate and different seasons of the year ($p < 0.05$).

From among the patients diagnosed with head lice infestation, 5855 (65%) cases did not have any previous history of head lice infestation, while 3047 (35%) had a previous history of the same infestation (Table 6). T-test results showed that the prevalence rate of head lice infestation was significantly different in the two groups (patients with and without previous history of head lice infestation) ($p < 0.05$).

Table 5: Frequency distribution of Pediculus capitis according to the season in the west of Ahvaz County, Southwestern Iran (2010-2014)

Season Years	Spring No. (%)	Summer No. (%)	Autumn No. (%)	Winter No. (%)	Total No. (%)
2010	52 (6.1)	231 (27.1)	114 (13.4)	454 (53.4)	851 (100)
2011	23 (2.6)	33 (3.6)	465 (51.6)	381 (42.2)	902 (100)
2012	250 (21.4)	67 (5.7)	403 (34.6)	446 (38.3)	1166 (100)
2013	119 (7.0)	59 (3.4)	748 (43.7)	784 (45.9)	1710 (100)
2014	341 (13.5)	150 (6.0)	588 (23.3)	1440 (57.2)	2519 (100)
Total	785 (11.0)	540 (7.6)	2318 (32.4)	3505 (49.0)	7148 (100)

Table 6: Frequency distribution of Pediculus capitis according to the infestation history in the west of Ahvaz County, Southwestern Iran (2010-2014)

Infestation History Years	Yes No. (%)	N0 No. (%)	Total No. (%)
2010	169 (19.9)	682 (81.1)	851 (100)
2011	133 (14.7)	769 (85.3)	902 (100)
2012	01 (17.2)	965 (82.8)	1166 (100)
2013	404 (23.6)	1306 (76.4)	1710 (100)
2014	386 (15.3)	2133 (84.7)	2519 (100)
Total	1293 (18.1)	5855 (81.9)	7148 (100)

DISCUSSION:

Despite the considerable improvements in all levels of hygiene in different societies, head lice infestation is still considered a major health problem in poor and developing countries. According to different researches, head lice infestation is present in different parts of Iran. Based on the statistics published by the World Health Organization (WHO), Iran is one of the countries where head lice infestation is reported as being prevalent [13].

In the present study, from among the 21000 suspected patients, 7148 cases (34%) were diagnosed with head lice infestation. The worldwide prevalence of pediculosis has increased since the mid-1960s. The 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, England, 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 [14-23]. Studies conducted in Iran revealed that the prevalence rate of head lice infestation in Shahr-e Qods (Tehran Province), Abadeh (Fars Province), Qazvin (Qazvin Province), Ahvaz (Khuzestan Province), Yasuj (Kohgiluyeh and Boyer-Ahmad Province), Kashan (Kashan Province), Zabol (Sistan- Baluchestan Province) and Qom (Qom Province) were 2.3%, 0.06%, 1.1%, 11%, 5.24%, 5.24%, 29.4%, and 13.3%, respectively [24-30]. Head lice infestation is more prevalent in social classes with lower economic and cultural resources and less access to health facilities. This can explain the relatively high prevalence rate of head lice infestation in Zabol, Ahvaz, and Qom. The high prevalence rate of this type of infestation in the aforementioned areas 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 areas [31].

A significant relationship was found between the prevalence rate of head lice infestation and age. The highest prevalence rate was observed in the 6-10 year age group. This can be due to the development of independence-seeking behaviors in this age group. Moreover, at 8-9 years old, school children have not still mastered their bathing and personal hygiene skills. However, as their age increases and their practical skills improve, they can better maintain their personal hygiene leading to lower head lice infestation prevalence rates in individuals over the age of 11. In their research, Doroudgar *et al.* investigated head lice infestation in the city of Aran

va Bidgol (Isfahan Province). They found that the prevalence rate was higher in second- and third-grade primary schoolchildren (8-9 years old). However, according to their findings, no significant relationship was observed between prevalence rate of head lice infestation and age [32]. The results of the present study are in accordance with the results of a similar study by Davari and Yaghmaei conducted in the city of Sanandaj (Kurdistan Province) as they also found a significant relationship between prevalence rate of head lice infestation and age [33]. Rafinejad *et al.* also found that the prevalence rate of head lice infestation decreases in primary schoolchildren as they go up the grade levels. This can be explained by the fact that as primary schoolchildren go up the grade levels, they become more aware of the need to maintain their personal hygiene and master the relevant skills accordingly [34].

In the present study, a significant relationship was found between prevalence rate of head lice infestation and gender. In other words, head lice infestation was more prevalent in female patients. The prevalence rate in male patients was even lower than 2%. This significant difference could be explained by behavioral differences between males and females. Females had longer hair and thicker hair mass, wore hijab to cover their hair and their head was more in near-contact with other objects. In their study in 2000, Motevalli Haghi *et al.* reported that head lice infestation prevalence in primary schoolgirls was seven times higher than that in primary schoolboys [35].

Furthermore, the results showed that 77.4% of patients diagnosed with head lice infestation lived in urban areas. Thus, a significant relationship was found between the prevalence rate of head lice infestation and place of residence. In a similar study in Bahar (Hamedan Province), Moradi *et al.* found that head lice infestation was more prevalent in primary schoolchildren living in urban areas. But, this finding was not in contrast with the findings of other studies conducted across Iran [8]. In most studies, head lice infestation was found to be more prevalent in rural areas. According to a study conducted in Brazil in 2005, the majority of children under the age of 15 living in rural areas were prone to head lice infestation [36]. This is not in contrast with the findings of the present research. Perhaps, one of the main reasons for this difference is that health workers have been regularly providing the rural population with health education and visiting and examining rural schoolchildren on a seasonal basis.

In urban areas, these responsibilities are undertaken by health educators working at schools or healthcare technicians working at urban healthcare centers. However, due to shortage of staff, schoolchildren are not regularly examined and this task is not taken seriously.

In addition, the results showed that head lice infestation was more prevalent in winter. Winter weather conditions characterized by regular heavy rainfalls create a fertile ground for the growth and development of insects including lice. This will significantly contribute to the widespread and intensified prevalence of the infestation within the community. Moreover, in humid and relatively cold weather conditions, most people wear warm cloths and prefer to remain indoors. This is particularly true for schoolchildren as they leave their warm clothes on benches or coat racks which will eventually spread the infestation [37-40].

There was also a significant relationship between the current head lice infestation and any previous history of the same infestation. Lice nits might have remained in the victim's hair from some previous infestation or some family members or acquaintances might act as the infestation source needing mass treatment. Additionally, some unhealthy behavior which caused the previous infestation in the first place might still be present. This behavior could belong to the victims themselves or their family members or acquaintances. This finding confirms the results of two separate studies conducted by Rafinejad and Farzinnia in Amlash (Gilan Province) and Qom (Qom Province), respectively [41,42].

CONCLUSIONS:

Head Lice infestation is still considered a major problem in most communities with different factors contributing to it [43]. Cultural, social, and economic issues as well as general level of hygiene are among these factors. In Iran, this health problem can be overcome by coordination among different organizations, including Ministry of Health and Medical Education, Ministry of Education and State Welfare Organization of Iran. It is also suggested that sufficient information be provided to primary school teachers so that they can educate students and help in the screening and follow-up processes until more health educators become available. Furthermore, according to reports, there have been some cases where head lice infestation did not respond to initial treatment. Consequently, it is strictly recommended that complementary regional studies be conducted on the susceptibility of head lice to different substances. This will help determine which shampoos and

medications can be most effective in treating the infestation. Seemingly, referring patients with suspected head lice infestation to dermatologists or infectious diseases specialists can also prove to be helpful.

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CONFLICT OF INTEREST STATEMENT:

The authors report no conflict of interest.

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