Prevalence and Risk Factors Associated with Head Louse (*Pediculus humanus capitis*) in Central Iran

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Abstract

Background

Recognition of head lice prevalence and related risk factors contributing in spreading the disease is a step forward to the control of this important health problem. This survey was done to determine prevalence and risk factors associated with head louse (*Pediculus Humanus Capitis*) in Central Iran.

Materials and Methods

In this descriptive–analytic study, a total of 38,237 suspected cases of head lice infestation that were referred to public health centers in Qom province during 2016 were studied. Data collection was done using standard check list that was conducted and approved by the Health Ministry of the Islamic Republic of Iran and physical examination of the hairs by visual inspections of scalp and hair for the presence of adult lice, nymphs, and eggs (nits) in all of suspected cases. For data analysis, Chi-square and Multiple Logistic Regression Tests were utilized.

Results

A total of 11,223 (29.35%) out of 38,237 suspected cases of all ages were found to have pediculosis. According to the multivariable logistic regression analysis, a significant relationship was observed between *Pediculus capitis* infestation and each of these factors: educational grade, family size, family income, having previous history of *P. capitis* infestation, number of combing per day (P<0.05). Head lice infestation was detected in 33.45% (7,182/21,469) of females and 24.09% (4,041/16,768) of males.

Conclusion

High prevalence of *P. capitis* among people of all ages, especially in students who reside in Qom province was attributable to inadequate access to health educators, health facilities, inattention to personal health, and other related factors.

Key words: Adolescents, Head lice, Iran, Pediculosis capitis, Prevalence.

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1-INTRODUCTION

Ectoparasitic infestations especially insect infestations are among society health threatened factors and are still considered a health burdens in spite of the health promotion and medical sciences developments (1). Bloodsucking lice are tiny insects of the order Diptera that responsible for biting and sucking the blood of mammals and birds and can survive far from their host body just for a short period of time (2). Three species of lice have lived on mankind body as obligate ectoparasite: the head louse (*Pediculus humanus capitis*) (3), the body louse (*Pediculus humanus*), and the pubic louse (*Pthirus pubis*) (4). Human lice have a history dating back to several thousand years for instance (5). Lice infestation is one of the most important health problems of the big cities where people live in overcrowded, unhygienic conditions with low hygiene facilities (6).

Head lice have a global distribution, but they bother people in tropical and sub-tropical areas more. Head lice infestation can cause intense irritation and severe itching. Besides that, body louse can transmit epidemic typhus, epidemic recurrent fever and trench fever (2). Head lice are detected near to the human scalp and usually bite and feed on blood repeatedly. Female head lays eggs (nits). Nits are attached on hair shafts almost 1–2 inches from the scalp (7). The symptoms of lice infestation may include fatigue, irritation, paranoia and lethargy. Because it can bite several times and its saliva is injected into the body repeatedly. Repeated inoculation of the louse saliva may cause allergies and severe itching; and if the feces dust is inspirited can cause symptoms like allergic rhinitis (8). Head louse infestation is seen worldwide, including Iran especially in congested areas with poverty and low sanitary conditions. This infestation is common among villages especially in children (9).

In Iran unfortunately, pediculosis is a health burden adding to other contagious diseases because of increased population, urbanization and sub urbanization, presence of subordinate cities with minimum facilities, health knowledge, social security and so on (10). Previous studies conducted on Iranian people have shown prevalence of head lice varied between 2.3% and 17.5 % (6, 10-15).

Also, it was previously proven that there are some risk factors associated with *pediculosis capitis (P. capitis)* in all communities in the world such as occupation, combing per day, bathing per week, itching sensation, family size, presence or absence of health education and pediculosis occurrence (16-18). Due to several reports from Qom province health center, there were a lot of suspected cases of head lice infestation of the urban and rural areas; in order to elevate the health level of the people and to help the province health authorities for a more precise program to control this health burden in future, the present study was conducted to determine the prevalence and risk factors associated with head louse (*Pediculus Humanus Capitis*) in Central Iran.

2-MATERIALS AND METHODS

2-1. Study design and population

This descriptive-analytical study has been conducted on all of suspected cases of head lice infestation 38,237 that were referred to Qom public health centers routinely from all rural and urban areas of Qom province- Iran during 2016.

2-2. Methods

In this research the visual census method was used. This means that all suspected head lice infestation cases referred to public health centers in Qom city, whom was registered, entered into the study.

In this study, 37,517 and 720 cases in urban and rural areas were recorded, respectively. The infested people had contact with the head louse in one of its life cycle stages or presence of the egg/nit in the distance of 1.4 inch (less than 4 cm) from the scalp (19) and physical examination of the hairs by visual inspections of scalp and hair for the presence of adult lice, nymphs, and/or eggs (nits). Hairs behind the neck and ears were observed for five minutes to detect nit, nymph or matured lice by direct observation method. Meanwhile we have considered some information about hair condition and factors such as occupational and educational levels, family size, type of house, living area, water source, family income, History of infestation and so on by filling the standard check list that was conducted and approved by the Health Ministry of the Islamic Republic of Iran. The suspected cases scalps and hair were inspected by educated health care workers of department of prevention and diseases control, Provincial Health Center of Qom, Iran under the guidance of a medical entomologist. In this study, patients with confirmed cases of head lice infestations were treated with permethrin 1% shampoo, twice a week.

2-3. Ethical consideration

At first, coordination and permission letter from department of prevention and diseases control of Qom provincial Health Center was taken. It should be mentioned that before the start of the study, the aim of the study was demonstrated and the target group were ensured about the confidentiality of their data.

2-4. Inclusion criteria

The inclusion criteria were determined of being Iranian suspected to head lice infestation who were resident in urban or rural districts of Qom Province and being satisfied to participate in this study.

2-5. Exclusion criteria

The exclusion criteria were included; being non-Iranian, not living permanently in the study area, just partial completing of the questionnaire and unwillingness for participation in current study.

2-6. Data Analyses

The data was analyzed with Chi-square and univariate regression analysis. Also, P-value less than 0.05 were considered significant level. The variables with significant level of lower than 0.2 in univariate regression analysis were entered into multiple logistic regressions model, and analysis, were conducted using SPSS version 16.0 software.

3-RESULTS

A total of 38,237 (16,768 males, 21,469 females) suspected cases of head lice who visited health centers were examined for pediculosis. Totally, 11,223 cases of them were found with head lice infestation. The total prevalence of head lice infestation was 29.35%. Head lice infestation was detected in 33.45% (7,182/21,469) of females and 24.09% (4,041/16,768) of males. This difference between males and females was found to be statistically significant ($P<0.05$).

The lowest and highest ages of infestation among the clients were between 6 months to 74 years, respectively. The overall mean age was 17.9 years (Standard Deviation (SD) = 12. 2) with 32.26% were from age group of 6-15 years constituted the highest infestation rate. The highest infestation in the study was found in people with no any form of Western education (40.56%). The highest rate of pediculosis (40.13%) was reported among the people (from students, teenagers or adults) who had families with more than six members.

The prevalence of head lice infestation was higher in people who had lower family income, having parents with low educational level, living with three or more siblings ($P<0.05$). A total of 7,968

(39.55%) head lice infested cases were people who lived in families with monthly income (per month for each family, in US dollars) lowers than 300 dollars (10,500,000 rials). Totally, 41.81% of cases had history of infestation. The results showed that 38.19% of head lice infested people were not combing their hair daily and 40.40% of them bathed once or less per week (**Table.1**).

The result of univariate regression analysis showed significant relationship between head louse infestation and gender, age, educational level, family size, living area (residence), family income, job and level of mother's education, history of infestation, access to primary health services and number of combing per day (P<0.05) (**Table.1**). In univariate regression analysis, the variables that had significant levels lower than 0.2 were entered into multiple logistic regression model. The results of the model indicated head lice infestation risk factors with significant level of association including gender (female) (P<0.001), age (P<0.001), educational level (P= 0.01), family size (P<0.001), family income (P<0.001), mother educational level (initial level) (P= 0.03), history of infestation (P<0.001), number of combing per day (P<0.001), and mother educational level (university level) only was as a preventive factor.

Although there was no relationship between head louse infestation and place of residence (living area), mother occupation, source of water , family size, family income, job and level of mother's education, history of infestation, access to primary health services (P>0.05) (**Table.2**).

Table-1: Socio-demographic features of the study subjects and the prevalence of *pediculosis capitis* in Qom Province Central Iran, 2016

Features	Level	Total	Pediculosis capitis frequency		P-value
			Number	Percent	
Gender	Male	16768	4041	24.09	<0.001
	Female	21469	7182	33.45	
Age group(Year)	0-5	6231	1793	28.77	<0.001
	6-15	20186	6512	32.26	
	>15	11820	2918	24.68	
Educational grade	Illiterate	5236	2124	40.56	<0.001
	Initial education	22262	8002	35.94	
	University education	10739	1097	10.21	
Family size	3 persons	8091	1201	14.84	<0.001
	4 persons	11809	3172	26.86	
	5 persons	7452	2481	33.29	
	6 or more than 6 persons	10885	4369	40.13	
Type of house	Private	8408	2468	29.36	0.54
	Rental	29829	8755	29.35	
Living area	Urban	37337	11103	29.73	<0.001
	Rural	900	120	13.33	
Water source	Public tube	722	212	29.35	0.054
	Own	37515	11011	29.35	
Family income (per month for each family, in US dollars)	Poor (< $300)	20147	7968	39.55	<0.001
	Good ($300–600)	7415	2470	33.31	
	Fine (> $600)	10675	785	7.35	
Father's occupation	Unemployed or died	4851	1424	29.35	0.42
	Self-employed	24163	7092	29.35	
	Governmental-employed	9223	2707	29.35	

Mother's occupation	Housewife	35395	9802	27.69	<0.001
	Employed	2842	1421	50.00	
Father's education	Illiterate or died	22844	6705	29.35	0.87
	Initial education	6978	2048	29.34	
	University education	8415	2470	29.35	
Mother's education	Illiterate or died	1364	694	50.87	0.02
	Initial education	13730	4617	33.62	
	University education	23143	5912	25.54	
History of infestation	Yes	4711	1970	41.81	<0.001
	No	33526	9253	27.59	
Access to primary health care services	Yes	37485	10709	28.56	0.03
	No	752	514	68.35	
Number of combing per day	None	16603	6341	38.19	<0.001
	Once	5584	2226	39.86	
	Twice	7129	1799	25.23	
	Three and more	8921	857	9.60	
Bathing per week	Once or less	16823	6797	40.40	0.40
	Twice	12238	3921	32.03	
	More than twice	9176	505	5.50	

Table-2: Multivariable logistic regression analysis of the relationship between *pediculosis capitis* infestation and potential risk factors in Qom Province central Iran, 2016

Variables	Level	Pediculosis (%)	β	SE	OR (95CI)	P-value
Gender	Male	4041 (24.09)			1	
	Female	7182 (33.45)	1.36	0.34	4.93 (2.96-5.76)	<0.001
Age group (Year)	< 5	1793 (28.77)			1	
	5-15	6512 (32.26)	0.51	0.46	1.54 (1.25-1.89)	<0.001
	>15	2918 (24.68)	0.31	0.26	1.54 (1.24-192)	<0.001
Educational grade	Illiterate	2124 (40.56)			1	
	Initial education	8002 (35.94)	0.041	0.39	1.54 (1.22-2.87)	0.017
	University education	1097 (10.21)	0.051	0.44	1.28 (1.11-2.33)	0.041
Family size	3 persons	1201 (14.84)			1	
	4 persons	3172 (26.86)	0.34	0.01	1.12 (1.08-1.46)	<0.001
	5 persons	2481 (33.29)	0.26	0.31	1.55 (1.27-1.88)	<0.001
	6 or more than 6 persons	4369 (40.13)	1.36	0.44	1.98 (1.57-2.50)	<0.001
Living area	Urban	11103 (29.73)			1	
	Rural	120 (13.33)	0.65	0.38	0.73 (0.48-1.41)	0.62

			β	SE	OR (CI)	P-value
Water source	Public tube	212 (29.36)			1	
	Own	11011 (29.35)	0.53	0.34	0.68 (0.42-1.83)	0.81
Family income (per month for each family, in US dollars)/ (10,500,000 Rials)	Poor (< $300)	7968 (39.55)			1	
	Good ($300–600)	2470 (33.11)	0.61	0.26	2.39 (1.41-4.08)	0.001
	Fine (> $600)	785 (7.35)	0.42	0.38	1.50 (1.23-1.84)	<0.001
Mother's occupation	Housewife	9802 (27.69)			1	
	Employed	1421 (50.00)	0.27	0.51	1.26 (0.98-1.62)	0.773
Mother's education	Illiterate or died	694 (50.87)			1	
	Initial education	4617 (33.62)	0.051	0.44	1.35 (1.03-2.49)	0.053
	University education	5912 (25.54)	0.061	0.26	0.81 (0.46-1.44)	0.065
History of infestation	Yes	1970 (41.81)			1	
	No	9253 (27.59)	1.36	0.44	2.18 (1.16-3.48)	<0.001
Access to primary health care services	Yes	10709 (28.56)			1	
	No	514 (68.35)	1.02	0.42	0.36 (0.24-1.60)	0.823
Number of combing per day	None	6341 (38.19)			1	
	Once	2226 (39.86)	0.61	0.26	1.71 (1.31-2.47)	0.04
	Twice	1799 (25.23)	2.29	0.28	3.14 (2.25-5.34)	<0.001
	Three and more	857 (9.60)	2.77	0.38	4. 46 (1.31-15.05)	<0.001

β: Slope; SE: Standard Error; OR: Odds Ratio; CI: Confidence Interval .

4-DISCUSSION

Despite the progress and awareness in health and medical sciences, human lice are still seen as public health problem in poor and developing countries (20). Head lice infestation differ according to active screenings, case findings, geographical and climatic conditions as the prevalence of pediculosis is higher in colder areas from records documented (21). Its prevalence also depends on season, detection methods, founding of head lice infestation or existence of nits, and the effectiveness rate of pediculicides (22). In this present study, the prevalence of head lice infestation among suspected cases that were referred to health centers in Qom province was 29.35 %. Previous epidemiological studies have shown different prevalence of *P. capitis;* 4.1% in England (23), 8.9% in Belgium (24), 3.3% in France (25), 52% in Ukraine (26), 87% in Pakistan (27), 35% in Malaysia (28),

23.2% in Thailand (29), 4.1% in Korea (30), 42.7% in Brazil (31), 29.7% in Argentina (32), and 9.1% in Peru (18). The prevalence of head lice infestation in various areas of Iran indicate that total prevalence of infestation varied from 0.47% in the Doroodgar et al. study in Isfahan (Center of Iran) to 27% in the study carried out by Alempour-Salemi et al. in Sistan-Baloochistan province (South-East of Iran) (10).

Perhaps, the high prevalence of head lice infestation in Qom province in comparison of other areas of Iran is due to some reasons such as suitable case finding, the suitability of weather condition for head lice, and so on. In this study, the results of the multiple logistic regression model indicated risk factors of having head lice infestation including gender (female), age, educational level, family size, family income, mother educational level (initial level), history of infestation and number of combing per day. In this study, most of head lice infested cases were females and being a female was one of the head lice infestation risk factors. Evidences from previous studies indicate that females were mainly infested with head lice rather than males (18, 22).

Probably, this difference in head lice prevalence is due to some reasons such as difference in behavioral habits between males and females, the suitability of female's hair as a breeding place for head lice, covering of the female's hair by scarf and so on. This study demonstrated the prevalence of pediculosis was higher in age groups 6-15. Also, the results indicated that age was a risk factor for head lice. This is in agreement with Downs et al.'s findings (1999) that head lice infestation occurred mostly in children attending school, although no document was found of its relationship with school attendance (21). The findings of previous studies in Shiraz city, South West of Iran have showed students mainly were

involved with head lice infestation (6). It is clear that most of the children in the age group of 6-15 are students and they are going to school. School is a public and cumulative place for educating children; on the other hand, head lice can be spread by directed contact. Therefore, it is logical that head lice infestation be most prevalent in school-aged children. According to the results, low educational level was a risk factor in head lice infestation and more than 35% of people who had elementary level of education were infested. Several studies have been conducted mainly in relation of socio- demographical status of people such as their educational level on head lice infestation (22, 24).

In this study most of the people infested with pediculosis belong to families with 6 or more than 6 persons. It is well known that head lice is an obligate ectoparasites of mammals animals especially in humans and it is spread by direct contact from person to person (9). Therefore, the prevalence of pediculosis is expected to be higher in crowded families. In a similar study that conducted in Belgium, it was detected lice infestation was significantly increased in families of low socio-economic level, in people with large family size, and in individuals with long hair (24). In addition, 39.55% of cases belong to families with low income. This finding suggests that family income may be responsible for the spread of head lice infestation in these areas with low income. Because of the family income level which is highly related to the family hygiene status. This is in agreement with the findings of Gulgun et al. (2013) (22).

Finally, more than 82% of cases had history of head lice infestation which can be caused by the remnant lice eggs or remaining route in the family, such cases need mass treatment. Many studies indicated that history of previous infestation can be a risk factor for re-infestation (1). In this study, we illustrate

that number of combing per day can be effective in prevention of head lice and more than fifty percent of infested people were not combing their hair even once per day and the results showed no combing per day was one of the risk factors in acquiring head lice. The findings of other studies indicated that good hair care and personal hygiene would go a long way in reducing the prevalence of lice infestation. Previous studies have shown that, regular brushing with a wooden fine-toothed comb has mostly been used as a physical preventive method not only reduce the prevalence of, and but also healing the infestation (33).

There was no relationship observed between head louse infestation and living area, mother occupation, water resource, access to primary health services. A previous study showed no document to support the theory that head lice prefer clean hair to dirty hair (34). As the results show; pediculosis is still a considerable health burden in low socioeconomic societies.

4-1. Limitations of the study

This study was designed on registered data in health center of Qom province, Iran. This makes the results of this study, can state just some of the epidemiological status of pediculosis in Qom province. In our knowledge this is can be one of the limitations of this the study.

5- CONCLUSION

This health problem is not attributed just to a single factor but a lot of factors like the family income, health education, attitude to change into healthy behavior, educational level, inter-sectional cooperation between organization and beneficiary offices like Ministry of Health and Education, the assertiveness of ministry of education to hire health educators are influential to this infestation. Based on the results of this study, the total prevalence of head lice infestation among males and females in this province is high in comparison of other provinces.

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