





Original Article

Prevalence of *Pediculus capitis* Infestation among Primary School Students in East Azerbaijan Province, Iran (2018 - 2019)

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ABSTRACT

Background and objectives: Head louse, also known as *Pediculus humanus capitis*, is an obligate ectoparasite that is a distributed all around the world. The aim of present study was to determine the prevalence of head lice infestation in primary school students in Tabriz, East Azerbaijan Province, Iran.

Methods: Overall, 3,032 students (1,515 boys and 1,517 girls) from 33 primary schools in Tabriz were selected via multi-stage cluster sampling in 2018. The students were examined individually and privately by experts. Head lice infestation was confirmed by detecting adult or nymph or nits less than 1 cm from base of hair. Data analysis was carried out in SPSS software package (version 23). Association of participants' characteristics with pediculosis infestation was evaluated using logistic regression and chi-square test at significance level of 0.05.

Results: Head lice infestation was present in 130 (4.29%) students, while the prevalence of this condition was higher in girls (2.11%) than in boys. The highest prevalence (6.05 %) was observed in children age 6 years old regardless of gender. The rate of head lice infestation was lowest among students aged ≥ 12 years (3.17%). There was a significant relationship between head louse infestation and parent's occupation, family size, the frequency of combing and hair style.

Conclusion: Although the prevalence of head lice infestation in Tabriz is relatively low, screening and treating schoolchildren should be done continuously in order to reduce the infestation rate.

Keywords: *Pediculus humanus*, Prevalence, Primary school student, Tabriz, Iran

INTRODUCTION

Pediculus capitis or head louse, belonging to the Anoplura order within the Pediculidae family, is an obligate ectoparasite. Pediculosis or louse infestation is a worldwide health problem defined as an infestation with head, body or crab lice. The condition is transmitted directly via person to person contact or indirectly via contact with contaminated personal equipment such as hat, scarf, underwear, towel and sponge of headphones in electrical devices (1-4). Many factors such as poor health status, low socioeconomic level, substandard hygiene and absence of medical care may rise the prevalence of head lice (3, 5). Infestation with head lice most frequently occurs in schoolchildren between 5 and 13 years of age (particularly girls) with annual incidence rate of 800-2400 cases per 10,000 children. This could be related to the more frequent direct contact as well as frequent sharing of combs, brushes, hats and other headgear among this group of children (6-10). It is known that pediculosis is the most common parasitic infection among children (11, 12). The first sign of pediculosis is severe itchy scalp caused by blood sucking, presence of antigens in the lice stool and saliva. (13). The anticoagulant agents may also cause anemia, allergies and impetigo (4). In addition, chronic irritation may lead to psychological and social distress and disrupt school performance (14, 15).

In recent decades, a significant increase in the prevalence of head louse infestation has been reported. Moreover, resistance to insecticides due to inappropriate application and formulation changes have contributed to the increased prevalence of head lice (16-18). Present treatment options for eradication of head lice include wet combing, topical pediculicides and oral therapies. Contemplation of treatment strategies should include the ovicidal and pediculocidal properties of the choices therapy (19).

Head lice is usually characterized by itching, inflammation of the scalp and detection of lice and eggs attached to hair shafts (20, 21). The frequency of shampooing and brushing does not influence the risk of head lice infestation, while head-to-head contact is by far the most common transmission route. Lice can also be transmitted by inanimate objects such as

clothes, hats, scarves, combs, towels, beddings, hair brushes and upholstered furniture or carpets (22-24).

In Iran, the prevalence of *Pediculus capitis* was reported to be between 1.05% and 29.3% in cities with various sociodemographic backgrounds (25, 26). Given the lack of data on the prevalence of this condition in Tabriz, this study was performed to determine the prevalence of head lice in primary children in Tabriz, Northwest of Iran.

MATERIAL AND METHODS

Tabriz is located in the East Azarbaijan Province (36°43'– 39°25'N and 45°3'– 48°19'E), a mountainous area with altitude of 1351.4 m and a temperate climate. The sample size was determined as 2,988 by using the below formula with the following assumptions: $p = 8.5\%$, 95% confidence level ($Z_{1-\alpha/2}$) and margin of error (d) = 0.01 .

$$n = z^2 * p * (1 - p) / d^2$$

In this study, 33 schools were selected by multi-stage cluster sampling. In the first stage, stratified random sampling was done based on educational region and grade of school (preschool centers and primary schools). Finally, students in 14 preschool centers and 19 primary schools were enrolled in the study. Screening was carried by visual inspection of the head and scalp under the light of a reading lamp for about 3-5 minutes. Infestation was confirmed if at least one adult, nymph and either live or dead nits of lice were detected. Female students were examined by female experts and boys were checked by male examiners. Subjects were treated and interviewed individually to avoid any sense of shame.

Data on various variables including gender, age, type of school, hygiene teacher, parents' occupation, parents' education level, family size, family income, qualified private bedroom, sharing a bed and pillow, frequency of hair washing (per week), sharing common comb and towel and hair characteristics were collected using a questionnaire. After careful examination, removed lice were collected with a small hair brush and dipped in 70% alcohol. Data analysis was carried out using SPSS software package (version 23).

Association between participants' characteristics and pediculosis infestation was evaluated using logistic regression analysis and chi-square test. P-values less than 0.05 were considered statistically significant. Variables with p-values less than 0.20 in univariate models were considered for multivariate analysis. A backward stepwise model was used to detect the main effects in the final model.

RESULTS

From January to March 2018, a total number of 3,032 (1515 boys and 1517 girls) preschool and primary school children in Tabriz were screened for head lice infestation. The total prevalence of head lice was 4.29%. The most common household size was 3 (48.28%). Approximately, 60% of children were in private schools and nearly 95% of parents had 300-600 Dollar monthly income. Only 18.73% of fathers and 30% of mothers were employed.

The mean \pm standard deviation (SD) age of the students was 8.31 ± 1.71 years (range: 6 to 12). As shown in table 1, 12% and 15% of children expressed that they had common comb and common pillow/shared room with another person. According to the multivariate analysis, being female [odds ratio (OR): 2.11; 95% CI: 1.42-3.14], studying in a private school (OR: 2.24; 95% CI: 1.46-3.42), household size of four or five, unemployment of mothers (OR: 1.68; 95% CI: 1.06-2.65) as well as having common comb (OR: 1.64; 95% CI: 1.01-2.67) and straight hair style (OR: 2.26; 95% CI: 1.21-4.25) were the most important risk factors for lice infestation in schools of Tabriz. Combing the hair twice a day was a protective factor for head lice infestation. There was no relationship between head louse infestation and parent's education level, family income and frequency of bathing per week and having a common pillow or shared room (Table 1).

Table 1. Univariate and multivariate analysis of the relationship between *Pediculus capitis* infestation and potential risk factors in Tabriz, Iran

Variables	Subgroup	Total	<i>Pediculus capitis</i> frequency		P-value	OR (95% CI)	Adjusted OR (95% CI)
			Number	%			
Gender	Male	1515	37	2.44	<0.001	2.61 (1.77-3.85)	2.11(1.42-3.14)
	Female	1517	93	6.13			
Type of school	Governmental	1227	30	2.44	<0.001	2.34(1.55-3.54)	2.24(1.46-3.42)
	Private	1805	100	5.54			
Age	6 years	628	38	6.05	0.02	Reference	
	7-9 years	1521	64	4.20		0.68 (0.45-1.03)	
	10-12 years	883	28	3.17		0.51 (0.31-0.84)	
Family size	3 persons	1464	43	2.93	<0.001	Reference	Reference
	4 persons	1350	69	5.11		1.78 (1.21-2.62)	1.94(1.30-2.90)
	5 persons	182	17	9.34		3.41 (1.90-6.11)	3.80 (2.07-6.98)
	6 persons	32	1	3.13		1.07 (0.14-7.99)	1.73(0.22-13.81)
Family income (per month for each family, in US dollars)	<300 \$	158	0	0.00	0.002	NA	
	300-600 \$	2874	130	4.52			
Father's occupation	Self-employed	2464	82	3.33	<0.001	2.68(1.86-3.88)	
	Governmental-employed	568	48	8.45			
Mother's occupation	Employed	898	31	3.45	0.14	0.74(0.49-1.11)	1.68(1.06-2.65)
	House wife	2134	99	4.64			
Father's education level	Lower than Diploma	42	2	4.76	0.59	Reference	
	Diploma	1857	74	3.98		0.83(0.20-3.50)	
	Graduate	1133	54	4.76		1.00(0.24-4.25)	
Mother's education level	Lower than Diploma	56	2	3.57	0.81	Reference	
	Diploma	1855	83	4.47		1.27(0.30-5.28)	
	Graduate	1121	45	4.01		1.13(0.27-4.78)	
Frequency of combing per day	Once	1034	54	5.22	0.14	Reference	Reference
	Twice	1147	40	3.49		0.66(0.43-1.00)	0.57(0.37-0.88)
	Thrice or more	851	36	4.23		0.80(0.52-1.24)	0.70(0.44-1.12)
Bathing per week	Once or less	1311	57	4.34	0.87	Reference	
	Twice	1059	47	4.43		1.02(0.69-1.52)	
	More than twice	662	26	3.93		0.90(0.56-1.44)	
Having a common comb	No	2681	106	3.95	0.01	1.78 (1.13-2.82)	1.64(1.01-2.67)
	Yes	351	24	6.84			
Having a common pillow or shared room	No	2579	107	4.14	0.37	1.24(0.78-1.96)	
	Yes	453	23	5.08			
Hair style	Curly	537	13	2.42	0.02	1.98(1.11-3.55)	2.26(1.21-4.25)
	straight	2495	117	4.69			

DISCUSSION

Head lice infestation is a major public health problem worldwide. Its prevalence is influenced by individual hygiene and socioeconomic status (27). The prevalence of *Pediculosis capitis* in the world is still unknown, and millions of people may be at risk of head lice infestation, particularly schoolchildren aged five to fourteen years (28) because of frequent head to head contact (3, 29, 30).

The lack of data on the epidemiology of head lice could hamper and disrupt developing appropriate strategies for controlling pediculosis infestation in Tabriz. The prevalence of head lice infestation in our study was 4.29%. In a systematic review (2015) in Iran, the prevalence of head lice was estimated to be 7.4%, which is higher than the rate observed in our study (31). The prevalence of lice infestation in different provinces of Iran was reported to be 1.05% and 1.3% in Hamadan (4, 32), 1.8% in Kerman (8), 2.3% in Asadabad (33), 4.7% in Kurdistan (29), 6.6% in Tabriz (27), 7.4% in Mazandaran (34), 8% in Kermanshah (35), 13.7% in Mashhad (36), 27.1% in Iranshahr (37), 29.3% in Qom (38), 23.38% in Khuzestan (59) and 3.2% in North Khorasan (60) provinces. The difference in the prevalence rates might be due to the differences in climate and sample size. The prevalence of head lice infestation in other countries was reported as 0.7% in Germany (39), 4.1% in South Korea (40), 5.2% in Saudi Arabia (41), 5.5% in Egypt (42), 5.8% in Korea (43), 5.1-9.1% in Turkey (44, 45, 46), 8.9% in Belgium (1), 13% in Australia (47), 13.3% in Yaman (48), 13.9% in Mexico (49), 14.1% in Palestine (3), 41.8% in India (5), 29.7% in Argentina (51), 35% in Brazil (52), 35.5% in Malaysia (53), 52% in Ukraine (54), 61.4% in Argentina (56) and 65.7% in Ethiopia (18). Generally, the prevalence of head lice infestation in female pupils was higher than in male pupils (32), which was also observed in our findings.

In the present study, the prevalence of lice infestation in private schools was higher than in public schools. Inconsistent with this finding, a study in Assadabad reported no difference in the frequency of infestation between students in public schools and private schools (33). In the mentioned study, the frequency of infestation was higher among

schoolchildren with curly hair, which is inconsistent with our findings. We found no association between head louse infestation and parents' education level, family income and frequency of bathing or having a common pillow or shared room, which is similar to the results obtained in studies conducted in Hamadan and Kerman (56, 57).

The highest prevalence rate (6.05 %) was observed in children aged 6 years old, which is similar to findings of previous studies in Iran and other countries (58). There was a significant relationship between head louse infestation and parent's occupation and family size, combing repetition per day and hair style.

CONCLUSION

It is necessary to find the risk factors of head lice infestation. Although the prevalence of head lice infestation is relatively low in Tabriz, screening and treating schoolchildren should be done continuously in order to reduce infestation rate. In addition, health professionals and school health system should raise awareness of children and parents about transmission and prevention of pediculosis and improve personal hygiene.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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