

## Risk Factors Associated with Head lice (Pediculosis) Infestation among Elementary School Students in Meshkinshahr County, North West of Iran

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### Abstract

**Background:** Head louse (*Pediculus humanus capitis*) is one of the common health problems of the children in elementary schools. The aim of this study was to determine risk factors associated with head lice (Pediculosis) infestation among elementary school students in Meshkinshahr County, Northwestern Iran.

**Materials and Methods:** This descriptive-analytic study is done over 1,950 students (1,055 girls and 895 boys) in Meshkinshahr County, North West of Iran that were selected two-stage cluster. Data collection was conducted using researcher-made questionnaire. In addition, the suspected cases were confirmed via physical examination for the presence of adult lice, and eggs. Head examinations were done by general physicians and medical entomologist experts. For data analysis, Chi-square and Regression Logistics tests were used.

**Results:** In total, out of 1,950 students of primary schools, 200 students (10.25%) were infested with pediculosis. A total of 131 (12.42%) of girls, and 69 (7.71%) of boys were head lice infested. Most of head lice infested students 145 (72.5%) were in the classrooms with capacity of more than 20 students. Also, one hundred sixty-one (80.5%) of the cases were in the schools with capacity of more than 100 students. This study revealed significant differences among student's family size, students and their parents' history of infestation, type of bathrooms, history of use shared hygiene items and head lice infestation ( $P < 0.05$ ).

**Conclusion:** The prevalence of head lice infestation in Meshkinshahr County was relatively high in comparison to other studied areas of Iran. It seems family size, students and their parents' history of infestation, type of bathrooms, and history of use shared hygiene items were probably risk factors associated with head lice infestation among students of primary schools.

**Key Words:** Head lice, Elementary students, Iran, Pediculosis.

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## 1- INTRODUCTION

Public health in any society has a great importance so that progress of the community depends on the general health people. One of the threatening factors of public health is the contamination to insects especially ectoparasites that despite the promotion of health and medical science, there is still a major health problem (1). Lice are the obligate ectoparasites of mammals that cannot live without the right host, except a short period (2). The head louse (*Pediculus humanus capitis*) can transmit diseases such as the epidemic typhus, relapsing fever, trench fever. Head louse do not transmit a special disease and it has a less importance compared to body louse. Although the contamination to body louse is almost eradicated in the world, but head louse can be seen in all over the world and in Iran, it can be seen in abundance especially in poor places with high population density lack of the personal hygiene instructions. These contaminations especially in villages and more importantly among children have almost high prevalence. Lice infestation causes to humility, psychological excitements, depression and insomnia in individuals (3).

Contamination to lice exists all over the world and each year 6-12 million people are infected (4). The prevalence of head louse in various countries has a difference for example in Mexico 13.6 % (5), Jordan 26.6 % (6), South Africa 15.93% (7), Thailand 23.32% (8), and Nigeria 26.4% (9). Lack of knowledge on personal public in elementary students and their presence in populated places such as schools, head lice is one of the most common health problems among schoolchildren in the world. Studies show that prevalence of head louse (*Pediculus humanus capitis*) in the world is ranged from under 5% to more than 40% (10), and in different regions of Iran; it is variant from 6 to 30% (11); for example, the prevalence rate in urban and

rural areas of North West of Iran was 5.1% and 6.1%, respectively (12), and among in primary school students in Bahar, Hamadan province, the infestation rate was 0.66% in urban and 1.66% in rural areas (13), and among students in Tabriz, the prevalence was 3.64% (14). The most important factor in spreading head lice directly is through being in direct head-to-head contact, with the infested people. Population growth and low health are of the heightening factors of its prevalence. There is a possibility of getting lice in different social-economic classes of a society (15). According to some executed researches, the highest prevalence rate to head louse is among the children at the age of 6 to 11 years old (11, 14, 16).

The infestation in this age group and its relation to education, which leads to generalization to whole society, is the main reason to select this age range for the present study. Studies on the causes of the increased prevalence of pediculosis makes it determine of the causes infection status and recognizes its relation to environmental, family and social factors and would the best methods to prevent and control them. The aim of this study was to determine the causes of increased morbidity to head lice in the elementary students in three parts (demographic, family and home place and school), in Meshkinshar city, Iran.

## 2- MATERIALS AND METHODS

### 2-1. Study design and population

Meshkinshar County is located on the Center of Ardebil province, North West of Iran. Meshkinshahr city is located on 38 degrees, 23 minutes and 34 seconds northern latitude and 47 degrees, 1 minute and 7 seconds on eastern longitude (17). The statistical population included all of the elementary students who were in the urban and rural districts of Meshkinshahr during 2015 to 2016 school years.



**Fig1:** The study area, Meshkinshar County in Ardabil province, North West of Iran.

## 2-2. Methods

The total number of primary schools and population of student in Meshkinshar County were 235 schools and 13,400 students. Based on previous studies (18, 19), this study was carried out in 20 primary schools on 1950 students (1,055 females and 895 males). The sample size was determined through multi stage cluster sampling method. In this descriptive-analytic study, at first, primary school children were divided into five clusters, and from each cluster, four schools were selected randomly. Data collection was conducted using standard check list that was approved by Iranian Centers for Disease Control and Prevention (CDC). The checklists have been completed by doctors or health staffs through interview with students. Standard check list included: demographic variants, residency place, Educational media, students density in classroom, history of infestation, bathing per week, having private homes

and ultimately, presence of adult lice, and eggs on head hair. In addition, hairs behind the neck and round the ears were investigated for five minutes to detect eggs, nymph or matured human head lice by direct observation method. According to the standards instructions to control head lice in schools, the suspected cases were confirmed via physical examination as visual inspections of scalp and hair for the presence of adult lice, and eggs. Head examinations were done by general physicians and medical entomologist experts (20). In order to complete the checklist, interviewers elicited some information from the sanitary files of the students (which is the office of the schools) or directly observed and for some they went to students' houses. For data analysis, Chi-square and Regression Logistics tests were used. In the second part of this study, 200 head lice infested students with 200 healthy students were compared for evaluating risk factors related to head lice infestation.

### 2-3. Ethical consideration

Firstly, the coordination and permission letter was taken from Ardabil University of Medical Sciences (ID-Number: 9420). It should be mentioned that before start of the study, the objects of this research was described and the students were ensured about the confidentiality of their personal information. However, we were told that participation in this study was completely optional and voluntary.

### 2-4. Inclusion criteria

The inclusion criteria were being an elementary student that permanent resident in urban or rural districts of Meshkinshahr in Ardabil Province and being satisfied to participate in this present study. Also, before this study their head lice infestation had not been confirmed.

### 2-5. Exclusion criteria

The exclusion criteria were being non-Iranian and not living permanently in the study area, just partial fill out of the questionnaire and unwillingness for participation in present study.

### 2-6. Data Analyses

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 23.0 software. Chi-square test and univariate regression analysis are designed to analyze the data. The variables with significant level of lower than 0.2 in univariate regression analysis, were entered into multiple logistic regressions model;  $P < 0.05$  was considered significant level.

## 3-RESULTS

The prevalence of head lice infestation was 10.25%; in other hand, out of 1,950 students of primary schools, 200 students were infested with pediculosis. A total of 131 (12.42%) of girls and 69 (7.71%) of boys were head lice infested. In terms of school grade, the highest frequency of infested students (19.37%) was in school grade I. In family size perspective, the infestation rate in the families with more than 7 members were higher than the other ( $P < 0.05$ ). Other socio-demographic data of students and the prevalence of head lice infestation among elementary schools of Meshkinshahr were presented in **Table.1**.

**Table-1:** The socio-demographic data of students and the prevalence of head lice infestation among elementary schools of Meshkinshahr County, 2017

Characteristics		Examination, Number (%)	Head lice infestation	Frequency of head lice, (%)
Gender	Boy	895 (45.90)	69	7.71
	Girls	1055 (54.10)	131	12.42
School grade	I	351 (18)	68	19.37
	II	320 (16.41)	40	12.50
	III	320 (16.41)	40	12.50
	IV	318 (16.31)	28	8.80
	V	321 (16.46)	13	4.05
	VI	320 (16.41)	11	3.44
Habitat	Urban	1189 (60.97)	122	10.26
	Rural	761 (39.03)	78	10.24
Family size	≤4	1266 (64.92)	56	4.42
	5-6	545 (27.95)	111	20.37
	>7	139 (7.13)	33	23.74
Father's education	Literate or primary	869 (44.56)	146	16.80

	Diploma	733 (37.59)	42	5.73
	University education	348 (17.85)	12	3.44
Mother's education	Literate or primary	855 (43.85)	162	18.95
	Diploma	792 (40.61)	28	3.53
	University education	303 (15.54)	10	3.30

### 3-1. Socio-demographic Section

Totally, of the 400 participating students in the case-control part of this study, 249 (62.2%) were resident in urban areas and 151 (37.8%) in rural areas. Most of head lice infested students (51.5%) were lived in the central part of the city and this rate was significantly higher than the other two parts ( $P < 0.05$ ); but there was no significant relation between head lice infestation and residential area rural/urban ( $P > 0.05$ ). The infestation rate of pediculosis was 12.42% in girl's students and 7.71% in boy students. There was no significant difference between head lice infestation

and gender of students ( $P > 0.05$ ). In terms of parents' education level, in the control group most of the infested students had parents with low education level and we observed significant relation between head lice infestation and parents' education level of students ( $P > 0.05$ ). More than 80 % of head lice infested students were resident in the families who had history of infestation. Based on statistical analysis, there was a significant relation between head lice infestation in students and their parents' history of infestation ( $P > 0.05$ ). Furthermore, 66% of cases had history of head lice infestation, too (**Table.2**).

**Table-2:** Multivariable logistic regression analysis of the relationship between head lice infestation and Socio-demographic risk factors, Meshkinshahr County, 2017

Variables		Control group Number (%)	Case group Number (%)	Odds ratio (95% CI)	P-value
District	Central	127 (63.5)	103 (51.5)	1	-
	West	41 (20.5)	37 (18.5)	1.11(0.665-1.86)	0.684
	East	32 (16)	60 (30)	2.31(1.4-3.81)	0.001
Residential area	Urban	121 (60.5)	128 (64)	1	-
	Rural	79 (39.5)	72 (36)	0.862(0.575-1.291)	0.47
Gender	Male	89 (44.5)	69 (34.5)	1	-
	Female	111 (55.5)	131 (65.5)	0.657(0.439-0.983)	0.041
Father education levels	Illiterate	10 (5)	31 (15.5)	1	-
	Under diploma	45 (22.5)	115 (57.5)	50.633(12.913-198.536)	0.001
	Diploma	59 (29.5)	42 (21)	41.741(12.378-140.761)	0.001
	Associate degree	37 (18.5)	9 (4.5)	11.627(3.395-39.82)	0.001
	Bachelor's degree or higher	49 (24.5)	3 (1.5)	3.973	0.049
Mather education levels	Illiterate	13 (6.5)	51 (25.5)	1	-
	Under diploma	46 (23)	111(55.5)	21.185(6.83-65.711)	0.001
	Diploma	79 (39.5)	28 (14)	13.03(4.726-35.928)	0.001

	Associate degree	35 (17.5)	5 (2.5)	1.914(0.672-5.453)	0.224
	Bachelor's degree or higher	27 (13.5)	5 (2.5)	0.771(0.203-2.938)	0.704
History of infestation	Yes	8 (4)	132 (66)	1	-
	No	192 (96)	68 (34)	0.081(.038-0.174)	0.001
Family history of infestation	Yes	11 (5.5)	162 (81)	1	-
	No	189 (94.5)	38 (19)	0.248(0.123-0.501)	0.001

95% CI: 95% confidence interval.

### 3-2. Residential related results

We found that 86% of students in control group who were free of head lice infestation had private bathrooms in their houses, whereas that in the case group, 56% of students did not have private bathrooms and they would shower in public bathrooms. There was significant difference between head lice infestation and type of bathrooms ( $P<0.01$ ). In the

case group, 75.5% of students would take a shower just one a week. There was no significant difference between head lice infestation and number of bathing ( $P>0.05$ ). In addition, 57.5% of students in the case group and 21.5% in the control group had history of use shared hygiene items that had a significant difference with head lice infestation ( $P<0.01$ ). Other residential data were mentioned in **Table.3**.

**Table-3:** Multivariable logistic regression analysis of the relationship between head lice infestation and residential risk factors, Meshkinshahr County, 2017

Variables		Control group Number (%)	Case group Number (%)	Odds ratio (95% CI)	P-value
Type of bathroom	Private	172 (86)	88 (44)	1	-
	Public	28 (14)	112 (56)	5.289 (3.225-8.671)	0.001
Number of bathing	Once during 2 weeks	40 (20)	15 (7.5)	1	-
	Once a week	107 (53.5)	153 (76.5)	3.813 (2.005-7.251)	0.401
	Twice a week	53 (26.5)	32 (16)	1.61 (0.77-3.368)	0.206
Use of shared hygiene items	Yes	43 (21.5)	115 (57.5)	1	-
	No	157 (78.5)	85 (42.5)	0.202 (0.131-0.314)	0.001
History of using anti-head lice shampoo.	Yes	8 (4)	49 (24.5)	1	-
	No	192 (96)	151 (75.5)	0.128 (0.059-0.279)	0.001

95% CI: 95% confidence interval.

### 3-3. School related results

Most of head lice infested students 145 (72.5%) were in the classrooms with capacity of more than 20 students. Also, one hundred sixty-one (80.5%) of the cases were in the schools with capacity of more than 100 students. We observed significant relation between density of student in the classroom and head lice infestation ( $P<0.01$ ). In the case group,

89.5% of the students were studying in a two-shift schools and 54% of them seated on multi-student benches that a significant difference was observed ( $P<0.01$ ) (**Table.4**). The result of this study has shown that 88.5 of the students in the case group were studying in old buildings schools that it had a significant difference with head lice infestation in comparison of newly-built schools ( $P<0.01$ ). We revealed

that 72(36%) of the infested students were examined just once a year by health instructors in their schools but 1470 (84%) of students who had not pediculosis, were

not examined even once a year. This study revealed significant differences between students with head examinations and head lice infestation ( $P < 0.05$ ).

**Table-4:** Multivariable logistic regression analysis of the relationship between head lice infestation and school related risk factors, Meshkinshahr County, 2017

Variables		Control group Number (%)	Case group Number (%)	Odds ratio (95% CI)	P-value
Density of student in classroom	Upper 20 students	82 (41)	145 (72.5)	1	-
	Under 20 students	118 (59)	55 (22.5)	0.128(0.059-0.279)	0.001
Density of student in school	Upper 100 students	44 (22)	161 (80.5)	1	-
	Under 100 students	154 (77)	39(19.5)	1.61(0.77-3.368)	0.024
School shifts	One	78 (39)	21 (10.5)	1	-
	Two	122 (61)	179 (89.5)	5.778(3.311-10.083)	0.001
Seat type in classrooms	Single	161 (80.5)	31 (15.5)	1	-
	Bench	39 (19.5)	169 (84.5)	22.505(13.39-37.8)	0.001
School buildings situation	New building	175 (77.5)	23 (11.5)	1	-
	Old buildings	25 (12.5)	177 (88.5)	53.87(29.45-98.51)	0.001
Having school health instructors	Yes	82 (41)	104 (52)	1	-
	No	118 (59)	96 (48)	0.641(0.432-.953)	0.028

95% CI: 95% confidence interval.

#### 4- DISCUSSION

Previously, many researches from all of the world and specially Iran have been studied on head lice that the main goals of these studies were to analyze the prevalence and infestation rate among students which they were descriptive-analytic. But this research has done on students diagnosed with head louse and healthy (free of head lice infestation). They are compared on demographic information, family lifestyle, characteristics of residential area and types of school building. The result of this study showed that the residential district of the students in the central part of Meshkinshahr where have more inhabitants, due to the weather and short distance to the center of the city and having income from agriculture and gardening, the villages that are so close together and the suburbs are vast, have more infestation rate compared to eastern and western parts that do not have these characteristics. But on the point of view of living in rural or urban areas

and the infestation rate the difference was not significant between the groups. This result of present study is consisting similar to previous studies in Iran and other parts of the world (5, 6, 11, 12). The findings of Dehghanzadeh et al. study (2015) (12) is in accordance with this study. However, the results of Moradi et al. research in Hamedan showed that the infestation rate in the rural area had estimated to be 1.66% and in the urban area 0.66% (13); but in Edalatkhah et al.'s study 35.5% infestation rate among village students and 1.2% in urban students were reported (21).

We found that prevalence of pediculosis in school boys was lower than school girls. This significant difference could be attributed to behavior patterns among boys and girls which affected transmission rates like girls' clothing. Furthermore, girls generally have longer hair as compared to boys and longer hair require better grooming and combing. In addition, it seems female's long hair is a breeding place for human head lice. Family history

of head lice infestation and students' prior history of infestation in a re-infestation to head lice was shown to be effective risk factor. This is in agreement with previous studies in this field (22). Analysis of the residential area of students in both groups showed that there is no significant difference between infestation rate in students and their residential areas (urban/rural). This finding showed that in the villages, most of the buildings were newly built with better material during recent years. Previous studies in other area of Iran revealed that type of the buildings and number of rooms was effective in infestation rate (23-25).

The type of school building that was studied in two groups, were either old governmental or new governmental which in the case group students were studying four times more in old governmental schools than the students in the control group. Having health instructor in the schools and also the visit of the crew of health centers that examined students were of the important effective factors in prevalence of infestation in a way that in the control group, more than 59% of the schools had health instructors and 84% of the schools were visited by the health instructors. In the studies by Saghafipour et al. (26), and Motavalli Haghii et al. (27) instructors and number of visits were effective on the progress of infestation. In this present study, 57.5% of students in the case group had history of use shared hygiene items that had a significant difference with head lice infestation.

This is in agreement with Wafa and AL-Megrin 's study (2015), Dehghanzadeh et al. (2015) that reported sharing things in the houses and school is effective, too (12, 28). The type of bathroom (private/public) was effective in taking bath and in head lice infestation rate among students. Previously, in similar studies, the significant relation between head lice infestation and number of taking baths

were confirmed (18, 29); whereas, this finding did not match with Moradi et al. (2009), and Wafa and AL-Megrin's studies (2015) (13, 28). According to this present study, most of head lice infested students (72.5%) were in the classrooms with capacity of more than 20 students. Also, 80.5% of the cases were in the schools with capacity of more than 100 students. There was significant relation between density of student in the classroom and head lice infestation. The results of Buczek et al. (2004) on the East of the Netherlands also showed that number of students in the school is affective in the infestation progress (25).

High density of students blocks proper washing and combing and as a result this helps the infestation progress (30). It seems high density of students in a classroom and also seating on a same bench due to being in contact with others is one of the probable reasons for human head lice infestation.

#### **4-1. Limitations of the study**

The lack of willingness and uncooperative involvement of some students and parents was limited in this project.

#### **5- CONCLUSION**

The prevalence of head lice infestation in elementary school students in Meshkinshahr County, was relatively high in comparison to other studied areas of Iran. According to the result, it seems family size, students and their parents' history of infestation, type of bathrooms, and history of use shared hygiene items were probably risk factors associated with head lice infestation among students of primary schools in Meshkinshahr County; North West of Iran. Personal health especially at families with more siblings and not use of shared hygiene items are recommended to prevention of human head lice infestation.

**6- CONFLICT OF INTEREST:** None.



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