

Prevalence Rate and Risk Factors of *Pediculus capitis* Among Primary School Children in Iran

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Abstract

Background: Human head lice infestations caused by *Pediculus capitis* are a common health problem in school aged children in many parts of the globe. Its transmission occurs directly, mostly by head to head contact, and causes scalp itching. This insect is not known to be the vector of any human disease.

Objectives: This descriptive-analytical study was conducted in order to determine the prevalence of pediculosis, as well as some effective treatments, among pupils in the primary schools of Glogah county in the Mazandaran province of Iran, during the 2009-2010 school year.

Materials and Methods: A total of three-hundred students in the first through fifth grades in boys' and girls' primary schools were selected via multistage, systematic, cluster, random sampling in the urban and rural areas of Glogah county. They were examined for live lice or nits by experienced educators, while a questionnaire was used to record data on the demographic features and other related information of each student. These data were compared using a chi square analysis (SPSS software), and a P value of less than 0.05 was considered to be significant.

Results: Based on a total of 300 pupils, 17 of them (5.7%) were infested with *Pediculus capitis*. The prevalence rate was 6.8% in the boys and 4.8% in the girls, while the rate of infestation was 7.7% in the urban areas and 3.4% in the villages. Those children between 9 and 10 years old showed the highest prevalence rate (7.4%). There was a significant association between pediculosis and a prior infestation, number of comb uses per day, frequency of hair washing (per week), having a hygiene teacher, sharing common instruments, health care of the children, children living with parents, knowledge of pediculosis, and the spacing of the children in each class.

Conclusions: The results showed that the prevalence of pediculosis among the Glogah county primary school students was less than the average percentages observed in other students inside and outside of Iran.

Keywords: Epidemiology, Head Lice, Risk Factors, Schools, Pupil

1. Background

Head lice infestations are a significant public health issue worldwide, and spread quickly in unsanitary and overpopulated areas (1, 2). They are often related to poor communities in run-down conditions, and cause considerable health problems in many societies, particularly among children between 3 and 14 years of age (2, 3). This disease is caused by *Pediculus capitis* (Anoplura: Pediculidae), an ectoparasite detected on the hair and scalp (4, 5), and is commonly transmitted through physical or direct contact (scalp-to-scalp) between children playing, or via indirect contact (brush, comb, clothing, towels, etc.) (6, 7).

Pediculus capitis does not appear to be a vector of any disease; however, the head louse can cause sleep loss, irritation, pruritus, discomfort, secondary bacterial infections (such as impetigo and acute glomerulonephritis), and lymphadenopathy in the lymph nodes on the back of the neck and ears (8-10). Moreover, head lice infestations can occasional cause mental disorders, because children imagine that they are the result of being unclean (11). Several studies from various regions in Iran have reported

head lice infestation rates varying between 0.47% and 28.5% (8, 10, 12-15).

Some investigations have been conducted in Iran on the epidemiology of the head louse and its related risk factors. In these surveys, some of the factors suggested to have significant associations with the prevalence of head lice infestations included: parents' literacy, family size, school grade, and having a bathroom in the home in a Sirjan county study (10); sex, father's occupation, mother's education level, having a bathroom in the house, previous history of disease, and nationality in an Aran-Bidgol county study (8); geographical area (city or village), itching, student's age, prevalence of the disease in the family, and history of infestation in a Damghan county study (14); school grade, family size, and type of house in a Kharajeh City study (16); age of children, father's job, father's education, mother's education, using a common comb, and school grade in a Pavah city study (7); and children's age, use of hair oil, and presence or absence of dandruff in an Iranshahr county study (15).

2. Objectives

The main objectives of the present study were to determine the prevalence of head lice in primary schools in Glogah county in the Mazandaran province of Iran, and to assess the risk factors related to infestation.

3. Materials and Methods

This primary school-based, descriptive, cross sectional, analytical study was conducted in Glogah county from 2009 to 2010. The study was conducted among boys and girls between 7 - 12 years old in 16 primary schools. The information was collected in two parts, an interview and a health examination. Three-hundred grade 1 - 5 primary school pupils in both urban and rural regions of the county were examined for head lice infestations. Finally, a multistep, stratified cluster random sampling strategy was pursued to select the study cases.

The pupils' scalps and hair were inspected by three trained health care workers under the guidance of a medical entomologist. The diagnosis of a pediculosis capitis infestation was certified by visual examination of the hair and scalp (especially behind the ears and above the neck), using a hand magnifying glass, with the aid of a desk lamp for the detection of living lice, nymphs, and/or nits, for three-five minutes. Finding eggs represented an old infestation, while the detection of live lice showed an active infestation. These examinations were carried out after combing the hair of the children with a louse comb for approximately seven minutes over white paper. Any observed stage of lice was collected using adhesive tape. The standard questionnaire (with 26 closed-ended questions) recorded the following data: school grade, gender, age, number of family members, parents' jobs, parents' literacy, length of hair, type of hair (curly or straight), number of comb uses per day, the sharing of personal items, knowledge of head lice, hair density, past lice infestations, other family members with lice, presence of one of the life stages of lice, infestation severity, frequency of hair washing per week, bathroom at home, presence or absence of dandruff, birth rank, number of family members per bedroom, and presence of a school health educator. For the data analysis, a chi-square test (SPSS software, version 11.5) was used, and a P value of less than 0.05 was considered to be significant.

4. Results

In total, 300 primary school students from 16 schools, including 132 boys (44%) and 168 girls (56%), were screened for lice. Among these students, 145 and 155 lived in rural and urban regions, respectively. The overall head lice infestation rate in the studied population was 5.7% (n = 17), and Table 1 shows the prevalence. The lice infestations were stratified by the sociodemographic status of the parents, as well as the geographical location, birth rank, age, gender, and school grade of the pupils.

The prevalence of head lice infestations based on personal hygiene is presented in Table 2. For example, the

age of the pupils had an effect on the prevalence of head lice, and infestations were higher in 9 year-olds; however this association was not statistically significant (Table 3). Although the infestation rate was found to be higher in boys, the difference was not statistically significant ($P > 0.05$). The head lice infestation rate was significantly related to the father's job ($P < 0.05$), but there was no significant relationship between the mother's job and the infestation rate. Moreover, no significant relationships were found between the levels of education of the father and mother and the infestation rate ($P > 0.05$).

Table 1. Prevalence of Head Lice Infestations in Relation to the Sociodemographic Status of the Parents, as Well Geographical Location, Birth Rank, Age, Sex, and School Grade of the Pupils (Glogah County, Mazandaran Province, Iran)

Variables	Number of Infestations, No. (%)	Total (No.)
Geographical location		
Urban areas	12 (70.6)	155
Rural areas	5 (29.4)	145
Gender		
Entire county		
Male	9 (52.9)	132
Female	8 (47.1)	168
Rural areas		
Male	2 (40)	60
Female	3 (60)	85
Urban areas		
Male	7 (58.3)	72
Female	5 (41.7)	83
School grade		
I	4 (23.5)	53
II	1 (5.9)	49
III	5 (29.4)	63
IV	4 (23.5)	67
V	3 (17.7)	68
Total	17 (100)	300
Mother's job		
Housewife	16 (94.1)	252
Employed	1 (5.9)	48
Father's job		
Government employee	2 (11.8)	84
Farmer	4 (23.5)	17
Laborer	2 (11.8)	69
Private	7 (41.1)	113
Unemployed	0 (0)	4
Others	2 (11.8)	13
Family size		
3	4 (23.5)	62
4	9 (52.9)	143
5	2 (11.8)	65
≥ 6	2 (11.8)	30
Total	17 (100)	300

The majority of the head lice infestations were in families with 4 members; however, there was no statistically significant difference between the number of members in the family and the infestation rate (Table 3). The prevalence of pediculosis was not significantly related to the school grade ($P > 0.05$); although the group most frequently exhibiting infestations was the third grade. The results showed that there was a negative correlation between the birth rank and the infestation rate.

The results of this study have shown that there are relationships between pediculosis and certain factors, such as children's health care ($P = 0.046$), children living with parents ($P \leq 0.001$), previous lice infestations ($P = 0.027$), shared use of items ($P = 0.004$), children's knowledge of pediculosis ($P = 0.005$), number of hair washings per week ($P = 0.04$), having a hygiene teacher ($P = 0.007$), number of hair brushings per day ($P = 0.015$), and approximate space per student in the class ($P = 0.028$) (Table 3).

The infestation rate was higher among those students with long hair; however, it was not significantly related to the infestation rate ($P = 0.56$). In addition, the infestation rate was higher among the students who did not have dandruff ($P = 0.535$), and the sharing of headscarves, beds, caps, combs, and towels were all risk factors for head lice in the pupils.

Table 2. Prevalence of Head Lice With Relation to Personal Hygiene (Glogah County, Mazandaran Province, Iran)

Variables	Infestations, No. (%)	Total (No.)
Children's Health Care		
By themselves	2 (11.8)	10
By parents	15 (88.2)	290
Shared use of items		
Yes	17 (100)	205
No	0 (0)	95
Children living with parents		
Living with one parent	3 (17.6)	14
Living with both parents	12 (70.6)	283
Living with none of the parents	2 (11.8)	3
Infestation with lice in the past		
Yes	5 (29.4)	37
No	12 (70.6)	263
Sanitary bathroom at home		
Yes	12 (70.6)	252
No	5 (29.4)	48
Hair density		
High	6 (35.3)	162
Low	11 (64.7)	138
Residential room lighting conditions		
Sufficient	16 (94.1)	289
Inadequate	1 (5.9)	11

Children's knowledge of pediculosis

Yes	9 (52.9)	239
No	8 (47.1)	61

Number of hair washings per week

Once a week	9 (52.9)	92
Twice a week or more	8 (47.1)	208

School health teacher

Yes	0 (0)	87
No	17 (100)	213

Using common items

Cap	2 (11.8)	29
Bed	5 (29.4)	47
Towel	3 (17.6)	100
Comb	5 (29.4)	83
Toothbrush	0 (0)	7
Headscarf	2 (11.8)	2
Underwear	0 (0)	22
Other items	0 (0)	10

Approximate spacing of students in the class

More than 1.5 m ²	4 (23.5)	148
Less than 1.5 m ²	13 (76.5)	152

Hair length

Long	12 (70.6)	192
Short	5 (29.4)	108

Number of hair brushings per day

Once	8 (47)	93
Twice	5 (29.4)	122
Three times or more	2 (11.8)	78
Did not comb hair	2 (11.8)	7

Having dandruff

Yes	1 (5.9)	31
No	16 (94.1)	269

Number of persons in bedroom

One	0 (0)	6
Two	11 (64.7)	168
Three	4 (23.5)	67
Four	1 (5.9)	42
Five or more	1 (5.9)	17

Hair type

Curly	4 (23.5)	42
Straight	13 (76.5)	258

Bathing place

Inside shower	14 (82.4)	258
Outdoor shower	3 (17.6)	42
Total	17 (100)	300

Table 3. Correlation Between Head Lice Infestations and Different Variables (Glogah County, Mazandaran Province, Iran)

Variables	df	χ^2	P Value
Gender (Entire County)	1	0.58	0.444
Geographical location	1	2.58	0.108
Gender in rural areas	1	0.46	0.495
Gender in urban areas	1	0.47	0.490
School grade	4	3.12	0.538
Age	5	3.62	0.605
Mother's job	1	1.37	0.241
Father's job	5	15.42	0.009
Family size	3	1.04	0.79
Mother's education	2	0.79	0.67
Father's education	2	1.54	0.46
Birth rank	5	1.35	0.929
Child's health care	1	3.97	0.046
Shared use of items	1	8.21	0.004
Children living with parents	2	28.46	≤ 0.001
Infestation with lice in the past	1	4.86	0.027
Sanitary bathroom at home	1	2.41	0.12
Hair density	1	2.53	0.11
Residential room lighting conditions	1	0.25	0.61
Children's knowledge of pediculosis	1	7.94	0.005
Number of hair washings per week	1	4.2	0.04
School health teacher	1	7.39	0.007
Using common items	7	56.03	≤ 0.001
Approximate space per student	1	4.80	0.028
Hair length	1	0.33	0.560
Number of hair brushings per day	3	10.33	0.016
Having dandruff	1	0.38	0.535
Number of people in bedroom	4	2.06	0.7
Hair type	1	1.40	0.491
Bathing place	1	0.19	0.655

5. Discussion

In this study, the prevalence of head lice in primary school students was found to be 5.7%. According to other studies in various areas of the world, especially in Africa and the Middle East, pediculosis capitis was a common condition among primary school students. The rates of lice infestation among school children in some countries have shown a wide range of differences, from 5 to 78% (7, 17-20). The infrequent prevalence of infestation in this research could be related to the difficulty in scheduling countrywide screening in children, and individual-public educational hygiene programs concerned with early detection and the prevention of this disease. In five other research studies in Iran, in Sanandaj county (Vahabi et

al., 2013), Paveh county (Vahabi et al., 2012), Ahvaz county (Rafie et al., 2009), Sirjan county (Yousefi et al., 2012), and Khajeh county (Shayeghi et al., 2012), the overall infestation rates were 4.7, 8, 11, 1.12, and 4.8%, respectively (7, 9, 10, 12, 16).

Our results showed that there was a greater prevalence of head lice infestations in boys than in girls, although this difference was not significant. It was presumed that gender-related behavioral dissimilarities affected the transmission rates, such as variations in hair styles, the use of hair products, and private grooming, as well as close contact and susceptibility. Girls commonly have longer hair requiring more frequent combing and grooming, and they also cover their hair with handkerchiefs during daily activities in Iran. Sometimes, however, they exchange these handkerchiefs with each other, which is a suitable vector for the transmission of lice.

In this research, the ratios of children with head lice infestations were dissimilar based on the age group, which may have been related to the behavioral differences in the various age groups. In addition, the infestation rates among the primary schools in both the urban and rural areas was not significant. Therefore, the differences in the head lice infestation rates may be based on the family income, economic status, overcrowded houses, degree of head to head contact, control methods, personal hygiene, primary school head lice strategy, parents' literacy, or situations in the health care system.

The findings suggested that there was a reduction in infestation rates in those students that had employed and educated mothers, which may have been due to the knowledge of pediculosis possessed by their educated mothers' social relationships. In addition, literate mothers may have a more positive attitude and knowledge with regard to hygiene. Overall, a higher level of the parents' education led to more suitable health behavior throughout the family, which is supported by other researchers (7, 8, 18, 21).

This investigation suggested that hair screening was significant in the prevention of lice. Direct contact, particularly head to head contact, was the main method of the transmission of head lice; therefore, it is an important factor in the dissemination and prevention of pediculosis. Moreover, a correlation was found between infested students and the use of common instruments. For example, the head lice infestation rate was greater in children sharing headscarves, hats, beds, pillows, sweaters, etc., which has also been shown in other studies (7, 9, 12, 22).

There was no significant difference between the type of hair and head lice, but some studies have suggested that hair type was an important factor in the head lice infestation rate. In Doroodgar et al.'s study (2014) in Aran-Bidgol county, a total of 88.2% of the cases had straight hair and 11.8% had curly hair, which was similar to the results of our survey (8). In the present study, nearly 70.6% of the cases had long hair, while Doroodgar et al.'s research (2014) showed that 64.7% of the cases had long hair (8).

Overall, the absence of a significant difference between the prevalence rate of head lice and the length of hair is in line with other articles, although there is generally an imagined association between long hair and pediculosis capitis. In spite of the opinion of the school authority, cutting the hair does not reduce the incidence of head lice infestation (15).

The pathobiology of dandruff is often correlated with *Pityrosporum ovale* (a fungus), which is incompatible with the nutrition and survival of lice. This study showed that those school students without dandruff were more infested than those with dandruff, which was in agreement with other articles (15). Differences in the infestation rates between the age categories (6 - 13 years-old) have been shown by many investigations. It seems as though the younger age groups are dependent on their parents for the cleaning, combing, and washing of their hair. This can contribute to the early discovery of head lice before a full blown infestation (15, 23).

In this study, the family size was one of the agents contributing to the infestation rate, and in busy houses the pediculosis rate was the highest. Of note is the fact that once one family member is infested, the other family members have a high risk of infestation (18). Our study also described an association between access to a private bathroom and the head lice infestation rate. A private bathroom in a house plays a significant role in preventing pediculosis, as well as maintaining children's welfare and health (8, 24). We found that school hygiene tutors play important roles in preventing head lice infestations in children, since they can raise the awareness of school student with regard to pediculosis.

This study had three limitations. First, because the detection of an infestation was based on a visual screening, several pupils with very low levels of head lice may have been missed. Second, the type of questionnaire we used assessed a limited number of items. Third, because of the great number of persons involved in this research, we did not have access to certain socioeconomic and cultural variables. The strength of this survey lies in its population-based methodology, and its ability to evaluate a relatively large number of individuals.

Hygiene education with regard to pediculosis capitis and the methods of prevention for parents, teachers, and students is necessary. Furthermore, the consistent inspection of children's hair by trained health teachers is quite significant in the prevention of head lice infestations.

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Footnotes

Authors' Contribution:Hamid Kassiri: Manuscript preparation, research project director, scientific advisor,

technical advisor, data analysis, development of study idea, experimental work, abstracted data, writing the manuscript and corresponding author; Ebrahim Esteghali: Fieldwork and collecting data.

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