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Examining the prevalence rate of *Pediculus capitis* infestation according to sex and social factors in primary school children

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PEER REVIEW

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Comments

This is a well designed study in which the researchers examined the frequency of head lice infestation in school children and reported association between the health condition of the family, health teacher and affliction to the disease.

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ABSTRACT

Objective: To determine the prevalence rate of head louse infestation among elementary students, and examine the associated factors with infection in the city of Aran and Bidgol.

Methods: A total of 19 boys' and girls' primary schools were selected by multistage, systematic random sampling. Overall, 3590 students were examined for head lice infestation in urban areas of Aran and Bidgol during 2008. The diagnosis was based on live louse or nit on the scalp of students. The students were screened by standard questionnaire and demographic data in addition to related information were obtained by interview and observation. The data were analyzed by SPSS software using chi-square and Fisher's exact tests.

Results: The mean age of students was (8.68±1.58) years ranging between 6–12 years. The total prevalence of head louse infestation was 0.47%. This rate was 0.42% and 0.05% in female and male, respectively. There was a significant association between pediculosis and sex, father's job, mother's education, access to bathroom in home, prior infection, drug use and nationality, respectively ($P<0.05$).

Conclusions: The results showed that pediculosis was not a major health priority among primary school in city of Aran and Bidgol. However, enhancing the knowledge of students about head lice infestation and the existence of health teachers in schools can play a significant role in disease control.

KEYWORDS

Head louse infestation, Students, Primary Schools, Iran

1. Introduction

History of pediculosis infection dated back to prehistoric time. The oldest nit louse fossil discovered is about 10000 years old[1]. Lice are found in all countries in the world and in different climatic conditions. During the past three decades, the world has witnessed an increase in the prevalence of lice infestation. Such condition has made the health authorities as well as the health

professionals consider its diagnosis and treatment as an important matter. Three types of lice including body and head lice and crab louse are the most common human ectoparasite. Lice are blood sucking insects and belong to the Anoplura order within the Pediculidae family. In recent decades, numerous cases of head louse infestation have been reported throughout the world yearly. Head louse prevalence in school-age children is more common. Every year more than 12 millions of cases have been

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reported in the United States alone and in Belgium, 8.9% of children within the age group 2.5 to 12 are infested to head louse[2–4]. A study in Turkey reported that 16.6% of children in Izmir were infested to head louse[5]. The prevalence of head louse infestation in Czech Republic and Slovakia has been reported twice in the year 2005. In these countries, the prevalence of live louse and nit in children age group 6–15 were 14.1% and 9.8%, respectively[6].

In addition, various rates of head louse infestation from different parts of Iran have been reported. Head louse infestation study in school children of Khajeh, East Azerbaijan Province showed that the infestation rate was 4.8%[7]. One study in the region of Amlews in the province of Gilan reported the infestation rate of 9.2% while another study in the province of Ardebil showed the higher infestation rate of 28.5% to head lice in school children[8,9]. The prevalence of head lice was 1% in Fars, 12.27% in Bandarabbas and 19.7% in Sanadaj[10–12].

Patients with head lice usually complain of itchy scalp area behind their neck and the ear expand. In the case that there is wound or secondary infection such as impetigo, treatment is necessary. In patients with head lice, lymphadenopathy in lymph nodes behind the ears and neck are not uncommon. Reaction to the lice bites may cause pruritic papules and urticaria. That condition depends on the duration of blood sucking of lice. In addition, new bites by lice in other parts of the body may lead to the relapse of the previous bite. Di Stefanie *et al.* claimed that there was a significant association between pediculosis and factors such as poor health and poverty, and infestation to this disease causes social stigma; therefore, many cases of infestations go unreported[13].

Considering the importance of the subject and the adverse effects of disease and mental health in society, and the necessity for pediculosis control, this study was conducted to determine the prevalence of head lice infestation and some risk factors associated with the infestation rate in elementary boys' and girls' school students, in Aran and Bidgol of Esfahan Province, Iran.

2. Materials and methods

This cross-sectional descriptive study was performed in 19 primary schools of Aran and Bidgol, Esfahan Province, Iran during October to December 2008. In this study, a total of 3589 elementary school students between 6–12 years old (2096 boys and 1493 girls) from all grade 1–5 were selected by multistage, systematic random sampling in urban areas in Aran and Bidgol.

The students' hair and scalp were examined by 2 trained examiners under the supervision of medical entomologist.

The diagnosis of head lice infestation was confirmed by clinical inspection of scalp and hair under the light of a reading lamp and by using a manual magnifier for the presence of eggs (nits) and nymph or adult lice, approximately 5 min.

In the questionnaire, personal details such as sex, age, school grade, family size, employment and education of parents, size and mode of hair, number of uses of comb per day, sharing personal items, itching place in the head,

history of louse infestation, presence of one of life stages of lice (eggs, nymph or adult) in the head, frequency of hair washing, bath at home, school health educator and nationality were recorded. The data were analyzed by SPSS software by using statistical tests including chi-square and Fisher's exact test at alpha level equal to 0.05.

3. Results

Over a 3-month period, 3590 elementary school students of 19 schools including 2096 boys (58.4%) and 1493 girls (41.6%) were examined. The mean age of these pupils was (8.68±1.58) years within the range of 6–12 years. The overall infestation rate in the studied population was 0.47%. The infestation rate among the girls and boys was 0.42% and 0.05%, respectively. The ratio of affliction in girls was 8 times higher than the boys and this difference was statistically significant ($P=0.0001$). The frequency rate of infestation to nit was 88.2%. Approximately, 17.8% of those afflicted carried live lice. About 1% of students in the girls' schools and 0.1% of student in the boys' schools were infested to head louse (Table 1).

Table 1

Prevalence of head louse infestation in primary school students by sex and social factors in Aran and Bidgol, Iran.

Characteristics	No. of Infestations	No. of Examination	Prevalence (%)
Sex			
Girls	15	1493	1.00
Boys	2	2096	0.10
School grade			
I	1	717	0.14
II	4	685	0.58
III	6	710	0.85
IV	3	735	0.41
V	3	742	0.40
Father's occupation			
Worker	7	1668	0.42
Free	5	998	0.50
Ranchman and farmers	2	57	3.50
Cultural	1	297	0.34
Driver	1	104	0.96
Clerk	1	412	0.24
Others	0	53	0.00
Mother's education			
Uneducated	5	388	1.28
Primary	10	1690	0.60
Guidance	0	528	0.00
Diploma or upper	2	983	0.20
Bath at home			
Yes	16	3583	0.45
No	1	6	16.70
Nationality			
Iranian	11	3387	0.32
Not Iranian	6	202	2.57

The infestation rate by school grade was 0.14%, 0.58%, 0.85%, 0.41% and 0.40% for first, second, third, fourth and

fifth grades, respectively. Frequency of infestation in the third grade elementary students with head lice was higher than other grades of education. There was not any significant association between the infestation and grade level.

There was a significant association between the infestation and father's occupation ($P=0.04$). Nearly, 0.42% of fathers of students infested to head louse were workers. No significant relationship between the level of education of father and infestation was found ($P>0.05$). The mother of all infested students to head louse were housekeeper. There was a significant association between the mother education level and infestation of children ($P=0.0001$). About 1% of students were living in the five-person families, having head lice infestation. *Chi*-square test between the two variables of household and head lice infections did not show a significant relationship. Risk of head lice among students with no bathroom in the house were significantly higher than students who had a bath at home. The Fisher's exact test statistic showed a significant relationship between bath at home and pediculosis capitis ($P=0.02$). Nearly, 47.1% of infested cases took weekly shower and 53% of them used shared personal belongings such as hair brush, head cover, hat and so on. A total of 64.7% of the cases kept long hair; 88.2% had straight hair and 11.8% had curly hair. Approximately, 58.8% of students with head lice once, 23.6% twice and 17.6% three times comb their hair per day. About 88.2% students with head lice complained of itching. A total of 53% suffered from wide spread itching and 29.4% and 17.6% complained of itching behind the ears and head.

Fisher's exact test showed a significant difference between infestation to head louse and previous history of disease ($P=0.0001$).

Approximately, 65% of the cases infested to head louse were infested for the second time.

In this study, 47.1% of the subjects infested to head louse referred to physician and consumed medication. Fisher's exact test showed a significant correlation between lack of medication and head lice infestation ($P=0.0001$). There was a significant association between the nationality and infestation. The Iranian student was less infested than the other nationalities in this study ($P=0.0002$). During the review period, health teachers were present in all public schools of Aran and Bidgol.

4. Discussion

The prevalence of infestation to head louse in the city of Aran and Bidgol was approximately 0.47%. This prevalence was 0.42% in girls whereas the value was 0.05% in boys. Significantly higher proportions of girls were found to be infested as compared with boys.

Pediculosis capitis infestation was observed among primary school students, and it has also been documented by others. The prevalence rate in Khajeh, (East Azerbaijan Province) was 4.8% and this prevalence rate was significantly higher in girls (6.66%) than in boys (2%)^[7]. In Tabriz, overall infestation rate was 3.64% and all of the

infested cases were found among girls^[14]. Such rate was 1.3% in Bahar (Hamadan Province) with 2.2% and 0.44% in girls and boys, respectively^[15]. The general prevalence of head lice infestation in Hamadan was 6.85%. Head lice were much more common in girls than boys (girls: 13.5%; boys: 0.7%)^[16].

The results of studies in other countries revealed similar findings about head lice among primary school students. The overall prevalence of head lice infestation in primary schools in Korea was 4.1%, 6.5% in girls and 1.9% in boys^[17].

The prevalence of pediculosis capitis among primary school students in Buenos Aires, Argentina was 29.7%. Girls were statistically significant more infested than boys, with infestation rate of 36.1% and 26.7%, respectively^[18].

In Turkey, 9.1% of the students in the study were infected to head lice. In this study, 16.4% of girls and 2.1% of boys had head lice infection^[19]. In England, 2.03% of students are infested to head lice, and in urban areas of Paris 3.3% of primary schools children infested to head lice were identified^[20,21]. Also, a study conducted in elementary schools in India reported a prevalence rate of 16.59% where the prevalence in girls was 20.42% in contrast to boys with 13.86%^[22]. The prevalence rate of head louse in students in Yemen was 13.3%, and this rate for girls and boys were 18.9% and 8.6% respectively^[23].

The prevalence of head louse infestation in all studies mentioned in Iran and other parts of the world approximately reported higher rate of infestation in girls than boys. The results of these studies were similar to our survey.

Probably one of the main factors contributing to the higher rate of infestation in girls is the length of their hair. However, Service believes that the amount of head louse infestation doesn't depend on the length of hair^[24].

Special behaviors in girls such as close contact in a friendlier manner might have affected transmission rates of head lice infestation. But these behaviors are different from boys. Since the transmission of head lice occur through close contact, possibly children's play and frequent contact of their head or use of scarves, hats, comb, hair brush and other accessories can transmit the head lice.

In this study, no significant correlation between age and head lice infestation was observed. Such results were confirmed by a study conducted in Babol^[25].

We also surveyed the prevalence of head lice infestation by father's occupation. The prevalence of head lice infestation in students with father who is worker was significantly higher ($P<0.05$). In another study in Sanandaj, similar finding was reported. Children with educated father had lower rate of infestation^[26]. On the contrary, no significant association between the father's occupation and infestation was found in the Hamadan Province^[27].

In this study, no significant correlation between the pediculosis capitis infection rate and father's education was found. However, a significant correlation between the mother's education level and infestation rate was observed. Shayeghi *et al.* reported that there was no significant relationship between the parent's education and infestation rate in Khajeh, East Azerbaijan Province^[7]. Bayat *et al.* reported no significant relationship between head lice

infestation and parent's education in Hamedan Province^[27].

Comparing the results of these two studies with what was found in our study, it can be concluded that pediculosis capitis is independent of father's education. However, Davari *et al.* have reported a positive role of parental education in reducing the prevalence of head lice infestation in primary schools in the city of Sanandaj^[12]. Moradi *et al.* showed an increase in the prevalence head lice infestation rate and parents' literacy. They observed an increase in the prevalence rates of infestation in children with uneducated parents^[15].

In various studies, it was found that the prevalence of infestation to head lice was associated with level of parents' education. It seems reasonable to assume that higher level of parents' education leads to more appropriate health behavior in the family.

The results of analysis showed no significant relation between family size and pediculosis capitis rate. However, in Babol, Zabihi *et al.* reported that there is a positive relationship between the family size and head lice infestation^[25]. This finding is contrary to what was observed in the present study.

This study also showed a significant association between the access to private bath and infestation rate. Daveri *et al.* reported similar findings^[12]. The private bathroom at home plays an important role in head lice infestation and protects student's health.

In this study, a significant correlation between the head lice infestation and history of exposure to this disease was observed. Daveri *et al.* reported similar findings in Sanandaj^[12].

Repeated exposure to head lice in students probably is due to bad sanitary conditions, lack of proper drug use and the emergence of drug-resistant species to treatment.

The results of the study indicated that the prevalence of pediculosis was not a major health problem and therefore it had no priority for the health policy makers in the city of Aran and Bidgol.

In general, head lice infestation is a common problem for the school children. It seems that head lice infestation is transferred more from school to home and family variables are of less importance.

The researchers concluded that school administrators and school health teachers play a more effective role in helping the students avoid the risk of head lice infestation. Therefore, the role of school health teachers in raising awareness in regard to health status is very important. It is suggested that appropriate measures should be taken to have health teachers in all schools.

Also, it is suggested that school health team have the responsibility to refer the infested students for treatment. Such measure can reduce the risk of head louse infestation in their family as well as other schoolmates.

Still, it was suggested that the parents and teachers receive appropriate training in regard to head lice infestation risk.

Conflict of interest statement

We declare that we have no conflict of interest.

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Comments

Background

Lice are found in all countries in the world and in different climatic conditions. During the past three decades, the world has witnessed an increase in the prevalence of lice infestation. Such condition has made the health authorities as well as the health professionals consider its diagnosis and treatment as an important matter. Three types of lice including body and head lice and crab louse are the most common human ectoparasite. Lice are blood sucking insects and belong to the Anoplura order within the Pediculidae family. In recent decades, numerous cases of head louse infestation has been reported throughout the world yearly. Head louse prevalence in school-age children is more common. Patients with head lice usually complain of itchy scalp area behind their neck and the ear expand. In the case that there is wound or secondary infection such as impetigo, treatment is necessary.

Research frontiers

Considering the importance of the subject and the adverse effects of disease and mental health in society and the necessity for pediculosis control, this study was conducted to determine the prevalence of head lice infestation and some risk factors associated with the infestation rate in elementary boys' and girls' school students, in Aran and Bidgol of Esfahan Province, Iran.

Related reports

Every year more than 12 millions of cases have been reported in the United States alone, and in Belgium, 8.9% of children within the age group 2.5–12 are infested to head louse. A study in Turkey reported that 16.6% of children in Izmir were infested to head louse. The prevalence of head louse infestation in Czech Republic and Slovakia has been reported twice in the year 2005. Head lice infestation study in school children of Khajeh, East Azerbaijan Province showed that the infestation rate was 4.8%. One study in the region of Amlesh in the province of Gilan reported that the infestation rate was 9.2% while another study in the province of Ardebil showed the higher infestation rate of 28.5% with head lice in school children. The prevalence of head lice was 1% in Fars and 12.27% in Bandarabbas and 19.7% in Sanadaj.

Innovations & breakthroughs

Repeated exposure to head lice in students probably is due to bad sanitary conditions, lack of proper drug use and the emergence of drug-resistant species to treatment.

The results of the study indicated that the prevalence of pediculosis was not a major health problem and therefore it

had no priority for the health policy makers in the city of Aran and Bidgol.

Applications

The researchers concluded that school administrators and school health teachers play a more effective role in helping the students avoid the risk of head lice infestation. Therefore, the role of school health teachers in raising awareness in regard to health status is very important. It is suggested that appropriate measures should be taken to have health teachers in all schools

Peer review

This is a well designed study in which the researchers examined the frequency of head lice infestation in school children and reported association between the health condition of the family, health teacher and affliction to the disease.

References

- [1] Araujo A, Ferreira LF, Guidon N, Maues Da Serra Freire N, Reinhard KJ, Dittmar K. Ten thousand years of head lice infection. *Parasitol Today* 2000; **16**(7): 269.
- [2] Burkhart CN, Burkhart CG. Fomite transmission in head lice. *J Am Acad Dermatol* 2007; **56**(6): 1044–1047.
- [3] Mimouni D, Ankol OE, Gdalevich M, Grotto I, Davidovitch N, Zangvil E. Seasonality trends of pediculosis capitis and *Phthirus pubis* in a young adult population: follow-up of 20 years. *J Eur Acad Dermatol Venereol* 2002; **16**(3): 257–259.
- [4] Willems S, Lapeere H, Haedens N, Pasteels I, Naeyaert JM, De Maeseener J. The importance of socio-economic status and individual characteristics on the prevalence of head lice in school children. *Eur J Dermatol* 2005; **15**(5): 387–392.
- [5] Akisu C, Aksoy U, Delibas SB, Ozkoc S, Sahin S. The prevalence of head lice infestation in school children in izmir, Turkey. *Pediatr Dermatol* 2005; **22**(4): 372–373.
- [6] Rupes V, Vlcková J, Mazánek L, Chmela J, Ledvinka J. [Pediatric head lice: taxonomy, incidence, resistance, delousing]. *Epidemiol Mikrobiol Imunol* 2006; **55**(3): 112–119. Czech.
- [7] Shayeghi M, Paksa A, Salim Abadi Y, Sanei Dehkoordi A, Ahmadi A, Eshaghi M, et al. Epidemiology of head lice infestation in primary school pupils, in Khajeh city, East azerbaijan province, Iran. *Iran J Arthropod Borne Dis* 2010; **4**(1): 42–46.
- [8] Rafinejad J, Nourollahi A, Javadian E, Kazemnejad A, Shemshad Kh. [Epidemiology of head louse infestation and related factors in school children in the county of Amlash, Gilan Province, 2003–2004]. *Iran J Epidemiol* 2006; **2**(3–4): 51–63. Persian.
- [9] Adalatkhah H, Arshi S, Sadeghi H, Sepehran V, Mahmoodzadeh B, Mortezaazadeh A, et al. [Prevalence of pediculosis capitis among boarding school girls in Ardabil, during academic year, 2001–2002]. *J Ardabil Univ Med Sci* 2003; **6**(2): 36–45. Persian.
- [10] Davarpanah MA, Mehrabani D, Khademolhosseini F, Mokhtari A, Bakhtiari H, Neirami R. The prevalence of *Pediculus capitis* among school children in Fars Province, Southern Iran. *Iran J Parasitol* 2009; **4**(2): 48–53.
- [11] Soleimani Zadeh L, Sharifi Sarasiabi Kh. [The assessment of main factors on the louse in primary school children at Bandar Abbas city, academic year 1999–2000]. *Iran J Infect Dis Trop Med* 2002; **7**(19): 79–85. Persian.
- [12] Davari B, Yaghmaei R. [Prevalence of head lice and its related factors in the primary school students in Sanandaj, 1378]. *Sci J Kurdistan Uni Med Sci* 2005; **10**(35): 39–45. Persian.
- [13] Di Stefani A, Hofmann-Wellenhof R, Zalaudek I. Dermoscopy for diagnosis and treatment monitoring of pediculosis capitis. *J Am Acad Dermatol* 2006; **54**(5): 909–911.
- [14] Hodjati MH, Mousavi N, Mousavi M. Head lice infestation in school children of a low socioeconomic area of Tabriz city, Iran. *Afr J Biotechnol* 2008; **7**(13): 2292–2294.
- [15] Moradi A, Zahirnia A, Alipour A, Eskandari Z. The prevalence of pediculosis capitis in primary school students in Bahar, Hamadan Province, Iran. *J Res Health Sci* 2009; **9**(1): 45–49.
- [16] Nazari M, Fakoorziba MR, Shobeiri F. *Pediculus capitis* infestation according to sex and social factors in Hamedan, Iran. *South East Asian J Trop Med Pub Health* 2006; **37**(3): 95–98.
- [17] Oh JM, Lee IY, Lee WJ, Seo M, Park SA, Lee SH, et al. Prevalence of pediculosis capitis among Korean children. *Parasitol Res* 2010; **107**(6): 1415–1419.
- [18] Toloza A, Vassena C, Gallardo A, González-Audino P, Picollo MI. Epidemiology of pediculosis capitis in elementary schools of Buenos Aires, Argentina. *Parasitol Res* 2009; **104**(6): 1295–1298.
- [19] Oğuzkaya Artan M, Baykan Z, Koç AN. [The prevalence of *Pediculus capitis* in students of eight primary schools in the rural area of the Kayseri province]. *Turkiye Parazitoloj Derg* 2006; **30**(2): 112–114. Turkish.
- [20] Harris J, Crawshaw JG, Millership S. Incidence and prevalence of head lice in a district health authority area. *Commun Dis Public Health* 2003; **6**(3): 246–249.
- [21] Millard RB, Bouges-Michel C, Bruel C, Bouvresse S, Izri A. Detection of pyrethroid resistance gene in head lice in schoolchildren from Bobi. *J Med Entomol* 2007; **44**: 796–798.
- [22] Khokhar A. A study of pediculosis capitis among primary school children in Delhi. *Indian J Med Sci* 2002; **56**(9): 449–452.
- [23] Al-Maktari MT. Head louse infestations in Yemen: prevalence and risk factors determination among primary schoolchildren, Al-Mahweet Governorate, Yemen. *J Egypt Soc Parasitol* 2008; **38**(3): 741–748.
- [24] Service M. *Medical entomology for students*. London: Chapman & Hall; 1996.
- [25] Zabihi A, Jafarian Amiri SR, Rezvani SM, Bijani A. [A study on prevalence of pediculosis in the primary school students of Babol, 2003–04]. *J Babol Univ Med Sci* 2005; **7**: 88–93. Persian.
- [26] Pour Baba R, Moshkbid Haghghi M, Habibi Pour R, Mirza Nezhad M. [A survey of prevalence of pediculosis among primary school students of Guilan province in the school year of 2002–03]. *J Med Faculty Guilann Univ Med Sci* 2005; **13**(52): 15–23. Persian.
- [27] Bayat S, Habibi Poor R. Prevalence of head lice and head fungal infections in primary school students in the Hamadan province 2004–2005. Sixth National Conference and the first Regional Congress of Parasitology and Parasitic Diseases; Karaj. 2006.