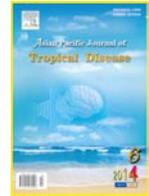




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The prevalence of pediculosis capitis and relevant factors in primary school students of Kashan, Central Iran

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PEER REVIEW

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Comments

This study is a comprehensive research about lice infestation among the primary school students in a dry tropical climate with applicable results to improve public health.

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ABSTRACT

Objective: To help health authorities in adopting the ways to control pollution in the Kashan city and improve public health.

Methods: In descriptive epidemiologic research, 2151 students were examined in 23 male and female schools. Their hair was examined for head louse infestation. Demographic data and related information were obtained by interview and observation. The data were recorded in the standard questionnaire and analyzed by SPSS statistical software by using *Chi*-square and Fisher's exact tests.

Results: The prevalence of head louse infestation in students was 0.70%. This survey showed that 0.75% and 0.60% of the students in female and male schools were infected to head louse respectively. Statistical tests showed significant relation between pediculosis and, father's and mother's job, father's and mother's education, previous history of infection, itchy scalp and school health teachers ($P < 0.05$).

Conclusions: The study indicated that the prevalence of pediculosis wasn't a major concern and health priority in Kashan's schools (2013). However, it was suggested that individual hygiene should be considered as a priority in the city to prevent the increase of infestation incidence, and also measures should be taken to increase the level of knowledge of individuals within the city.

KEYWORDS

Students, Elementary schools, Pediculosis, Iran

1. Introduction

The public health is one of significant issues in every society and infestation with insects is a common public health problem[1]. Three types of blood-sucking lice occur on humans, the body louse (*Pediculus humanus*), the head louse (*Pediculus*

capitis) and the pubic or crab louse (*Phthirus pubis*). All three species of lice have a worldwide distribution[2]. Infection with head lice (pediculosis) is already a worldwide, common and serious pollution and is one of the health problems of human societies in different countries including United States, Brazil, Canada, France and India[3].

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The official reported cases do not reflect the extent of problem because the patient record system does not include all the infected. The disease occurs in both sexes, but it is more common in girls. Disease outbreaks aren't related to specific age groups but children are of the most vulnerable age group and the high level of pollution intensity. Long-term close contact with each other is the most common and major transmission path. Lice in these students may cause them to fall behind in school in addition to health problems and adverse psychological effects and social pressures. Due to the importance of the issue and health and adverse psychological effects on society and the need to control pediculosis, examination of the elementary school children is important. Evaluation of head lice infestation will lead to early detection and treatment that prevent the occurrence of complications such as bacterial infections and other infectious diseases. Considering that the recent scientific study was not accurate, elementary school students were studied in Kashan city. The results of this study will help health authorities in adopting the ways to control pollution in the region.

2. Materials and methods

A cross-sectional descriptive study was performed in 23 primary schools of Kashan, Esfahan province, Iran from November 2012 to May 2013. Data were obtained by the observation method and multi-stage sampling was conducted. Cluster sampling conducted in areas of the city was considered to form a cluster. Elementary male and female schools were randomly selected in each cluster. A total of 2151 school children (1077 males and 1074 females) between 6–10 years old were examined. The mean age of these students was 7.92 ± 1.52 . All students in the selected schools were examined by trained and experienced researchers under the supervision of medical entomologist.

The diagnosis of pediculosis was confirmed by clinical inspection of scalp and hair under the light of a reading lamp and by using a magnifier glass for the presence of egg and nymph or adult lice, approximately 5 min. The suspicious samples were evaluated in laboratory using a stereomicroscope. A special questionnaire was completed for students. The questionnaire included personal details such as age, sex, school grade, occupation and education of parents, bath at home, frequency of bathing, sharing personal items, history of previous pediculosis, family size, size and mode of hair, itchy scalp, presence of one of life stage of louse (nit, nymph or adult) in the head, awareness of louse infection, previous treatment history, drug usage, school health educator and nationality.

3. Results

The overall pediculosis infestation rate was 0.7% (among the girls and boys were 0.75% and 0.6% respectively). The ratio of

head lice infestation in girls was estimated 1.25 times higher than males. Statistical test showed no significant difference between head lice and sex. The frequency rate of infestation to nit and live lice were seen 0.8% and 0.1% respectively. About 1.5% of second grade and 1% of fifth grade elementary students were infected with head lice in comparison with other grades having higher infection. There was not any significant association between pediculosis and different educational grades. There was statistically significant association between pediculosis rate in students and father's job ($P=0.002$). About 0.6% of students whose fathers were self-employed were infected with head lice. In this study, a significant relationship was observed between head lice infestation and mother's occupation ($P=0.0001$). Approximately 85.7% of students with lice whose mothers were housekeeper. Statistical analysis showed that there was a significant relationship between pediculosis and different educational levels of students' parents ($P=0.0001$). Perhaps 35.7% of students with head lice had uneducated mothers or fathers with primary education. Although statistical test showed no significant relationship between two variables of family size and head lice, 50% of infected students were living in the four-person families. Probably 98.4% of students had bathroom at home. All children with pediculosis have had a bath at home. There was no significant relationship between bath at home and pediculosis capitis. Between the number of weekly bathing and head lice, there was not a significant relationship. About 50% of infested cases took shower twice a week. Roughly 57.1% of them used shared personal belongings such as hair brushes, head covers, hats and so on. There was no significant association between the infestation and shared use of personal items. In total, 9.5% of students in this study complained of itchy scalp. About 3.4% of students suffering from itchy scalp had pediculosis. *Chi*-square test between the two variables of itching of the scalp and head lice infections showed a significant relationship ($P=0.0001$). Approximately 50% of students with head lice comb their hair twice per day. Half of current students with head lice in the past had a history of infestation. Fisher exact test showed a significant difference between infestation to head louse and previous history of disease ($P=0.0001$). Maybe 74.1% of the cases had short hair. Among the hair length and hair condition (straight or curly) and pediculosis, there were not significant relationships. In the study, 3.2% of the subjects infested to head louse referred to physician and consumed medication. Statistical test showed a significant correlation between drug use and head lice infestation ($P=0.001$). Probably 85.2% of the students in this study were Iranian and others were non-Iranian. In this study, 64.3% of students with pediculosis were Iranian and the others were non-Iranian. The Iranian students were less infested than the other nationalities in this study. About 0.5% of Iranian students and 1.6% of non-Iranian students had lice. There was no significant association between the nationality and infestation. Perhaps 72.6% of students were studying at schools that did not have health teacher. About 78.6% of students with head lice were in schools that had no health teacher. *Chi*-square test

between health teacher at the school and infestation showed significant correlation ($P=0.049$). Distribution of variables of head lice infestation among primary students are showed in Table 1.

Table 1

Distribution of variables of head lice infestation among primary students in Kashan, Iran.

| | Variables | Infected | | Non-infected | | Total | | P value | | |
|-----------------------|--------------------|-------------------|------|--------------|-------|-------|------|------------|-----|------------|
| | | N | % | N | % | N | % | | | |
| Grade | First | 2 | 0.3 | 622 | 99.7 | 624 | 100 | $P=0.106$ | | |
| | Second | 3 | 1.5 | 203 | 98.5 | 206 | 100 | | | |
| | Third | 2 | 0.4 | 515 | 99.6 | 517 | 100 | | | |
| | Fourth | 1 | 0.6 | 316 | 99.4 | 318 | 100 | | | |
| | Fifth | 5 | 1.0 | 481 | 99.0 | 486 | 100 | | | |
| | Sum | 14 | 0.7 | 2137 | 99.3 | 2151 | 100 | | | |
| | Free | 5 | 0.6 | 704 | 99.4 | 708 | 100 | | | |
| Father's job | Workers | 2 | 0.4 | 688 | 99.6 | 691 | 100 | $P=0.002$ | | |
| | Clerk | – | – | 212 | 100.0 | 212 | 100 | | | |
| | Driver | – | – | 71 | 100.0 | 71 | 100 | | | |
| | Farmer/ rancher | 1 | 2.4 | 41 | 97.6 | 42 | 100 | | | |
| | Cultural | 1 | 0.1 | 31 | 96.9 | 32 | 100 | | | |
| | Other | 5 | 1.3 | 377 | 98.7 | 382 | 100 | | | |
| | Sum | 14 | 0.7 | 2137 | 99.3 | 2151 | 100 | | | |
| | Mother's job | Housekeeper | 12 | 0.6 | 1956 | 99.4 | 1968 | | 100 | $P=0.0001$ |
| | Employed | 2 | 1.1 | 181 | 98.9 | 183 | 100 | | | |
| | Sum | 14 | 0.7 | 2137 | 99.3 | 2151 | 100 | | | |
| Uneducated | 2 | 0.9 | 231 | 99.1 | 123 | 100 | | | | |
| Primary | 5 | 0.7 | 758 | 99.3 | 763 | 100 | | | | |
| Guidance | 2 | 0.5 | 427 | 99.5 | 429 | 100 | | | | |
| High school | 3 | 0.6 | 464 | 99.4 | 467 | 100 | | | | |
| Father's education | Associate degrees | – | – | 50 | 100.0 | 50 | 100 | $P=0.0001$ | | |
| | BS | – | – | 158 | 100.0 | 158 | 100 | | | |
| | MS | 2 | 7.1 | 26 | 92.9 | 28 | 100 | | | |
| | Other | – | – | 23 | 100.0 | 23 | 100 | | | |
| | Sum | 14 | 0.7 | 2137 | 99.3 | 2151 | 100 | | | |
| | Uneducated | 5 | 1.7 | 290 | 98.3 | 295 | 100 | | | |
| | Primary | 3 | 0.4 | 803 | 99.6 | 806 | 100 | | | |
| | Guidance | 4 | 1.0 | 397 | 99.0 | 401 | 100 | | | |
| | High school | 1 | 0.2 | 457 | 99.8 | 458 | 100 | | | |
| | Mother's education | Associate degrees | – | – | 39 | 100.0 | 39 | | 100 | $P=0.0001$ |
| BS | – | – | 130 | 100.0 | 130 | 100 | | | | |
| MS | 1 | 0.1 | 9 | 90.0 | 10 | 100 | | | | |
| Other | 4 | – | 12 | 100.0 | 12 | 100 | | | | |
| Sum | 14 | 0.7 | 2137 | 99.3 | 2151 | 100 | | | | |
| Itchy scalp | Had | 7 | 5.9 | 197 | 99.6 | 204 | 100 | $P=0.0001$ | | |
| Had not | 7 | 0.3 | 1940 | 99.6 | 1947 | 100 | | | | |
| Sum | 14 | 0.7 | 2137 | 99.3 | 2151 | 100 | | | | |
| Previous head lice | Had | 7 | 5.9 | 111 | 94.1 | 118 | 100 | $P=0.0001$ | | |
| | Had not | 7 | 0.3 | 2026 | 99.7 | 2033 | 100 | | | |
| | Sum | 14 | 0.7 | 2138 | 99.3 | 2151 | 100 | | | |
| Drug use | Used | 2 | 0.6 | 60 | 96.8 | 62 | 100 | $P=0.001$ | | |
| | Not used | 12 | 0.6 | 2077 | 99.4 | 2089 | 100 | | | |
| | Sum | 14 | 0.7 | 2137 | 99.3 | 2151 | 100 | | | |
| School health teacher | There was | 3 | 0.5 | 586 | 99.5 | 589 | 100 | $P=0.049$ | | |
| | There was not | 11 | 0.7 | 1551 | 99.3 | 1562 | 100 | | | |
| | Sum | 14 | 0.7 | 2137 | 99.3 | 2151 | 100 | | | |

4. Discussion

The frequency rate of infestation to head louse was

estimated 0.7% in the city of Kashan. Head lice infestation is observed at all ages. But infestation in children at age of kindergarten and primary school and their family members and caregivers is more common^[4]. The results of studies on head lice infestation in primary school students are different worldwide. In countries such as Turkey 13.10%, Jordan 26.60%, Thailand 23.32%, Argentina 29.70%, Korea 4.10% and Germany 0.70% of primary school students were infested^[4–9]. In Iran, in cities such as Qom 7.60%, Khajeh city (East Azerbaijan province) 4.80%^[11], Hamadan 6.70% and 1.05%, Urmia 4.00%, Birjand 3.00%, Sanandaj 4.70%, Sirjan 1.12%, Aran and Bidgol 0.47% of primary school students were infested with head lice^[1,10–17]. In this study, the ratio of head lice infestation in girls was 1.25 times greater than boys. In various studies conducted in Iran and foreign countries, the highest infection rate in females has been reported^[4–17].

At the present study, statistical analysis showed no significant differences among pediculosis and gender and hair length of students. The most important cause of head lice infestation in females is long hair. While the Service (2009) believes that the infection rate does not depend on the length of hair but head lice infestation occurs in men less often than in children and all ages of women^[2]. Since head lice are spread through close contact, children's play and frequent contact of their head or use of scarves, hats, combs, hair brushes and other accessories can transmit head lice. Special behaviors in girls such as close contact in a friendlier manner might have affected transmission rates to head lice infestation. In females, close contact is more intimate and longer. But these behaviors are different for boys. But close contacts for boys are very short and limited to rough plays^[17].

At the present survey, 0.60% and 0.75% students in boys' and girls' schools were infested respectively. Similar studies conducted in past in Kashan city showed lice infestation rate in primary schools for boys and girls, 0.90% and 5.24% respectively. Comparing these results indicates there is reduction in infestation in the city of Kashan. Probably, the increase of families' health awareness and students' appropriate health performance can decrease infestation. Having access to health facilities or required information has reduced the frequency of infestation in primary school.

In this study, no significant correlation observed between the pediculosis capitis infestation rate and different grades of students. At the present study, significant correlations were observed between head lice infestation and parent's occupation and education. But in various studies in Iran and other parts of the world, different association between

pediculosis and occupation and education of parents was found^[4,12–17]. But what is certain is that parental education and job status is an indicator of socio–economic level of the family. Increase of parents' sanitary awareness can increase family's knowledge level that is effective in prevention of infestation and early treatment. In the present study, statistical tests showed no significant relationship between family size and head lice infestation. Various studies have shown different results of the effect of family size on pediculosis^[16,17]. Since the increase of family population with status of socio–economic and student's health are associated, it is probably effective in prevalence of head lice infestation in these families. This study also showed no significant association between the accesses to private bath, bathing times per week, shared use of personal belongings such as hair brushes, head covers, hats and infestation rate. A significant correlation was observed between head lice infestation in school children and bathroom at home in the cities of Sanandaj and Sirjan^[15,16]. Surveys conducted at the Urmia and Sanandaj showed a significant correlation between bathing times per week and head lice infestation^[13,15]. In a study conducted in Sanandaj, a significant relationship was observed between pediculosis and hair brushes^[15]. The private bathroom at home has an important role in reducing head lice infestation and student's health. Lice are transmitted by using contaminated shared personal belongings such as hats, scarves, brushes and combs, clothing even when they are placed in dressing rooms. When pediculosis has high prevalence in the community, seats of city and intercity buses, taxis, communities and halls also could have a role in the transmission and spread of head lice.

According to above, in epidemic conditions, children with appropriate personal hygiene are also infected with head lice. Girls' schools are considered as an important location for the occurrence of pediculosis epidemic with a high potential. In this study, a significant correlation among the head lice infestation and some factors such as scalp itching, history of exposure to disease and medication use was observed. Similar study conducted in Aran and Bidgol, observed relation between previous infection and head lice^[17]. Repeated contamination to head lice and itching of the scalp in students probably is due to bad sanitary conditions, lack of proper drug use and the emersion of head lice drug–resistance species. This study also showed a significant association between school health teacher and pediculosis. About 72.6% of studied students were in schools that did not have health teacher. In Iran, various surveys have shown that head lice have been considerably high in

elementary girls' school. So school teachers' knowledge of signs and symptoms of the disease is a positive step to control pediculosis. In general, head lice infestation is a common problem for the school children. It seems head lice infestation is transferred more from school to home and family variables are of less importance. But raising awareness of various levels of society, especially teachers and improving individual health behaviors, diagnosing and treating of patients are important ways to control head lice infestation. Coordination and cooperation of health sector with other parts of development is an essential action for lice control.

The results of this study showed that the prevalence of pediculosis in primary schools in Kashan is not an important problem, but disease control and treatment and follow–up is necessary to currently head lice infested. The researchers concluded that school administrators and school health teachers have a more effective role in helping the students avoid the risk of head lice infestation. It is suggested that appropriate measures 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.

Conflict of interest statement

We declare that we have no conflict of interest.

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Comments

Background

The achievements of this study could be used to raise awareness of different levels of society, especially the teachers, and improve the individual health behaviors, in addition to improving the diagnosis techniques and

treatment procedures of lice infestation.

Research frontiers

Lice infestation is one of the most important ectoparasite contaminations among the female and male primary school students, aging 7–12 years old, which is correlated with social factors like individual and public health, parents' education, parents' employment, sharing personal items and school health educator.

Related reports

Various reports based on the results of similar surveys indicate that the prevalence of infestation is ranging from less than 1% to 30% in different countries that depends on social situations. In this study, experimental laboratory techniques and direct observation were applied besides filling the related questionnaires, which are appropriate methods.

Innovations & breakthroughs

The results of this study show the prevalence of lice infestation in the primary school students of this region, which is of a great epidemiological significance, besides implying the public health issues in this society.

Applications

The achievements of this study could be used to raise awareness of different levels of society, especially the teachers, and improve the individual health behaviors, in addition to improving the diagnosis techniques and treatment procedures of lice infestation.

Peer review

This study is a comprehensive research about lice infestation among the primary school students in a dry tropical climate with applicable results to improve public health.

References

- [1] Omidi A, Khodaveisi M, Moghimbeigi A, Mohammadi N, Amini R. Pediculosis capitis and relevant factors in secondary school students of Hamadan, west of Iran. *J Res Health Sci* 2013; **13**(2): 176–180.
- [2] Service M. *Medical entomology for students*. UK: Cambridge University Press; 2008.
- [3] Burkhart CN, Burkhart CG. Fomite transmission in head lice. *J Am Acad Dermatol* 2007; **56**: 1044–1047.
- [4] Gulgun M, Balci E, Karaoglu A, Babacan O, Türker T. Pediculosis capitis: prevalence and its associated factors in primary school children living in rural and urban areas in Kayseri, Turkey. *Cent Eur J Public Health* 2013; **21**(2): 104–108.
- [5] AlBashtawy M, Hasna F. Pediculosis capitis among primary–school children in Mafraq Governorate, Jordan. *East Mediterr Health J* 2012; **18**(1): 43–48.
- [6] Rassami W, Soonwera M. Epidemiology of pediculosis capitis among schoolchildren in the eastern area of Bangkok, Thailand. *Asian Pac J Trop Biomed* 2012; **2**(11): 901–904.
- [7] 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.
- [8] 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.
- [9] Jahnke C, Bauer E, Feldmeier H. [Pediculosis capita in childhood: epidemiological and socio–medical results from screening of school beginners]. *Gesundheitswesen* 2008; **70**(11): 667–673. German.
- [10] Saghafipour A, Akbari A, Noruzi M, Khajati P, Jafari T, Tabaraie Y, et al. The epidemiology of pediculus is humanus capitis infestation and effective factors in elementary schools of Qom Province Girls 2010, Qom, Iran. *Qom Univ Med Sci J* 2012; **6**(3): 46–51.
- [11] 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.
- [12] Moradi AR, Bathaie SJ, Shojaeian M, Neshani A, Rahimi M, Mostafevi E. Outbreak of pediculosis capitis in students of Bahar in Hamedan province. *Dermatol Cosmet* 2012; **3**(1): 26–32.
- [13] Tappeh KH, Chavshin A, Hajipirloo HM, Khashaveh S, Hanifian H, Bozorgomid A, et al. Pediculosis capitis among primary school children and related risk factors in Urmia, the main city of West Azarbaijan, Iran. *J Arthropod Borne Dis* 2012; **6**: 79–85.
- [14] Ghaderi R, Eizadpanah AM, Miri MR, Ahmadi SM, Taheri N, Hoseinzadeh F. The prevalence of pediculosis capitis in school students in Birjand. *Modern Care* 2010; **7**: 49–54.
- [15] Vahabi A, Shemshad K, Sayyadi M, Biglarian A, Vahabi B, Sayyad S, et al. Prevalence and risk factors of *Pediculus (humanus) capitis* (Anoplura: Pediculidae), in primary schools in Sanandaj City, Kurdistan Province, Iran. *Trop Biomed* 2012; **29**(2): 207–211.
- [16] Yousefi S, Shamsipoor F, Salim Abadi Y. Epidemiological study of head louse (*Pediculus humanus capitis*) infestation among primary school students in rural areas of Sirjan County, south of Iran. *Thrita J Med Sci* 2012; **1**(2): 53–56.
- [17] Doroodgar A, Sadr F, Doroodgar M, Doroodgar M, Sayyah M. Examining the prevalence rate of *Pediculus capitis* infestation according to sex and social factors in primary school children. *Asian Pac J Trop Dis* 2014; **4**(1): 25–29.