

Review Article

Head lice among Iranian elementary school children: A systematic reviewMorteza Akbari¹, Akbar Bagheri¹, Mohammad Moradi¹, Atiyeh Rafinejad¹, Javad Rafinejad^{1*}¹ Department of Medical Entomology and Vector Control, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

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ABSTRACT

Head lice are considered as mandatory ectoparasites living on human head hair, which are transmitted to others through direct physical contact. This disease is mostly seen among children. In this review study, search was conducted among all studies performed in the past 20 years and studies were selected and reviewed. Contributing factors like location, study year, etc. were analyzed to procure a national management guideline. The finding of the present study showed that age, gender, parents' education, parents' job, family size, and presence of health inspector at schools were of statistical positive significance. However, hair type, hair length, dandruff, woven hair, and hair oil application showed no effect on head lice infestation. Head lice could be managed significantly regarding educational health and personal and public principles, especially regarding head lice biology and epidemiology to students, teachers, and parents.

Introduction

Pediculosis is an infection with complications. Head lice are mandatory ectoparasites found in the hair and scalp which spread through physical contact (1). Although head lice are not able to transmit the disease, their repeated bites and injection of saliva can cause itching, irritation, redness, and appearance of rashes on the skin, which is usually accompanied by swelling of the lymph nodes (2). Sometimes, individuals experience fatigue and pallor and severe cases of accumulated feces, in addition, dead head lice in body fat may cause secondary fungal infections (3). In the present study, a systematic review has been conducted on studies carried out on head lice infestation among children in different parts of the country over the past 20 years. Elementary

school students were selected by random sampling method. In this study, demographic information including age, sex, socioeconomic status, occupation and educational level of students and parents, family size, parents' income and occupational status, information like hair length, plaited/not plaited hair, smooth or curly hair, dandruff and the frequency of washing of hair, and use of hair cream were included in a questionnaire prepared for this purpose. In addition to straight hair and the factors affecting search and examination by healthcare workers, educators, teachers, and school health entomologists, a narrative was recorded and the results of which were analyzed using SPSS software (version 16, SPSS Inc., Chicago, IL, USA).

Results

The results of investigations conducted in this study were published in scientific and research journals in both Persian and English from 2000 to 2013 and in 13 out of the 20 provinces of Iran, including Razavi

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Khorasan, West Azerbaijan, East Azerbaijan, Sistan and Baluchistan, Hamadan, Kurdistan, Kermanshah, Gilan, Golestan, Mazandaran, Isfahan, Kerman, and Hormozgan, as can be seen in table 1. Factors in relation to personal hygiene were also studied, as illustrated in table 2. This study was conducted to review and analyze these factors. Since the sample size varied in different studies, all factors were expressed as the rate (%) of samples to be compared with other studies.

Age: Age was one of the factors examined in this study. The results obtained in the study by Riabi and Atarodi in Razavi Khorasan from 2006 to 2010 showed that the highest incidence rate was found for children between 6 to 10 years of age (4). In a study in Tabriz, Hodjati et al. reported that the highest rate of infection among children occurred between 10 to 14 years of age as 6.5%, followed by the incidence rate of 5.7% and 1.6% among children in 5 to 9 years old and 15 to 19 years old, respectively (5). Another study by Alempour Salemi et al. in Iranshahr, South East Iran reported that the highest incidence occurred in the age group 10 to 12 years (6). Vahabi et al. in a study indicated that the incidence rate was significantly higher for students between 10 to 11 years with an infection rate of 19.42% in this age group (7). Sayyadi and Vahabi conducted an epidemiological investigation of lice in Ravansar county of Kermanshah Province in which, the highest and lowest infection rates of infection was 27.14% and 1.12% related to 8 to 9 and 12 year-old children, respectively (8). Vahabi et al. in a study carried out in the city of Paveh, have reached similar results (9). Motevalli-Haghi et al. in Mazandaran Province showed significant differences in the incidence rate of the disease in different age groups in this province (10). In most studies, the incidence at ages 8-12 was higher than other age groups, which can be due to the that these students were not big enough to be able to consider personal hygiene when they go to the bathroom, and not so small that they go to the bathroom with their parents.

Gender: Out of the total of 401 infected students, 8.5% and 91.5% were boys and girls, respectively (4). In the study by Hodjati et al.

conducted in Tabriz, 5.23 of the cases were contaminated; all of them were girls with no pollution among boys (5). In a study conducted by Rafinejad et al. in the city of Amlash, 9.2% of primary school pupils have been infected, with gender breakdown of 13.75% and 4.70% for girls and boys, respectively (1). It should be noted that in other articles, due to the fact that girls were more contaminated, only girls were included in the studied population. Most studies have shown a higher incidence of infection among girl students than their boy counterparts.

Location: As the lice contamination was higher among children in rural areas due to the low quality of life (QOL), most studies have been accomplished in rural areas, and the results also indicated the same fact, however sometimes the contamination rate was higher in the urban areas. For example, in the study by Riabi and Atarodi in Razavi Khorasan Province, versus the total contamination rate of 219 cases in urban area, rural infection was recorded to be 141 cases. The difference in the results among various studies was due to human migration to urban areas for employment and education or job-seeking purposes (4). A study conducted by Moradi et al. in Bahrar city of the Hamedan Province showed incidence rates of 0.66% and 1.66% in urban and rural areas, respectively (11). The study conducted by Rafinejad et al. in Amlash in Gilan Province revealed that pollution in rural areas was 11.7 times higher than in urban areas, in addition, pollution in schools in urban areas was found mostly in the suburbs due to the immigrants living in rural areas. On this basis, it seems that cultural, geographic, and economic factors and also access to health facilities in urban and rural areas affected the rate of infection. Studies in Palestine, Libya, and Korea also yielded similar results and the infection rate was higher in rural areas compared to the urban areas. Other studies conducted have compared urban and rural areas or have separately addressed rural or urban areas (1). Due to the lack of facilities in rural areas and the increased rate of pollution, the majority of studies have been performed in rural areas, however the results have also indicated the problem of urban pollution.

Table 1. Incidence rate (%) of head lice infestation in relation to the socio-demographic status of parents and age of the children in Iran

Variable/Article			Amlash	Paveh	Ravansar	Sanandaj	Bahar	Gheshm	Khajeh	Iranshahr	Mazandaran
Sex	Men	Number of examinations	2115	-	-	-	450	246	200	-	9213
		Incidence (%)	4.70	-	-	-	0.44	35.69	2.00	-	0.01
	Women	Number of examinations	2129	750	385	810	450	269	300	918	36024
		Incidence (%)	13.70	8.00	15.80	4.69	2.20	11.02	6.60	27.00	1.52
Age (year)		6-7	10.10	13.11	12.63	04.15	1.60	11.57	13.54	36.40	2.03
		8-9	19.30	25.30	27.15	14.41	2.20	36.37	7.28	49.30	1.95
		10-11	18.30	20.30	21.16	19.43	20.57	53.60	3.30	55.60	3.72
		12 ≥	9.50	2.24	1.12	02.41	-	-	-	11.80	1.54
Children's grade in school		I	10.00	14.12	15.75	04.15	1.60	-	13.54	-	0.02
		II	9.70	13.11	11.63	09.14	1.10	-	4.42	-	1.96
		III	9.50	11.18	14.78	05.19	1.10	-	2.85	-	1.94
		IV	7.60	14.14	13.92	11.14	2.20	-	2.29	-	1.76
		V	9.20	8.17	8.77	10.20	55.00	-	1.01	-	1.80
Father's job		Government	0.60	13.18	12.93	04.184	-	6.20	-	-	1.48
		Private	10.70	30.40	18.86	24.47	-	38.71	-	-	1.90
		Labor	11.20	17.16	31.21	11.15	-	23.25	-	-	2.34
Mother's job		Employed	0.40	6.61	9.47	02.730	-	9.30	-	-	-
Father's education level		Housewife	9.30	54.68	52.34	36.74	-	24.40	-	-	-
		Illiterate	25.60	16.97	10.45	07.110	2.07	66.95	12.30	-	3.10
		Elementary education	5.10	28.36	23.13	26.41	0.70	24.23	6.20	-	1.80
Mother's education level		University education	1.50	16.28	8.620	05.29	0	4.63	0	-	1.56
		Illiterate	19.20	23.16	35.94	14.18	1.48	21.40	6.04	-	3.03
		Elementary education	4.00	31.41	14.14	22.446	68.00	-	1.92	-	1.81
Family size		University education	0.50	6.16	5.32	02.179	0	-	0	-	1.45
		4 ≥	9.10	-	31.22	-	1.78	-	0	-	2.50
		4 <	41.70	-	15.25	-	1.60	-	5	-	1.79
School type		Public	9.50	-	-	-	-	-	-	-	-
		Private	0.70	-	-	-	-	-	-	-	-

Table 2. Incidence rate (%) of head lice infestations in relation to personal hygiene

Variable /Article		Amlash	Paveh	Ravansar	Sanandaj	Bahar	Qeshm	Khajeh	Iranshahr	Mazandaran
No. of baths per week	Once a week	10.40	27.25	25.12	14.27	1.28	-	3.70	-	-
	Twice a week	0.40	9.15	30.18	18.36	2.20	-	0	-	-
Length of hair	Long	15.10	11.185	25.99	7.20	-	-	-	16.70	-
	Medium	14.70	29.29	18.12	15.31	-	-	-	28.00	-
	Short	5.90	20.27	18.16	16.29	-	-	-	26.23	-
Hygiene teacher	Yes	1.70	6.89	30.21	34.74	-	-	-	-	1.19
	No	15.00	56.66	31.18	4.61	-	-	-	-	2.40
Location	Urban	-	-	-	-	1.66	45.50	4.80	27.00	-
	Rural	-	-	-	-	66.00	-	-	-	-
Hair type	Smooth	8.10	-	-	-	-	-	-	-	-
	Curly	15.70	-	-	-	-	-	-	-	-
Dandruff	Yes	9.60	-	-	-	-	-	-	18.20	-
	No	9.20	-	-	-	-	-	-	27.20	-
Braiding	Yes	9.00	-	-	-	-	-	-	24.70	-
	No	10.50	-	-	-	-	-	-	27.60	-
Using hair cream	Yes	-	-	-	-	-	-	-	33.20	-
	No	-	-	-	-	-	-	-	22.20	-

Educational level of parents: Studies conducted showed that the infection rate among fatherless students, parental level of knowledge, and also the parental education level, especially those with high school diploma, significantly varied among children. Vahabi et al. conducted an investigation on head louse infestations and factors affecting the rate of infestation among primary school children in Paveh City, Kermanshah Province with the following results: percentage of students with parents having initial education were 28.36, whereas 16.28% were students with fathers with university education. This factor was also affected by their mothers' education, as the rate of students with mothers with university degree and primary education was 6.16% and 31.41%, respectively (9). Moradi et al. conducted a study in Bahar city of Hamadan Province; none of the students' fathers had a university degree and students whose fathers and mothers had primary education was 0.70% and 0.68%, respectively (11). A study conducted by Soleimani et al. in Qeshm, Hormozgan Province indicated incidence rates of 66.95%, 4.63%, 21.40%, and 0% for the students with fathers with primary education, with fathers with higher education, with mothers with primary education, and mothers with university education, respectively (12). In another study conducted by Sayyadi and Vahabi in Ravansar, the rates of students with fathers and mothers with primary education were 14.10% and 23.12%, respectively, however the students with fathers and mothers with university education were 8.62% and 5.32%, respectively (8).

In another study conducted by Rafinejad et al. in Amlash, the rates of students with illiterate fathers and students with fathers with a diploma and higher was 25.6% and 1.5%, respectively; in addition, 19.20% and 0.05% infection rate were reported among children with illiterate mothers and students with mothers with a diploma degree and higher, respectively (1). The studies have shown that infection rate of students with illiterate parents was significantly different as compared to students with educated parents and infection rate was lower among children with educated parents.

Parents' jobs: In some studies, investigations on the rate of pediculosis have been conducted on students with dead parents, students with unemployed or self-employed parents, and parents with governmental jobs. There were statistically significant differences between the studies. Rafinejad et al. reported incidence among children without fathers, with an unemployed father, with a self-employed father, and with father with governmental job as 2.00%, 3.18%, 9.90%, 20.00%, and 0.40%, respectively (1). Results of the study by Soleimani et al. reported the incidence rate of infection in Qeshm for students with worker fathers, with employed fathers, with mothers as housewives, and with employed mothers as 38.71%, 6.20%, 24.45%, 9.30%, respectively (12). Studies conducted by Vahabi et al. in Sanandaj showed that the incidence rate of pediculosis among the students whose parents were employees and labors was 4.184% and 11.151%, respectively (7). In the study by Sayyadi and Vahabi in Ravansar, it was shown that the incidence rate among the students whose parents were employees and labors was 12.93% and 31.2%, respectively; the study also showed the infection incidence rates of 52.338% and 9.470% among students with mothers as housewives and students with employed mothers, respectively (8). In another study in Paveh, Vahabi et al. found that the infection incidence rates among students with employed mothers and mothers as housewives were 6.61% and 54.68%, respectively (9). Several studies have investigated this factor as poor, as the rate of students whose parents have died of infection and students whose parents were unemployed or self-employed or had government jobs, had statistically significant differences. Students whose fathers had government jobs had less infection.

Number of family members: Studies have shown that increasing the number of members increases the pediculosis incidence; the study conducted in Amlash by Rafinejad et al. showed that the rate of infected individuals in the families with 4 or fewer members and in households of more than 4 individuals was 9.10% and 41.70%, respectively (1). Soleimani et al. conducted a study in Qeshm, showing that the rate of contamination among families with 4

or less members and more than 4 individuals was 2.50% and 1.79%, respectively (12). Studies have shown that increasing the number of members has increased the infection incidence.

Type of school: Only the study by Rafinejad et al. in Amlash reported the incidence rates of 9.5% and 0.7% in public and private schools, respectively (1).

Frequency of washing scalp hairs: The frequency of washing scalp hairs was examined in some of the articles. In a study from Khaje City in East Azerbaijan Province, Shayeghi et al. concluded that the incidence of infection varied with the frequency of washing hairs in the week as the greater the frequency of washing, the less the pollution. For individuals who washed their hairs more than twice a week, no contaminations were found (13). The study by Rafinejad et al. in Amlash indicated that 10.40% and 0.04% of the infected individuals had bath once a week and two or more times a week, respectively (1). The results of the study by Vahabi et al. in Paveh showed that incidence of infection among the students who bathed twice a week and once a week was 9.15% and 27.25%, respectively, and bathing was effective in reducing contamination (9). The rate of washing of scalp hairs was examined in some of the articles, which showed that individuals bathing more than twice a week were less polluted compared to those bathing once a week.

Hair type: In terms of straight or curly hair, the study by Rafinejad et al. have shown the incidence rates of 8.1% and 15.7% among individuals with straight hairs and curly hair, respectively (1). Moreover, according to the study by Vahabi et al. in Sanandaj, 49% and 51% of the individuals with lice infection were smooth-haired and curly-haired, respectively (7). In other studies, this factor has not been studied. A few studies examining this factor are very low and the results did not show significant differences.

Hair length: According to the results of the study by Alempour Salemi et al. in Iranshahr, Southeast of Iran, the incidence among individuals with long, short, and medium hairs were 16.7%, 28.0%, and 26.3%, respectively (6). In the study by Rafinejad et al. in Amlash, incidence for long, medium, and short hairs were

15.1%, 14.7%, and 5.9%, respectively (1). In addition, in the study by Vahabi et al. in Paveh, incidence rates for long, medium, and short hairs were 11.185%, 29.292%, and 20.273%, respectively (9). Furthermore, in the study by Vahabi et al. in Sanandaj, 16.29%, 15.31%, and 7.20% the infected individuals were with short, medium, and long hair, respectively (7).

Dandruff and the braided hair: These two factors were evident in the study by Alempour Salemi et al. in Iranshahr (6) and also in the study by Rafinejad et al. in Amlash (1). In a study conducted by Alempour Salemi et al., the incidence rate among individuals with hairs with and without dandruff was 18.2% and 27.2%, respectively. Moreover, regarding the patients in this study, the incidence rates among individuals with braided and woven hairs were 24.7% and 27.6%, respectively (6). In a study by Rafinejad et al. in Amlash, investigations revealed 9.6% and 9.2% incidence rates among individuals with hairs with and without dandruff, respectively. Furthermore, patients with and without woven hairs were accounted for 9.0% and 10.5% of the samples, respectively (1).

Health educator: A number of studies have investigated this factor; the results of the study by Rafinejad et al. are available in this regard. The incidence rates among individuals with and without a health educator were 1.7% and 15.0%, respectively (1). Moreover, Vahabi et al. reported the incidence of 6.89% and 56.66% in a study involving patients with and without a coach, respectively (9). Furthermore, in the study by Sayyadi and Vahabi, 31.18% of the infected individuals had no health educators (8). A number of studies were examined, and it was found that schools with a health educator had a lower head lice infestation rate.

Conclusion

Head lice (*Pediculus humanus*) is a compulsory ectoparasite among humans and it could be transferred due to direct contact among persons, especially school children, so that personal hygiene will reduce the infestivities to head lice. Health education to the parents and personal protection is highly recommended.

Conflict of Interests

Authors have no conflict of interests.

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