

Epidemiological Prevalence of Pediculosis and its Influencing Factors in Iranian Schools: Systematic Review and Meta-analysis

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ABSTRACT

Introduction: Pediculosis is an endemic parasitic infestation in many countries of the world. Iran is one of the countries with a high rate of pediculosis.

Aim: To investigate the prevalence and factors associated with pediculosis in primary school students of Iran.

Materials and Methods: The literature search was carried out by two researchers on national databases including: SID, Iranmedex, Magiran, Irandoc and international database including: Scopus, Pubmed and Web of Science to find relevant articles between 2000 and 2016. The search strategy was performed using keywords such as: “epidemiology”, “prevalence”, “infestation”, “head louse”, “head lice”, “*Pediculus humans capitis*”, “pediculosis”, “primary school students”, “primary students”, “school children”, and “Iran”, as well as their Farsi equivalents. In this study, a random effects model and a fixed effect model were used. To test heterogeneity, the

Q-Cochran test was used at an error level of less than 10% and the quantity was estimated by I². The Begg Rank Correlation Test and Eggers Regression Method were used to measure the publication bias.

Results: The results showed that 428,993 students were studied in 55 papers between 2000 and 2016 and the prevalence of head louse (*Pediculus human capitis*) was 6.4% (95% CI: 6-6.9). The prevalence of lice (pediculosis) infestation among girls was 6.1% (95% CI: 4.6-7.4) and in boys was 1.2% (95% CI: 0.8-1.7) and in rural areas prevalence was more than urban areas.

Conclusion: The results of this study demonstrated a high incidence of pediculosis among rural school-girls. It is recommended that, creating awareness among this population is required, especially schools that do not have a health teacher. Large families, having low education among parents, must be educated about the condition and its prevention.

Keywords: Head lice, Infestation, Primary students

INTRODUCTION

Public health is important in any society, so that the development depends on people's general health. Infestation with parasites is one of the issues which are still a health concern. Lice are external parasites that transmit pathogens such as typhus, recurrent fever and thus have been the focus of various researchers [1].

Lice are mainly transmitted through contact with contaminated objects (towels, comb, scarves, etc.). Today, with the improvement in quality of life, body lice infection are less observed and most of the infections are head lice [2].

The results of different studies in numerous countries have shown that the prevalence of pediculosis infestation varies among students. Prevalence of infestation in Chile is 40.3% [3], in Egypt is 16.7% [4], in Turkey [5], it is 13.1%, in Australia [6], it is 5.3% and, in Mexico it is 13.6% [7].

Since the prevalence of pediculosis capitis among the students of all educational levels of Iran is not completely clear and pediculosis capitis causes socio-economic damage and is a particular problem in elementary schools, therefore the aim of this study was to determine the prevalence of pediculosis and its related factors in Iranian schools.

MATERIALS AND METHODS

Data Sources

Relevant studies published in major national databases such as SID, Iranmedex, Magiran, Irandoc and international electronic bibliographic databases of PubMed, Scopus and Web of Science were systematically searched from 2000 to 2016.

Inclusion and Exclusion Criteria

All Persian and English papers that passed the required evaluation stages, received the required quality scores and estimated the prevalence of pediculosis in male or female students were included.

Studies in which sample size was not measured and abstracts presented in conferences for which no full text was available, were excluded from the study.

Selection of Studies and Data Extraction

All collected articles were independently reviewed by two researchers in terms of methodological quality.

The search strategy was performed using keywords such as: “epidemiology”, “prevalence”, “infestation”, “head louse”, “head lice”, “*Pediculus humans capitis*”, “pediculosis”, “primary school students”, “primary students”, “school children”, and “Iran”, as well as their Farsi equivalents.

Finally, after removing duplicate articles, reviewing the title, abstract and full text of the articles, 55 articles related to the subject and purpose of the study were reviewed.

Any conflict between the two researchers was resolved by a third-person. After including the accepted papers into the study and approving the quality of the papers, data were extracted by the PRISMA checklist. A form was developed for data extraction including variables such as sample size, study type, publication year, location, target population, prevalence rate, and so on. The required data were then extracted from all the selected studies.

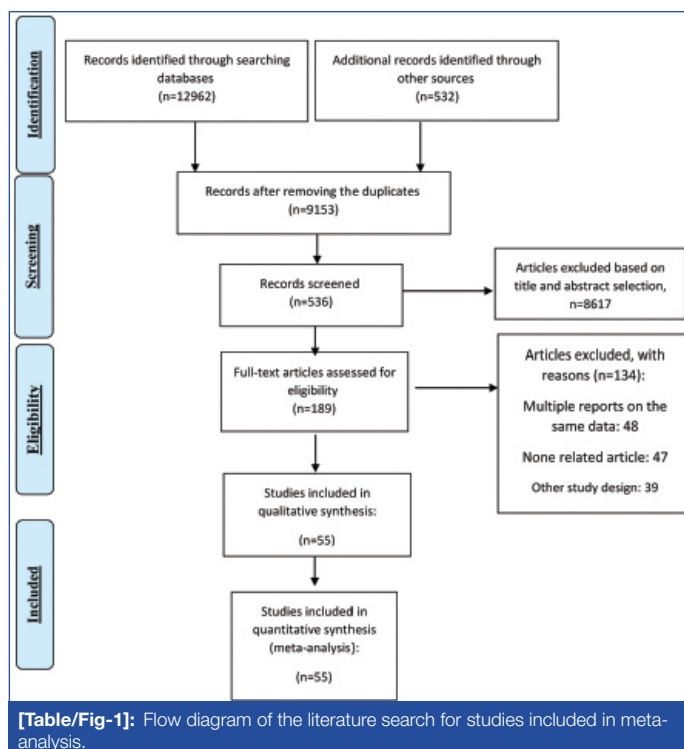
STATISTICAL ANALYSIS

In the present study, the pooled effect evaluation was in weighted mean of the results of individual studies. The weighted mean for

each study was calculated based on sample size and variance. In this study, the random effects (DerSimonian and Laird method) and the fixed effects model (Mantel and Haenszel method) were used. The index in the study was prevalence that was calculated as Proportion (P) with a confidence interval of 95%. To test heterogeneity, the Q-Cochran test was used in an error level of less than 10% and the quantity was estimated by I² (I²% of the total variation observed in studies, which is rather than chance due to heterogeneity). A value of 0% indicates that there is no heterogeneity among the studies. Where, p<0.1 and I² was more than 50%, we used the random-effects model; otherwise the fixed-effect model was used. The Begg Rank Correlation Test and Eggers Regression Method were used to measure the publication bias. All meta-analysis was performed using Stata software version 12 (Stata Corp, College Station, TX, USA).

RESULTS

During the initial search, 13494 records were enrolled. The authors screened articles by title, abstract and full text. Duplicates were removed, and in the final step, 55 studies were included in the analysis. [Table/Fig-1] shows the diagram of the included studies (35 Persian articles and 20 English articles). The studies were from different provinces. The sample size in these studies varied from 250 to 90636 people. The highest incidence rate for pediculosis capitis was reported for students in the study by Zareban et al.'s (29.4%) in 2002 in Zabol; the lowest prevalence (0.26%) was found in the study by Davarpanah MA et al., in Fars Province in 2012 [Table/Fig-2,3] [8-62].



[Table/Fig-1]: Flow diagram of the literature search for studies included in meta-analysis.

The research showed that 428,993 students (mean age 10.4±3.8) were investigated in 55 studies, between 2000 and 2016, with a prevalence of head lice infestation of 6.4 (95% CI: 6-6.9) [Table/Fig-4].

ID	Authors	Year	Research location	Sample size	Frequency		Prevalence		Location		Total prevalence	Education		Family size	Hair length
					Boy	Girl	Boy	Girl	Urban	Rural		Father	Mother		
1	Hodjati MH et al., [8]	2008	Tabriz	2795	847	1948	5.23	0	---	---	5.2	--	--	--	--
2	HazratiTappeh K et al., [9]	2012	Urmia	2040	866	1174	5.5	1.8	---	---	4	p<0.05	p<0.05	--	--
3	Kassiri H et al., [10]	2016	Khorramshahr	750	405	345	1.5	1.6	---	---	2	p<0.05	p<0.05	p<0.05	p<0.05
4	Dehghani R et al., [11]	2012	Kashan	1200	585	615	1.14	0.17	---	---	0.7	NS	NS	p<0.05	--
5	Moradi A et al., [12]	2009	Hamadan	900	450	540	2.2	0.44	0.66	1.66	1.3	p<0.05	p<0.05	--	--
6	Nazari M et al., [13]	2006	Hamadan	847	440	407	13.5	0.7	---	---	6.85	p<0.05	p<0.05	p<0.05	p<0.05
7	Vahabi B et al., [14]	2010	Kermanshah	750	--	750	8	---	---	---	8	p<0.05	p<0.05	--	--
8	Sayyadi M et al., [15]	2013	Kermanshah	385	--	358	15.8	----	---	---	15.8	p<0.05	NS	--	p<0.05
9	Haghi FM et al., [16]	2014	Golestan	1510	--	1510	3.6	----	---	---	3.6	p<0.05	NS	p<0.05	--
10	Vahabi A et al., [17]	2012	Sanandij	810	--	810	4.7	----	---	---	4.7	p<0.05	p<0.05	--	NS
11	Omidi A et al., [18]	2013	Hamadan	10841	6350	4491	2.3	0.11	1.27	0.05	1.05	NS	NS	NS	--
12	Soleimani-Ahmadi M [19]	2007	Qeshm	515	246	269	35.27	11.7	---	---	23.9	NS	NS	--	p<0.05
13	Nazari M et al., [20]	2016	Asadabad	600	188	412	2.3	--	---	---	2.4	p<0.05	NS	p<0.05	---
14	Yousefi S et al., [21]	2012	Kerman	1772	926	846	1.65	0.64	---	---	1.12	p<0.05	--	--	--
15	Shayeghi M et al., [22]	2010	Azerbaijan	500	200	300	6.7	2	---	---	4.8	p<0.05	p<0.05	p<0.05	--
16	Motovali-Emami M et al., [23]	2008	Kerman	40586	19774	20812	2.9	0.6	1.5	4.6	1.8	p<0.05	p<0.05	p<0.05	--
17	Salehi S et al., [24]	2014	Abadan	624	302	322	4.23	0	---	---	4.33	p<0.05	p<0.05	--	--
18	Kamiabi F et al., [25]	2005	Kerman	1200	564	636	6.8	0.4	---	---	3.8	p<0.05	p<0.05	p<0.05	p<0.05

19	Azni SM, [26]	2014	Damghan	2700	--	2700	3.6	----	3	5.9	3.6	--	--	--	--
20	Salemi JA et al., [27]	2003	Iranshahr	918	--	918	27	----	---	---	27	--	--	--	--

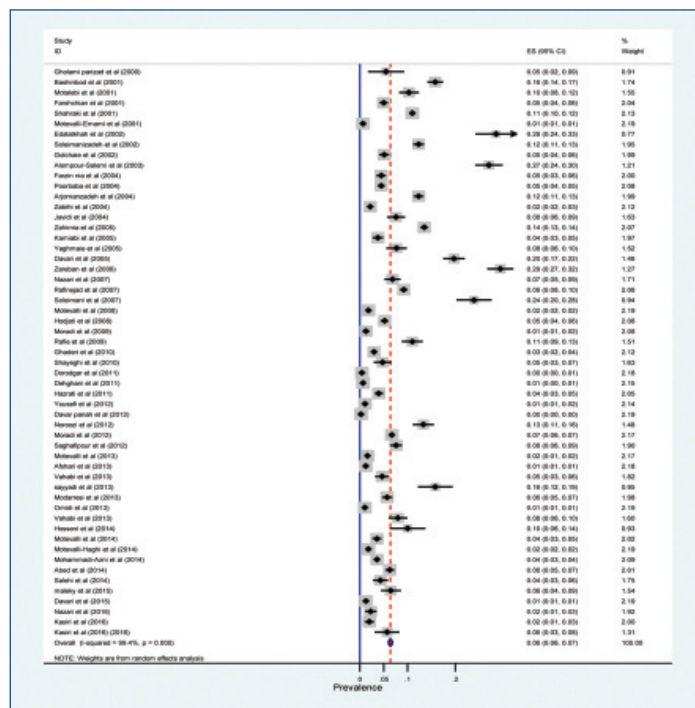
[Table/Fig-2]: Characteristics of articles on the prevalence of head lice among students in Iran (English articles).

ID	Authors	Language study	Research location	Sample size	Frequency		Prevalence		Location		Total prevalence	Education		Family size	Hair size
					Boy	Girl	Boy	Girl	Urban	Rural		Father	Mother		
21	Kassiri H et al., [28]	2016	Galugah	300	--	--	5.7	--	---	---	5.7	p<0.05	p<0.05	--	--
22	Adalatkhah H et al., [29]	2002	Ardabil	417	--	417	28.5	---	1.2	35.5	28.5	--	---	--	---
23	Rafie A et al., [30]	2009	Ahvaz	810	--	810	11	----	---	---	11	p<0.05	p>0.05	--	--
24	Zabihi A et al., [31]	2005	Babol	2300	1150	1150	3.5	0.96	---	---	2.2	p<0.05	p<0.05	--	--
25	Arjomanzadeh S et al., [32]	2001	Bushehr	3913	1962	1951	22	2	---	---	12.27	p<0.05	p<0.05	--	--
26	Ghaderi R et al., [33]	2010	Birjand	3046	1531	1515	5	1	---	---	3	--	--	--	--
27	Davari B et al., [34]	2015	Tehran	53732	28242	25490	2.1	0.4	0.8	0.3	1.3	p<0.05	p<0.05	--	--
28	Modarresi M et al., [35]	2013	Tonekabon	1846	889	957	8.8	2.5	4.8	6.61	5.74	p<0.05	p<0.05	--	--
29	Motevalli-Emami M et al., [36]	2001	KhomeyniShahr	68968	34473	34495	1.3	0.01	0.28	0.38	0.68	p<0.05	p<0.05	p<0.05	--
30	Afshari A et al., [37]	2013	RobotKarim	10000	--	10000	1.25	---	---	---	1.25	p<0.05	p<0.05	NS	---
31	Golchai J et al., [38]	2002	Sari	1780	913	867	6.2	4.16	---	---	5.1	---	---	---	---
32	Zareban I et al., [39]	2006	Zabol	1066	--	1066	29.4	----	---	---	29.4	p<0.05	p<0.05	---	---
33	Motevalli Haghi S et al., [40]	2014	Mazandaran	4712			1.65	---	1.65	1.63	1.65	p<0.05	p<0.05	NS	p<0.05
34	Yaghmaie R et al., [41]	2006	Sanandij	600	--	600	7.7	----	---	---	7.7	NS	p<0.05	---	NS
35	Noroozi M et al., [42]	2013	Qom	900	--	900	13.3	---	---	---	13.3	p<0.05	p<0.05	p<0.05	--
36	Farzinnia B et al., [43]	2004	Qom	1650	--	1650	4.5	----	---	---	4.5	NS	p<0.05	p<0.05	p<0.05
37	Saghafipour A et al., [44]	2012	Qom	1725	--	1725	7.6	----	---	---	7.6	p<0.05	p<0.05	NS	NS
38	Noori A et al., [45]	2014	Semnan	2500	1480	1020	10.07	1.75	--	---	6.28	p<0.05	p<0.05	---	p<0.05
39	Yazdani-Charati J et al., [46]	2016	Semnan	541	265	276	10.86	1.8	---	---	6.5	NS	NS	---	p<0.05
40	Poorbaba R et al., [47]	2004	Gilan	2893	1493	1400	5.7	3.2	---	---	4.5	p<0.05	p<0.05	--	--
41	Motevalli-Haghi SF et al., [48]	2014	Mazandaran	45237	9213	36042	1.9	1.7	1.4	5.6	1.8	p<0.05	p<0.05	--	--
42	Hosseini SH et al., [49]	2014	Khorasan	250	120	130	15.4	4.2	---	---	10	p<0.05	p<0.05	p<0.05	p<0.05
43	Moradi A et al., [50]	2012	Hamadan	17722	9346	8376	6.8	0.1	---	---	6.74	p<0.05	p<0.05	--	--
44	Davarpanah MA et al., [51]	2013	Fars	90636	--	--	0.55	0.41	0.42	0.54	0.26	p<0.05	p<0.05	p<0.05	--
45	Doroodgar A et al., [52]	2011	Isfahan	3589	2096	1439	0.42	0.05	---	---	0.47	p<0.05	p<0.05	p<0.05	--
46	Rafinejad J et al., [53]	2006	Amlash	4344	2115	2129	13.7	4.7	1.3	15.3	9.2	p<0.05	p<0.05	p<0.05	p<0.05
47	Gholami PE et al., [54]	2001	Ilam	658	315	343	6.5	4.5	---	---	5.5	p<0.05	p<0.05	--	p<0.05
48	Davari B et al., [55]	2005	Sanandij	1195	---	---	--	--	---	---	19.7	p<0.05	p<0.05	p<0.05	--
49	Motalebi M et al., [56]	2000	Gonabad	846	410	436	19.5	0.48	0.7	19.9	10.28	p<0.05	p<0.05	--	--
50	Javidi Z et al., [57]	2004	Mashhad	769	--	769	7.6	---	---	---	7.6	---	--	--	--

51	Zahrneia M et al., [58]	2005	Hamadan	7219	--	7219	13.5	----	---	---	13.5	---	---	--	--
52	Shahraki GH et al., [59]	2001	Yasuj	12247	6438	5809	21.8	1.3	---	---	11	--	--	--	--
53	Bashirbod H et al., [60]	2001	Tehran	1921	--	--	15.8	24.3	8.2	---	15.8	--	--	--	p<0.05
54	Soleimanizadeh L et al., [61]	2002	Bandar Abbas	3249	--	---	20.29	1.7	---	---	12.3	p<0.05	p<0.05	p<0.05	p<0.05
55	Farshchian M et al., [62]	2001	Hamadan	2400	--	--	-	--	--	--	5	p<0.05	p<0.05		p<0.05

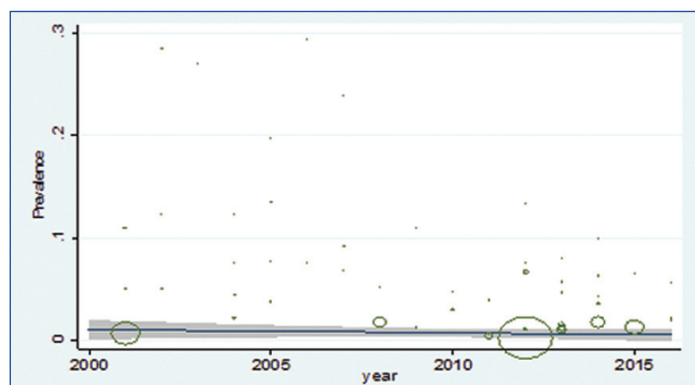
[Table/Fig-3]: Characteristics of articles about the prevalence of head lice among students in Iran (Persian articles).

The results of the meta-regression analysis showed that for each year, the prevalence of the disease was reduced by 0.55 (0.2, 0.91) percent, which was statistically significant (p<0.003) [Table/Fig-5].



[Table/Fig-4]: The prevalence of head lice in school students according to studies in the current meta-analysis. ES: estimate; ID: identification.

During the study of factors related to pediculosis capitis, the study showed that father's educational level (39 studies), mother's educational level (37 studies), the presence of a health educator in schools (13 studies), household size (17 studies), and hair size in students (15 studies) are associated with pediculosis infestation rates (p<0.05).



[Table/Fig-5]: Meta-regression plots of change in prevalence of pediculosis according to years of study.

DISCUSSION

The results of the study showed that 428,993 students were evaluated in 55 studies over the years 2000 to 2016, and the prevalence of pediculosis capitis was 6.4 (95% CI: 6-6.9). The

prevalence of pediculosis capitis in girls was found to be higher. The prevalence of pediculosis capitis in rural areas is higher than urban areas (3.1% vs. 1.8%).

The prevalence of pediculosis capitis in Iranian schools was 6.1 (CI 95%: 6-6.9). Studies in Egypt [4], Chile [63], Thailand [64] and Mexico [7] have a higher prevalence of pediculosis capitis compared to Iran, due to the role of many interfering factors such as climatic conditions, health conditions, and socioeconomic status.

In studies conducted in Jordan [65], Turkey [5], the prevalence of pediculosis capitis was higher in girls than in the present study. Covering hair with scarf by girls causes late detection, the spread of infestation and increases the prevalence of infestation [66]. Short hair length in boys can be a reason for the low incidence of the disease among them.

The prevalence of pediculosis capitis in rural areas was 3.1% and in urban areas was 1.8%. It seems that geographical, economic, and cultural factors influence the higher prevalence of pediculosis capitis in rural areas. In rural areas, the prevalence of pediculosis capitis was higher due to lower access to sanitary equipment. Families living in villages are more likely to be infected with lice because of their lower socioeconomic status [67,68]. Some researchers believe that pediculosis capitis is found in various socio-economic groups, although some researchers have reported that pediculosis capitis is more common in lower socioeconomic groups [63,69].

In most studies, fathers' educational level (39 studies) and mothers' educational level (37 studies) was effective in the prevalence of pediculosis capitis, although some studies did not show a significant relationship between the prevalence of pediculosis capitis in students and parents' education.

Head lice infestation was observed in both groups of students (students with literate parents and students with illiterate parents). The study of Jahnke C et al., found lice infestation in families with low literacy and families with low awareness [70]. Increasing parental awareness to the disease, prevention, timely identification and complete treatment of students can be very effective in reducing the incidence of the disease.

The larger the families, the less the parents can take care of their children's health. As a result, such children are expected to have higher rates of infestation due to greater contact with each other. Similar studies have shown that the incidence of lice increases with increasing household size [20,28].

School health instructors can decrease the spread of the infestation by increasing the awareness and repeated students' visits and timely detection and treatment.

Limitation(s)

One of the limitations of this study was the heterogeneity between studies. Therefore, we applied a random effect model to combine the primary results in this meta-analysis.

CONCLUSION(S)

Pediculosis capitis is still a major problem in low-living and low health and societies, and it emphasises the necessity of further training about individual health for families. Not just a single factor determines

pediculosis capitis. However, it depends on many factors such as economic status, parental education, household size, the presence of a health trainer in schools for training and early detection.

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