



Factors Affecting *Pediculosis capitis* Transmission among Primary School Children

Salim Ali Alarifi ^a, Ghait Alsdæ ^b and Gamal A. Duweb ^{a*}

^a Dermatology Department, Faculty of Medicine, Benghazi University, Benghazi, Libya.
^b Dermatology Department, Sirte University, Sirte, Libya.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2022/v43i1730656

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/91008>

Original Research Article

Received 15 June 2022
Accepted 20 August 2022
Published 25 August 2022

ABSTRACT

Introduction: Human head lice infest people worldwide and are most prevalent in children. Outbreaks of head lice more commonly affect children 3 to 12 years old, with girls being affected more commonly than boys. The aim is to study the factors affecting transmission of the disease among the school children in villages in Benghazi - Libya.

Patients and Methods: In a cross-sectional study in western region of Benghazi, 556 students in three schools from Alhlys, Alatry and Abofakra regions were enrolled. The ages of children ranged from 6 to 13 years. Data collected include socio-demographic characteristics of the students, sex, age, school and hair were examined individually for head lice infestation in a separate room. Descriptive analysis and Chi-square test was used to determine the statistical significance of p-value ≤ 0.05 .

Results: The data were collected on 556 students from the 3 villages: 39.7% from Al-Helys, 28.8% from Al-Tarya and 31.5% from Abofakra regions. The age of children ranged from 6 to 13 years. Female children were more than 50%. The mean of family size was 7 ± 2 persons, number of bedroom in houses ranged from 1-5 rooms.. Sharing of personal equipment such as hair comb and linen was reported in 33.5% of families. *Pediculosis capitis* manifestation was reported in 26.3% of the participants. The prevalence of pediculosis capitis was 19.5% in Al-Helys, 35.6% in Al-Tarya and 26.3% in Bo-Fakra; this difference was statistically significant ($p < 0.05$). The prevalence of pediculosis capitis in males was 10.2%, while in females was 41.8%, this difference was highly statistically significant ($p = 0.0001$) The highest prevalence of pediculosis capitis was in age of 11

*Corresponding author: Email: drduweb@gmail.com;

years old (42.9%), followed by age of 10 years old (36.6%). There were no reported cases at the age of 6 and 13 years. There was no effect of parent occupation or education level on pediculosis infestation transmission.

Conclusion: The present study revealed that, *Pediculosis capitis* was prevalent in school children, more in females. Furthermore pediculosis was higher in certain villages than others.

Keywords: *Pediculosis capitis*; school children; prevalence; transmission.

1. INTRODUCTION

Pediculosis capitis is an infestation with the human head louse (*Pediculus humanus capitis*). They are ectoparasites, in which their infestation clinically present with scalp pruritus, excoriations, cervical lymphadenopathy, conjunctivitis and hypersensitivity rash or pediculid that mimic a viral exanthem [1,2,3]. Head lice infestation crosses all economic and social boundaries [4,5]. Head lice are 1 mm to 3 mm long. The head louse is an obligate parasite that spends its entire life on the human host. Head lice feed exclusively on blood, unable to jump or fly, and transmission requires close contact. Transmission of head lice is thought to occur by head-to-head contact, sharing of headgear, or other direct contact with fomites [6,7]. The life cycle of the head louse has three stages: egg, nymph, and adult. Nits are hard to see and often confused for dandruff or hair spray droplets. Nits are laid by the adult female and are cemented at the base of the hair shaft nearest the scalp [1,2,8]. They are 0.8 mm by 0.3 mm, oval and usually yellow to white. Nits take about 1 week to hatch (range 6 to 9 days). Viable eggs are usually located within 6 mm of the scalp [2,3].

The aim of this study was to assess the prevalence of head pediculosis capitis among school children in the villages in Benghazi – Libya and to study factors affecting transmission of the disease among this age group.

2. MATERIALS AND METHODS

In a cross-sectional study, 556 students in three schools from three villages in west region of Benghazi (Alhlys, Altry and Abofakra) were evaluated. The age of children in this study was ranged from 6 to 13 years. Data collected regarding the selected socio-demographic characteristics of the students, sex, age, school, class, medical history, complaint if any. The hair of each child was examined individually for head lice infestation in a separate room, and *Pediculosis capitis* was defined as the finding of living adult, nymph, or egg (nits) for all students.

Questionnaire had been sent to parents of the children and included demographic data for mothers and fathers. The observation of nits and nymphs or adult lice was considered as a positive.

Data was analyzed using (SPSS) statistical package of social science program version 23. The statistical analysis included: I. Descriptive Statistics: Including (Mean value, Standard deviation, Number and Percentage). II. Inferential Statistics: was used when needed as t- test and Chi-square, P-value will be considered significant when ≤ 0.05 .

3. RESULTS

The data collected on 556 children from three schools located in three different region in western of Benghazi-Libya (Al-Helys, Bo-Fakra and Al-Tarya) represented 39.7%, 31.5% and 28.8% respectively. The percentages of age of participants were high in 10-13 years and 6-9 years groups and presented as 50% each group.. Females were slightly higher than male (50.7% Vs 49.3%). Pediculosis capitis manifestation was reported in 26.3% of the participants (Fig. 1). The diagnosis was depending on demonstration of nits and rarely on live louse (Figs. 2, 3). Pediculosis capitis was more prevalent in the Al-Tarya region ($P=0.002$) (Table 1). Furthermore, there was a significant difference between types of pediculosis infestation and genders ($P=0.0001$) in which girls had more pediculosis infestation than boys (Table 2). Pediculosis increased with children ages and reached the peak at age 11 years old ($P=0.0001$) (Table 3). Parents' occupations and education levels have been investigated and showed no statistically significant relation with pediculosis infestations ($P> 0.05$) (Tables 4, 5). The other variables such as family sizes, number of bedrooms, number of people in each bedroom, and charring of personal equipment such as hair comb and linen. There was no significant relationship between these variables and pediculosis capitis (Tables 6, 7).

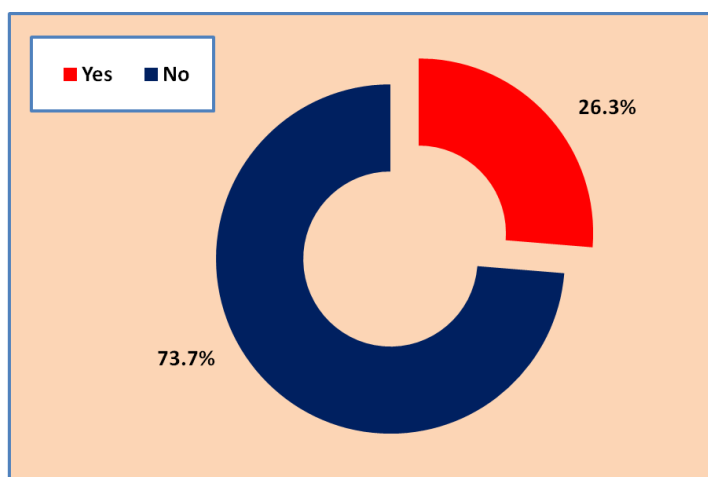


Fig. 1. Percentage of infested students with *Pediculus capitis*

Table 1. Distribution of students *Pediculus capitis* by each school

Name of school	<i>Pediculus capitis</i>			
	Yes		No	
	No	%	No	%
Al-Helys	43	19.5	178	80.5
Al-Taraya	57	35.6	103	64.4
Abofakra	46	26.3	129	73.7
Total	146	26.3	410	73.7

$\chi^2 = 12.529=2, p= 0.002$

Table 2. Distribution of students *Pediculus capitis* in relation to sex

Sex	<i>Pediculus capitis</i>			
	Yes		No	
	No	%	No	%
Male	28	10.2	246	89.8
Female	118	41.8	164	58.2
Total	146	26.3	410	73.7

$\chi^2 = 71.779 df=1, p= 0.0001$

Table 3. Distribution of students *Pediculus capitis* , according to age

Age /year	<i>Pediculus capitis</i>			
	Yes		No	
	No	%	No	%
6	0	0	2	100
7	18	22.8	61	77.2
8	14	13.7	88	86.3
9	23	24.7	70	75.3
10	34	36.6	59	63.4
11	36	42.9	48	57.1
12	21	20.8	80	79.2
13	0	0	2	100
Total	146	26.3	410	73.7

$\chi^2 =28.909 df=7, p= 0.0001$

Table 4. Distribution of students *Pediculus capitis* in relation to fathers' education

Fathers level of education	<i>Pediculus capitis</i>			
	Yes		No	
	No	%	No	%
Illiterate	0	0	3	100
Primary	10	29.4	24	70.6
Preparatory	20	20.2	79	79.8
Secondary	21	23.6	68	76.4
University and above	17	21.5	62	78.5
Total	68	22.4	236	77.6

$\chi^2 = 2.213 df=4, p= 0.697$



Fig. 2. Diagnosis of *Pediculus capitis*: Nits attached to hair shaft



Fig. 3. Diagnosis of *Pediculus capitis*: Live lice

Table 5. Distribution of students *Pediculosis capitis* in relation to Mothers' occupation

Mothers' occupation	<i>Pediculosis capitis</i>			
	Yes		No	
	No	%	No	%
House wife	44	23.8	141	76.2
Teacher	18	28.1	46	71.9
Employee	1	5.9	16	94.1
Doctor	0	0	5	100
Nurse	2	16.7	10	83.3
Student	1	50	1	50
Lab. technician	0	0	2	100
Total	66	23	221	77

$\chi^2 = 7.013$ $df=6$, $p= 0. 320$

Table 6. Distribution of students *Pediculosis capitis* in relation to family size

Family size	<i>Pediculosis capitis</i>			
	Yes		No	
	No	%	No	%
≤ 5	12	17.4	57	82.6
>5	58	23.9	185	76.1
Total	70	100	242	100

$\chi^2 = 1.296$ $df=1$, $p= 0.255$

Table 7. Distribution of students *Pediculosis capitis*, according to the number of persons living in each bedroom

Number of person in each bedroom	<i>Pediculosis capitis</i>			
	Yes		No	
	No	%	No	%
One	2	16.7	10	83.3
Two	19	19	81	81
Three	21	21.9	75	78.1
Four	15	27.8	39	72.2
Five	8	34.8	15	65.2
Seven	0	0	1	100
Eight	1	50	1	50
Total	66	22.9	222	77.1

$\chi^2 = 4.876$ $df=6$, $p= 0. 560$

4. DISCUSSION

The prevalence of *Pediculosis capitis* in this study was 26.3%, which was lower than the study conducted in Sabha city that showed the head lice infestation of 38.6% [9]. In literature, there are various studies which have reported prevalence rates of *Pediculosis capitis* throughout the world among school children. In the Americas, prevalence varies from 3.6 % to 61.4 % and is higher in females [10]. In Europe, prevalence oscillates from 0.48 to 22.4 %. In Asia, prevalence ranges from 0.7 to 59 %, being

higher in girls and women. In Africa, the majority of studies were applied in Egypt and prevalence varied from 0 % to 58.9 % and was higher in females as well [11]. A study applied by the same authors in 2015 in our country determined a prevalence of 11.5 % in a similar institution [12]. In Yemen, the overall prevalence of head lice infestation was 13.3%, being 18.9% in girls and 8.6% in boys [13]. In Argentina, the overall prevalence of head lice infestation in primary school students was 27.9%, which was significantly higher in girls than in boys [14]. Despite the progress in medical science and development of civilization, *Pediculosis capitis* is still an important health issue worldwide [15]. A large variation in the global spread of head lice is observed. As demonstrated by the available data, its prevalence reaches even 64.1% depending on the examined population [16,17]. The symptoms in the current research *Pediculosis capitis* were more common in girls than boys and long hair seems to be an important risk factor. Although long hair has been widely referred in the literature [18,19] there are some authors who disagree [20]. While in other study in Houn city, 21.9% of individuals were found infested with nits, immature or adult of *Pediculus humanus capitis* [21]. In Jordan the prevalence of *Pediculosis capitis* was 26.6% [22]. The prevalence of pediculosis capitis was 19.5% in Al-Helys, 35.6% in Al-Tarya and 26.3% in Bo-Fakra. This difference was statistically significant ($p < 0.05$). Nits were present in all male students and in 87.2% of females at Al-Helys school, both nits and lice were recorded in 12.8% of female students in the same school; these differences were not statistically significant ($p = 0.0919$). Nits were present among 88.9% of male students and 68.8% of females at Al-Tarya school, Mixed was recorded in 11.1% of male students and 31.3% of females in the same school, these differences were not statistically significant ($p = 0.407$). In a similar study the infestation rate among girls varied from 26.07% (12 year group) to 55.89% (8 years group) [15]. Nits were present in all the male students and in 76.2% of females in Bo - Fakra school. Mixed was recorded in 23.8% of females in the same school. This difference was not statistically significant ($p = 0.639$). Prevalence of *Pediculosis capitis* in males was 10.2% while in females was 41.8%, this difference was highly statistically significant ($p = 0.0001$) the result was with agreement of other study the prevalence was significantly lower in boys (27.1%) than in girls (55.0%); ($p < 0.0001$) [9]. Also there was agreement with other study in Houn city, male children had a lower rate of infestation (6.27%)

than females (38.66%) [6]. In the study in Jordan, there were significant differences in the prevalence between girls [34.7%] and boys [19.6%] [22]. The highest prevalence of *Pediculosis capitis* was in age 11 years (42.9%) followed by age 10 year (36.6%), this difference was statistically significant ($p = 0.0001$). In another study, the infestation rate among school children significantly varied from 51.8% in children aged 7 years old to 27.5% in children aged 10 years old ($p < 0.0001$) [9]. In the Houn study, it was found that school children exhibited decreased infestation rate with age groups, the children aged 7-8 years were the most frequently affected [6]. A study in Iran recorded that the children aged 10-11 years were the most frequently affected [23]. In another study, there was a significant difference between age ($p < 0.001$) [22]. Evidence by cases of transmission between siblings recorded in 68.5% of the surveyed schools. Having siblings as one of the factors increasing the probability of *P. humanus capitis* infestation has been indicated by other authors as well [24-26]. Dissemination of head lice is facilitated by staying in large groups of people. Our analysis has shown that pediculosis *capitis* is more frequent in schools with greater numbers of children. This was similar to a study conducted in Poland [27]. There was no effect of fathers' occupation in having *Pediculosis capitis* ($p = 0.419$). Also there was no effect of fathers level of education ($p = 0.697$). Also, pediculosis was not affected with mothers' occupation or education level ($p = 0.320$ and 0.740 , respectively). In another study, there was a significant relationship between head louse infestation, family income and parents' education level [24]. Prevalence of *Pediculosis capitis* was seen at 17.4% in family size ≤ 5 persons and 23.9% in family size > 5 persons, although there was no significant difference ($p = 0.255$). A study in Jordan found that there was a significant difference for family size and income ($p < 0.001$) [22].

5. CONCLUSION

Pediculosis capitis constitute a major health problem in school children in the three study villages (Alhlys, Altarya and Abofakra). The present study revealed that, the prevalence of pediculosis was lower than the other studies, particularly those done in Libya. Girls have significantly higher rate of *Pediculosis capitis* infestation than boys and socio-demographic factors including parents' education, jobs, family size, number of rooms have not been shown to

play a significant role in overspread or increased the infestation.

CONSENT AND ETHICAL APPROVAL

This study was approved by the local Ethics Committee. Informed written consent was obtained through a consent form that was given to the participants along with the questionnaire.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Lye MS, Tohit NF, Rampal L. Prevalence and predictors of pediculosis capitis among primary school children in Hulu Langat, Selangor. Med J Malaysia. 2017 Feb; 72(1):12-17.
2. Dasetima DA, Obinna CE, Bliss MM, et al. Pattern of Skin Disorder among School children in Port-Harcourt, Rivers State. Asian Journal of Research in Dermatological Science. 2020;14-24.
3. Rukke BA, Birkemoe T, Soleng A, et al. Head lice prevalence among households in Norway: importance of spatial variables and individual and household characteristics. Parasitology. 2022; 138:1296–1304.
4. Ebrahim H. Infestation of head lice, pediculus humanus capitis, in primary school children at Houn City, Libya. J Acad Res. 2019;13:38-52.
5. 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):901-4.
6. Meister L, Ochsendorf, Head lice: Epidemiology, Biology, Diagnosis and Treatment; Dtsch Arztebl Int. 2016 Nov; 113(45):763-772.
7. Doroodgar A, Sadr F, Paksa A, et al. The prevalence of pediculosis capitis and 1 relevant factors in primary school students of Kashan, Central Iran. Asian Pac J Trop Dis. 2014;4(6):500 -4.
8. Szymanek M, Wojnowska D, Krasowska D. Pediculosis still an up to date clinical problem. Przegląd Lekarski. 2009;66:206-8.
9. Hasan I, Hind M. Prevalence and associated factors of Pediculus humanus

- capitis infestation among primary school children in Sebha, Libya. *Journal of Pure & Applied Sciences*. 2020;19:5:132-38.
10. McCue JD, Kahan S. In a page infectious disease. 1 st Edition, Lippincott Williams &Wilkins: USA; 2006.
 11. Mimouni D, Ankol OE, Gdalevich M, et al. Seasonality trends of pediculosis capitis and Phthirus pubis in a young adult population: follow-up of 20 years. *Journal of the European Academic Dermatology and Venereology*. 2002;16:257-9.
 12. Rafie A, Kasiri H, Mohammadi Z, et al. Pediculosis capitis and its associated factors in girl primary school children in Ahvaz City in 2005 -2006. *Iran J Infect Dis Trop Med*. 2009;45:41-5.
 13. Al-Maktari MT. Head louse infestations in Yemen: Prevalence and risk factors determination among primary schoolchildren, Al-Mahweet Governorate, Yemen. *Journal of Egyptian Society of Parasitology*. 2008;38:741-8.
 14. Toloza A, Vassena C, Gallardo A, et al. Epidemiology of *Pediculus capitis* in elementary schools of Buenos Aires: Argentina. *Parasitology Research*. 2009; 104:1295-8.
 15. Watcharawit R, Mayura S. Epidemiology of pediculosis capitis among school children in the eastern area of Bangkok, Thailand. *Asian Pac J Trop Biomed*. 2012;2(11):901-904.
 16. Costa DL, de Sousa DS, da Silva RM, et al. Preventive actions against *Pediculus capitis* humanus in children of a community Riverside's Metropolitan Region of Belém-Pará in Eastern Amazon. *International Journal of Tropical diseases & Health*. 2018;7:1-3.
 17. Feldmeier H, Jahnke C. Pediculosis capitis. *Epidemiologie, Diagnose und Therapie. Pädiatrische Praxis*. 2020; 76:359–370.
 18. Feldmeier H. Treatment of *Pediculus capitis*: a critical appraisal of the current literature. *Am J Clin Dermatol*. 2014; 15(5):401-12.
 19. Rassami W, Soonwera M. Epidemiology of pediculosis capitis among school children in the eastern area of Bangkok, Thailand. *Asian Pac J Trop Biomed*. 2012; 2(11):901-4.
 20. Mumcuoglu KY, Meinking TA, Burkhart CN, et al. Head louse infestations: the “no nit” policy and its consequences. *Int J Dermatol*. 2006;45(8):891–6.
 21. Hana E. Infestation of head lice, *Pediculus humanus* capitis, in primary school children at Houn City, Libya. *Journal of Academic Research*. January 2019;13:38-52.
 22. Al Bashtawy M, Hasna F. Pediculosis capitis among primary-school children in Mafrq Governorate, Jordan. *EMHJ - Eastern Mediterranean Health Journal*. 2012;18(1):43-48.
 23. Drali R, Shako JC, Davoust B, et al. A new clade of African body and head lice infected by *Bartonella quintana* and *Yersinia pestis*-Democratic Republic of the Congo. *Am J Trop Med Hyg*. 2015; 93(5):990-3.
 24. Willems,S, Lapeere H, Haedens N, et al. The importance of socio-economic status and individual characteristics on the prevalence of head lice in schoolchildren. *Eur. J. Dermatol*. 2005;15: 387–392.
 25. Dehghanzadeh R, Asghari-Jafarabadi M, Salimian S, et al. Impact of family ownerships, individual hygiene, and residential environments on the prevalence of pediculosis capitis among schoolchildren in urban and rural areas of northwest of Iran. *Parasitol. Res*. 2015; 114:4303 - 4295.
 26. Birkemoe T, Lindstedt HH, Ottesen P, et al. Head lice predictors and infestation dynamics among primary school children in Norway. *Fam. Pract*. 2015; 33:23–29.
 27. Bartosik K, Janczaruk M, Zając Z, et al. Head lice infestation in schoolchildren, in Poland—Is There a Chance for Change?. *Journal of Clinical Medicine*. 2022; 11(3):783.

© 2022 Alarifi et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:

<https://www.sdiarticle5.com/review-history/91008>