



## Original article

Prevalence of head lice (*Pediculus humanus capitis*) infestation among schools workers in the Eastern Region, Saudi Arabia<sup>☆</sup>Hanadi B. Baghdadi<sup>a,b,\*</sup>, Eltigani O.M. Omer<sup>c</sup>, Dina M. Metwally<sup>d</sup>, Rewaida Abdel-Gaber<sup>e,f</sup><sup>a</sup> Biology Department, College of Science, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia<sup>b</sup> Basic and Applied Scientific Research Center, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia<sup>c</sup> Department of Public Health, College of Public Health, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia<sup>d</sup> Department of Parasitology, Faculty of Veterinary Medicine, Zagazig University, Zagazig, Egypt<sup>e</sup> Department of Zoology, College of Science, King Saud University, Riyadh, Saudi Arabia<sup>f</sup> Zoology Department, Faculty of Science, Cairo University, Cairo, Egypt

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## ABSTRACT

In a cross-sectional survey in February–May 2019, the prevalence of *Pediculosis capitis* with demographic data and the behavioral practices were investigated among 750 participants in the Eastern region of Saudi Arabia. Female participation was highly remarked with a percentage of 94.08% compared to that of male one about 5.91%. A deficiency of knowledge about lice infestation was noted especially among illiterate participants raised from their socio-economic levels ( $p$ -value = 0.001). Lice infestation reached higher rates in children aged less than 20 years with itching of the hair scalp. The obtained results revealed that 59.33% of the respondents believed that frequency of personal hygiene and washing of hair were the best methods for preventing the lice infestation. However, the treatment of lice infestation using anti-lice agents ( $p$ -value = 0.020) was preferred by 14.26% of participants. Although knowledge about the preventive tools for lice infestation ( $p$ -value 0.089) was not significantly associated with the experience of infestation but knowledge about the appropriate treatment to kill lice ( $p$ -value 0.020) and the wrong practices in the treatment of a head lice infestation were ( $p$ -value 0.005) significantly associated with the experience of infestation. Health programs and campaigns preventions are highly advised to increase the awareness of *Pediculosis capitis* with an effective strategic plan to control, manage, and prevent this disease.

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## 1. Introduction

Infestation with head lice (*Pediculosis capitis*) is a common health problem (Tolozza et al., 2009), it is an infectious condition caused by an obligatory ectoparasite, the human louse (*Pediculus humanus capitis*) and affects only the human scalp. The transmis-

sion is achieved by head to head direct contact or indirect contact through shared things as brushes, scarfs, and caps (Linardi et al., 1988; Bailey and Procriv, 2000; Burkhart and Burkhart, 2007; Shayeghi et al., 2010). Although lice infestation is asymptomatic, the mainly well-known side effect is pruritus, which may happen as a consequence of sensitivity to lice faces and saliva and perhaps lead to abrasions and secondary infections (Speare and Buettner, 1999; Motovali-Emami et al., 2008; Mahmud et al., 2011).

Numerous factors such as poor hygiene, socioeconomic status, lack of medical treatment, and resistance to the treatment; affected head lice predominance (Koch et al., 2001; Al-Shawa, 2008). Additional factors related to financial situations could help to this spread of the infestation (Moradiasl et al., 2018). School children are highly infested and presented a high risk for this disease (Al-Zanbagi and Al-Hashdi, 2016). Physical appearance such as hair type, length, and color, were reported to be crucial factors that cause this disease (Malcolm and Bergman, 2007). *Pediculosis*

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<sup>☆</sup> **Significance:** There was no study related to extending head lice infestation in the Eastern region of Saudi Arabia. So a systematic survey was undertaken and the outcomes were summarized and discussed in the prepared manuscript. Peer review under responsibility of King Saud University.



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capitis is also related to the parent's level of education and their approach to safety principles (Silva et al., 2008).

Worldwide extensive information about head lice infestation isn't directly comparable because of wide varieties of studies groups even inside one society (Falagas et al., 2008; Rukke et al., 2011). Overall, the reported data indicated that head lice infestation rates were too high and reached values up to 80%. In many developed countries, the prevalence of Pediculosis capitis increased in the last two decades despite the improvement of hygienic conditions and the effective methods of treatment (Burgess, 2004; Kim et al., 2004). Few studies were conducted in Saudi Arabia about the awareness, attitude, and practices of the head lice and its treatment (El-Mehmady, 1995; Bahamdan et al., 1996; Al-Saeed et al., 2006; Bosely and El-Alfy, 2011; Al-Megrin, 2015; Al-Zanbagi and Al-Hashdi, 2016; Al Abdullah and Kaki, 2017; Assaedi et al., 2018; Moussa et al., 2018). The control of lice infestation continues to be a difficult problem due to the uncontrolled modes of transmission and the relative deficiency of the available treatments (Combescot-Lang et al., 2015).

To control the extent of head lice and to reduce the infestation rate, essential planning should be fostered and encouraged. One of the used tools will be the collection of epidemiological information from various areas. A survey was developed using the concept of the question for the text that specifies which information should be given and the response alternatives that were offered. The target population was the school workers in the Eastern Region of Saudi Arabia.

## 2. Materials and methods

A cross-sectional school-based study was conducted in the eastern region of Saudi Arabia during the period of February-May 2019. The target population was the school workers both males and females. The sample size of 750 was determined and 659 of the targeted sample units responded to the study and accepted to fill in the questionnaire. Multistage stratified random sample techniques were followed to select the units of the study. A validated self-filling questionnaire was used for data collection. The questionnaire includes some questions related to age, gender, educational level, childhood infection, parasitic spread in local schools, and other related parameters. The questionnaire was published and distributed electronically to the targeted participants. The collected data were analyzed by using the statistical package for social science (SPSS Inc., Chicago, IL, USA) software version 24. The chi-square test was used to assess the statistical significance of subgroup differences in the prevalence of infestation.  $P$ -value  $\leq 0.05$  was considered statistically significant.

**Table 1**  
Demographic data about the participants.

Variables		Head lice infestation		
		Number of infestations	%	$p$ -value
Age	Less than 20	211	32.01	0.000
	20–30	151	22.91	
	30–40	142	21.54	
	More than 40	155	23.52	
Gender	Male	39	5.91	0.023
	Female	620	94.08	
Level of education for the participants	Intermediate school	40	6.06	0.001
	High secondary school	135	20.48	
	University education level	428	64.94	
	Illiterate or did not complete primary school	56	8.49	
<b>Total</b>		659/750	87.86	

## 3. Results

659 persons (out of 750) have responded and filled the survey. Most of the participants' with 32.01% (211) were in the age group less than 20 years (Table 1). Comparing head lice infestation and age, a significant difference found among the age group ( $p = 0.000$ ). The infestation among participants was higher in females with 94.08% (620) than 5.91% (39) in males, and this difference was significant regarding the gender ( $p = 0.023$ ) (Table 1). Regarding the level of education for the participants and head lice infestation, the illiterate or those who did not complete primary school (8.49%, 56) were aware and knew better what was the parasite causing the infestation, and associated with a significant difference ( $p = 0.001$ ) (Table 1).

In table (2), a high percentage was recorded for the participants' with good knowledge about the different types of lice 76.32% (503) that including 66.16% (436) with experience for observing lice with naked eyes, and significantly different ( $p = 0.027$ ) from the segment that had no information about lice. The overall prevalence of infection was found to be positive in 77.69% (512). The most important symptom with significant value ( $p = 0.009$ ) was severe itching of the scalp 87.25% (575) and the appearance of the eggs of the parasites on the hair of the affected person or child. All responses agreed that the age group most affected by the parasite was the children category less than 20 years Although 70.26% think that head lice are infectious (as reported in Table 2), but only 33.23% (219), considered it one of the serious diseases while others consider it less serious 33.83% (223). Nearly half (50.37%) of participants had a previous idea and correct knowledge about the diseases that may cause by head lice.

From the results in Table 3, regarding knowledge about the preventive tools for lice infestation, about 59.33% mentioned that personal hygiene, the other 14.26% mentioned the anti-lice treatment, 10.47% isolation of infection, but this knowledge was not significantly associated with head lice infestation experience. Anti-lice treatment listed by 64.94% of the participants as the most appropriate treatment to kill lice, followed by Hair hygiene, Iron comb with oil 18.51%, 7.13% respectively. Table 3 reports that knowledge about the appropriate treatment to kill lice was very significantly associated with previous experience with head lice infestation ( $p$ -value 0.020). Knowledge about the wrong practices in the treatment with a head lice infestation highly significantly associated with previous experience with head lice infestation ( $p$ -value 0.005). The main items listed regarding the wrong practices in the treatment of head lice were; ignoring it 32.32%, pesticides 16.38%, poor hygiene 22.61%, petroleum products 7.28% and about 10.01% don't know.

**Table 2**  
Knowledge of school workers about head lice infestation.

Variables		Head lice infestation		
		Number of infestations	%	p-value
Have previous knowledge about types of lice (hair lice, body lice, public lice)	Yes	503	76.32	0.027
	No	82	12.44	
	Others	74	11.22	
Know whether head lice could be observed with the naked eye	Yes	436	66.16	0.000
	No	222	33.68	
Had ever been exposed to lice infestation	Yes	512	77.69	0.070
	No	147	22.30	
Do you think that head lice is infectious	Yes	463	70.25	0.331
	No	121	18.36	
	Maybe	75	11.38	
Is the head lice infestation is a dangerous infection	Yes	219	33.23	0.076
	No	223	33.83	
	Maybe	217	32.92	
Have a previous idea about the diseases that may cause by head lice	Yes	332	50.37	0.074
	No	162	24.58	
	Maybe	165	25.03	
Have previous knowledge about symptoms that may be caused by head lice infestation	Itchiness	575	87.25	0.009
	Dandruff	20	3.03	
	Redness	15	2.27	
	Lice presence	13	1.97	
	Uncomfortable	10	1.52	
	Inflammation	7	1.06	
	Breakage	5	0.75	
	Bad odor	4	0.60	
	Allergy	2	0.30	
	Headache	2	0.30	
	More hair	2	0.30	
	Hair fall	1	0.15	
	Fever	1	0.15	
	Yellowface	1	0.15	
	Anaemia	1	0.15	
	<b>Total</b>		659/750	

#### 4. Discussion

Infestation with head lice is a public health issue in many regions of the world (Al-Saeed et al., 2006; Motovali-Emami et al., 2008; Toloza et al., 2009; Shayeghi et al., 2010; Bosely and El-Alfy, 2011; Değerli et al., 2013; Mohammadi-Azmi, 2014; Al-Zanbagi and Al-Hashdi, 2015, 2016; Al Abdullah and Kaki, 2017; Nategh et al., 2018; Alberfkani and Mero, 2020). In this study, the overall prevalence of head lice infestation was 77.69% among school workers which agreed with all previous studies on lice infecting school children; this percentage could be related to the common nature of the school workers and their way of social life, poor personal hygiene, and the continuous sharing of hair combs and other hair items with family members and most of the barbers and make up places.

In this study, the prevalence of infestation was significantly higher among girls ( $p$ -value = 0.023) only 5.91% of males were infected compared to 94.08% of females. The reported results were in agreement with the data reported by Speare and Buettner (1999); Ko and Elston (2004), Takano-Lee et al. (2005), Motovali-Emami et al. (2008); Toloza et al. (2009); Rukke et al. (2011); ALBashtawy and Hasna (2012); Abd El Raheem et al. (2015), and Assaedi et al. (2018) that the significant relation of head lice with gender and girls have a higher risk of pediculosis than boys, due to different behaviors and lifestyle between both sexes.

A significant association was found between educational levels and knowledge of infestation with lice ( $p$ -value = 0.001). As expected Illiterate and low education level participants were found to have the lowest knowledge (8.49% and 6.06%, respectively), compared to university education level 64.94% and High secondary school 20.48 those have the level of knowledge about the head lice

infestation. The former results were in agreement with data reported by Moussa et al. (2018).

A significant association found between age groups and head lice infestation. Children aged younger than 20 years were the most frequently affected with head lice infestation and had a two-fold higher risk of infestation compared with other age groups, which could be explained by older children taking more care of their hygiene than the younger children (Shakkoury and Abu-Wandy, 1999; Motovali-Emami et al., 2008; ALBashtawy and Hasna, 2012). The most common symptoms of head lice infestation listed by the participant of our study were; itching of the hair scalp, which agreed with the same symptom mentioned by Rafinejad et al. (2006), and Nutanson et al. (2008).

Family poverty and overcrowding were associated with poor hygiene among the family members. Many participants in different studies similarly indicated that bad hygiene habits rather than economic status were responsible for lice transmission (Moussa et al., 2018). The present study revealed that frequent hair washing and body bathing resulted in significantly a lower rate of infestation. In another hand, a relatively high percentage of participants (32.32%) believed that head lice infestation can be treated spontaneously without further intervention, in good agreement with the results of Heukelbach et al. (2003) and Canyon et al. (2010) reported that people didn't present to health care center due to pediculosis, which points to a similar perception of the disease in the affected population. Although it's dangerous and life-threatening about 16.38% of the participants were using pesticides for the treatment of a head lice infestation these results agreed with Birkemoe et al. (2012) who stated that many people believed the use of insecticides for head lice treatment.

**Table 3**  
Possible tools for prevention, control, and wrong practices for head lice infestation.

Variables		Head lice infestation		
		Number of infestations	%	p-value
Knowledge about the preventive tools for lice infestation	Personal hygiene	391	59.33	0.089
	Not sharing fomites	42	6.37	
	Isolation of infection	69	10.47	
	Anti-lice treatment	94	14.26	
	Diagnosis of hair	12	1.82	
	Tea tree oil	7	1.06	
	Olive oil	1	0.15	
	Iron comb	1	0.15	
	Pesticides	1	0.15	
	Hair tie	11	1.66	
	Cinnamon infusion	20	3.03	
	Lavender oil	4	0.60	
	Conditioner	1	0.15	
	Educating students	5	0.75	
Knowledge about the appropriate treatment to kill lice	Anti-lice treatment	428	64.94	0.020
	Hair hygiene	122	18.51	
	Iron comb with oil	47	7.13	
	Thermal comb	8	1.21	
	Pesticide	9	1.36	
	Garlic	1	0.15	
	Cleaners	2	0.30	
	Tea tree oil	1	0.15	
	Vinegar	13	1.97	
	Cinnamon infusion	5	0.75	
	Chamomile	1	0.15	
	Isolation of infection	12	1.82	
	Henna	5	0.75	
	Gasoline	5	0.75	
Knowledge about the wrong practices in the treatment with a head lice infestation	Pesticides	108	16.38	0.005
	Vinegar	5	0.75	
	Oil	4	0.60	
	As home remedy	8	1.21	
	Cleaning products	28	4.24	
	Blow-dry	1	0.15	
	Investigating it	8	1.21	
	Open hair	11	1.66	
	Shaving/cutting	10	1.51	
	Don't know	66	10.01	
	Petroleum products	48	7.28	
	Poor hygiene	149	22.61	
	Ignoring it	213	32.32	
	Total		659/750	

## 5. Conclusion

From the survey that was carried out through this research, it is necessary to make awareness leaflets for different groups of society about head lice infestation and its causes, attention to personal hygiene and not to share personal tools with others, and spreading awareness of the possibility of using different natural alternatives for the treatment.

### Research involving human participants and/or animals

Not applicable.

### Informed consent

Not applicable.

### Ethical approval

Not applicable.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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