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Prevalence of Head Lice among School Children in Tehsil Shakargarh, Pakistan

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Abstract

The purpose of this study was to assess the prevalence of *Pediculosis* infection among school children in relation to their families' economic situation. The research included 439 students from seven government and private schools in Shakargarh. They were checked for lice, and a questionnaire was used to record data on each student's demographic characteristics and other relevant information. A chi-square test was performed to compare the data by using SPSS software; a P-value less than 0.05 was considered as significant. The overall prevalence of head lice infestation was 17.5% (95% CI: 14.1–21.5). Lice infestation was relatively higher among girls (21.8%) than boys (10.0%, $\chi^2 = 9.45$, $p = 0.002$). Government school students showed a higher infestation rate (31.0%) than private school students (6.3%, $\chi^2 = 46.2$, $p < 0.001$). Infestation was significantly associated with larger family size ($\chi^2 = 8.7$, $p = 0.003$), sharing personal items such as combs and scarves ($\chi^2 = 12.1$, $p < 0.001$), and lower socioeconomic status ($\chi^2 = 10.3$, $p = 0.001$). The prevalence of significantly higher among girls who share stuff and have a lower socioeconomic status.

Keywords: Pediculosis, Head lice, Infestation, Risk factor

1. Introduction

Lice are persistent ecto-parasites that must spend their whole life cycle on the host (Saddozai & Kakarsulemankhel, 2008; Majid et al., 2020). It represents a significant public health and social issue rather than a direct medical threat, as the infestation causes irritation, secondary bacterial infections, insomnia, and embarrassment, leading to psychological distress and absenteeism from school. Head lice infestation (HLI) is a worldwide public health issue caused by *Pediculuc humanus capitis* (Gharsan et al., 2016). Globally, prevalence rates vary from 1.6 % to 87 % [4](Rassami & Soonwera, 2012). Head lice are wingless parasitic insects that are between 1/6 to 1/8 inch in length (Frankowski et al., 2002). Human heads are infested with Pediculosis, which lives and deposits its eggs on the hair of the head (Leo et al., 2005). There are three stages of Pediculosis, i.e., (a) egg, (b) nymph, and (c) adult. Throughout their lifetimes, female *P. capitis* can produce up to 100 eggs (nits). Nit sheath is a protective egg sheath produced by lice to help attach freshly laid eggs to hair. This sheath-forming material, also known as louse glue, is secreted from a pair of female accessory glands (Kim et al., 2021). The female may survive for 3-4 weeks and can lay up to 10 eggs each day when fully mature. Because of their tiny size and ability to blend in, lice can be difficult to spot (Devore et al., 2015). Lice may eat and mate every 4 hours, and they can do both at the same time (Hansen, 2004).

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Head lice are seldom able to survive outside of their host for longer than 36 hours without feeding on blood. Light repels them; therefore, they prefer gloomy places (Madke & Khopkar, 2012). Fomite transmission and direct head-to-head contact are the two main ways that head lice spread. A fomite is anything that could potentially spread a pathogenic organism to other people. Inanimate objects that could have lice include hair brushes, combs, hair accessories, blow-dryers, bedding, helmets, headgears, etc. (Burkhart & Burkhart, 2007).

Age, sex, family size, clothing sharing, and socioeconomic position all impact the course and spread of head lice in a group of people (Weems & Fasulo, 1999). Infestation of head lice is frequently seen in children between the ages of 6 and 12; however, females are at a 2-4-times higher risk than males (Bloomfield, 2002; Saraswat et al., 2020). Lice lay more eggs and are typically more active at warmer temperatures or conditions than in colder temperatures or environments (Hansen, 2004). Sleep loss, irritation, pruritus, pain, and secondary bacterial infections are among the symptoms of *P. capitis*. It's unappealing, and it's a social embarrassment. To hatch, nits require a temperature comparable to that found near the human scalp (Gharsan et al., 2016). A head lice infestation can cause irritation, pruritus, insomnia, and (in severe cases) anaemia. The main symptom of head lice

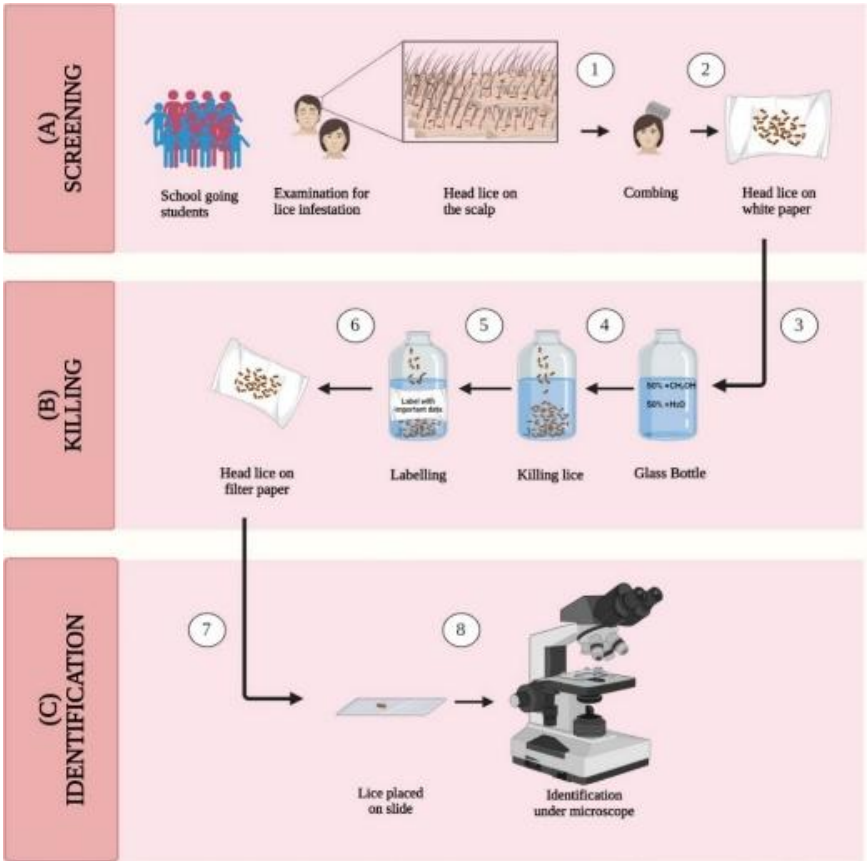

Figure 1 Screening and identification of Pediculus humans capitis.
(A) Visual inspection of scalp and hair; (B) Collection of lice using a fine-tooth comb over white paper; (C) Microscopic identification at 100× magnification

Table 1 Questionnaire filled for each student participating in the current study

Variable	Categories	Description
Gender	Male / Female	Biological sex
Age group	3–6 / 7–10 / 11–13 years	Child's age
School type	Government / Private	Institutional classification
Family size	2–5 / 6–9 members	Household size
Father's occupation	Employed / Unemployed / Business	Socioeconomic proxy
Sharing personal items	Yes / No	Habitual sharing of combs, scarves, or bedding
Transport use	Yes / No	Use of private transport
Family type	Nuclear / Joint	Living arrangement

patients is scalp pruritus. Hypersensitivity to the lice's saliva injection during blood feeding may cause itchy papules to appear. Other types of head lice infestation include irritability and a tickling sensation; secondary bacterial infections can also arise from scratching scores on the scalp (Alberfkani & Mero, 2020). The objective of this study was to collect data on the prevalence of head lice infestations among school-aged children, so that effective measures can be taken to alleviate the problem and enhance these children's quality of life.

2. Materials and Methods

District Narowal is located on the western bank of the river Ravi in the northeast of the province of Punjab. It is divided into three Tehsils, i.e., Tehsil Narowal, Tehsil Shakargarh, and Tehsil Zafarwal. The study was conducted in Tehsil Shakargarh, District Narowal, Punjab, Pakistan, located between 32.25°N and 74.90°E. This was a descriptive cross-sectional survey carried out between September and November 2022. A total of 439 students aged 3–13 years were selected from seven schools (four private and three government). To maintain confidentiality, school names were anonymized as Private Schools A–D and Government Schools E–G. Schools were selected using stratified random sampling, ensuring representation from both public and private sectors. Within each school, systematic random sampling was used to choose participants proportionate to class size. The screening was conducted through visual inspection of the students' hair and scalp. Students aged 3–13 years, enrolled during the study period, with parental consent. Students were excluded from this study with scalp disorders other than lice infestation or those unwilling to participate.

A structured questionnaire recorded demographic and socioeconomic details (age, sex, grade, family size, father's occupation), and behavioral factors (sharing of combs, scarves, bedding, and transport use). "Sharing personal items" was defined as habitual sharing of combs, scarves, hats, or bedding at least twice a week, and Father's occupation was categorized (El-Sayed et al., 2017) (Table 1).

Each student was thoroughly examined for approximately 2-4 minutes under illuminated conditions. The students were

examined while sitting on a chair in a well-lit room, which greatly aided in the detection of lice. Students suspected of having lice were combed with a fine-toothed comb for about 5 minutes over a 60×75 cm (about 2.46 ft) white paper. A child was classified as positive if visible evidence of parasites was found. The comb was cleaned with a tissue and water, and carefully checked to detect any live head lice.

Lice were counted after they were transferred to a bottle containing a 50% methyl alcohol and 50% water solution, which killed them (Suleman & Jabeen, 1989). The bottle was labelled with the necessary data for further processing. Specimens were transferred to the laboratory of the Department of Zoology, University of Narowal, for identification. Lice were taken from the bottle and were placed on filter paper for the removal of excess methanol. They were mounted on the microscope slide and were identified under microscope at 100X magnification (Dehghani et al., 2012) (Fig. 1).

Ethical Considerations

Ethical approval was obtained from the Departmental Ethics Committee, University of Narowal (Ref. No. UON-ZOO/2022/19). Written informed consent was obtained from parents or guardians, and verbal consent was obtained from each child. School administrators provided formal permission prior to data collection.

Statistical Analysis

SPPSS version 25 was used to analyze the data. Descriptive statistics were used to calculate prevalence. Association between categorical variables were tested using chi-square (χ^2). Odds ratios (OR) and 95% confidence intervals (CI) were computed. A p-value < 0.05 was taken as statistically significant.

Table 2 Prevalence of head lice infestation by demographic and socioeconomic factors

Variable	Category	Total	Infested	Prevalence (%)	χ^2	p-value
Gender	Male	159	16	10.0	9.45	0.002
	Female	280	61	21.8		
School type	Private	239	15	6.3	46.2	<0.001
	Government	200	62	31.0		
Age group	3–6	180	17	9.4	7.8	0.01
	7–10	175	38	21.7		
	11–13	84	22	26.1		
Father's occupation	Employed	47	4	8.5	10.3	0.001
	Unemployed	287	64	22.2		
	Business	105	9	8.6		
Family size	2–5	300	38	12.7	8.7	0.003
	6–9	139	39	28.0		
Sharing items	No	220	18	10.7	12.1	<0.001
	Yes	219	44	25.8		
Transport use	Yes	75	6	8.0	2.3	0.13
	No	364	71	19.5		

3. Results

Out of 439 students examined, 77 (17.5%) were infested with head lice (95% CI: 14.1–21.5). As shown in Table 2, infestation was significantly higher among government school students (31.0%) than private school students (6.3%) ($\chi^2 = 46.2$, $p < 0.001$). Children enrolled in government schools were approximately 6.5 times more likely to be infested than their counterparts in private schools (OR = 6.54; 95% CI: 3.51–12.18). This disparity is depicted in Table 2, which shows a steep contrast between the two school types. The difference likely reflects variations in socioeconomic background, classroom density, hygiene infrastructure, and health education emphasis between public and private institutions.

Out of 159 boys examined, 16 (10.0%) were infested, compared to 61 (21.8%) of 280 girls. This gender difference was statistically significant ($\chi^2 = 9.45$, df = 1, $p = 0.002$). The odds of infestation among girls were 2.5 times higher than in boys (OR = 2.49; 95% CI: 1.33–4.67). This trend is shown in Table 2, where female students consistently show higher rates across both government and private schools. The infestation rate among girls in government schools (37.3%) was nearly double that among boys in government schools (19.7%), suggesting a gendered pattern of vulnerability likely influenced

by hair length, grooming practices, and sociocultural norms related to physical contact.

Father's occupation was used as a proxy for socioeconomic status (SES). Among 287 children with unemployed fathers, 64 (22.2%) were infested, whereas only 4 (8.5%) and 9 (8.6%) were infested in the employed and business categories, respectively. The difference was highly significant ($\chi^2 = 10.3$, df = 2, $p = 0.001$). Children of unemployed fathers were 3.1 times more likely to be infested than those of employed fathers (OR = 3.13; 95% CI: 1.42–6.90). The prevalence of head lice infestation was higher in students who were aged from 11-13 years, 26.14% (22/84), and a lower infestation rate of head lice was in 7-10 year 21.7 % (38/175), followed by 3-6 year i.e., 9.44% (17/180). There was a significant relationship between the age statistics ($P < 0.01$) (Table 2).

Infestation was more frequent among children from larger families (6–9 members), with 39 of 139 (28.0%) affected, compared to 38 of 300 (12.7%) in smaller families (2–5 members). This association was statistically significant ($\chi^2 = 8.7$, df = 1, $p = 0.003$; OR = 2.65; 95% CI: 1.40–5.00). In contrast, family structure (joint vs. nuclear) did not significantly affect infestation rates ($\chi^2 = 0.32$, $p = 0.57$). Joint families exhibited 16.3% prevalence versus 17.8% in nuclear families. These results indicate that family size—not structure—is the stronger determinant of transmission risk.

The habit of sharing personal items such as combs, scarves, or bedding was a major predictor of infestation. Among children who shared items, 44 of 219 (25.8%) were infested compared to 18 of 220 (10.7%) who did not share. This difference was highly significant ($\chi^2 = 12.1$, df = 1, $p < 0.001$; OR = 2.89; 95% CI: 1.58–5.27). These findings confirm that indirect transmission via fomites plays a substantial role in sustaining infestation within schools and households. Transport use (shared vs. personal) showed no significant relationship with infestation ($\chi^2 = 2.3$, $p = 0.13$), possibly because lice transmission is limited to close physical contact, not brief proximity during travel.

4. Discussion

This study was conducted to determine the head lice and infestation in the primary school students in Shakargarh city. A total of 439 students were studied, including 281 (64.0%) girls and 158 (36%) boys. Out of 439 school children, 239 are private school students and 200 are government.

school students. Current research shows that head lice is most common in students aged 10-13, followed by the 7-10 year age group, and lowest level in the age of 3-7. The reason for this is likely due to the fact that these younger children are still under their parents' constant attention. They were washed and combed daily by their parents. These results were similar to those of Sadegh Mohammadi-Azni (2014), as he also stated that the prevalence of the infection increases with age and found most cases among fifth-grade students (Azni, 2014). Contrary to the findings of Majidi *et al.* (2017), who focused on the first six grades and observed the highest prevalence among third-grade students (Majidi et al., 2017). According to Archna et al. (2009), Girls are more likely to be infested than boys, i.e., 2.54% and 0.29% ($P < 0.05$), respectively (Rashmi et al., 2009). Similarly, Ibrahim and Mohamed (2020) showed the relationship between the prevalence of infection and gender, where the overall prevalence of Pediculosis was 38.6% (375/971), and the infestation rate was higher in girls (55.0%) than in boys (27.1%) ($P < 0.0001$) (Ibrahim & Mohamed, 2020). Similar studies were reported by Lashari et al. (2015) with significance ($P < 0.001$) and Chaudhry *et al.* (2012), where they found Pediculosis was more prevalent in girls (85.45%) as compared to boys (52.45%) (Lashari et al., 2015; Chaudhry et al., 2012). The present study also demonstrates that the prevalence of head lice was more prevalent in girls (21.78%) than in boys (10.0 %), which indicates that our result correlates well with the findings of previous studies.

Ibrahim and Mohamed (2020) observed that the rate of lice infestation has a significant relation with shared items like head cover/scarf, 53.0% among children who shared, than 29.8% in those who did not share ($P < 0.0001$) (Ibrahim & Mohamed, 2020). The rate of Pediculosis prevalence had a significant relationship with the variable, such as using personal devices ($P < 0.05$) (Jahandideh et al., 2017). In our investigation, we found that the rate of infestation was strongly correlated with the number of shared goods, a finding that is consistent with the results of other studies. The highest percentage of Pediculosis was found among the students whose fathers had the profession of laborers (83.3%) by Afsar and his co-workers (Omidi et al., 2013). Sadia Chaudhry and her colleagues (2012) found that the prevalence of Pediculosis was higher in people having low socioeconomic status than in middle and high socioeconomic status. They also studied the Pediculosis incidence in low, middle, and high socio-economic groups were also studied which were 61.40%, 50.00% and 29.41% in boys, whereas 95.48%, 81.90% and 60.31% in girls, respectively (Chaudhry et al., 2012). Similarly, in another study by Jahandideh et.al. (2017) indicated that the relation between the infection and fathers' profession shows the highest percentage of infection (6.49%) in children with a businessman father and the lowest (6.48%) with a government-employed father, which is a statistically significant difference ($P>0.05$) (Jahandideh et al., 2017). As crowded conditions in the house are a common effect of financial hardship, it was hypothesized that this factor might contribute to head lice infection (Ali & Ramzan, 2004). Our findings were consistent with the results of these studies. In the present study, the prevalence of Pediculosis among children of unemployed parents was almost two times higher than children's of employed parents, and one time higher than children's of businessman.

In a study performed by Dehghani and his coworkers in 2009, they found that the infestation rate among larger families (5+ members) was 1.98%, while it was 0.4% among families having 3-4 members. There was a correlation between the

infestation rate and the family size ($P < 0.031$). The likelihood of infestation among children with five or more family members was 5.02 times more than those having 3-4 family members (Dehghani et al., 2012). Similarly, in another study, it was noted that there was an increase in infested proportion (48.8%) among students if the student had five or more siblings with infection (Al-Zanbaqi & Al-Hashdi, 2025)**.** There is a significant association between head lice intensity and number of siblings ($P = 0.008$), and Pediculosis infestation increases when the number of siblings increases ($r = 0.153$). Our findings indicate that the infestation rate increases with the number of children in the family. Consistent with prior research, these results show that children in large families are more likely to pick up head lice from one another, maybe because parents in those households find less time for their children's hair maintenance. The higher rate of prevalence belonged to the public schools (1.2%) as compared to the private schools (0.3%) reported by Afsar and his colleagues (2013). The results showed a significant relationship between the school type and the prevalence rate ($P = 0.003$) (Omidi et al., 2013). Our study also corroborated their findings, which indicated a higher prevalence of Pediculosis among students attending public schools.

5. Conclusion

Pediculosis is a common public health problem mostly affecting school-going children. The prevalence of lice was found to be significantly higher in girls, families with lower economic status, among the young age group (10-13 years), sharing of different items, and more number of family members. Therefore, the awareness programs should have focused on the school-going children to educate them about the importance of sanitation and personal hygiene.

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