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Article

Prevalence and Risk Factors Of Pediculosis Capitis n Elementary School Children: A Systematic Review

M. Bima Zulfikar [1*], Pariyana [2], Nina Melita [3]

[1] IKM-IKK Department, Faculty of Medicine, Sriwijaya University, Palembang, Email; bimazulfikar@fk.unsri.ac.id
[2] IKM-IKK Department, Faculty of Medicine, Sriwijaya University, Palembang
[3] IKM-IKK Department, Faculty of Medicine, Sriwijaya University, Palembang
* Corresponding Author : M. Bima Zulfikar

Abstract: Pediculosis is an infestation of lice on the body, head or genitals in humans that occurs throughout the world. Head lice infestation (Pediculosis capitis) affects 100 million people worldwide each year. Pediculosis capitis is more common in developing countries and affects school-aged children. This study was conducted to review and provide information regarding the prevalence and risk factors associated with pediculosis capitis in elementary school-aged children. This method of study uses systematic literature review and data searches through databases such as PubMed, ScienceDirect, ProQuest, Scopus, Springer, Taylor and Francis, Wiley Online Library which discusses the prevalence and risk factors for pediculosis capitis in elementary school-aged children. Eleven cross-sectional studies were included. The results showed that the prevalence of pediculosis capitis in elementary school children ranged from 0.58% to 65.7%, more in girls than boys and tended to be more frequent in the upper grades. In this study, the prevalence of pediculosis capitis was associated with long hair size, low educational level of parents, parents who did not work, large number of family members, and use of shared combs and rare frequency of combing hair during a day.

Keywords: Pediculosis head, Prevalence, Risk factors, elementary school children

1. Introduction

Pediculosis is an infestation of lice on the body, head, or pubic area of humans that can occur worldwide. **1** Pediculosis has been known for more than 10,000 years, with the oldest human louse eggs found in hair from an archaeological site in northeastern Brazil. **2** Two species of blood-sucking lice that infect humans are pediculus humanus and pthirus pubis. The species Pediculus humanus is divided into two ecotypes, the body louse Pediculus humanus humanus (P. h. corporis) and the head louse Pediculus humanus capitis (P. h. capitis) which can be called the head louse. **3**

Head lice infestation (Pediculosis capitis) affects 100 million people worldwide and 6-12 million people in the United States each year. Transmission can occur through direct contact, namely head to head , in addition it can also occur through indirect contact because head lice survive for 4 days on transmission objects used, such as hair combs, hats, pillows and so on. **1** Pediculosis capitis globally occurs more often in developing countries and attacks school-age children ranging from 5-13 years in densely populated environments. **4**

Previous meta-analysis studies reported the prevalence rate of pediculosis capitis in school-aged children in the world showed a figure of 19%, with the incidence rate of pediculosis capitis in girls being higher (19%) than in boys (7%). 5 Symptoms caused by head lice bites can cause inflammation, pruritus, popular urticaria, restlessness, sleep disturbances, and mild fever. In children, pruritus and sleep disturbances can cause children to be absent from school. **1.6**

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Many factors influence the pattern of pediculosis capitis distribution in school children, depending mainly on socio-demographic factors, hair characteristics, population density, lifestyle and education level. **7** Previous studies reported that pediculosis capitis is more common in school students with low-educated parents, long hair, large family size, unemployed mothers and fathers, and low levels of personal hygiene. **5** Control and treatment of pediculosis must be based on evidence-based methods because ignorance of appropriate treatment can endanger children and their families. **8**

To date, various epidemiological studies have been conducted to evaluate the prevalence of pediculosis capitis in school-age students worldwide. The purpose of this literature review article is to review and analyze the available information to provide a perspective on the prevalence and risk factors associated with pediculosis capitis in elementary school-aged children.

2. Method

The method used in this literature is a systematic literature study using secondary data obtained from journal search results in the form of scientific reports related to the prevalence and risk factors of pediculosis capitis in elementary school children. Journal searches were obtained through several electronic data-based publication centers , namely PubMed, ScienceDirect, ProQuest, Scopus, Springer, Taylor and Francis, Wiley Online Library, Portal Garuda. Variations in search terms used in this literature use the keywords: Pediculosis capitis, head lice, children, primary school, schoolchildren, students, risk factors, prevalence, elementary school-age, elementary school, using a combination of conjunctions in the form of "and (AND)" and "or (OR)".

The journals used in this literature study are articles that meet the following inclusion criteria: 1) Articles discussing the prevalence of Pediculosis capitis 2) Articles discussing risk factors for Pediculosis capitis in school-aged children 3) are original articles using the cross-sectional method 4) Articles published in the last 5 years 5) Articles in English and/or Indonesian 6) Journals accredited by SCOPUS and/or SINTA. In addition, articles that do not have full access, and/or are not original studies, are excluded. With the search terms that have been explained, 463 articles related to this literature were obtained. Then data selection was carried out by assessing the criteria related to the literature study so that 11 articles were obtained which were relevant studies. The flow diagram of article selection is shown as follows.

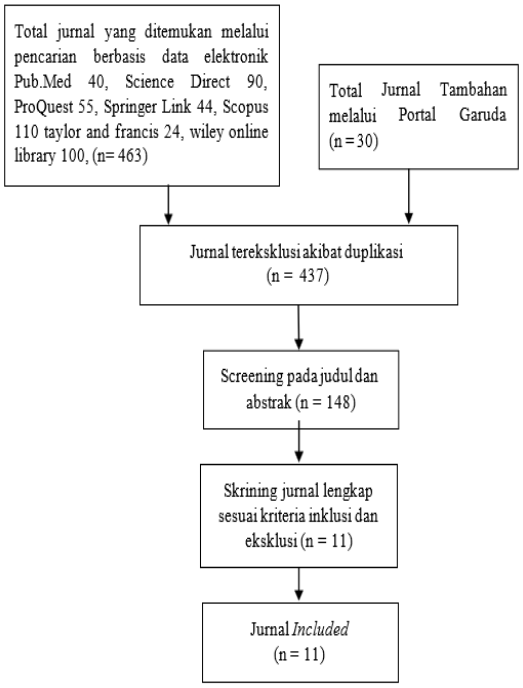

Diagram 1. Diagram *screening* dan metodologi

3. Results

Eleven cross-sectional studies included in this review were assessed for their objectives, study design, study location, mean age, prevalence of pediculosis capitis in the study population, prevalence of pediculosis capitis in the female population, prevalence of pediculosis capitis in the male population, and risk factors for pediculosis capitis including hair size, parental education and occupation, family density, use of shared combs, and frequency of combing (Table 1). **3,4,8–16** Various risk factors for pediculosis capitis were mentioned in the studies and were systematically examined. Data were taken from studies conducted in several countries, namely Ethiopia, Iran, Abidjan, India, Iraq, Indonesia. **3,4,8–16**

Table 1. Study characteristics and prevalence data of Pediculosis capitis

Writer article	Study design	location	Mean age ± std deviation (years)	Prevalence *of pediculosis capitis* % (Cases/total number) sample)	Prevalence *Pediculosis capitis* in elementary school boys % (Male cases/total) sample man)	Prevalence *pediculosis capitis* on child SD female % (Female cases/total sample Woman)	Factor risk
Dragoon H, et al [10]	*Cross-sectional*	Ethiopia	10.19 ± 1.62	65.7% (264/402)	54.8% (102/186)	75 % (162/54) *	Maternal Education, Use of comb together
Bekri G, et al [11]	*Cross-sectional*	Paveh, Iran	TL	7.2% (26/361)	TS	7.2% (26/361)	Education Mother, Father, amount member family, frequency comb daily
John V, et al [3]	*Cross-sectional*	abidjan	4.8 ± 2.3	0.58% (28/4805)	0.3% (7/2274)*	0.8% (21/2531)*	Hair size, Mother's, father's occupation, number of member family, shared comb use, frequency combed per day
Ghofleh Maramzi H, et al [12]	*Cross-sectional*	Karoon country Iran	9.42 ± 1.68	23.38% (199/851)	TS	23.38 % (199/85	Mother's and father's education, mother's and father's occupation, number of

						1)	children member family, frequency combed per day
Khamaiseh AM [8]	*Cross-sectional*	Jordan, India	8.94 ± 1.68	20.4% (98/481)	13% (31/238)*	27.6% (67/243)*	Hair Size, Education Mother, Father, amount member family
Hama-Karim YH, et al [13]	*Cross-sectional*	Kurdistan, Iraq	9.4	9.16% (189/2064)	1.82% (19/1046)*	16.7% (170/1018)*	Hair size, Mother's, father's education, Occupation Mother, frequency combed per day

*Note: TL: Data not reported ; TS: Data not available ; *: p -value : < 0.05 ;*

3.1. Prevalence

The prevalence of pediculosis capitis in elementary school children was reported in 11 cross-sectional studies (Table 1). These 11 studies used questionnaires that they had modified each regarding the risk factor variables of pediculosis capitis, after which all studies also used the same technique, namely direct examination of the subject's scalp hair to assess the presence of pediculosis capitis. **3,4,8–16** After the data extraction process and compiling the findings in each of these studies, the prevalence of pediculosis capitis in elementary school children with an average age of 8.7 years was found to be 12.3% (5749/46625). The prevalence of pediculosis capitis in elementary school children ranged from 0.58% to 65.7% (Table 1). The study in Ethiopia reported the highest prevalence among the other 10 studies, namely 65.7% (264/402). **10** This was followed by two studies in Indonesia, 59.7% (85/144) and 43.1% (62/144). 9,16 After that, the remaining studies reported a prevalence below 30%, such as the five studies conducted in Iran; 26.3% (1562/5930), 23.38% (199/851), 10.5% (2995/28410), 7.9% (240/3033), 7.2% (26/361), then in a study conducted in India 20.4% (98/481) and a study conducted in Iraq 9.16% (189/2064).4,8,11–15 A study in Abidjan reported the lowest prevalence of only 0.58% (28/4805) of students reported having pediculosis capitis. **3** According to the class, the highest prevalence was in a study conducted in Ahvaz country, Iran with class 5 having the highest prevalence of 30.2% in pediculosis capitis. **15**

Table 2. Results of the Analysis of Studies on Risk Factors Associated with the Incidence of Pediculosis Capitis

Factor risk	Writer Article	P Value	OR (95% CI)	Information
	John V, et al [3]	<0.001 (significant	2.77 (1.32-5.85)	Risk factors (length, > 5 cm)
	Khamaiseh AM [8]	0.275 (not significant)	TL	TL

Long hair	Hama-Karim YH, et al [13]	<0.001 (significant)	9.86 (6.21-15.66)	Risk factors (hair long)
	Kassiri H, And Mehraghaei M [15]	<0.001 (significant)	TL	TL
	Dear, et al. [16]	<0.001 (significant)	TL	TL
	Putu N, et al [9]	<0.001	TL	TL
	Dagne H, et al10	<0.001 (significant)	3.57 (1.74-7.33)	Risk factors (Cannot read)
	Bekri G, et al11	0.06 (not significant)	16 (0.83-305.75)	Risk factors (Cannot read)
	Ghofleh Maramatzi H, et al12	0.02 (significant)	1.67 (0.84-2.58)	Risk factors (Cannot read)
	Khamaiseh AM8	0.269 (no significant)	TL	TL
Mother's Education	Hama-Karim YH, et al13	<0.001 (significant)	1.06 (0.71-1.59)	Risk factors (Education) last elementary school)
	Nejati J, et al14	<0.002 (significant)	TL	TL
	Kassiri H, and Mehraghaei M 15	<0.001 (significant)	TL	TL
	Moosazadeh M, et al4	0.003 (significant)	2.05 (1.27-3.31)	Risk factors (Last education elementary school)
	Cahyarini, et al 16	0.122 (not significant)	TL	TL
	Bekri G, et al11	0.14 (not significant)	5.88(0.53-65.43)	Risk factors (Cannot read)
	Ghofleh Maramatzi H, et al12	0.165 (not significant)	1,509 (0,845-2,696)	Risk factors (Cannot read)
	Khamaiseh AM8	0.193 (no significant)	TL	TL
Father's Education	Hama-Karim YH, et al13	0.007 (significant)	1.7 (1.01-2.85)	Risk factors (Cannot be read)
	Nejati J, et al14	<0.001 (significant)	TL	TL
	Kassiri H, and Mehraghaei M 15	<0.001 (significant)	TL	TL
	Moosazadeh M, et al4	0.378 (not significant)	1.25 (0.76-2.06)	Risk factors (Last education elementary school)
	Cahyarini, et al 16	0.111 (not significant)	TL	TL
	Djohan V, et al3	0.712 ((not significant)	TL	TL

	Ghofleh Maramatzi H, et al12	0.273 (not significant)	1.37 (0.777-2,445)	Risk factors (not working)
Mother's job	Hama-Karim YH, et al13	<0.001 (significant)	0.31 (0.19-0.51)	Protective factors (Work)
	Kassiri H, and Mehraghaei M 15	<0.001 (significant)	TL	TL
	Moosazadeh M, et al4	0.671 (no significant)	0.92 (0.62-1.36)	Protective factors (Doesn't work)
Father's occupation	Djohan V, et al3	0.825 (no	TL	TL

Note: TL: Data not reported

3.2. Risk Factors

a. Hair size

May be a significant risk factor in the occurrence of pediculosis capitis (table 2). A study in India reported no significant relationship with the prevalence of hair size being almost the same between long hair (23.4%), medium (20%) and short (16%).8 Meanwhile, five other studies said there was a significant relationship. A study in Abidjan reported that children with long hair had a 2.7 times higher risk of developing pediculosis capitis than short hair (OR= 2.77, 95% CI=1.32-5.85, p<0.001).3 Similarly, a study in Iraq also reported that children with long hair had a 9.86 times higher risk of developing pediculosis capitis than short hair (OR=9.86, 95% CI=6.21-15.66 p<0.001). **13**

b. Gender

Gender is a risk factor that is significantly correlated with the occurrence of pediculosis capitis. Eight studies reported a significant relationship between gender differences and pediculosis capitis (Table 1). 3,8–10,13–16 The eight studies also reported the same prevalence results that the prevalence of pediculosis capitis in women was higher than in men. A study conducted in Bali, Indonesia reported the highest prevalence of pediculosis capitis in women (87.3%) (p<0.05). **16**

c. Parents' Education and Occupation

Nine studies reported on the influence of maternal education level (Table 2). Six studies stated that there was a significant relationship. **4,10,12–15** A study from Ethiopia reported that mothers who could not read were a **3.57** higher risk factor for the incidence of pediculosis capitis (OR = 3.57, 95% CI = 1.74-7.33, p = <0.001). **10** The same thing was also said in three studies from Iran. **12,14,15** While two other studies from Iraq13 and Mazandaran, Iran4 reported that the mother's last educational level of elementary school had a 2.05 times higher risk (OR = 2.05, 95% CI = 1.27-3.31, p = 0.003). **4** Another thing is the level of father's education, eight studies reported on the influence of the father's education level (Table 1). Three studies reported a significant relationship between father's education level and the incidence of pediculosis capitis (p<0.05) **13–15** A study in Iraq stated that fathers with the last level of education of elementary school had a risk factor of 1.7 higher suffering from pediculosis capitis (OR= 1.7, 95% CI=1.01-2.85, p=0.007). **13** One study

conducted by Bekri G, et al., although it found an insignificant relationship, it was stated in his study that fathers who could not read had a risk factor of 5.88 higher suffering from pediculosis capitis (OR= 5.88, 95% CI=0.53-65.43, p=0.14). **11**

Mother and father's occupation can also be related to the incidence of pediculosis capitis. Five studies reported on the influence of mother's occupation (table 2). Two studies said there was a significant relationship, with a study conducted by Hama-Karim YH, et al **13** , it was said that working mothers had a protective factor of 0.31 times suffering from pediculosis capitis (OR = 0.31, 95% CI = 0.19-0.51, p <0.001). A study conducted by Ghofleh Maramatzi H, et al **12** reported an insignificant relationship but it was also said in the study that unemployed mothers had a risk factor of 1.37 higher suffering from pediculosis capitis (OR = 1.37, 95% CI = 0.77-2.44, p = 0.273). While for father's occupation there were only five studies that reported. Three studies stated there was a significant relationship. A study conducted by Ghofleh Maramatzi H, et al **12** stated that unemployed fathers had a 2.38 times higher risk of suffering from pediculosis capitis (OR= 2.385, 95%CI=1.518-3.750, p=0.001).

d. Number of family members

Seven studies reported on the relationship between the number of family members and the incidence of pediculosis capitis (table 2). Two studies stated that there was a significant relationship between the number of family members and the incidence of pediculosis capitis. **4.15** In a study conducted by Moosazadeh M, et al.4, it was stated that children who lived with more than 6 family members had a risk factor 2.34 times higher for suffering from pediculosis capitis (OR = 2.34, 95% CI = 1.34-4.07, p = 0.003). **4**

e. Shared comb usage and combing frequency

Four studies reported on the relationship between shared comb usage (table 2). One study conducted in Ethiopia stated that there was a significant relationship with children who used shared combs having a 2.72 higher risk factor for suffering from pediculosis capitis (OR= 2.72, 95% CI=1.58-4.69, p<0.001). **10** In addition, the frequency of combing in a day is also a risk factor for pediculosis capitis. Six studies reported on the relationship between daily combing frequency and the incidence of pediculosis capitis (table 2). Four studies stated that there was a significant relationship (p<0.05). **4,11,14,15** A study conducted by Moosazadeh M, et al4, children who never combed their hair in a day had a 3.75 times higher risk factor for suffering from pediculosis capitis (OR= 3.75, 95% CI=1.72-8.16, p=0.001). **4**

4. Discussion

This literature review analyzed a total of 11 cross-sectional studies from developing countries to determine the prevalence and risk factors associated with pediculosis capitis in primary school children. Our findings showed that the average prevalence of pediculosis capitis in primary school children with a mean age of 8.7 years was 12.3%, with prevalence rates ranging from 0.58% to 65.7%. The prevalence of pediculosis capitis in girls was higher than in boys. A study in Ethiopia explained that girls tend to have a 3.29 times higher chance than boys. 10 This may be due to the habit of girls/students having long hair which can be a breeding ground for lice

and girls tend to have close relationships with other girls so that it involves more body contact between girls than boys. 3.10 The prevalence of pediculosis capitis according to class level varies in each study, but the prevalence tends to increase based on the increase in class and tends to be low in lower class levels. The low prevalence of pediculosis capitis in lower class levels may be because children at that age still depend on their parents, especially their mothers, to comb their hair and care for their bodies, while students in higher class levels usually do such things independently but in practice it is still rarely done correctly by the child. 15,17 Therefore, monitoring and improving children's personal hygiene practices is very important as a preventive measure for pediculosis capitis . Comparison with state-of-the-art is an important part. This section can provide a more measurable illustration of your research contribution. This section can also be added to a brief discussion. If you feel that this section is insufficient and unsuitable to be a separate section, the author(s) can integrate this section with section four (Results and Discussion).

Many studies have shown that the prevalence of pediculosis capitis in elementary school children is related to various factors such as parental education and parental profession. Infestation is more common in school students with low-educated parents, long hair, large family size, unemployed mothers and fathers, and low frequency of bathing at home. 5 Based on the analysis of these 11 studies, several risk factors related to pediculosis capitis in elementary school children were also found, namely hair size, parental education, parental occupation, number of family members, use of shared combs and frequency of combing in a day. However, several studies did not report a significant level of relationship.

In the risk factors related to hair size, significant differences were found in all studies except those conducted by Khamaiseh AM 8, this is likely because the study divided hair size into three, namely short, medium and long, in contrast to other studies which stated that there was a significant relationship that divided hair size into two, namely short and long only. A study in Indonesia said that the significant relationship between long hair and the increased incidence of pediculosis capitis could be caused by. Long hair is more difficult to care for than short hair.9 Long hair also causes hair/head conditions to be more moist and warm , allowing head lice to survive and reproduce well.18

The level of parental education in the studies analyzed was reported to have no significant relationship. In a study conducted by Cahyarini , et al. 16, the results of an insignificant relationship were obtained between the level of parental education of both mothers and fathers and the incidence of pediculosis capitis, and it was also explained in his study that the incidence of pediculosis capitis was not limited to the level of parental education because many other factors could influence it. In contrast, three studies conducted by Hama-Karim YH, et al. 13, Nejati J, et al. 14 Kassiri H, and Mehraghaei M. 15 stated that the prevalence of pediculosis capitis was lower in children with parents with high levels of education than in children with parents with low levels of education. This also shows that literacy plays an important role in reducing the prevalence of pediculosis capitis. 13 The level of education also correlates with the desire and desire to gain new knowledge where this knowledge can help someone in having better personal hygiene practices. 10.19

Parents' occupation can also be a risk factor for pediculosis capitis in elementary school children. However, several studies have obtained insignificant results regarding this. In a study with significant results such as those conducted by Kassiri H, and Mehraghaei M 15, it was stated that the prevalence of pediculosis capitis was higher in students whose mothers were housewives and fathers were livestock keepers or laborers. This is also supported by the statement of Nejati J, et al 14 which states that people's occupational factors are related to the family's socioeconomic status, low socioeconomic status significantly increases the incidence of pediculosis capitis. Hama-Karim YH, et al 13 in his study also stated that students with mothers working outside the home generally have a higher level of education and higher health awareness.

In contrast, the study by Ghofleh Maramatzi H, et al 12, stated that there was no relationship between maternal occupation and the incidence of pediculosis capitis because working mothers tend not to have the opportunity to care for their children and housewives are unable to control and treat head lice due to low health awareness. In addition, working mothers usually leave their children in daycare, which can increase the risk of transmission of head lice from close contact with child to child. 12.20 In a study discussing the relationship regarding the number of family members, it was found that most studies found no relationship. However, in several studies there was a tendency for the prevalence of pediculosis capitis to be higher in families with a large number of members compared to those with a small number. 8.12 In a study conducted by Kassiri H, and Mehraghaei M 15, a significant relationship was obtained, and it was said in their study that in larger families, parents would spend less time maintaining the health of their children. In addition, head lice can be transmitted more easily between family members due to close contact in large families, so that the level of pediculosis capitis increases.

The use of shared combs according to a study conducted by Dagne H, et al10, has a 2.7 times higher chance of being infected with lice than those who do not share combs. Sharing items such as combs have also been significantly associated with pediculosis capitis in previous studies.21 This is due to the fact that sharing combs is an efficient method of transmitting lice and eggs.10 And the last risk factor related to pediculosis capitis is the frequency of combing in a day. In a study conducted by Moosazadeh M, et al4, children who never combed their hair in a day had a 3.75 times higher chance of experiencing pediculosis capitis than children who combed their hair more than 2 times a day. In addition, a study conducted by Kassiri H, and Mehraghaei M15 stated that there is also a significant relationship between the prevalence of pediculosis capitis and the frequency of combing hair., This is because combing every day can eliminate the possibility of lice eggs and adult head lice, thereby reducing the incidence of pediculosis capitis.

Our findings provide a less comprehensive description of pediculosis capitis including the reduction of studies based only on English and Indonesian. And the studies analyzed still have many differences regarding the relationship and significance of the data so that further studies are needed in the future. Further studies can utilize the results of the description of pediculosis capitis that has been provided in this study.

5. Conclusions

This literature review states that the prevalence of pediculosis capitis among elementary school children ranges from 0.58% to 65.7%, more in girls than boys and tends to be more frequent in higher grade levels. The prevalence of pediculosis capitis is associated with various risk factors such as long hair, low parental education level, unemployed parents, large family size, and shared comb use and frequent hair combing during a day. These findings suggest that combining behavioral interventions and minimizing risk factors may help in the therapeutic approach related to recurrent infestation in the community.

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