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The Association between Gender, Personal Hygiene Indicators, and Occupancy Density with the Incidence of *Pediculosis Capitis* at *Madrasah Tsanawiyah Pondok Pesantren* (Ponpes) Nurus Sunnah Semarang

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ABSTRACT

Background: Pediculosis capitis is one of the neglected tropical diseases (NTDs) caused by Pediculus humanus capitis, an obligate ectoparasite that lives parasitically on human skin. This disease is most common in women, in people with poor personal hygiene, and in densely populated areas. Boarding schools are densely populated and pose a risk for transmission of pediculosis capitis due to the many interactions among residents. **Purpose:** This study aims to investigate the association between gender, personal hygiene indicators, and occupancy density with the incidence of pediculosis capitis at *Madrasah Tsanawiyah Pondok Pesantren* Nurus Sunnah Semarang. **Methods:** In this cross-sectional observational study, all the junior high school students at *Ponpes* Nurus Sunnah were included in a total of 49 subjects. The data were collected by filling out questionnaires, doing a direct examination of the hair, and counting the measurements of the room area. Data analysis was performed using SPSS 23.0 for Windows. **Result:** Pediculosis capitis infestation was found among 13 (26.5%) students, with a higher incidence in females (46.4%) than males (0%), in respondents with the habit of combing hair using a personal comb (37.1%), and in non-densely populated areas (58.8%). There was an association between gender (p=0.000), the habit of combing hair using a personal comb (p=0.006), and occupancy density (p=0.000) and the incidence of pediculosis capitis. **Conclusion:** Gender, the habit of combing hair using a personal comb, and occupancy density are associated with the incidence of pediculosis capitis. Routine screening, knowledge, and practice improvement of personal hygiene are necessary to prevent transmission of pediculosis capitis.

Keywords: gender, personal hygiene, occupancy density, *pediculosis capitis*.

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BACKGROUND

Pediculosis capitis is one of the skin diseases classified as neglected tropical diseases (NTDs). However, its prevalence remains high in some countries, reaching 20-65%.[1] The global prevalence of pediculosis capitis is 19% in schoolchildren and 2% in adults. Schoolchildren between the ages of 3 and 12 are most affected, with girls being affected more than boys.[2]

Pediculosis capitis is a poorly controlled health problem and is not considered a major disease, but it has a high morbidity rate in densely populated areas and is rapidly transmitted.[3] The incidence of pediculosis capitis in Indonesia is highest in boarding schools. The prevalence ranges from 29.3-88.9% in school-aged children.[4] Densely populated areas, such as boarding schools, facilitate the transmission of pediculosis capitis, which can lead to serious health problems.

Personal hygiene is one of the factors that have an impact on health. Individual health can be maintained through good personal hygiene.[5] Good personal hygiene is one of the best ways to prevent an

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infestation of pediculosis capitis.[6] This is because good personal hygiene can prevent the entry of microorganisms so that various types of diseases, like infectious diseases, skin diseases, gastrointestinal diseases, oral diseases, and diseases that can affect bodily functions, such as pediculosis capitis, can be avoided.[5]

Some previous studies have reported the association between personal hygiene and the incidence of pediculosis capitis. However, there is a lack of studies on the association between each indicator of personal hygiene and the incidence of pediculosis capitis. The results of this study can help authorities reduce infestation by targeting risk factors that influence the incidence of pediculosis capitis. Based on the above description, this study aims to investigate the association between gender, personal hygiene indicators, and occupancy density with the incidence ofp pediculosis capitis at MTs *Ponpes* Nurus Sunnah Semarang.

METHODS

This is an analytical observational study with a cross-sectional design conducted at *Ponpes* Nurus Sunnah, one of the boarding schools in Semarang, in August 2023. All junior high school students at *Ponpes* Nurus Sunnah Semarang were chosen as the population in this study. The sampling method that was used in this study was total sampling with 49 students. In this study, a questionnaire was used to collect data on gender and personal hygiene. The personal hygiene questionnaire by Aruan (2021) consists of 12 questions related to body, hair, and personal belongings (such as clothes, towels, or linen) hygiene, as well as the habit of sharing personal belongings.[7]

Occupancy density is determined by the area of the room, which was measured with a tape measure. Occupancy is considered dense if the room area is $<8m^2/2$ persons and not dense if the area is $\geq 8m^2/2$ persons.[8]

The incidence of pediculosis capitis was determined by a direct examination of the hair. The hair was combed with a lice comb from root to tip on each part of the head. Each section of hair was combed 3-4 times before moving on to the next section. Eggs, nymphs, or adults of Pediculus sp. were identified and classified according to Jahnke's criteria: negative (no eggs/nymphs/adults found), mild (1-2 adults and/or 1-2 nymphs, with or without eggs), moderate (3-4 adults and/or 2-4 nymphs, with or without eggs), or severe (≥5 adults and/or ≥5 nymphs, with or without eggs).[9]

The data obtained were analyzed using SPSS (Statistical Package for Social Science) version 23.0 for Windows. Univariate analysis aims to analyse each variable independently. Bivariate analysis using Chi-square and Fisher's exact test was used to determine the association between gender and the incidence of pediculosis capitis, the association between personal hygiene indicators and the incidence of pediculosis capitis, and the association between occupancy density and the incidence of pediculosis capitis among respondents.

This study was approved by the Ethics Committee of Dr. Moewardi Regional General Hospital Surakarta No. 1.404/HREC/2023 on August 2, 2023.

RESULT

Table 1 shows that the majority of respondents were female, as many as 28 students (57.1%). The highest frequency was found among students aged 13, which consists of 18 students (36.7%). The students in the 7th grade had the highest frequency compared to the other grades, as many as 18 students (36.7%). At *Ponpes* Nurus Sunnah Semarang, there are 5 dormitories occupied by junior high school students. There are 3 dormitories, namely Sumayyah, Khoulah, and Aisyah rooms, which are occupied by female junior high school students. Meanwhile, the other 2 dormitories, namely Dorm 1 and Dorm 2, are occupied by male junior and senior high school students. The majority of students, which consists of 32 students (65.3%), lived in a densely populated area.

Table 2 shows that around a quarter of students 13;26.5 were positive for pediculosis capitis. Meanwhile, 36 students were negative.

Table 1. The characteristics of the respondents and *Ponpes Nurus Sunnah Semarang*

Characteristics	Frequency (%)
Gender	
Male	21 (42.9)
Female	28 (57.1)
Age (years old)	
11	2 (4.1)
12	14 (28.6)
13	18 (36.7)
14	13 (26.5)
15	1 (2)
16	1 (2)
Grade	
7	18 (36.7)
8	14 (28.6)
9	17 (34.7)
Dorm name	
Dorm 1	9 (18.4)
Dorm 2	12 (24.5)
Sumayyah Room	8 (16.3)
Khoulah Room	11 (22.4)
Aisyah Room	9 (18.4)
Occupancy density	
Dense	32 (65.3)
Not dense	17 (34.7)

Table 2. The distribution of the incidence of pediculosis capitis

Pediculosis capitis	Frequency (%)
Negative	36 (73.5)
Mild	8 (16.8)
Moderate	1 (2)
Severe	4 (8.2)
Total	49 (100)

Data analysis using the Chi-square test in Table 3 shows that the prevalence of pediculosis capitis was higher in females than in males, which was 46.4% with p=0.000 (p-value <0.05).

The personal hygiene indicator with the lowest number of participants was the habit of changing bed linen every two weeks, with only 19 respondents having this habit. On the other hand, washing hair with shampoo was performed by all respondents. The association between each personal hygiene indicator and the incidence of pediculosis capitis was analysed using Fisher exact. The personal hygiene indicator that was significantly correlated with the incidence of pediculosis capitis was the habit of using a personal comb p=0.006; p-value <0,05). The incidence of pediculosis capitis was higher in respondents who had the habit of using a personal comb. The association between washing hair with shampoo and the incidence of pediculosis capitis cannot be assessed because all respondents have the habit of using shampoo.

Data analysis using Fisher exact shows that the incidence of pediculosis capitis was higher in non-crowded dormitories than in crowded dormitories, which was 58.8% with p=0.000 (p-value <0.05).

Table 3. The association between gender, personal hygiene indicators, and occupancy density with the incidence of pediculosis capitis

Variable	Pediculosis capitis Yes n (%)	 No n (%)	P value
Gender			
Male	0 (0)	21 (100)	0.000*
Female	13 (46.4)	15 (53.6)	
Changing clothes (at least twice a day)			
Yes	11 (32.4)	23 (67.6)	0.149
No	2 (13.3)	13 (86.7)	
Always wearing personal clothing			
Yes	10 (24.4)	31 (75.6)	0.355
No	3 (37.5)	5 (62.5)	
Using detergent to wash clothes			
Yes	12 (26.7)	33 (73.3)	0.716
No	1 (25)	3 (75)	
Washing hair more than twice a week			
Yes	12 (26.1)	34 (73.9)	0.612
No	1 (33.3)	2 (66.7)	
Washing hair with shampoo			
Yes	13 (26.5)	36 (73.5)	-
No	0 (0)	0 (0)	
Rubbing the hair while shampooing			
Yes	13 (27.1)	35 (72.9)	0.735
No	0 (0)	1 (100)	
Drying hair after shampooing			
Yes	13 (30.2)	30 (69.8)	0.139
No	0 (0)	6 (100)	
Brushing hair with a comb			
Yes	13 (30.2)	30 (69.8)	0.319
No	0 (0)	6 (100)	
Always using personal combs			
Yes	13 (37.1)	22 (62.9)	0.006*
No	0 (0)	14 (100)	
Always using personal towels			
Yes	13 (27.1)	35 (72.9)	0.735
No	0 (0)	1 (100)	
Drying towels after use			
Yes	12 (26.1)	34 (73.9)	0.612
No	1 (33.3)	2 (66.7)	
Changing bed linen once every two weeks			
Yes	3 (16.8)	16 (84.2)	0.175
No	10 (33.3)	20 (66.7)	
Occupancy density			
Dense	3 (9.4)	29 (90.6)	0.000*
Not dense	10 (58.8)	7 (41.2)	

*Statistically significant ($p \leq 0.05$)

DISCUSSION

The results of the study show that the prevalence of pediculosis capitis is higher in females than in males. The results of the statistical tests that were conducted show that there is a significant relationship between gender and the incidence of pediculosis capitis. This result is in line with the study conducted by Maryanti et al. (2018) among children in orphanages in Pekanbaru.[10] Women usually have long hair that requires more care and moisture than short hair in men.[11] The condition of long hair may also affect the circulation of air from the hair pores, making the hair more humid, so these conditions may be a preferred habitat for Pediculus humanus capitis.[12] In *Ponpes*, all women cover their heads using

headscarves. This habit can affect the moisture of the hair if it is done when the hair is wet by preventing the pores on the scalp from opening optimally.[12] Furthermore, women are more likely to use hair accessories, such as headscarves, headbands, and hats. If these items are lent to others, they can be an indirect source of transmission for *pediculosis capitis*.[13] Another possibility is that women are more likely to be in close contact with their friends, which can facilitate the transmission of *pediculosis capitis*.[14]

The indicator of personal hygiene that is significantly associated with the incidence of *pediculosis capitis* is the habit of using a personal comb. This result is consistent with the study conducted by Dagne *et al.* (2019) among schoolchildren in Woreta Town, Northwest Ethiopia. This is due to the fact that the habit of sharing combs may facilitate the indirect transmission of *pediculosis capitis*.[15]

In this study, there is no significant association between the frequency of changing clothes and bed linen, the frequency of washing hair, sharing personal belongings (clothes and towels), using detergent to wash clothes, brushing hair with a comb, the habit of rubbing hair while shampooing, drying hair after shampooing, and drying towels after use with the incidence of *pediculosis capitis.*

A study by Rahmawati *et al.* (2020) at X Orphanage Palangka Raya showed no association between the habit of using shampoo and the incidence of *pediculosis capitis.*[16] Tresna *et al* (2019) reported no association between hair hydration and the incidence of *pediculosis capitis* in a boarding school in Bandung Barat.[12] Maharani et al. (2019) reported that the practice of drying towels after use and sharing clothing, such as headscarves, has no significant association with the incidence of *pediculosis capitis* among Komunitas Dinding at Bersehati Market Manado.[16] Yunida *et al* (2016) reported that the incidence of *pediculosis capitis* among female students in Martapura is not associated with the habit of sharing towels or the frequency of changing bed linen.[17]

The results of this study are not in line with the study conducted by Hudayah (2019), who found an association between the frequency of hair washing and the incidence of *pediculosis capitis* among students at *Sekolah Dasar* Inpres Benteng Timur Selayar.[18] The difference in the results of this study may be due to the fact that shampooing alone cannot kill *Pediculus humanus capitis.* After shampooing, combing the hair with a lice comb should be continued to lift *pediculus humanus capitis,* and it is recommended to repeat this action every three days for two weeks.[13] Khasanah *et al.* (2022) reported a significant association between the habit of rubbing the hair while shampooing and the incidence of *pediculosis capitis* among female students at *Ponpes* Miftahul Huda, which is not consistent with the result of this study.[19]

Although these habits are preventive actions against *pediculosis capitis*, there is still a possibility of *pediculosis capitis* infection if these habits are not followed by treatment to kill *pediculus humanus capitis* and the practice of personal hygiene, due to the possibility of transmission from *pediculosis capitis* sufferers who live in the same place.[20] The insignificant results of the study regarding indirect transmission of *pediculosis capitis* through items such as clothing, towels, and bedding may be influenced by the ability of lice to survive outside the body of the host before infecting a new host.[17]

In this study, there is an association between occupancy density and the incidence of *pediculosis capitis.* The results of this study are different from a previous study by Rahmita *et al* (2019) among female students at Martapura Darul Hijrah Boarding School which stated that the more densely people live, the closer they are to each other. This makes it easier for *pediculosis capitis* to be transmitted.[21] The results of this study contradict the existing theory, as this study shows that less densely populated respondents suffer more *pediculosis capitis* infestation than more densely populated respondents. This may be due to the fact that students at *Ponpes* Nurus Sunnah Semarang interact with each other 24 hours a day, so they still do a lot of activities outside the dorm with their friends. As a result, the possibility of *pediculosis capitis* transmission does not only occur in the dormitory but also outside the dormitory. In addition, age and hair length may also have influenced the results of this study. The most densely populated rooms are occupied by junior and senior high school students. As they grow, their experience and knowledge of personal hygiene will increase, so that the incidence of *pediculosis capitis* will be less frequent.

Although most of the non-densely populated dormitories are occupied by female students, the incidence of *pediculosis capitis* is higher in this group. This may be because women's long hair tends to be more moist and difficult to clean, making it a preferred habitat for *Pediculus humanus capitis.*

The prevalence of *pediculosis capitis* among junior high school students at *Ponpes* Nurus Sunnah Semarang is 26.5%. Gender, the habit of using a personal comb, and occupancy density are significantly

correlated with the incidence of *pediculosis capitis*. To stop the transmission of *pediculosis capitis*, the authorities of *Ponpes* Nurus Sunnah Semarang are advised to conduct simultaneous treatment of *pediculosis capitis*, routine screening for *pediculosis capitis* with lice combs, and improvement of knowledge and personal hygiene practices, especially among women by changing bedding every two weeks and not sharing personal belongings, to prevent transmission of *pediculosis capitis*. The relationship between personal hygiene and the incidence of *pediculosis capitis* needs to be investigated and evaluated in further study.

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