

Association of pruritus visual analogue scale and risk factors in adolescence pediculosis capitis in two public boarding schools, West Java

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Abstract

Background Pediculosis capitis is a scalp infestation by *pediculus humanis capitis* which can be found all over the world and most commonly affects children aged 3-12 years. Pruritus is the main symptom caused by sensitization to the saliva components injected by the lice into the scalp. Generally, it takes 2 to 6 weeks for pruritus to develop with the first infestation. Atopic conditions may also increase the severity of scalp pruritus. In addition, similar complaints in family and roommates are potential symptoms of pediculosis capitis.

Methods This study aimed to assess the pruritus severity using Visual Analogue Scale (VAS), and its association with several risk factors that might affect the pruritus degree in adolescence pediculosis capitis. This is an analytic descriptive study using cross-sectional design in two public boarding schools, West Java, during September 2018-March 2019.

Results We identified 357 (311 females, 46 males) students diagnosed with pediculosis capitis among a total of 713 students. The age ranges of the subjects were 11-18 years, with an average 13.8 years (SD 1.5357). The mean pruritus VAS was 3.9 (SD 1.93). Significant association were found between pruritus VAS and onset of disease ($p=0.0149$), previous history of similar complaint ($p=0.02049$), and family history of pediculosis capitis ($p=0.02849$).

Conclusion In conclusion, the majority of students with pediculosis capitis suffered from moderate pruritus. Onset of disease was associated with pruritus, consistent with the pathogenesis of pediculosis capitis, while the other associated risk factors need further investigation.

Key words

Pediculosis capitis, pruritus, visual analogue score, risk factors.

Introduction

Pediculosis capitis is a human hair and scalp infestation caused by *Pediculus humanus capitis*.¹ Pediculosis capitis can be observed all

over the world. It is most commonly found at the ages of 3-12 years, which mostly occurs in school and rapidly spreads in overcrowded environments such as dormitories. The prevalence of pediculosis in school-aged children in Belgium, a developed country, is 8.9%, which is lower than in India, a developing country (16.59%).² Estimated incidence of pediculosis capitis in Indonesia in school-aged children is 15-51.9%.^{3,4} A recent study by Pertiwi LK et.al revealed that 100 female

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students in public boarding school had pediculosis capitis.⁵ Infestations are diagnosed by demonstrating nits and living lice. Pruritus is the main symptom caused by sensitization to the saliva components injected into the scalp when the lice feed and release pruritic cytokines from the activation of T-helper 2 (Th₂) lymphocytes.¹ Most patients experience pruritus, especially in the occipital and retro-auricular regions. Pruritus takes 2 to 6 weeks to develop often the first infestation. The duration will get shorter along with subsequent infestations. Pruritus may be very mild if the infestation has just occurred or severe if the infestation has been untreated for a long time.⁶ Atopy may also increase the severity of scalp pruritus due to altered sebum's amount and composition.⁷ Pruritus is a subjective complaint that is difficult to be measured and it is different in every individual. It originates in the epidermis and dermo-epidermal junction, leading to the activation of unmyelinated C-fibers, immune cells and keratinocytes, which results in the release of proteases, cytokines, prostaglandins, histamines.⁶ To date, there are still very limited tools for measuring the quantity of pruritus, one of them is visual analogue scale (VAS). VAS can only measure the severity of pruritus, but it cannot measure the effect of pruritus on the quality of life.⁸ Similar complaints in family and roommates might be potential risk factors in developing pediculosis capitis.⁶ This study was a part of a larger study investigating pediculosis capitis and scabies in two boarding schools, West Java. Currently, there has been no study assessing the severity of pruritus in adolescence pediculosis capitis. Therefore, this study aimed to assess the pruritus severity using VAS and investigate several potential risk factors which might affect the pruritus severity in pediculosis capitis.

Methods

This was an analytic descriptive study with a

cross-sectional design in Public Boarding School (PBS A) and Public Boarding School B (PBS B), West Java conducted from September 2018 to March 2019. The subjects were all students from both boarding schools. The diagnosis of pediculosis capitis was established by history taking and physical examination conducted by dermatologists and residents from Department of Dermatology and Venereology Faculty of Medicine Universitas Indonesia/Dr. Cipto Mangunkusumo National Central General Hospital. The inclusion criteria were all students who consented to this study, were diagnosed with pediculosis capitis, also had cognitive and cooperative abilities to fill out the VAS questionnaire. The students, who were not present during data collection, were excluded from the study. Data collection was performed using a questionnaire containing pruritus VAS with 10 scales and 6 questions regarding risk factors. All students were informed on how to fill out the questionnaire. The students were asked to describe their pruritus severity by making a line on the VAS line. The VAS was interpreted as follows: 0 for no pruritus, <3 for mild pruritus, ≥ 3 to <7 for moderate pruritus, ≥ 7 to <9 for severe pruritus, and ≥ 9 for very severe pruritus. All data were analyzed using R-3.5.2 program. Fisher test were used as appropriate. P-values of <0.05 were regarded as statistically significant. This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia.

Results

Out of 713 students, 357 students were diagnosed with pediculosis capitis. A total of 333 questionnaires were filled out and returned. Flowchart of data collection is shown in **Figure 1**. Baseline characteristics of the subjects were shown in **Table 1**. The numbers of subjects in each characteristic are different due to incomplete data filled by the subjects. From pruritus VAS assessment, we found 4 students

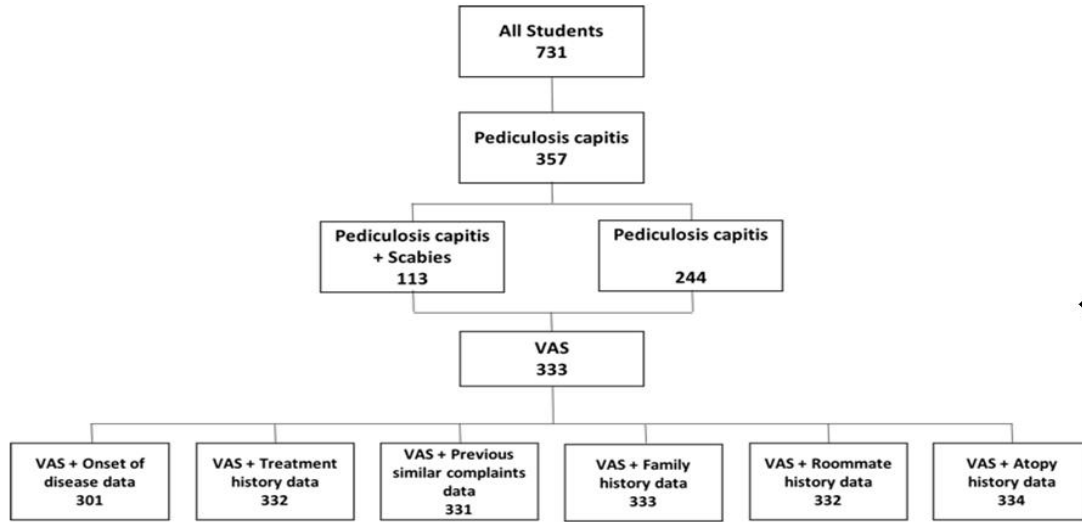


Figure 1 Procedure for data collection.

Table 1 Baseline characteristics of pediculosis capitis subjects at PBS A and PBS B, West Java in 2018.

Characteristics		%
Age (n=357), mean (SD)	13.8 (1.54)	-
Sex (n=357)		
Male	46	12.9
Female	311	87.1
Onset of disease (n=301)		
< 6 weeks	108	35.9
≥ 6 weeks	193	64.1
Treatment history (n=332)		
Yes	135	40.7
No	197	59.3
Previous history of similar complaints (n=331)		
Yes	206	62.2
No	125	37.8
Family History (n=333)		
Yes	116	34.8
No	217	65.2
Roommates History (n=332)		
Yes	293	88.2
No	39	11.8
Atopy History (n=334)		
Yes	78	23.4
No	256	76.6
Diagnosis		
All Student	713	-
Pediculosis capitis	244	34.2
Pediculosis capitis and Scabies	113	15.9
Scabies	175	24.5
No scabies and pediculosis capitis	181	25.4
Pruritus Visual Analogue Scale (VAS), mean (SD)	3.9(1.93)	-

with no pruritus (1.2%), 111 students with mild pruritus (33.3%), 191 students with moderate pruritus (57.4%), 22 students with severe pruritus (6.6%) and 5 students with very severe pruritus (1.5%). The pruritus VAS was compared between pediculosis capitis infestation, scabies infestation, and co-infestation of pediculosis capitis and scabies. We found that there is no statistically significant difference of VAS score between pediculosis capitis infestation vs. scabies infestation ($p=0.396$) as well as between pediculosis capitis infestation vs. co-infestation of pediculosis capitis and scabies ($p=0.291$). The association of pruritus VAS and 6 potential risk factors in pediculosis capitis was described in **Table 2**.

Discussion

We found no statistically significant difference of pruritus VAS between pediculosis capitis group and co-infestation group ($p=0.291$) due to similar main symptom, pruritus in both diseases. However, they can be differentiated by lesion, time of itch, and predilection. Scabies manifests as excoriating papular rashes, prominent nocturnal pruritus, and predilection around the skin fold while pediculosis capitis manifests as a persistent intense itch on the scalp with secondary bacterial infection caused by repeated scratching.¹ Both are mediated by delayed-type hypersensitivity involving Th₂ cell producing allergic reaction.⁹ Pruritus in pediculosis capitis

Table 2 Association of pruritus VAS and potential risk factors in pediculosis capitis subjects at PBS A and PBS B, West Java in 2018.

	Pruritus					p-value
	No	Mild	Moderate	Severe	Very severe	
Sex						
Male	1	13	24	3	1	0.576
Female	3	98	168	18	3	
Onset of disease						
< 6 weeks	2	44	56	3	2	0.015
≥ 6 weeks	0	53	120	14	2	
Treatment history						
Yes	2	62	126	11	0	0.896
No	2	49	62	5	4	
Similar Previous Complaints						
Yes	2	62	126	11	0	0.020
No	2	49	62	5	4	
Similar Complaints in Family						
Yes	0	29	74	9	2	0.028
No	4	82	115	8	2	
Similar Complaints in Roommate						
Yes	4	93	171	16	4	0.353
No	0	18	17	1	0	
History of Atopy						
Yes	1	19	51	5	1	0.288
No	3	92	139	12	3	

arises from the saliva and excretions produced by the lice while feeding. The students age ranged from 11 to 18 years, with an average of 13.8 years (SD 1.54), in line with the study of Mustafa *et al.* in Turkey, which found that pediculosis capitis was mostly observed in students aged 12-15 years.¹⁰ This study showed that pediculosis capitis was more common in female subjects (87.1%), in line with Lesshaft *et al.* study. Study by Pertiwi LK, found that 100 female students had pediculosis capitis.⁵ Female has longer hair so it increases the likelihood of transmission due to greater contact.¹² However, we found no significant association between pruritus VAS and gender (p=0.576) which is in contrast to the study by Stander *et al.*, which reported that chronic pruritus caused higher VAS and higher impact on quality of life in women.¹²

The mean of pruritus VAS in this study was 3.9 (SD 1.93), equal to moderate pruritus. VAS is a uni-dimensional scale that measures the intensity

of pruritus without measuring the impact on the quality of life (sensitivity of 81% and specificity of 74%).⁸ From pruritus VAS assessment, we found that the most common findings were moderate pruritus (57.4%), followed by mild pruritus (33.3%), severe pruritus (6.6%), very severe pruritus (1.5%), and no pruritus (1.2%). The varied result in pruritus VAS assessment can be due to the extent and onset of disease.⁷ Onset of pediculosis capitis is mostly more than 6 weeks (64.1%), which had statistically significant association with pruritus VAS (p=0.015). Gordon *et al.* defined persistent/chronic pediculosis as ≥3 active infestations involving the presence of living lice in a period of 6 weeks.¹³ Several theories state that pruritus experienced by patients is related to delayed-type hypersensitivity. Pruritus may be very mild if the infestation has just occurred or severe if the infestation has been untreated for a long time.⁶ To date, there has been no study comparing pruritus severity and onset of disease in pediculosis capitis.

We found that 59.3% of students did not have history of previous treatment which had no significant association with pruritus severity ($p=0.896$). There are 2 aspects in pediculosis management, which are medical treatment and environment control. Medical treatment eliminates all lice and nits while treating secondary infections. Treatment is administered to patient with active infestations and prophylactic to people sharing bed with the patients.⁶ Pruritus can be controlled or become persistent following treatment due to other associated conditions, e.g. drug resistance or itch tolerance. Pathophysiology of itch has not fully understood despite being the main symptom of pediculosis so further exploration is necessary to support this finding.¹⁴

A total of 206 students (62.24%) claimed to have similar complaints previously, which might indicate a recurrent infestation. There was significant association between similar previous complaint and pruritus severity ($p=0.020$). Similar complaints in family were found in 34.8% of the students, which has statistically significant association with pruritus severity ($p=0.028$). If the lice were to be found in one student, ideally the whole school or the whole family are considered infested and should receive treatments.¹¹ There has been no similar study that could support or explain these findings. However, family history of infestation might indicate that patient might had been infested by pediculosis capitis, even before living in the boarding school, leading to longer onset of disease. In chronic phase, recurrent and longer onset of disease, the pruritus might be more severe due to increase of sensitivity.¹⁵

It was found that 88.2% of the students had roommates with the similar condition. However, there was no statistically significant association between pruritus severity and roommate history ($p=0.353$). Several theories stated that having

roommates with pediculosis capitis in an overcrowded space is a risk factor for pediculosis capitis. Beside direct contact, transmission can spread through combs, hair dryers, hair accessories, pillows, bed linen, towels.¹ As described above, recurrent infestation from the transmission might increase pruritus severity, which is in contrast with our findings.¹⁵

History of atopy was found in 23.4% of the students, which has no statistically significant association with pruritus severity ($p=0.288$). Nevertheless, theoretically it is known atopic patients have a greater pruritus level and greater tendency for infection. Atopic patients have increased IgE response towards parasitic infestation.¹⁵ Atopic condition may also increase pruritus severity by modifying sebum amount and composition on the scalp.⁷ The result of this study suggests that atopic condition did not necessarily affect the pruritus severity. Limitation of this study was incomplete data in the questionnaires filled out by the students.

Majority students with pediculosis capitis suffered from moderate pruritus. The pruritus severity was significantly associated with onset of disease that supports the pathogenesis of pruritus in pediculosis capitis. Further studies were needed to assess the other risk factors, similar previous complaint and similar complaints in family, due to lack of supported theory and similar study.

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