

Scalp pruritus measurement using visual analog scale and 5-D itch scale in children with pediculosis capitis

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Abstract

Background Pediculosis capitis is defined as a skin infestation which manifests as scalp itchiness and leads to poor quality of life. To evaluate the quality of life, several instruments can be used, such as 5-D itch scale and visual analog scale (VAS) for pruritus.

Objective This study aims to analyze the correlation between VAS for pruritus and 5-D itch scale as well as determine the validity of these instruments in pediatric populations with pediculosis capitis.

Methods The cross-sectional study was conducted in two boarding schools in Bogor, West Java, Indonesia in September 2018. The investigators establish the diagnosis by identification of any forms of the lice (adult, eggs, or larva) on the hair. The eligible participants were evaluated with both instruments. Analysis of association between categorical variables was performed with Chi-square test. Analysis of correlation between VAS for pruritus and 5-D itch scale was performed with Spearman's correlation test.

Results Among 357 students with pediculosis, female students were more likely to be infected than male students (POR = 3.4 (3.03–3.85), 333 students were able to complete the VAS scale and 312 students were able to complete the 5-D itch scale (P = 0.01). The correlation analysis showed that VAS scale was moderately correlated with 5-D scale in evaluating pruritus on pediculosis capitis patients ($\rho=0.52$, $P<0.001$).

Conclusion VAS is simple and valuable tools that can be used to assess the severity and quality of life in pediatric populations with scalp itchiness.

Key words

Pediculosis capitis, scalp pruritus, VAS scale, 5-D itch scale, quality of life.

Introduction

Pediculosis capitis, caused by *Pediculosis humanus capitis*, is the most common parasitic infestation in the head area of children worldwide with prevalence ranging from 1.6%

to 87%.^{1,2} The parasite is easily spread in high densely populated with poor hygiene such as boarding school and orphanage. It is transmitted via shared household objects such as hair comb, pillow, hijab, and hat.³ Scalp pruritus is the major symptom of pediculosis due to sensitization of parasite saliva and fecal antigens.⁴ In addition, severe and untreated scalp pruritus could lead to complications such as scalp excoriations, secondary infections, and interfere with children's learning quality.⁵

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However, pruritus is a subjective feeling and a tool to translate the subjective into the objective measurement is needed. An simple and practical objective measurement such as pruritus visual analogue scale (VAS) might not be able to establish the effect of itch on quality of life but is handy to be used on children.^{6,7} On the other hand, another more complicated objective measurement called 5-D itch scale can point out the extent, severity, course, disability, and distribution due to pruritus hence able to evaluate multiple aspects and complications associated with pruritus.⁸ Therefore, this study was carried out to analyze the correlation between VAS for pruritus and 5-D itch scale as well as determine the validity of these instruments in pediatric populations with pediculosis capitis.

Methods

The cross-sectional study was conducted in two public boarding schools in Bogor, West Java, Indonesia on September 2018. This study was approved by Ethics Committee of Faculty of Medicine Universitas Indonesia, number 0920/UN2.F1/ETIK/2018.

Subjects: The participation was voluntary. All participants (aged 11-18 years old) were asked to sign the assent form and their guardians were asked to sign the informed consent after receiving information regarding the study. The investigators establish the diagnosis by identification of any forms of the lice (adult, eggs, or larva) on the hair or scalp of the participants.

Data and Sample Collection: Two pruritus evaluation scales were used in the study. The first one is VAS for pruritus that consists of a minimum point of 0 and a maximum point of 10 to evaluate the severity of the pruritus. The point will be then classified into five categories, which

are 0 as none, <3 as mild, $\geq 3-6$ as moderate, $\geq 7-8$ as severe, as well as ≥ 9 as very severe. The second scale was a cross-cultural adapted and validated 5-D itch scale. This instrument comprises five parts to be assessed which should be given points ranging from one to five. They were extent, severity, course, disability (chores, leisureliness/ social events, sleep, and employment/ education), as well as distribution of the itchiness.⁹

Statistical Analysis: All eligible subjects were assessed using both scales and the results were recorded for statistical analysis. Data was analyzed with R version 3.5.2. Both scales were translated into categorical data and presented as a frequency table. The demographic characteristics were presented as median and range. A chi-square test was used to determine the relationship between two categorical variables. Analysis of association between categorical variables was performed with Chi-square test. Analysis of correlation between VAS for pruritus and 5-D itch scale was performed with Spearman's correlation test. P-value was considered significant if <0.05.

Results

Seven hundred and thirteen students (47.4% male and 52.6% female) were enrolled in the study with 357 (50.1%) students diagnosed with pediculosis capitis. Among 357 students with pediculosis, female students (87.1%) were more likely to have pediculosis capitis than male students (12.9%) (Prevalence Odds Ratio [POR]=3.4, 95% Confidence Interval [CI]=3.03–3.85). The median of the student age was 14 (11–18) years old. The proportion of the students who were able to complete the VAS scale (n=333) and 5-D itch scale (n=312) was significantly different (P=0.01). The complete categorical distribution from the VAS scale and 5-D itch scale were presented in **Table 1**.

Table 1 Categorical distribution of the VAS and 5-D itch scale.

VAS Category (n = 333)	n (%)
No pruritus	4 (1.2)
Mild pruritus	111 (33.3)
Moderate pruritus	192 (57.7)
Severe pruritus	22 (6.6)
Very severe pruritus	4 (1.2)
5-D Itch Category (n = 312)	
A. Duration	
1. Less than 6 hours/day	210 (67.3)
2. 6-12 hours/day	63 (20.2)
3. 12-18 hours/day	20 (6.4)
4. 18-23 hours/day	3 (1.0)
5. All day	16 (5.1)
B. Degree	
1. Not present	10 (3.2)
2. Mild	118 (37.8)
3. Moderate	150 (48.1)
4. Severe	26 (8.3)
5. Unbearable	8 (2.6)
C. Direction	
1. Completely resolved	24 (7.7)
2. Much better, but still present	61 (19.6)
3. Little bit better, but still present	65 (20.8)
4. Unchanged	120 (38.5)
5. Getting worse	42 (13.5)
D. Disability	
Sleep	
1. Never affects sleep	152 (48.7)
2. Occasionally delays falling asleep	110 (35.3)
3. Frequently delays falling asleep	24 (7.7)
4. Delays falling asleep and occasionally wakes up at night	21 (6.7)
5. Delays falling asleep and frequently wakes up at night	5 (1.6)
Leisure/social	
1. Never affects this activity	136 (43.6)
2. Rarely affects this activity	53 (17.0)
3. Occasionally affects this activity	100 (32.1)
4. Frequently affects this activity	20 (6.4)
5. Always affects this activity	3 (1.0)
Housework/errands	
1. Never affects this activity	155 (49.7)
2. Rarely affects this activity	57 (18.3)
3. Occasionally affects this activity	78 (25.0)
4. Frequently affects this activity	19 (6.1)
5. Always affects this activity	3 (1.0)
Works/school	
1. Never affects this activity	126 (40.4)
2. Rarely affects this activity	51 (16.3)
3. Occasionally affects this activity	99 (31.7)
4. Frequently affects this activity	30 (9.6)
5. Always affects this activity	6 (1.9)
E. Distribution (location)	
1. 0-2	270 (86.5)

2. 3-5	30 (9.6)
3. 6-10	12 (3.8)
4. 11-13	0 (0)
5. 14-16	0 (0)

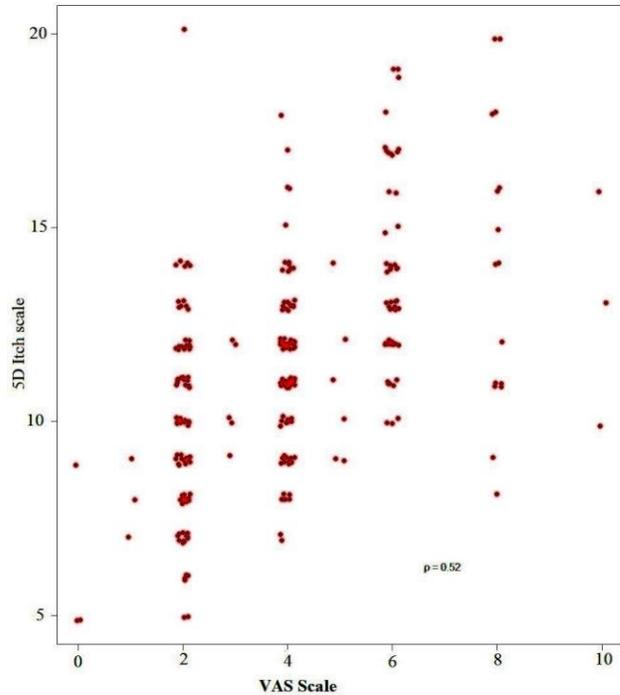


Figure 1 Spearman's rank correlation coefficient of VAS and 5-D itch scale in evaluating scalp pruritus in children.

Three hundred four students (85.2%) completed both pruritus scales evaluation. The VAS scale was moderately correlated (**Figure 1**) with a 5-D scale in evaluating pruritus on pediculosis capitis patients ($\rho=0.52$, $P<0.001$).

Discussion

The skin of the scalp has distinctive characteristics from the skin in other parts of the body. The scalp contains abundant sensory nerves, blood vessels, more hair follicles and more sebaceous glands.¹⁰ Pruritus sensation is commonly transferred by the small unmyelinated C fibers to multiple different locations through the brain area that culpable to sensation and emotion.¹⁰ Those C fibers on the scalp believed to make the scalp area had a

particular entity compared to other body parts.¹⁰ Due to this special characteristic, when pruritus occurs on the scalp it will not only produce physical symptoms but also lead to disturbance of quality of life and psychological stress because the area of the scalp played a pivotal role in daily activities.¹⁰

Pediculosis capitis is one of disease that can cause pruritus in the scalp. The disease mostly affects children may correlate to the increasing possibility of closer contact among this age group rather than the older group.^{3,5} The severity of pruritus can be evaluated using a simple tool called VAS for pruritus where children asked to point the picture or the number on the scale. However, VAS for pruritus might not be able to establish the influence of scalp pruritus on the quality of life in pediatric populations.⁷ Another scale that can be utilize to assess the quality of life in children related to pruritus symptom is called 5-D itch scale. Nevertheless, the tool has never been used and evaluated in children with scalp pruritus. Hence, we conducted this study to analyze the correlation between VAS for pruritus and 5-D itch scale in assessing scalp pruritus.

More than half of the students in this study experienced pediculosis capitis. This high infestation rate might be correlated with the higher spread in a highly dense population, in this case, boarding school.³ Similar infestation rate (55.3%) mentioned by Karimah et al on their study at public elementary school in Jatinangor, Indonesia.¹¹ On the other hand, lower rates were found from another study in Syria (14.3%), Iran (4%), and Egypt (33%).^{3,5,12}

In our study, female students were more prone to have pediculosis capitis than male students, which was similar to previous findings. This tendency affected by many factors such as long hair, closer contact between girls, and exchange

of household objects which can be the important route of transmission of pediculosis.^{3,12-14} The median of student age with pediculosis infestation in this study was 14 (11–18) years old. This result was similar to previous studies that showed significantly higher rates of infestation among older than 10 years of age.^{12,13}

A similarity was observed in the degree of pruritus from VAS for pruritus and 5-D itch scale. Half of the students had moderate pruritus due to pediculosis. This is an interesting result since pediculosis is called as an “incurable itch” as it may cause severe pruritus once the parasite infested.¹⁵ However, to our knowledge, this is the first study that assesses the severity of pruritus caused by pediculosis using two objective measurements. Related to disability scores, we found that the scores were mostly mild in every aspect. This result could indirectly explain that pruritus caused by pediculosis cause an itchy feeling that did not interfere with daily activities.

In this study, we also found that VAS for pruritus has a moderate positive correlation with 5-D itch scale in evaluating children with scalp pruritus ($\rho=0.525$, $p<0.001$). We found that this result is interesting since this result resembles other studies despite the studies conducted in adults and not aimed to evaluate scalp pruritus.^{8,16} In addition, we also found that more students completed the VAS for pruritus than the 5-D itch scale. This result showed that VAS for pruritus was more easily to fill or answered by the children rather than 5-D itch scale which contains too many questions and requires more time too answered.

Since pruritus measurement has no gold standard instrument, it can be concluded from this study that VAS for pruritus can be used to assess the severity and quality of life in children affected with scalp pruritus. Supported by its

simplicity and child-friendly properties, VAS for pruritus is a valuable tool to evaluate scalp pruritus in children in clinical settings.

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