

# Clinico-laboratory findings of Malassezia folliculitis in Indonesia: A multicentre study

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ORIGINAL ARTICLE

# Clinico-laboratory findings of *Malassezia* folliculitis in Indonesia: A multicentre study

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## Abstract

**Background:** *Malassezia* folliculitis (MF) is a humid-favoured fungal skin disease caused by *Malassezia* species. Inaccurate treatments, changes in skin flora and disease exacerbation are often occurred due to oversights in the diagnosis. Several diagnostic methods are established for MF.

**Objective:** To identify clinico-laboratory findings of *Malassezia* folliculitis in Indonesia.

**Methods:** The study was conducted from January 2014 to December 2018 in seven referral teaching hospitals. Medical records of MF-diagnosed patients were obtained and analysed using the binomial test, chi-square test and Cohen's Kappa coefficient in SPSS 26.0.

**Results:** A total of 353 cases of MF were identified in seven referral teaching hospitals in Indonesia, 66.3% of which were males and 33.7% were females, dominated by the 17–25 years old group (44.5%). Itchy sensation (83.9%) was a major subjective complaint. Lesions were majorly found on the trunk-chest, back and shoulder (68.3%), while the clinical manifestation are mostly follicular papule-pustular lesions (62.1%). Patients were 87.4% positive by KOH examination (modified Jacinto Jamora's criteria) and 69.1% positive by Wood's lamp. Generally, sex, age, subjective complaint, lesion location, clinical manifestation and both examinations were statistically significant ( $p < .001$ ). A significant relationship between all the clinical criteria of the patients in the KOH especially the clinical manifestation was significantly related to Wood's lamp. The Cohen's Kappa assessment suggested that there was an agreement between KOH and Wood's lamp ( $\kappa = -0.272, p < .001$ ).

**Conclusion:** The clinical symptoms of *Malassezia* folliculitis are dominated by pruritus, papulopustular follicular lesions on the trunk and the presence of spore load.

## KEYWORDS

KOH, *Malassezia* folliculitis, modified Jacinto-Jamora criteria, papulopustular, pruritus, trunk

## 1 | INTRODUCTION

**3** *Malassezia* folliculitis also known as *Pityrosporum* folliculitis is a chronic pilosebaceous follicle infection caused by *Malassezia* species, a lipophilic yeast that normally invades the stratum corneum and hair follicle of 92% of healthy individuals.<sup>1,2</sup> The disease is distinctively recognised by follicular-based, monomorphic, erythematous papules and pustules on the face, trunk and upper arms.<sup>2,3</sup> Teenage and young adults are most vulnerable to *Malassezia* folliculitis, presumably due to their relatively active sebaceous glands.<sup>1</sup> On the contrary, the disease tendency towards certain sex is still uncertain to date.<sup>3</sup>

The worldwide prevalence of *Malassezia* folliculitis is still undergoing study.<sup>4</sup> The development of *Malassezia* folliculitis is majorly influenced by high temperatures and humidity as well as excessive sweating; thus, the tropics make the perfect climate.<sup>2,3,5</sup> In areas that of high heat and humidity, prevalence of *Malassezia* folliculitis is estimated at 2.5 to 16%.<sup>6</sup> One clinic in the Philippines documented that 16% of all patient visits are a result of *Malassezia* folliculitis.<sup>7</sup> A 2008 report from China cites that 1.5% of all dermatology patients were diagnosed with *Malassezia* folliculitis.<sup>8</sup> In a period of 2015–2016, a hospital in Singapore reported that 57.1% of their patients are *Malassezia* folliculitis positive.<sup>9</sup>

*Malassezia* folliculitis can go underdiagnosed and commonly misdiagnosed as acne vulgaris and oftentimes confused with bacterial folliculitis.<sup>10,11</sup> It is crucial that *Malassezia* folliculitis is recognised differently with acne vulgaris and bacterial folliculitis because they have their own respective appropriate treatments, and if the disease is being mistakenly cared with antibiotics it can change the skin flora and worsen the disease.<sup>10</sup> In general, diagnosis is integrated with clinical manifestation and aided with the presence of spore load.<sup>5</sup> Several diagnostic methods used to identify spores are direct microscopy on skin lesion using potassium hydroxide (KOH) solution with the addition of Parker blue-black, Wood's lamp,<sup>2,12</sup> skin biopsies,<sup>3</sup> dermoscopy examination<sup>13</sup> and/or culture.<sup>6,10</sup> Effective and efficient integration is very important in the provision of appropriate and optimal therapy. To the authors' knowledge, data of diagnostic criteria for *Malassezia* folliculitis are as yet available widely. This retrospective multicentre study presented clinico-laboratory findings of *Malassezia* folliculitis in seven referral teaching hospitals in Indonesia.

## 2 | MATERIALS AND METHODS

### 2.1 | Design

The study was designed using a retrospective and descriptive approach for the period of January 2014 to December 2018 in Indonesia. Data were obtained from medical records of seven referral teaching hospitals: Dr. Cipto Mangunkusumo National Central General Hospital (Jakarta), Prof. Dr. Kandou General Hospital (Manado), Dr. Soetomo General Hospital (Surabaya), Saiful Anwar

Hospital (Malang); Adam Malik Hospital (Medan); M. Djamil Hospital (Padang); Dr. Mohammad Hoesin Hospital (Palembang).

### 2.2 | Ethics approval

**17** This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia.

### 2.3 | Participants

All patients diagnosed with *Malassezia* folliculitis who were routinely visiting Dermatology and Venereology Outpatient Clinic for period of January 2014 to December 2018 regardless of age and sex. The diagnosis of *Malassezia* folliculitis was established based on clinical manifestation, direct microscopic examination with KOH solution and Wood's lamp examination.

### 2.4 | Data collection

The data acquired from patients' medical records included patients' characteristics (age and sex), patients' complaints (itchiness, cosmetic-related problems), clinical examination (the presence of follicular papule-pustular lesions), sites of lesions (face; trunk-chest, back and shoulder; and upper arm) and results of direct microscopic examination with KOH—spore load detection based on the modified *Jacinta-Jamora's criteria* were positive if spore load grading between +2 up to +4 and negative it was 0 to 1+. The grading criteria of spore load by direct microscopic examination (per high power field) were as follows: 1+ (1 to 2 single spores, no cluster), 2+ (small cluster, not more than 6 spores; or 12 spores if dispersed), 3+ (large clusters of 7–12 spores; or 20 spores if dispersed) and 4+ (cluster of 12 spores; or 20 spores and more if dispersed).<sup>7</sup> In this study, since KOH is the most commonly used existing method for identifying *Malassezia* folliculitis, it is considered a gold standard. In addition, the results of Wood's lamp examination (a positive result is noted with fluorescence) and other testing were taken into account.

### **39** 2.5 | Statistical analysis

**26** Data were analysed using *Statistical Packages for the Social Sciences* (SPSS) version 26.0. and supported with *Microsoft excel*. Categorical data were presented in frequency. Associations between demographic and clinical factors with the *Malassezia* folliculitis were analysed with the binomial test and the chi-square test. Analysis on the association between laboratory approach with *Malassezia* folliculitis was also conducted with the chi-square test. A *p*-value < .001 was considered significant. Further analysis was carried out based on the agreement between the results of the KOH examination and Wood's lamp which was assessed by using Cohen's Kappa coefficient.

### 9 3 | RESULTS

A total of 353 cases of *Malassezia* folliculitis were reported in seven referral hospitals in Indonesia. The demographic, clinical characteristics and additional testing are shown in Tables 1–4. Males were more susceptible to *Malassezia* folliculitis compared to females (66.3% vs 33.7%,  $p < .001$ ), and the disease was dominated by an age group of 17–25 years old (44.5%,  $p < .001$ ). The most common subjective complaint by patients was itchy sensation (83.9%,  $p < .001$ ). Several sites of lesions have been identified, the trunk-chest, back and shoulder being the most favourable (68.3%,  $p < .001$ ), wherein the majority of clinical manifestations were follicular papule pustular lesions (62.1%,  $p < .001$ ). From 96.6% of subjects who were performed direct microscopic examination with KOH, spores were identified in 87.4% of them ( $p < .001$ ). 62.4% of subjects were performed the Wood's lamp examination, and 69.1% ( $p < .001$ ) of them revealed positive result. In general, sex, age, subjective complaint, location of lesion and clinical manifestation of *Malassezia* folliculitis show significant results statistically ( $p < .001$ ), also both of the additional examination, KOH or Wood's lamp. Table 5 shows a significant relationship between all the clinical criteria of the patients (subjective criteria, location of lesion and clinical manifestation) in the KOH examination, specifically for itchy, trunk location and papulopustular lesions; meanwhile, Table 6 indicates that among the criteria, the clinical manifestation is significantly associated with the Wood's lamp examination. On the contrary, the subjective criteria could not be assessed with Wood's lamp test as all the subjective complaints of the 152 subjects are itchy sensations. Based on the additional examination, there were 34.3% of patients only receive one type of examination (KOH) and there were 62.4% that receive 2 types of examinations, KOH and

TABLE 1 Demographic characteristics of patients with *Malassezia* folliculitis at the Dermatology and Venereology Outpatient Clinic, Indonesia, 2014–2018 (number of the patient  $n = 353$ )

Characteristics	Frequency (n, %)	p-value
Sex		
Male	234 (66.3)	<.001 <sup>a,*</sup>
Female	119 (33.7)	
Age		
0–5 years	6 (1.7)	
5–11 years	3 (0.9)	
12–16 years	59 (16.7)	
17–25 years	157 (44.5)	<.001 <sup>b,*</sup>
26–35 years	54 (15.3)	
36–45 years	44 (12.5)	
46–55 years	22 (6.2)	
55–65 years	7 (2.0)	
>65 years	1 (0)	

<sup>a</sup>Binomial test,

<sup>b</sup>Chi-square test.

\*Statistically significant.

Wood's lamp. The combined examination yielded 52.7% of positive results. The examination result of KOH positive and Wood's lamp negative was 30.9%; meanwhile, the result of KOH negative and Wood's lamp positive was 16.4%. The Cohen's Kappa assessment between two raters, KOH and Wood's lamp, shows  $\kappa = -0.272$  with  $p < .001$ , which suggests that there is an agreement between the two raters (Table 7). There was no case of dermoscopy, cultures and biopsy during the examination.

## 4 | DISCUSSION

This study reveals that *Malassezia* folliculitis tends to occur in males than females (2:1), between the ages of 17 to 25 years (44.5%) with the average age being 23 years, then followed with the age group of 12–16 and 26–35 years. There is a significant association between sex and age with *Malassezia* folliculitis infection. Similar results are also suggested by a study conducted in Singapore, that *Malassezia* folliculitis happens in most males at the age of 11–12 and 21–30 years,<sup>9</sup> a study in Taipei found a majority of *Malassezia* folliculitis patients are males at the age of 10–19 years,<sup>14</sup> and a study performed in Jakarta revealed that male patients at the age of >18 are the most.<sup>15</sup> In addition, a study between the year 2014 and 2016 conducted in 6 hospitals in Indonesia found males at the age of 15–30 years are the most.<sup>16</sup> In contrast, a study in Tunisia reported that females are the most common cases regarding the disease, although the average age is not so divergent, which is individuals at the age of 24.<sup>6</sup> This type of data on the comparison between sexes is already recognised to be limited and inconsistent,<sup>3,15</sup> while age group, conversely, shows consistent occurrence in young to middle age group.<sup>10</sup> In these groups, sebum production is relatively low, while young adults have relatively high *Malassezia* density, resulting in a more oily scalp.<sup>5</sup> Skin colonisation by *Malassezia* spp. is started between the ages of 3 to 6 months and higher rates of *Malassezia* infections are likely to happen in adolescence and young adults wherein sebum production is the highest and this phenomenon is strongly influenced by the activity of the sebaceous glands.<sup>3</sup> On the contrary, considering the majority of the group is in productive age, it is thought that a high frequency of physical activity also plays a part, causing a tendency to sweat and to have moist skin which increases the risk of getting *Malassezia* folliculitis in this group.

Diagnosis can be integrated clinically based on anamnesis and usual clinical presentation, combined with a specimen for fungal microscopy via direct microscopy and culture, histopathological examination, also rapid efficacy of oral antifungal treatments.<sup>5,10</sup> Itchy skin, also known as pruritus, on predilection areas becomes the most frequent subjective complaint by *Malassezia* folliculitis patients.<sup>3,10</sup> This study found that pruritus is the most received complaint (83.9%) and it is supported with statistical data. The results are in line with studies performed by Widaty et al.<sup>15</sup> and Thayikkanu et al.<sup>17</sup> which states that pruritus is the hallmark of *Malassezia* folliculitis.

*Malassezia* folliculitis is clinically manifested in form of follicular papules and 2–4 mm papulopustules with perifollicular erythema on

Teaching hospitals	Number of the patient	Frequency (%)
Dr. Cipto Mangunkusumo National Central General Hospital (Jakarta)	53	15.0
Prof. Dr. Kandou General Hospital (Manado)	53	15.0
Dr. Soetomo General Hospital (Surabaya)	217	61.5
Saiful Anwar Hospital (Malang)	2	0.6
Adam Malik Hospital (Medan)	1	0.3
M. Djamil Hospital (Padang)	3	0.8
Dr. Mohammad Hoesin Hospital (Palembang)	24	6.8

TABLE 2 *Malassezia* folliculitis patients' distribution at the Dermatology and Venereology Outpatient Clinic in seven referral teaching hospitals in Indonesia in 2014–2018

Characteristics		Frequency (n, %)	p-value <sup>a</sup>
<i>Anamnesis</i>			
Subjective criteria	Itchy sensation	296 (83.9)	<.001*
	Cosmetic	7 (2.0)	
	Itchy sensation and cosmetic	32 (9.1)	
	No complaint	18 (5.0)	
<i>Clinical examination</i>			
Location	Face	7 (2.0)	<.001*
	Trunk	241 (68.3)	
	Upper arm	3 (0.8)	
	Face, trunk	30 (8.5)	
	Trunk, upper arm	56 (15.9)	
	Face, upper arm	2 (0.6)	
	Face, trunk, upper arm	14 (3.9)	
Clinical manifestation	Papules	108 (30.6)	<.001*
	Pustules	22 (6.2)	
	Papulopustules	219 (62.1)	
	Papulopustules and nodules	4 (1.1)	

TABLE 3 Clinical characteristics of patients with *Malassezia* folliculitis at the Dermatology and Venereology Outpatient Clinic, Indonesia, 2014–2018 (number of the patient  $n = 353$ )

<sup>a</sup>Chi-square test.

\*Statistically significant.

TABLE 4 Laboratory finding of patients with *Malassezia* folliculitis at the Dermatology and Venereology Outpatient Clinic, Indonesia, 2014–2018

	Characteristics	Frequency (n, %)	p-value <sup>a</sup>
KOH	Positive	298/341 (87.4)	<.001*
	Negative	43/341 (12.6)	
Wood's lamp	Positive	152/220 (69.1)	<.001*
	Negative	68/220 (30.9)	

<sup>a</sup>Chi-square test.

\*Statistically significant.

the face, trunk-chest, back and shoulder, and upper arms.<sup>3,10</sup> This study indicated that the majority of lesions are papulopustules (62.1%) that occur on the trunk (68.3%) which includes chest, back and shoulder. Papulopustular skin lesions and trunk-infected areas in

relation to *Malassezia* folliculitis are statistically significant. Adelaide et al.<sup>9</sup> and Bahlou et al.<sup>6</sup> expressed that pustules and papulopustules are frequently discovered on the trunk and back. This parallel distribution is closely related to the skin environment such as sweating, seborrhoea and the distribution of *Malassezia* species on the body region; also, those particular areas are usually covered compared to other regions. Clinical manifestation of *Malassezia* folliculitis is difficult to differentiate with acne vulgaris and bacterial folliculitis, although *Malassezia* folliculitis is non-comedogenic.<sup>3</sup> Besides, itchy skin lesion is a common symptom, especially in immunocompetent *Malassezia* folliculitis patients.<sup>10</sup> In clinical scenarios, initial diagnosis based upon the combination of symptoms such as itch, clinical manifestation with monomorphic papulopustules without comedones supported by detection of direct mycological by microscopy is sufficient to initiate therapy.<sup>2</sup>

Fungal specimen detection via direct microscopy is useful for making a diagnosis.<sup>18</sup> The direct microscopy modality is value to

**TABLE 5** Association between clinical characteristics of patients with *Malassezia* folliculitis and KOH examination (number of the patient  $n = 341$ )

Characteristics		KOH		p-value <sup>a</sup>
		Positive (%)	Negative (%)	
Subjective criteria	Itchy sensation	260 (87.3)	36 (83.7)	<.001*
	Cosmetic	7 (2.3)	0 (0)	
	Itchy sensation and cosmetic	31 (10.4)	1 (2.3)	
	No complaint	0 (0)	6 (14)	
Location	Face	0 (0)	7 (16.3)	<.001*
	Trunk	212 (71.1)	29 (67.4)	
	Upper arm	3 (1.0)	0 (0)	
	Face, trunk	30 (10.1)	0 (0)	
	Trunk, upper arm	53 (17.8)	3 (6.9)	
	Face, upper arm	0 (0)	2 (4.7)	
	Face, trunk, upper arm	0 (0)	2 (4.7)	
Clinical manifestation	Papules	72 (24.2)	36 (83.7)	<.001*
	Pustules	22 (7.4)	0 (0)	
	Papulopustules	204 (68.4)	7 (16.3)	

<sup>a</sup>Chi-square test.  
\*Statistically significant.

**TABLE 6** Association between clinical characteristics of patients with *Malassezia* folliculitis and Wood's Lamp (number of the patient  $n = 220$ )

Characteristics		Wood's Lamp		p-value <sup>a</sup>
		Positive (%)	Negative (%)	
Subjective criteria	Itchy sensation	152 (100)	68 (100)	#
Location	Face	7 (4.6)	0 (0)	.072
	Trunk	145 (95.4)	68 (100)	
Clinical manifestation	Papules	108 (71)	0 (0)	<.001*
	Pustules	22 (14.5)	0 (0)	
	Papulopustules	22 (14.5)	68 (100)	

<sup>a</sup>Chi-square test.  
\*Statistically significant.  
#Unable to assess.

**TABLE 7** Association between KOH solution and Wood's Lamp

		Wood's Lamp			Kappa value ( $\kappa$ )	p-value
		Positive	Negative	Total		
KOH	Positive	116	68	184	-0.272	<.001*
	% of Total	52.7%	30.9%	83.6%		
	Negative	36	0	36		
	% of Total	16.4%	0%	16.4%		
Total	Count	152	68	220		
	% of Total	69.1%	30.9%	100%		

\*Statistically significant.

differentiate *Malassezia* folliculitis from bacterial folliculitis. Skin scrapings taken from the content of pustule and examine under the microscope after treating with the KOH serves as a rapid, easily performed and non-invasive method for *Malassezia* detection.<sup>1,2</sup>

which the characteristic microscopic finding is multiple conidia with unipolar budding and occasionally also hyphae.<sup>5</sup> In this study, an examination by using KOH gives a positive result of 87.4%, consisting of spore load +2 up to +4 which is suggested by Jacinto-Jamora<sup>7</sup> as

a leading factor to the diagnosis of *Malassezia* folliculitis, and this result is statistically significant. Wood's lamp is another diagnostic method used to detect subclinical and broad infections, in which a fit to differentiate *Malassezia* folliculitis from another folliculitis.<sup>2,12,18</sup> Positive subjects based on Wood's lamp examination are indicated with the presence of certain compound produced by *Malassezia* spp., ptyriacitrin and ptyrialactone, which absorb Wood light and fluorescence under the ultraviolet (UV) of 365 nm.<sup>19</sup> Under Wood's lamp examination of papulopustular lesions, the yellow-green<sup>2,12,18</sup> or bluish-white<sup>10,16</sup> in a follicular pattern reflection indicates the *Malassezia* folliculitis. According to Remya et al,<sup>20</sup> the diagnostic efficacy of Wood's lamp is comparable to KOH wet mount in patients with pityriasis versicolor. To our knowledge, no studies are available regarding the diagnostic efficacy of Wood's lamp compared to KOH in *Malassezia* folliculitis' patients. Wood's light results in this study showed 69.1% of positive subjects which is statistically significant. On the contrary, combined examination of both techniques indicated that the majority of subjects are positive for each technique, albeit a case of negative upon Wood's light examination and positive upon KOH examination was 30.9%, while a case of positive upon Wood's light examination and negative upon KOH examination was 16.4%. The incidence of false-negative can also be found on Wood's lamp examination, which is thought caused by skin washing prior examination. Likewise, false-positive is also feasible to occur because of topical liquid such as makeup, deodorant and moisturising cream.<sup>21</sup>

To date, dermoscopy examination has been acknowledged as one of the tools for various dermatoses examinations and is mostly used follow-up pigmented lesions and melanocytic nevi.<sup>12</sup> Dermoscopy can serve as an auxiliary tool in the initial assessment of *Malassezia* folliculitis.<sup>13</sup> The distinct features that denote dermoscopy of *Malassezia* folliculitis are folliculocentric papule and pustules with surrounding erythema; dirty white perilesional scales; coiled hairs with perifollicular erythema and scaling; hypopigmentation of involved hair follicles; perilesional brownish discoloration in resolving lesions.<sup>14</sup> Based on our finding, there has been no cases encountered exercising dermoscopy examination. It may be because the procedure has not been routinely used for fungal-infected dermatoses but is actively used for the initial examination of suspicious pigmented skin lesions and malignancy.

Similar to dermoscopy, culture procedure is not an everyday tool used to integrate *Malassezia* folliculitis diagnosis in health facilities in this study. A fungal culture is rarely used in the diagnosis of *Malassezia* folliculitis because the causative yeasts do not grow on standard mycology media.<sup>12</sup>

Histopathological examination can differentiate *Malassezia* folliculitis from another folliculitis such as bacterial folliculitis, drug eruption with eosinophilic or pustular by fungal staining of serial sections through hair follicle.<sup>25</sup> Histopathology demonstrates dilated follicular openings with keratin plugging, cellular debris and a mixed inflammatory infiltrate. Special fungal stains may highlight budding yeast forms and spores within the follicle.<sup>1</sup> In this study, there were no cases that employ histopathological examination. This procedure is not frequently used to integrate *Malassezia* folliculitis diagnosis in our local health facilities.

Based on the analysis of the association between KOH and Wood's lamp, it is obtained  $\kappa$ -value = -0.272 with  $p$ -value < .001 (Table 7) which indicates there was evidence of an agreement between variables. Thus, our study found that besides clinical features and direct microscopic examination through KOH preparation, Wood's lamp examination proves to be an important addition to the diagnostic criteria for *Malassezia* folliculitis and should be considered in the diagnosis of the disease.

There are several limitations of this study. There were a few incomplete medical records that need to be excluded. The other limitation was number of data that were poorly documented, including predisposition factors and responses upon therapy caused by lack of follow-up. Furthermore, no culture examinations were conducted in this study, and as a result, the *Malassezia* species could not be described.

Studies on clinico-laboratory findings of *Malassezia* folliculitis are still limited. The statistically significant clinico-laboratory findings of *Malassezia* folliculitis in seven referral teaching hospitals in Indonesia are now available in this retrospective study, comprises anamnesis of pruritus, the characteristic clinical manifestation of papulopustular follicular lesions on the trunk-chest, back and shoulder, as well as the presence of spore load detected using KOH and positive Wood's lamp fluorescence noted in yellow-green or bluish-white.

## 15 AUTHOR CONTRIBUTION

**Nurdjannah J. Niode:** Conceptualization (lead); Investigation (lead); Funding acquisition (lead); Writing—original draft (lead); Methodology (lead); Validation (lead); Visualisation (lead); Writing—review & editing (lead); Software (lead); Formal analysis (lead); Project administration (lead); Data curation (lead); Supervision (lead); Resources (lead). **Pieter Levinus Suling:** Conceptualization (equal); Investigation (equal); Methodology (equal); Validation (equal); Visualisation (equal); Writing—review & editing (equal); Formal analysis (equal); Data curation (equal); Supervision (equal); Resources (equal). **Aryani Adji:** Conceptualization (equal); Investigation (equal); Methodology (equal); Validation (equal); Visualisation (equal); Writing—review & editing (equal); Formal analysis (equal); Data curation (equal); Supervision (equal); Resources (equal). **Eliza Miranda:** Conceptualization (equal); Investigation (equal); Writing—original draft (equal); Methodology (equal); Validation (equal); Visualisation (equal); Writing—review & editing (equal); Formal analysis (equal); Data curation (equal); Supervision (equal); Resources (equal). **Kusmarinah Bramono:** Conceptualization (equal); Investigation (equal); Methodology (equal); Validation (equal); Visualisation (equal); Writing—review & editing (equal); Formal analysis (equal); Data curation (equal); Supervision (equal); Resources (equal). **Linda Astari:** Conceptualization (equal); Investigation (equal); Methodology (equal); Validation (equal); Visualisation (equal); Writing—review & editing (equal); Formal analysis (equal); Data curation (equal); Supervision (equal); Resources (equal). **Evy Ervianti:** Conceptualization (equal); Investigation (equal); Methodology (equal); Validation (equal); Visualisation (equal); Writing—review & editing (equal); Formal analysis (equal); Data curation (equal); Supervision (equal).

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#### CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

#### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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