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Original Article

Health Literacy of High School Students in Indonesia: Prevalence and Gender Differences in Predictors

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Abstract

Background: Health literacy refers to the ability to find, understand, and apply health information to make informed health decisions. In Indonesia, students generally have low levels of health literacy. Research on student health literacy and its predictors is rarely conducted in Indonesia. This study aimed to investigate gender differences in the factors associated with the health literacy levels among high school students in Central Java, Indonesia.

Methods: A school-based cross-sectional survey was conducted from January 2023 to May 2023. A total of 1285 tenth- and eleventh-grade students were randomly chosen from five state high schools located in the Central Java region, Indonesia. Data on health literacy were collected using the Short-Form Health Literacy Scale (HLS-SF12). A gender-stratified multivariable analysis was conducted to investigate gender differences in factors determining health literacy levels.

Results: The majority of the respondents (44.75%) had problematic health literacy, while only 2.96% exhibited excellent health literacy. Factors associated with health literacy levels in students differed by gender. Health literacy levels in female students were determined by grades, family affluence scale, and academic score (OR = 2.05, 95% CI:1.44-2.94). In male students, academic score was the only factor significantly associated with health literacy (OR = 2.04, 95% CI: 1.29-3.23).

Conclusion: Students' academic ability plays a central role in determining health literacy levels in male and female students. Therefore, integrated efforts need to be undertaken in schools to increase the health literacy of high school students, especially targeting vulnerable groups such as adolescents with low academic performance, grades, and family affluence scale.

Keywords: Academic performance, Socioeconomics factors, Health literacy, Students

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Introduction

Health literacy refers to the knowledge, motivation, and skills needed to access, understand, evaluate, and use health information to make informed decisions about care, disease prevention, and health promotion throughout life (1). It has been a global concern since the World Health Organization (WHO) emphasized the importance of public health literacy for strengthening national health systems (2). In particular, the need for health literacy became especially urgent during the COVID-19 pandemic. In today's globalized information era, the pandemic has brought a new problem, known as the *infodemic*, a rapid surge of information, whether accurate or inaccurate, triggered by specific events such as pandemics. This information spreads rapidly through social media and often includes misinformation, rumors, and manipulation. The emergence of widely circulated information related to COVID-19 across various media platforms has raised significant challenges for health educators and healthcare providers (3).

Health literacy is a key determinant of individual health status. Good health literacy is associated with improved individual health promotion across all age groups. A systematic review has shown that it is linked to improved individual health promotion, more effective use of health services, and a better perception of overall health and quality of life (4,5). It also positively influences the younger age group, as healthy habits typically begin early in life (5). Research on students in Pakistan demonstrated that individual health literacy positively predicted COVID-19 prevention behaviors and awareness (6). In addition to COVID-19, health literacy also influences other disease-related preventive behaviors. A literature review found that adolescent health literacy is associated with health information-seeking behavior, medication adherence, and health-promoting behaviors such as abstaining from smoking, engaging in physical activity, maintaining a healthy diet, and practicing safe sex (7).

However, inadequate health literacy remains a concern worldwide, particularly among adolescents. A study on Health Behavior in School-Aged Children (HBSC) in Europe found that 13.3% of adolescents had low health literacy, 67.2% had intermediate levels, and only 19.5% had high health literacy (8). Although no national-level data on adolescent health literacy levels in Indonesia are available, regional studies have reported varying levels of adequate or high adolescent health literacy, ranging from 25.4% to 74.9% (9,10).

The factors influencing adolescent health literacy are multifaceted. A model explaining these factors divides them into three domains: individual characteristics (e.g., general literacy and cognitive skills), demographic factors (e.g., age, gender, and socioeconomic status), and contextual factors (e.g., family support, school environment, community resources, culture, and media exposure) (5). A health literacy model for children and adolescents highlights two key factors: family demographics and parental influences, influencing their health literacy. Adolescents tend to rely on their parents for social and economic support, so adolescents' socioeconomic status cannot apply to this context. Consequently, the Family Affluence Scale (FAS) is often used to assess family socioeconomic status in this context (5,8,11). A previous study showed that female adolescents tended to have higher levels of health literacy than their male counterparts (8). In addition, health literacy has been influenced by educational indicators such as school academic performance, general literacy skills, and learning motivation (5,12,13).

Adolescents' health literacy in Indonesia has not been widely investigated. Previous studies have focused on university students' health literacy rather than high school adolescents (9,14,15). However, adolescents begin adopting healthy habits during their formal education, making it essential to examine health literacy at the high school level. Previous studies on the health literacy of high school students have mainly been conducted in metropolitan cities such as Surabaya. These studies have also found that gender determines health literacy level (9) Therefore, the present study was conducted across several regions in Central Java to provide insights into adolescent health literacy in suburban areas. This study had two main objectives: (1) to describe the health literacy level of high school students and (2) To determine gender differences in factors associated with health literacy such as family affluence scale, academic ability, and age among high school students in Central Java.

Materials and Methods

Study Design, Population, and Sampling Technique

This school-based cross-sectional study was conducted from January 2023 to May 2023 in Central Java province, Indonesia. A multistage sampling method was used to select eligible students. In the first stage, five regencies were randomly chosen from all regencies in Central Java Province. One public high school from each regency was selected based on its "A" school accreditation status. In this study, academic ability was measured using academic scores from the previous academic year. To ensure comparability, it was essential to select schools with a standardized assessment and scoring system, so "A" accredited high schools were chosen, as they follow the same standardized evaluation criteria, ensuring consistency across all schools included in the study. The study sample consisted tenth- and eleventh-grade students who were active WhatsApp users. The simple random sampling technique was used to choose the respondents in each school. The sample size was determined using the following formula (16): :

$$n = \frac{N(Z^2)p(1-p)}{d^2(N-1)+(Z^2)p(1-p)}$$

where

n = Required sample size

N = total population (3527)

Z = Z-score (1.96 for a 95% confidence level), estimated proportion

p = Estimated proportion (0,357 based on a previous study (9))

d = Margin of error (0.05)

Based on this calculation, the minimum required sample size was 657. However, this study collected responses from a total of 1,285 students to enhance statistical power, improve representativeness, and account for potential missing or incomplete data.

Data Collection

This study collected data online using Google Forms. Students' contact numbers were obtained through school captains or homeroom teachers. Respondents were given a maximum of three opportunities to complete the form, and they could withdraw at any point if they did not respond.

Variables and Measurement

This study examined the relationship between several independent variables, including family affluence, age, grade, and academic ability, and health literacy as the dependent variable. The Short-Form Health Literacy Scale (HLS-SF12) evaluates health literacy across three domains: health care, disease prevention, and health promotion (17). The questionnaire consists of twelve questions, each covering four dimensions: access, understanding, appraisal, and application, using a four-point Likert scale. The questionnaires were validated using item-total correlation analysis. The r-count values, obtained from the Pearson correlation coefficient, were all greater than 0.361, indicating that each item was valid and consistent with the

overall scale. In addition, a reliability test was conducted using Cronbach's alpha, which yielded a score of 0.813, demonstrating good internal consistency. Health literacy scores were obtained by calculating the average score of twelve questions using the following formula:

(mean-1) x (50/3)

This resulted in scores ranging from 0 to 50. Respondents were categorized as low health literacy if the score was between 0 and 33 and good health literacy if the score was between 34 and 50 (17).

The FAS-III questionnaire measured family affluence containing six questions (18). Five questions from the Indonesian version were valid and reliable, including car ownership, access to a private bedroom, computer ownership, number of bathrooms, and frequency of traveling abroad. Respondents were classified as low or high based on their score range, with a Cronbach's alpha score of 0.773. The questions included were questions about car ownership (no = 0, one = 1, two = 2), private bedrooms (no = 0, yes = 1), the number of computers owned by the family (no = 0, one = 1, two = 2, three = 3), the number of bathrooms (no = 0, one = 1, two = 2, three = 3), and the frequency of going abroad in the past year (no = 0, one = 1, two = 2, three = 3). Respondents were categorized as having a low family affluence scale if their total score ranged from 0 to 7 and high family affluence if their score was 8 or above.

Academic ability was measured using items adapted from the Indonesian version of the Global School-based Student Health Survey, focusing on respondents' highest academic grades and perceived ease of learning (19). The Cronbach's alpha score was 0.782, and good academic ability was defined as having no difficulty in learning or completing assignments and having a minimum academic score of 74.6 in the last years (20).

Data Analysis

This study utilized multiple logistic regression analysis, generating three models to explore the relationship between health literacy and its influencing factors among female and male students. Model selection was guided by theoretical frameworks, literature review, and statistical indicators such as Akaike information criterion (AIC), Bayesian information criterion (BIC), and pseudo R2 values. All analyses were conducted using Stata version 14, with a 95% confidence interval (CI) and a significance level set at $P < 0.05$.

Results

Characteristics of Respondents

Table 1 summarizes the characteristics of respondents by gender, age, grade, health literacy, family affluence, and academic ability. The majority of participants were female aged 14-16 years, with 14.40% from high socioeconomic status families. Female students demonstrated significantly higher academic scores, although the overall proportion of students classified as having high academic ability was low.

Health Literacy Score

Tables 1 and 2 display that the mean health literacy score among the 1285 participants was 31.32 (± 5.64). Of these, 44.75% (n = 575) had problematic health literacy, and only 2.96% (n = 38) had excellent health literacy levels (Table 1). Therefore, 58.84% of participants were categorized as having low health literacy (i.e., insufficient or problematic levels). There was no statistically significant difference in total health literacy scores between female students (31.27 ± 5.48) and male students (31.42 ± 5.95), with a *P*-value of 0.253. The health promotion domain had the highest competency scores, particularly in understanding media information, while the healthcare domain scored the lowest. In health promotion, understanding media information ranked highest, whereas application skills scored the lowest. In the disease prevention domain, application skills were strongest, while understanding was the weakest. In the health domain, access competencies ranked highest, with appraisal of treatment options scoring the lowest (Table 2).

Table 3 presents a simple analysis of health literacy levels based on gender, age, grade, family affluence scale, and academic ability. The results showed that all independent variables, except gender, were significantly related to health literacy level. Meanwhile, academic ability had the strongest association with health literacy, with an odds ratio (OR) of 2.02 (95% CI: 1.52,-2.67). Subsequently, these five variables were used to develop a model that explained the factors associated with health literacy level.

Factors Associated With Health Literacy Among High School Students (Female and Male)

Table 4 presents the final three models that identify the factors influencing health literacy among all respondents (Model 1), female students (Model 2), and male students (Model 3). Multiple logistic regression models were developed to identify the best predictors of health literacy in total respondents. The variance inflation factor (VIF) analysis showed no significant multicollinearity, but age and grade were highly correlated. The final model shown in Table 4 was selected based on the lowest AIC and BIC values, as well as the highest pseudo-R2. As seen in Table 4, in Model 1 (total students), students with good academic ability were more than twice as likely to have adequate health literacy (OR = 2.03, 95% CI (1.53-2.69). Other factors associated with good health literacy were being in the eleventh grade and belonging to a family with a good family affluence scale.

Models 2 and 3 reveal distinct factors associated with the health literacy level of female and male students. The level of health literacy in female students was determined by three factors: grade (OR = 1.64, 95% CI: 1.23-2.18), family affluence scale (OR = 1.69, 95% CI: 1.13-2.51), and academic score (OR = 2.05, 95% CI: 1.44-2.94). Female

Table 1. Characteristics of Respondents by Gender

Variable	Male (n = 445) No. (%)	Female (n = 840) No. (%)	Total (N = 1285) No. (%)
Age			
14-16	286 (64.27%)	552 (65.71%)	838 (65.21%)
17-18	159 (35.73%)	288 (34.29%)	447 (34.79%)
Grade			
10	257 (57.75%)	461 (54.88%)	718 (55.88%)
11	188 (42.25%)	379 (45.12%)	567 (44.12%)
Regency			
Pemalang	104 (23.37%)	132 (15.71%)	236 (18.37%)
Salatiga	92 (20.67%)	160 (19.05%)	252 (19.61%)
Surakarta	83 (18.65%)	181 (21.25%)	264 (20.54%)
Karanganyar	86 (19.33%)	194 (23.10%)	280 (21.79%)
Sragen	80 (17.98%)	173 (20.60%)	253 (19.69%)
Family Affluence Scale			
Low	380 (85.39%)	720 (85.71%)	1,100 (85.60%)
High	65 (14.61%)	120 (12.49%)	185 (14.40%)
Health literacy level			
Insufficient	61 (13.71%)	120 (14.29%)	181 (14.09%)
Problematic	192 (43.15%)	383 (45.60%)	575 (44.75%)
Sufficient	175 (39.33%)	316 (37.62%)	491 (38.21%)
Excellent	17(3.82%)	21 (2.50%)	38 (2.96%)
Academic score			
High	111 (24.94%)	191 (22.74%)	302 (23.50%)
Low	334 (75.06%)	649 (77.26%)	983 (76.50%)
Highest academic score in the past year			
Least than 59.5	4 (0.90%)	2 (0.24%)	6 (0.47%)
59.6-74.5	38 (8.54%)	41 (4.88%)	79 (6.15%)
74.6- 90.5	254 (57.08%)	419 (49.88%)	673 (52.37%)
90.6-100	149 (33.48%)	378 (45.00%)	527 (41.01%)
Difficulty in studying/doing assignments			
Always	10 (2.25%)	15 (1.79%)	25 (1.95%)
Often	79 (17.75%)	147 (17.50%)	226 (17.59%)
Sometimes	268 (60.22%)	516 (61.43%)	784 (61.01%)
Rarely	69 (15.51%)	133 (15.83%)	202 (15.72%)
Never	19 (4.27%)	29 (3.45%)	48 (3.74%)

students in higher grades were 1.64 times more likely to exhibit adequate health literacy compared to those in lower grades. Similarly, students from more affluent families were 1.69 times more likely to have adequate health literacy than those from less affluent backgrounds. Notably, students with higher academic scores were more than twice as likely (OR = 2.05) to have good health literacy compared to those with lower academic performance. In contrast, the only factor significantly associated with health literacy level in male students was the academic score (OR = 2.04, 95% CI: 1.29-3.23).

Discussion

This study revealed that the health promotion domain had the highest mean score, while the health care domain had the lowest. These findings suggest that students are more familiar with general health knowledge than navigating the healthcare system or making personal medical decisions. Similar studies in Denmark, Nepal, and Germany found higher health literacy in health promotion but difficulties in communication and decision-making (21-23). A study among German adolescents found that only 8.4% had significant difficulties in understanding health information, indicating relatively good access and understanding. However, 28.13% had low health-related communication skills, and more than half (50.65%) reported challenges in making judgments and health-related decisions (23). These results highlight a gap between understanding and applying health information, underscoring the need for programs that strengthen

Table 2. Descriptive Statistics of Health Literacy Score

No.	Questions	Very Difficult n (%)	Fairly Difficult n (%)	Fairly Easy n (%)	Very Easy n (%)	Mean (±SD)
Healthcare domain						2.72 (±0.42)
1	Q1. Access	19 (1.48)	220 (17.12)	903 (70.27)	143 (11.13)	2.91 (±0.58)
2	Q2. Understand	43 (3.35)	414 (32.22)	747 (58.13)	81 (6.30)	2.67 (±0.64)
3	Q3. Appraise	36 (2.80)	467 (36.34)	718 (55.88)	64 (4.98)	2.63 (±0.62)
4	Q4. Apply	62 (4.82)	434 (33.77)	686 (53.39)	103 (8.02)	2.64 (±0.69)
Disease prevention domain						2.87 (±0.45)
5	Q5. Access	54 (4.20)	315 (24.51)	706 (54.94)	210 (16.34)	2.84 (±0.74)
6	Q6. Understand	55 (4.28)	381 (29.65)	738 (57.43)	111 (8.64)	2.70 (±0.68)
7	Q7. Appraise	29 (2.26)	261 (20.31)	801 (62.33)	194 (15.10)	2.90 (±0.66)
8	Q8. Apply	8 (0.62)	142 (11.05)	921 (71.67)	214 (16.65)	3.04 (±0.55)
Health promotion domain						3.05 (±0.43)
9	Q9. Access	11 (0.86)	205 (15.95)	806 (62.72)	263 (20.47)	3.02 (±0.63)
10	Q10. Understand	4 (0.31)	44 (3.42)	761 (59.22)	476 (37.04)	3.33 (±0.55)
11	Q11. Appraise	8 (0.62)	137 (10.66)	866 (67.39)	274 (21.32)	3.09 (±0.58)
12	Q12. Apply	58 (4.51)	384 (29.88)	660 (51.36)	183 (14.24)	2.75 (±0.75)
	Total					31.32 (±5.64)

Note. SD: Standard deviation.

Table 3. Simple Analysis of Health Literacy Based on Age, Grade, Gender, Family Affluence Scale, and Academic Ability Variables

Variable	Health Literacy (N=1285)				*P*-value	COR	95% CI for COR
	Low		Adequate				
	n	%	n	%			
Gender							
Male	253	56.85	192	43.15	0.294	1.13	0.89-1.42
Female	503	59.88	337	40.12			
Age							
14-16	518	61.81	320	38.19	0.003	1.42	1.12-1.79
17-18	238	53.24	209	46.76			
Grade							
10	454	63.23	264	36.77	<0.001	1.51	1.21-1.88
11	302	53.26	265	46.74			
Family Affluence Scale							
Low	663	60.27	437	39.73	0.011	1.50	1.09-2.05
High	93	20.27	92	49.73			
Academic score							
High	215	71.19	87	28.81	<0.001	2.02	1.52-2.67
Low	541	55.04	442	44.96			

Note. COR: Crude odds ratio; CI: Confidence interval.

decision-making and communication skills (24).

This study also suggested that 58.8% of the respondents exhibited low health literacy. This proportion is lower than that reported in previous research on health literacy levels in high school students in Surabaya, Indonesia, which was 64.27% (9). This level of health literacy is similar to that in other Asian countries, with 61.6% of Indian adolescents and 61% of Nepali adolescents demonstrating inadequate health literacy (21,24). A study conducted in Lithuania and Ghana found that 70.5% of the students had low health literacy, and 55% had a limited degree of health literacy (25,26). In contrast, the proportion of students with adequate health literacy in this study was higher than in a previous study conducted in China, which reported that only 14.4% of adolescents had sufficient health literacy (27).

Conversely, a study in Taiwan found that 30.17% of the participants had low health literacy (28), while a study in Melbourne on teenage health literacy found that 32.2% of students were prone to having inadequate health literacy (29). These differences may be attributed to several factors, including differences in rural versus urban residence. A prior systematic review revealed that urban populations exhibited superior health literacy compared to rural populations. However, this disparity in health literacy

Table 4. Multiple Logistic Regression Analysis of Factors Associated With Health Literacy of High School Students

Variable	Model 1 (Total)		Model 2 (Male)		Model 3 (Female)	
	AOR (95% CI)	*P* Value	AOR (95% CI)	*P* Value	AOR (95% CI)	*P* Value
Grade 10[ref] 11	1.54 (1.23-1.94)	<0.001	1.42 (0.96-2.08)	0.073	1.64 (1.23-2.18)	0.001
Family Affluence Scale Low [ref] High	1.46 (1.06-2.01)	0.018	1.13 (0.66-1.94)	0.643	1.69 (1.13-2.51)	0.009
Academic score High Low [ref]	2.03 (1.53-2.69)	<0.001	2.04 (1.29-3.23)	0.002	2.05 (1.44-2.94)	<0.0001
AIC	1703.79		1703.79		1703.79	
BIC	1724.43		1724.43		1724.43	
Pseudo R^2	2.6%		2.2%		3.0%	

Note. AOR: Adjusted odd ratio; ref: Reference; AIC: Akaike information criterion; BIC: Bayesian information criterion.

between rural and urban areas cannot be solely attributed to rurality, and sociodemographic characteristics are significant contributing factors (30).

The study suggests that health literacy is influenced by academic ability, grade, and family affluence. Individual factors such as age, gender, socioeconomic status, education, occupation, and general literacy also impact personal health literacy levels (31,32). Studies in Brazil and Germany found that higher socioeconomic status and family affluence are positively associated with better health literacy (23,33). Parents with higher socioeconomic status can influence their children's health literacy by providing better educational environments, including health-related education (34-36). Moreover, parents with high socioeconomic status are more likely to have good health literacy. Therefore, they can better motivate their children to use health services, which in turn indirectly improves their health literacy. This is consistent with a study showing that adolescents from more affluent families are more likely to utilize reproductive health services (37).

Adolescents from highly educated families with good affluence have adequate health literacy and often rely on parental support to access health information (11). Family demographics, parental influence, and environmental factors significantly influence adolescent health literacy (5). Conversely, individuals from a low family affluence scale are more vulnerable and prone to the impacts of low health literacy. Therefore, they should be prioritized when establishing policies related to adolescent health.

Moreover, health literacy is strongly influenced by academic achievement and general literacy. This study found that both academic ability and grade level were related to health literacy level, consistent with a study in Pakistan, where higher education levels were associated with better health literacy (38,39). Academic ability is a mediator for factors influencing an individual's health condition (13). Individuals with good academic ability possess better basic reading skills, which supports one domain of health literacy, namely, health information-seeking behavior. They are also more likely to have the critical thinking skills needed to make complicated health decisions in the modern era (40). Interestingly, family affluence is linked to academic ability, as adolescents from wealthier families generally have access to better education. However, academic ability significantly correlates with adolescents' health literacy, highlighting health disparities in groups with low academic ability.

Interestingly, unlike previous studies, this study found no significant relationships between gender and health literacy levels. Earlier studies have frequently identified gender as a key determining factor, with female adolescents often demonstrating better health literacy (9,21,41,42). This is likely due to the assumption that women experience more health-related problems and are, therefore, more attentive to health issues than men. However, this study found no evidence of a significant relationship between age or gender and health literacy. The findings suggest that factors associated with health literacy levels differ by gender. Among male students, academic ability emerged as the only predictor of health literacy. In contrast, the health literacy of adolescent females was predicted by grade level, family affluence scale, and academic ability. These findings support existing literature suggesting gender differences in factors affecting adolescent behavior, with females more influenced by environmental factors such as family and peer relationships and males more influenced by internal ones (43). A similar pattern was observed in a study on Chinese middle school students, showing gender differences in health literacy, its associated factors, and related health behaviors (44). However, further research is still needed to better understand how gender differences impact the elements related to health literacy. Empirical investigations are required to examine these mechanisms in depth.

This study has several notable strengths. It is the first study in Indonesia to investigate gender-specific factors affecting health literacy levels among high school students in Central Java Province, thereby contributing to the minimal existing literature on adolescent health literacy in Indonesia. Although parental socioeconomic status and academic ability are often difficult to modify, they help explain health disparities in disadvantaged socioeconomic

groups (13). Consequently, future interventions must consider parental socioeconomic status and students' academic ability. Given that the majority of adolescents spend a significant portion of their time in the school environment, future interventions should involve educating and improving self-efficacy in schools (23). For example, Germany offers a school-based intervention that integrates health literacy materials into the curriculum while building social support networks among students. This intervention can potentially increase students' health literacy (45,46).

This study has several limitations. First, it included only one high school in each district, which may not reflect the heterogeneity of the student population across Central Java Province. Second, its focus on suburban areas limits the generalizability of the findings to urban and rural contexts. Third, the cross-sectional approach does not provide causal relationships for health literacy. Therefore, similar research should be conducted at the national level using a nationally representative sample by adding variables other than socioeconomic and demographic factors. Furthermore, this study used the HLS-SF12, a self-reported instrument, to assess health literacy, which may introduce response bias. Participants might overestimate their abilities due to social desirability or a lack of awareness of their actual literacy level, or conversely, underestimate their skills due to a lack of confidence or misinterpretation of the questions. To improve accuracy, future studies should combine objective measures such as TOFHLA or NVS, which assess functional health literacy, with self-reported tools (e.g., HLQ or eHEALS), which capture perceived abilities.

Conclusion

This study found that most high school students in Central Java had low health literacy. Factors that are associated with health literacy levels differ by gender. Grades, family affluence scale, and academic scores determined female students' health literacy level. The only factor significantly associated with the health literacy level in male students was academic ability. Students' academic ability emerged as a dominant predictor of health literacy levels for both male and female students. The students' age was not related to students' health literacy. It is necessary to increase the health literacy of high school students through integrated efforts in schools, especially targeting vulnerable groups, namely, adolescents with low family affluence scale, grades, and academic ability.

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Authors' Contribution

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Competing Interests

The authors declare no competing interests associated with the material presented in this paper.

Ethical Approval

This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Surakarta (Approval No. 4952/B.2/KEPK-FKUMS/VIII/2023). Furthermore, informed consent was obtained from all participants prior to their inclusion in the study.

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