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Biopsychosocial Factors Associated with Dysmenorrhea among High-School Girls in Makassar, Indonesia

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ABSTRACT

Introduction: Dysmenorrhea is a common menstrual disorder among adolescents and constitutes a significant public health concern due to its adverse effects on school attendance, academic performance, and quality of life. In low- and middle-income countries, including Indonesia, school-based evidence examining associations between biological, psychological, and lifestyle factors and dysmenorrhea remains limited. This study aimed to investigate associations between selected biopsychosocial variables and dysmenorrhea among senior high-school girls in Makassar, Indonesia.
Method: A school-based cross-sectional study was conducted among 45 female students at SMA Bajiminasa Makassar using a total sampling approach. Data were collected through a structured, self-administered questionnaire assessing dysmenorrhea status, physical activity level, psychological stress, family history of dysmenorrhea, age at menarche, and menstrual cycle regularity. Descriptive statistics were used to estimate prevalence. Associations between variables were examined using bivariate analyses, including chi-square or Fisher's exact tests when appropriate, and effect sizes were expressed as odds ratios (ORs) with 95% confidence intervals (CIs).
Results: The prevalence of dysmenorrhea was 82.2%. Bivariate analyses indicated statistically significant associations between dysmenorrhea and inadequate physical activity, psychological stress, positive family history of dysmenorrhea, earlier age at menarche, and irregular menstrual cycles. Adolescents reporting psychological stress or a family history of dysmenorrhea demonstrated particularly high proportions of menstrual pain within this sample.
Conclusion: Dysmenorrhea is highly prevalent among senior high-school girls in Makassar and was associated with several biological, psychological, and lifestyle variables examined in this exploratory analysis. These findings are consistent with biopsychosocial perspectives on adolescent dysmenorrhea, although the cross-sectional and bivariate analytical design limits causal interpretation. The results highlight the potential relevance of integrated school-based screening and health education initiatives addressing physical activity, psychological well-being, and menstrual health. Given the small sample size and single-school setting, findings should be interpreted cautiously and warrant confirmation in larger multi-site studies.

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INTRODUCTION

Adolescent girls worldwide are frequently diagnosed with dysmenorrhea, indicating a significant public health concern that is often overlooked. Despite the existence of systematic reviews, and multi-country studies, all evidence suggests that dysmenorrhea is most common in adolescents in low- and middle-income countries (LMICs), where schooling girls experience menstrual pain (1–3). The prevalence estimates for adolescent girls in sub-Saharan Africa and South Asia are often higher than two thirds in many LMIC settings, but the reported rates vary depending on study design, population characteristics, and measurement approaches (1,3,4). The results suggest that dysmenorrhea is not merely a clinical condition, but possesses widespread effects on teen health and development.

In LMICs, dysmenorrhea has a significant impact on educational participation and academic engagement in school settings. Why is this so? Research conducted in Africa and South Asia has revealed significant functional consequences, such as school dropout rates, decreased classroom engagement, and poor concentration levels (5–9). This method serves as a function for water, sanitation, and hygiene (WASH) facilities, limited access to menstrual health resources, and persistent menstrual stigma further exacerbate the effects of menstrual pain on adolescents' daily lives (10–12). This evidence together shows that dysmenorrhea acts as a structural obstacle that affects girls' ability to get an education and leads to unequal opportunities in low and middle income countries.

Academic performance and quality of life have been found to decline in people with dysmenorrhea. Approximately 18-20% of adolescents who experience menstrual pain report absenteeism, as well some international and regional studies on their symptoms, which can also lead to reduced concentration, decreased study efficiency and less participation in the classroom (13–16). The presence of dysmenorrhea can have detrimental effects on adolescents, causing them to experience psychosocial distress, fatigue, and emotional strain that is often linked to their educational situation. This is particularly concerning in families with young children. According to LMIC-focused research, menstrual pain is linked to reduced life satisfaction and decreased involvement in academic and social activities (17–19). In combination, these results suggest that dysmenorrhea is a significant contributor to the development of adolescents' educational and psychosocial well-being.

From a biological point of view, primary dysmenorrhea in teenagers is usually caused by too much production of prostaglandins during their period, especially prostaglandin F2α and prostaglandin E2. High levels of prostaglandins cause strong contractions in the uterus, narrow blood vessels, reduce blood flow to the uterus, and send pain signals, which result in menstrual cramps. The enzyme cyclooxygenase-2 is very important in this process (20–22). However, just looking at biological factors doesn't fully explain why some teenagers experience much more severe menstrual pain and have a bigger impact on their daily lives than others.

The biopsychosocial model helps us understand this better by considering not only the biological aspects but also the psychological and social influences that affect health. In this model, things like stress, anxiety, mood changes, how well someone can handle difficult situations, and what they expect about pain all play a role along with body-related factors. These things together affect when menstrual pain starts, how bad it is, and how much it feels like a burden to the person (20,23–25). Psychological stress can change how the body regulates hormones and processes pain, making pain feel worse and making it harder for teenagers to handle it well. Social situations like how people learn about periods, feelings of shame, what family members think, and how easy it is to get health care all play a role in how people talk about their symptoms, whether they ask for help, and how well they can do everyday tasks (23–25). This method serves as a tool to address comorbid anxiety and depressive symptoms, along with existing cultural norms around menstruation, may further exacerbate the educational and psychosocial consequences of dysmenorrhea.

Lifestyle factors have also been found to possibly influence dysmenorrhea in teenage groups, and these factors might be changed or adjusted. Doing physical activities can help ease menstrual pain because it affects things like inflammation, releases natural painkillers called endorphins, and improves the flow of blood to the uterus. This method serves as a tool for physical activity and structured exercise, which are linked to reduced pain intensity and enhanced functional outcomes among adolescents with dysmenorrhea (26–28). Non-drug methods like exercise, heat treatment, and massage have been shown to help reduce pain. This might happen because they can change the levels of prostaglandins and affect how the brain processes pain signals (26,29). These results show how important it is to focus on everyday habits as easy ways to make a difference in schools.

This method serves as an instrument, with evidence from Southeast Asia, and Indonesia in particular, still remaining limited. Many existing studies in Indonesian schools report a high occurrence of dysmenorrhea and

associated absences from school, but most focus mainly on describing how common it is or looking at single factors rather than exploring several biological, psychological, and social factors all together in the same study (30). Besides that, differences in how measurements are taken and the fact that not many studies use the same tools make it hard to compare results from one study to another. This method serves as a tool for examining though not necessarily adjusted associations between biological, psychological, and lifestyle factors in Indonesian school environments remains relatively scarce.

To fix these gaps, more research is needed in Indonesian schools that looks at several factors affecting both body and mind together, especially in school environments where painful periods might impact how students participate in classes. This kind of evidence can help create better programs for adolescent reproductive health that help find problems early and promote health in schools. This study looks at how certain biological, psychological, and lifestyle factors are connected to dysmenorrhea in senior high-school girls in Makassar, Indonesia. It focuses on physical activity levels, feelings of stress, family history of painful periods, the age at which girls first start their periods, and how regular their menstrual cycles are.

METHODOLOGY

Study Design

This study used an observational analytic method and took a cross-sectional approach. Cross-sectional studies are commonly used in research conducted in schools to find out how common certain health issues are and to look at how different factors are connected to these health outcomes in groups of adolescents. This type of study is especially common in countries with lower or middle incomes, where it can be difficult to follow the same group of people over a long period of time due to limited resources (31,32). Because the study group was small and limited in size, the design was mainly meant for looking things over and learning more, rather than proving cause and effect.

Study Setting and Population

The research took place at SMA Bajiminasa, which is a high school for senior students in Makassar, Indonesia. The group we focused on included every girl who was a student at the school during the study and had started her menstrual cycle. This method was chosen to provide systematic access to adolescents within a defined educational setting, in line with methodological guidance for adolescent reproductive health research (27). Since the study focused on one school, the results apply mainly to that specific setting and may not reflect what's true for all teenagers in general.

Sampling Technique and Sample Size

A total sampling technique was applied, whereby all eligible female students at the school were invited to participate. This approach was chosen to minimize selection bias and to ensure complete coverage of the available study population, which was relatively small and bounded within a single school. A total of 45 respondents met the inclusion criteria and provided complete data for analysis. Because the study was conducted within a finite school population, a priori sample size calculation was not performed and recruitment was determined by the number of eligible students available during the study period. Although larger and stratified samples are recommended for multi-site or inferential studies, total sampling is considered appropriate for exploratory, single-school analyses and provides valuable context-specific evidence (27). However, the modest sample size and the limited number of non-dysmenorrhea cases may reduce statistical precision and increase susceptibility to sparse-data bias; therefore, results should be interpreted cautiously.

Variables and Operational Definitions

Dependent Variable

Dysmenorrhea was defined as the self-reported presence of menstrual pain experienced during menstruation. Self-reported dysmenorrhea is often used in studies about teenage health and is seen as a good way to show how symptoms happen and how much they bother people, especially when the same definition is used every time (33). Respondents were categorized into dysmenorrhea and non-dysmenorrhea groups based on their reported menstrual pain experience. This method has function as an instrument. This binary classification helped make it easier to analyze categories and see how they relate to the chosen explanatory variables.

Independent Variables

The factors studied were how active someone is, how much stress they feel, if their family has a history of painful periods, their age when they first started having periods, and whether their monthly cycles happen on a regular schedule. These variables were chosen beforehand using a biopsychosocial framework that combines biological, psychological, and lifestyle factors as determinants of dysmenorrhea (34,35). This method serves as an instrument for analyzing the relationship between dysmenorrhea and each variable individually via bivariate analysis. The study looked into the associations between dysmenorrhea and each variable individually through bivariate analysis.

Physical activity was measured through questions people answered about their usual activities and whether they did enough based on how often and how regularly they engaged in those activities. Studies show that when adolescents are asked about their physical activity and they have clear guidelines on how long to remember their activities, the results are reliable. However, there is still a chance that people might not remember accurately, which could affect the results. (36). The way activities were grouped was based on how often people reported doing regular physical exercise in a usual week. Their answers were put into two groups: one for enough activity and one for not enough, based on specific rules set by the study.

Psychological stress was measured through a self-completed questionnaire that evaluated how stressed the person felt. Earlier research shows that when stress is measured through self-reports, it tends to be reliable and accurately reflects the concept being studied in teenagers, especially when the tools are adjusted for cultural differences and tested beforehand (36). Responses were divided into two groups, "stress" and "no stress," based on specific scoring limits that were set using answers from a questionnaire.

Family history of dysmenorrhea means if a woman's mom, sister, or daughter has had menstrual pain, it shows there might be a genetic link or shared family and social factors that influence how pain is felt.

The age at which a girl first starts menstruation was recorded in years and grouped into categories for analysis, serving as an indicator of reproductive maturation.

Menstrual cycle regularity was determined based on the respondents' own reports and classified as regular or irregular depending on how consistent the cycle length was perceived to be. All the variables that are not the main focus were treated as categories when doing the statistical analysis.

Data Collection Instruments and Procedures

Data was gathered through a structured questionnaire that people filled out on their own. The questionnaire included sections about their personal background, menstrual history, level of physical activity, feelings of stress, and family history of painful periods. It's best to use questionnaires with several questions in studies about teenage menstrual pain to make the results more trustworthy and to look at different aspects of health and well-being all at once (37,38). The questionnaire was created using information from existing studies and modified to fit the local school setting so that teenage students could understand it easily.

Before starting to collect data, the questionnaire was checked and tested beforehand to make sure it was clear, suitable for the local culture, and easy for teenagers to understand. This followed the best practices suggested for research on reproductive health in schools (37). The self-administered format was chosen to improve privacy and minimize social desirability bias when discussing sensitive topics related to menstrual health.

Data Analysis

The data was looked at using both descriptive and inferential statistical techniques. The study used basic statistics, like how often something happens and what percentage of people it applies to, to describe the participants' features and find out how common dysmenorrhea is. The study used the chi-square test to look at the connection between dysmenorrhea and each other factor, but only when the expected numbers in each group were suitable for this type of analysis. When there are small expected numbers or cells with zero counts in contingency tables, Fisher’s Exact Test was used to get more accurate results for significance. Effect sizes were calculated using odds ratios (ORs) along with their 95% confidence intervals (CIs) to show how strong the connections were and how accurate the results are (39). This method serves as a function with a p-value less than 0.05. Because the number of examples was small, all the statistical results were treated carefully. They were seen as possible links, not proof that one thing causes another.

Validity and Reliability Considerations

This method selects self-reported measures for dysmenorrhea, psychological stress, and physical activity. The selection of self-reported measures for dysmenorrhea, psychological stress, and physical activity was informed by evidence supporting their acceptable validity and reliability in adolescent populations. Although differences in how dysmenorrhea is defined across studies may make it harder to compare results, using consistent definitions and standardized questionnaires helps improve the reliability of the findings (39). The reliability of self-reported stress and physical activity was also checked using several questions and specific time frames for recalling information; but it's still possible that some bias in reporting remains. In addition, using self-reported information might lead to errors in how things are classified, so the results should be understood with careful consideration of the methods used.

Ethical Considerations

Ethical approval and permission to conduct the study were obtained from the appropriate school and institutional authorities. The study received ethical approval under the Ethical Approval Recommendation Number: Rek/064/KEPK-IIKP/VIII/2024. Written permission was obtained from parents or guardians, and assent was obtained from all students who participated in the study, in accordance with ethical principles for research involving children and adolescents (27). Participants were informed about the purpose of the study, the procedures involved, potential risks and benefits, and were assured that their information would remain confidential and that their identities would not be disclosed.

The data collection procedures were designed to protect participants' privacy, particularly because information related to reproductive health is considered sensitive. Students were free to decide whether or not to participate, and they were informed that they could withdraw from the study at any time without any consequences or penalties. Measures were taken to minimize pressure on participants and to ensure the safety of vulnerable participants, in accordance with standard ethical guidelines for research involving adolescents in school settings.

RESULTS

Characteristics of Respondents

Table 1. Socio-demographic and menstrual characteristics of respondents (n = 45)

Variable	Category	n	%
Dysmenorrhea	Yes	37	82.2
	No	8	17.8
Physical activity	Adequate	18	40.0
	Inadequate	27	60.0
Psychological stress	Yes	31	68.9
	No	14	31.1
Family history of dysmenorrhea	Yes	31	68.9
	No	14	31.1
Age at menarche	< 12 years	22	48.9
	≥ 12 years	23	51.1
Menstrual cycle regularity	Regular	11	24.4
	Irregular	34	75.6

Among the 45 respondents, 37 students (82.2%) reported experiencing dysmenorrhea. The estimated prevalence of dysmenorrhea in this sample was therefore high, although the precision of this estimate is limited by the modest sample size. A majority of respondents reported inadequate physical activity (60.0%). More than two-thirds experienced psychological stress (68.9%), and an identical proportion reported a positive family history of dysmenorrhea (68.9%). With regard to menstrual characteristics, respondents were nearly evenly distributed by age at menarche, while most participants (75.6%) reported irregular menstrual cycles. These descriptive findings provide

contextual information for subsequent bivariate analyses examining associations between dysmenorrhea and selected explanatory variables.

Physical Activity and Dysmenorrhea

Table 2. Association between physical activity and dysmenorrhea

Physical activity	Dysmenorrhea (Yes)	Dysmenorrhea (No)	Total	p-value
Inadequate	26	1	27	0.004
Adequate	11	7	18	
Total	**37**	**8**	**45**	

Dysmenorrhea was reported by almost all respondents with inadequate physical activity (26 of 27). In contrast, a lower proportion of dysmenorrhea was observed among respondents with adequate physical activity (11 of 18). Bivariate analysis indicated a statistically significant association between physical activity level and dysmenorrhea ($p = 0.004$). Given the small sample size and the presence of low expected cell counts, Fisher's Exact Test was applied where appropriate to obtain more reliable significance estimates. The magnitude of association was further evaluated using odds ratios (OR) with corresponding 95% confidence intervals (CI).

Psychological Stress and Dysmenorrhea

Table 3. Association between psychological stress and dysmenorrhea

Psychological stress	Dysmenorrhea (Yes)	Dysmenorrhea (No)	Total	p-value
Yes	31	0	31	< 0.001
No	6	8	14	
Total	**37**	**8**	**45**	

All respondents who reported experiencing psychological stress also reported dysmenorrhea (31 of 31), whereas fewer than half of respondents without stress experienced dysmenorrhea (6 of 14). This distribution resulted in a zero-frequency cell in the contingency table. Therefore, Fisher's Exact Test was used to assess the association between psychological stress and dysmenorrhea. The association between psychological stress and dysmenorrhea was statistically significant ($p < 0.001$). However, the presence of complete separation should be interpreted cautiously, as sparse data may lead to unstable effect estimates.

Family History of Dysmenorrhea and Dysmenorrhea Occurrence

Table 4. Association between family history of dysmenorrhea and dysmenorrhea

Family history	Dysmenorrhea (Yes)	Dysmenorrhea (No)	Total	p-value
Yes	31	0	31	< 0.001
No	6	8	14	
Total	**37**	**8**	**45**	

Dysmenorrhea was reported by all respondents with a positive family history of dysmenorrhea (31 of 31). Among respondents without a family history, dysmenorrhea was less frequently reported (6 of 14). Because the contingency table contained a zero-frequency cell, Fisher's Exact Test was used to assess the statistical association. The analysis indicated a statistically significant association between family history and dysmenorrhea ($p < 0.001$). As with other analyses involving sparse cells, the magnitude and precision of the estimated association should be interpreted with caution.

Age at Menarche and Dysmenorrhea

Table 5. Association between age at menarche and dysmenorrhea

Age at menarche	Dysmenorrhea (Yes)	Dysmenorrhea (No)	Total	p-value
< 12 years	21	1	22	0.001
≥ 12 years	16	7	23	
Total	**37**	**8**	**45**	

Respondents who experienced menarche before the age of 12 years more frequently reported dysmenorrhea compared with those who experienced menarche at 12 years or older. Bivariate analysis indicated a statistically significant association between earlier age at menarche and dysmenorrhea ($p = 0.001$). Effect size estimates were calculated using odds ratios with 95% confidence intervals to assess the magnitude of this association.

Menstrual Cycle Regularity and Dysmenorrhea

Table 6. Association between menstrual cycle regularity and dysmenorrhea

Menstrual cycle regularity	Dysmenorrhea (Yes)	Dysmenorrhea (No)	Total	p-value
Irregular	33	1	34	< 0.001
Regular	4	7	11	
Total	**37**	**8**	**45**	

Dysmenorrhea was reported by nearly all respondents with irregular menstrual cycles (33 of 34). In contrast, a lower proportion of dysmenorrhea was observed among respondents with regular cycles (4 of 11). Bivariate analysis demonstrated a statistically significant association between menstrual cycle regularity and dysmenorrhea ($p < 0.001$). Because of the small number of non-dysmenorrhea cases, Fisher's Exact Test was used where appropriate to ensure more reliable inference. The magnitude and precision of this association were further assessed using odds ratios with 95% confidence intervals.

DISCUSSION

This study found links between painful menstrual periods and various factors like biology, mental health, lifestyle, and family influences among high school girls in Makassar. This method serves as an instrument to examine physical activity, psychological stress, family history of dysmenorrhea, age at menarche, and menstrual cycle regularity within the same study population, the analysis provides exploratory evidence regarding multiple factors that may be related to menstrual pain among adolescents. However, since the analysis used simple statistical methods without considering multiple factors together, the results shouldn't be seen as proof of effects that happen on their own or together. Even so, the pattern of connections seen is generally in line with biopsychosocial viewpoints, which see menstrual pain as shaped by the mix of biological, psychological, and social factors.

The study looks at a specific group of people and provides initial evidence about several factors that could be connected to menstrual pain in teenagers. However, since the analysis used only bivariate statistical methods and did not account for multiple variables together, the results should not be taken as proof of independent or combined effects. Nevertheless, the pattern of associations observed is generally in line with biopsychosocial perspectives, which view menstrual pain as influenced by interactions among biological, psychological, and social factors. International evidence indicates that integrating biological mechanisms such as prostaglandin-mediated uterine activity and hormonal regulation with psychological factors, including stress, coping capacity, and emotional regulation, and with social determinants, such as water, sanitation, and hygiene facilities, stigma, and social support, yields a more comprehensive understanding of adolescent menstrual pain experiences (40–42). Even though this study didn't use multivariable or interaction models to officially check these combined paths, the fact that several related factors showed up together in the group of people studied fits with this wider idea (40,42).

The results of this study align with earlier research that has found connections between dysmenorrhea and lifestyle or psychological factors in adolescents. Prior studies have documented links between menstrual pain and physical activity patterns, psychological stress, and family history, as well as functional consequences such as school absenteeism and reduced academic engagement (32,43,44). This method has a function as an instrument for assessing these factors. The link found between low levels of physical activity and menstrual pain in this group matches what has been seen before, showing that being active regularly might help reduce pain and improve how well young people function during their periods.

In the context of Indonesia, these current results match what earlier studies in schools have found, showing that a large number of teenage girls experience severe menstrual pain. Studies from Indonesia and other parts of Southeast Asia show that things like mental stress, beliefs about menstruation in the culture, and how easy it is for teenagers to get health services that are friendly to them can all affect how much menstrual pain they feel (27,45,46). The study found a link between psychological stress and dysmenorrhea, which aligns with global research indicating that stress might affect how pain is perceived through changes in the body's hormonal systems and the brain's processing of pain signals. Similarly, the fact that dysmenorrhea tends to cluster among people who have a family history of it could be because of genetic factors, or because families share similar views and ways of dealing with menstrual pain.

This method serves as a tool for adolescent health research and school-based health initiatives. The findings also have potential implications for adolescent health research and school-based health initiatives. From a methodological point of view, the results show how important it is to use tools that are standard and adapted to different cultures, so they can properly measure biological, psychological, and lifestyle factors. Using more detailed ways to measure things can help make results from different studies easier to compare and better understand. This method serves as a tool to combine self-reported data with objective indicators, such as school attendance or academic performance records, could further strengthen the evidence base for policy and programmatic decision-making (27,47).

From a prevention point of view, the fact that many different factors were found in this study shows that school-based methods focusing on both healthy habits and mental health aspects for teenagers could be helpful. Programs that include physical activity promotion, stress-management strategies, menstrual health education, and improvements in school water, sanitation, and hygiene (WASH) facilities may be more effective in addressing multiple pathways simultaneously (13,48). These methods could be especially useful in schools in low- and middle-income countries, where problems related to menstrual health are connected to wider educational and social factors.

This method serves as a tool for psychological stress and family history associations with dysmenorrhea, which also have implications for school-based awareness and screening initiatives. Screening methods that only look at menstrual symptoms might miss important factors that affect how teenagers experience pain during their periods. Checking on students' mental health and family situations can help find those who need more help (49,50). These methods need to be carried out in a private and respectful way that considers cultural differences, which can help students feel safe to share information and protect their privacy (51-54).

Some important things to consider when understanding the results of this study should be mentioned. The way the study is set up means we can't be sure about cause and effect, and because the sample is small and comes from just one school, the results might not apply to other situations. In addition, the small number of non-dysmenorrhea cases led to sparse contingency tables and zero-frequency cells in some analyses, which may reduce the stability and precision of statistical estimates. Depending on self-reported information can also lead to bias in how people remember or report things. Using just bivariate analysis and not adjusting for multiple variables makes it hard to see the true effect of each factor or understand if other factors are influencing the results. Even though the study is exploratory and focused on a specific context, it provides important evidence from a setting that has not been well-researched before. This adds to the small amount of research on menstrual pain among teenagers that is based in schools in Indonesia

The results of this study also highlight important areas where more research is needed in the future. Longitudinal cohort studies are necessary to better understand how psychosocial factors, family dynamics, menstrual characteristics, and the course of dysmenorrhea change over time during adolescence (50,55). Future research using bigger and more varied groups could also allow for multivariable analyses that can assess both independent and interacting factors contributing to dysmenorrhea. Also, studies that look at multiple parts of school-based programs

can check how well combined approaches work for increasing physical activity, helping with stress, teaching about menstrual health, and creating better school support systems (56–58). Using both qualitative and quantitative methods in research can help better understand how different factors affect menstrual health in adolescent girls in Indonesia and other similar places (56,59).

CONCLUSION

This study found that a large number of senior high-school girls at SMA Bajiminasa Makassar experience menstrual pain, with over four out of five participants saying they have painful periods. The results show that dysmenorrhea is linked to various factors studied in this research, such as how active a person is, their level of stress, whether their family has a history of dysmenorrhea, the age they started their period, and how regular their menstrual cycle is. Because these connections were looked at using simple comparisons, the findings should be seen as initial explorations rather than proof of separate or cause-and-effect relationships.

From a scientific point of view, this study provides specific evidence from Indonesian teenagers in a school setting, which generally aligns with the biopsychosocial understanding of dysmenorrhea. By looking at different factors like biology, mental health, and daily habits in the same group of people, the study offers initial information about what might be connected to menstrual pain in teenage girls. The way dysmenorrhea is grouped together among people who report feeling stressed and those with a family history of similar issues suggests that factors from their environment and family might be involved, along with biological factors like when they first started their period and how regular their menstrual cycles are.

The results hint at possible effects on how teens understand their health and the importance of health programs in schools. Screening and support approaches that only look at menstrual symptoms might miss other important factors like mental health, social life, and daily habits that affect how teenagers feel about their period pain. This method serves as a tool to consider psychological well-being, lifestyle behaviors, and family context may assist schools and health educators to better understand the needs of students experiencing dysmenorrhea. However, we should be careful in how we understand these results because the analysis was exploratory in nature.

When looking at these results, there are a few things we should be aware of. The study used a cross-sectional approach, which means it can't show cause and effect. Also, the sample was small and came from just one school, so the findings may not apply to other groups of teenagers. The few cases that didn't have dysmenorrhea also led to very small tables and some cells with no data in certain analyses, which might make the statistical results less reliable and less accurate. In addition, depending on self-reported information can lead to bias in how people remember and report things. These limitations in the methods show that the results are still being explored and remind us to be careful when understanding them.

This method serves as a tool to clarify the temporal relationships between psychosocial factors, menstrual characteristics, and the issue lies with the cement and gravel, which are still pending. Future studies should employ longitudinal designs to better understand how these elements interact over time during adolescence. Studying bigger and more varied groups would also make it possible to use advanced analysis methods that can look at different factors on their own and how they affect each other in relation to dysmenorrhea. In addition, studies that look at multiple sites and well-planned school-based trials could check out ways that mix encouraging physical activity, teaching stress management, educating about menstrual health, and creating better school environments. This type of research could help create better, science-backed methods to improve menstrual health and help teenagers in Indonesia and similar areas attend school more effectively.

AUTHOR'S CONTRIBUTION STATEMENT

The first author contributed to conceptualization, methodology, investigation, project administration, and writing of the original draft. The second author contributed to data curation, formal analysis, investigation, and manuscript review and editing. The third author contributed to supervision, validation, critical revision, and final approval of the manuscript. All authors reviewed and approved the final version of the manuscript.

CONFLICTS OF INTEREST

No conflicts of interest exist in relation to this study.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

AI-assisted technology was used solely to support language refinement, grammar correction, and clarity of expression. All AI-assisted outputs were reviewed, verified, and finalized to ensure scientific accuracy, integrity, and consistency with the study findings.

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