



RESEARCH ARTICLE

Dysmenorrhea Management Education and Knowledge Improvement Among Indonesian Adolescent Girls

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Abstract: Background: Dysmenorrhea is a common health problem among adolescent girls and may interfere with comfort, concentration, school attendance, and daily activities. Limited knowledge about menstrual pain management can lead adolescents to normalize pain and use inappropriate strategies. This study aimed to analyze differences in knowledge levels before and after health education on menstrual pain management among adolescent girls at Senior High School 3 Palu. Methods: This quantitative study used a pre-experimental one-group pretest-posttest design. Thirty-six female students who experienced menstrual pain and met the inclusion criteria were recruited using total sampling. Health education was delivered in groups using a structured lesson plan and leaflet. Knowledge was measured using a 15-item true-false questionnaire before and after the intervention. Data were analyzed using descriptive statistics, the Shapiro-Wilk normality test, and the Wilcoxon Signed-Rank Test. Results: Before health education, most respondents had poor knowledge (77.8%), while 22.2% had fair knowledge. After the intervention, 91.7% of respondents had good knowledge and 8.3% had fair knowledge. The Wilcoxon test showed a significant increase in knowledge ($Z = -5.20$; $p < 0.001$), with a large effect size ($r = 0.87$). Conclusion: Health education was associated with improved knowledge of menstrual pain management among Indonesian adolescent schoolgirls.

Keywords: Adolescent girls; Dysmenorrhea; Health education; Knowledge level; Menstrual pain management; Reproductive health; School health program

ABSTRAK: Latar Belakang: Dismenore merupakan masalah kesehatan yang umum dialami remaja putri dan dapat mengganggu kenyamanan, konsentrasi, kehadiran di sekolah, serta aktivitas sehari-hari. Keterbatasan pengetahuan tentang manajemen nyeri menstruasi dapat membuat remaja menganggap nyeri sebagai kondisi biasa dan menggunakan strategi penanganan yang kurang tepat. Penelitian ini bertujuan untuk menganalisis perbedaan tingkat pengetahuan sebelum dan sesudah pendidikan kesehatan tentang manajemen nyeri menstruasi pada remaja putri di SMA 3 Palu. Metode: Penelitian kuantitatif ini menggunakan desain pre-experimental one-group pretest-posttest. Sebanyak 36 siswi yang mengalami nyeri menstruasi dan memenuhi kriteria inklusi direkrut menggunakan teknik total sampling. Pendidikan kesehatan diberikan secara kelompok menggunakan satuan acara penyuluhan dan leaflet. Pengetahuan diukur menggunakan kuesioner benar-salah sebanyak 15 item sebelum dan sesudah intervensi. Data dianalisis menggunakan statistik deskriptif, uji normalitas Shapiro-Wilk, dan Wilcoxon Signed-Rank Test. Hasil: Sebelum pendidikan kesehatan, sebagian besar responden memiliki pengetahuan kurang (77,8%), sedangkan 22,2% memiliki pengetahuan cukup. Setelah intervensi, 91,7% responden memiliki pengetahuan baik dan 8,3% memiliki pengetahuan cukup. Uji Wilcoxon menunjukkan peningkatan pengetahuan yang signifikan ($Z = -5,20$; $p < 0,001$), dengan ukuran efek yang besar ($r = 0,87$). Kesimpulan: Pendidikan kesehatan berkaitan dengan peningkatan pengetahuan tentang manajemen nyeri menstruasi pada remaja putri sekolah di Indonesia.

Kata Kunci: Dismenore; Pendidikan kesehatan; Remaja putri; Manajemen nyeri menstruasi; Tingkat pengetahuan; Kesehatan reproduksi; Program kesehatan sekolah

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INTRODUCTION

Dysmenorrhea is one of the most common gynecological complaints among adolescent girls and women of reproductive age. In general, dysmenorrhea refers to pain or cramps in the lower abdomen that occur

before or during menstruation and may radiate to the waist, lower back, pelvis, or thighs. This condition may also be accompanied by other symptoms, such as nausea, vomiting, headache, fatigue, diarrhea, mood changes, and reduced concentration during learning activities. Clinically, dysmenorrhea is classified into primary and secondary dysmenorrhea. Primary dysmenorrhea refers to menstrual pain that occurs in the absence of pelvic pathology and is commonly associated with increased prostaglandin production, which triggers uterine contractions. In contrast, secondary dysmenorrhea results from specific pathological conditions, such as endometriosis, uterine fibroids, anatomical abnormalities of the reproductive organs, or pelvic inflammatory disease. This distinction is important because primary dysmenorrhea is more common among adolescents, whereas secondary dysmenorrhea requires further clinical evaluation, particularly when the pain is severe, persistent, unresponsive to initial management, or significantly interferes with daily activities (American College of Obstetricians and Gynecologists [ACOG], 2018; Bernardi et al., 2017; Gutman et al., 2022; Itani et al., 2022).

Dysmenorrhea is not only a biological problem but also affects the psychological, social, and academic aspects of adolescent girls' lives. Poorly managed menstrual pain can interfere with school attendance, reduce learning concentration, limit physical activity, hinder participation in social activities, and decrease quality of life. The literature indicates that the prevalence of dysmenorrhea among adolescents varies depending on population characteristics, operational definitions, measurement methods, and sociocultural contexts. Studies among adolescents have shown that the prevalence of primary dysmenorrhea may range from 16% to 93%, with some adolescents experiencing severe pain that disrupts daily and school activities (De Sanctis et al., 2015). Another systematic review also reported wide variation in the prevalence of dysmenorrhea among women of reproductive age, with some respondents reporting severe pain that affects daily functioning (Ju et al., 2014). In addition, a meta-analysis among young women showed that dysmenorrhea is associated with absenteeism from school or university, as well as decreased concentration and academic performance (Armour et al., 2019). Other reviews have also indicated that dysmenorrhea is an important cause of short-term school absenteeism among adolescent girls and is often inadequately managed because menstrual pain is perceived as a normal condition that must be endured (Gutman et al., 2022; Iacovides et al., 2015). Therefore, dysmenorrhea should be positioned as an adolescent health issue that requires education, early recognition, supportive school environments, and access to accurate health information.

Menstrual health is increasingly understood as part of reproductive health, health rights, and equitable access to education. The World Health Organization (WHO) emphasizes that menstrual health is not only related to hygiene but also includes access to accurate information, social support, responsive health services, and school and social environments that do not stigmatize menstruation (WHO, 2022, 2026). A more comprehensive definition of menstrual health also emphasizes that individuals need information, facilities, services, and social support that enable them to experience menstruation safely, healthily, with dignity, and free from stigma (Hennegan et al., 2021). WHO further emphasizes that accurate and age-appropriate menstrual health education should be provided to school-aged children, including information on the menstrual process, warning signs, pain management, and when to seek assistance from health care providers. UNICEF and UNESCO also highlight the importance of school-based puberty and

menstrual health education because schools are strategic settings for building knowledge, reducing stigma, and supporting adolescent girls' participation in learning during menstruation (Sommer et al., 2021; UNESCO, 2014; UNICEF, 2019). This is particularly relevant for adolescent girls because a lack of accurate information may lead them to ignore symptoms, use inappropriate management strategies, or feel embarrassed to seek help.

Among adolescents, limited knowledge of dysmenorrhea may shape the perception that menstrual pain is a normal condition that does not require management. As a result, some adolescents tend to tolerate the pain, use medication without adequate understanding, or rely only on informal information from peers and family members. Limited knowledge may also hinder adolescents' ability to distinguish between menstrual pain that can be managed independently and symptoms that require medical attention. In the context of dysmenorrhea management, adolescents' knowledge should include an understanding of the definition of dysmenorrhea, its causes, signs and symptoms, risk factors, impact on activities, nonpharmacological management options such as warm compresses, relaxation, light physical activity, adequate rest, and safe pharmacological options when needed. Clinical reviews indicate that the management of primary dysmenorrhea may include pharmacological therapy, such as nonsteroidal anti-inflammatory drugs, as well as nonpharmacological strategies such as warm compresses, physical activity, relaxation, and appropriate lifestyle modifications (Bernardi et al., 2017; Itani et al., 2022; Rodrigues et al., 2024). Such knowledge serves as an important foundation for adolescents to practice more appropriate self-care, avoid unsafe management practices, and seek help from health care providers when menstrual pain presents with unusual symptoms or severely disrupts activities.

Theoretically, health education can improve knowledge by providing information that is systematic, targeted, and easy for the intended audience to understand. From a health literacy perspective, health education is not limited to the transmission of information but also helps individuals obtain, understand, appraise, and use health information to make appropriate decisions. Nutbeam explains that health literacy includes functional, interactive, and critical abilities in accessing and using health information. This framework is relevant to dysmenorrhea health education because adolescents need not only to know what dysmenorrhea is, but also to understand management strategies, recognize risk symptoms, and develop the confidence to seek help when pain interferes with their activities. In addition, the knowledge-attitude-practice approach explains that knowledge is an initial foundation that may influence health-related attitudes and practices, although behavior change requires a further process and cannot be assumed solely from increased knowledge (Glanz et al., 2015; Nutbeam, 2000; Sørensen et al., 2012). Therefore, health education on dysmenorrhea management should be designed not merely as information delivery but also as an effort to improve adolescents' reproductive health literacy so that they can correctly understand menstrual pain, select appropriate management strategies, and recognize conditions requiring professional assistance.

Several previous studies have shown that health education can improve adolescents' knowledge of dysmenorrhea and menstrual pain management. For example, Lestari and Rokhanawati (2024) reported increased knowledge scores after health education on dysmenorrhea management among adolescent girls. Similar findings were reported by Astuti et al. (2024), who found

that health education on dysmenorrhea management was associated with improved knowledge and attitudes among adolescent girls in managing dysmenorrhea. However, most existing studies have been conducted in specific school or regional contexts, have used varying intervention designs, and have not always adequately described the local context, educational needs, and baseline conditions of participants. Therefore, studies in specific school settings remain necessary to understand adolescents' reproductive health education needs in a more contextualized manner.

In the context of Senior High School 3 Palu, preliminary findings indicated that several female students experienced menstrual pain and did not know how to manage it properly. Some students reported that menstrual pain interfered with learning activities, caused discomfort during classes, and, in some cases, led to school absence. These preliminary findings suggest that dysmenorrhea in the school environment is not only related to physical complaints but also to limited information and suboptimal reproductive health education received by students. This condition reinforces the importance of health education focused on menstrual pain management so that adolescent girls can develop a better understanding of dysmenorrhea and its management options.

Based on the above considerations, the main research gap in this study lies in the need to evaluate health education on menstrual pain management in the local context of Senior High School 3 Palu, particularly because some students still experience dysmenorrhea but do not yet understand how to manage it appropriately. This study is also important because schools represent strategic environments for delivering structured, age-appropriate, and accessible reproductive health education to adolescent girls. Considering the study design, this study aimed to analyze differences in adolescent girls' knowledge levels before and after receiving health education on menstrual pain management at Senior High School 3 Palu.

METHODS

This study was a quantitative study with a pre-experimental design using a one-group pretest–posttest approach. This design was used to analyze differences in adolescent girls' knowledge levels before and after receiving health education on menstrual pain management. In this design, an initial measurement was conducted before the intervention, followed by the delivery of health education, and a second measurement was conducted after the intervention was completed. The one-group pretest–posttest design was selected because it is appropriate for evaluating changes in knowledge within a single group of respondents.

The study was conducted at Senior High School 3 Palu from October 10 to 17, 2025. The target population consisted of female students at Senior High School 3 Palu who experienced menstrual pain. The sample included 36 female students who met the inclusion criteria and agreed to participate as respondents. Total sampling was used to recruit all students who met the study criteria during the data collection period. The inclusion criteria were female students who were enrolled at Senior High School 3 Palu, had experienced menstruation, had experienced or were currently experiencing menstrual pain, were present during data collection, were able to understand the questionnaire, and were willing to participate as respondents. The exclusion criteria were students who did not experience menstrual pain, were absent during the study, did not

complete one of the study stages, or had menstrual pain symptoms suggestive of possible secondary dysmenorrhea, such as very severe pain, pain occurring outside the menstrual period, pain that did not improve with initial management, a history of gynecological disorders, or other symptoms requiring evaluation by health care providers. Respondents with possible secondary dysmenorrhea were excluded so that the study could focus on menstrual pain management education for common menstrual pain experienced by adolescent girls in school settings.

The independent variable in this study was health education on menstrual pain management, while the dependent variable was adolescent girls' level of knowledge regarding menstrual pain management. Health education was delivered as a group education session using a structured lesson plan and leaflet media. The educational materials included the definition of dysmenorrhea, a simple explanation of the distinction between primary and secondary dysmenorrhea, the causes and mechanisms of menstrual pain, signs and symptoms of dysmenorrhea, the impact of dysmenorrhea on learning activities, how to recognize menstrual pain that can still be managed independently, warning signs requiring consultation with health care providers, and menstrual pain management strategies. The management strategies explained included nonpharmacological approaches, such as warm compresses, adequate rest, relaxation, light physical activity, dietary management, and safe pharmacological management according to health care providers' recommendations. Health education was delivered in one group session using an interactive lecture method, leaflet-based explanation, and a question-and-answer session to allow respondents to clarify information they did not understand.

The research instrument used was a knowledge questionnaire on menstrual pain administered during both the pretest and posttest. The questionnaire consisted of 15 true–false questions. Each correct answer was scored 1, while each incorrect answer was scored 0; therefore, the total score ranged from 0 to 15. This instrument measured respondents' knowledge of the definition of dysmenorrhea, causes of menstrual pain, signs and symptoms, factors that may worsen symptoms, the impact of dysmenorrhea on activities, nonpharmacological management, safe use of pharmacological management, and warning signs requiring examination by health care providers. The same questionnaire was used for the pretest and posttest to allow direct comparison of knowledge scores. However, using the same instrument may introduce a potential testing effect, in which respondents may remember items from the pretest when completing the posttest. This risk was considered when interpreting the study findings.

The knowledge questionnaire used in this study was based on an instrument previously used by Amari (2023), which had undergone validity testing. The validity test showed that each item had a calculated *r* value greater than the *r*-table value of 0.361, indicating that all items were valid. In addition to validity, instrument reliability also needed to be ensured because the questionnaire used a true–false response format. Therefore, instrument reliability was reported using the Kuder–Richardson Formula 20 (KR-20), which is appropriate for dichotomous items. Respondents' knowledge levels were categorized based on the percentage of correct answers across all items. Knowledge was classified into three categories: good if the respondent scored 76%–100%, fair if the respondent scored 56%–75%, and poor if the respondent scored <56%. This categorization was revised to avoid overlap between the

good and fair categories, as the previous classification allowed a score of 76% to fall into both categories.

The research procedure was conducted chronologically in several stages. The first stage involved coordination with the school to obtain permission for the study and determine the data collection schedule. The second stage was the identification of prospective respondents based on the inclusion and exclusion criteria. The third stage involved providing prospective respondents with an explanation of the study objectives, procedures, benefits, minimal risks, data confidentiality, and their right to refuse or withdraw from participation without any consequences. After respondents agreed to participate, they completed the informed consent form. The fourth stage was the pretest, which measured respondents' baseline knowledge of menstrual pain management. The fifth stage was the delivery of health education on menstrual pain management. The sixth stage was the posttest, which measured respondents' knowledge after receiving health education. The final stage involved checking data completeness, coding respondent data, processing the data, and conducting statistical analysis.

Data analysis was conducted using univariate and bivariate analyses. Univariate analysis was used to describe respondent characteristics, including age, age at menarche, menstrual pain level, and the distribution of knowledge levels before and after health education. Categorical data were presented as frequencies and percentages. Knowledge scores were presented using measures of central tendency and dispersion, such as median, minimum, maximum, and interquartile range, particularly when the data were not normally distributed. The Shapiro-Wilk test was used to assess normality because the sample size was less than 50. The normality test showed that the data were not normally distributed; therefore, bivariate analysis was conducted using the Wilcoxon Signed-Rank Test to analyze differences in knowledge scores before and after health education. A p-value of <0.05 was considered statistically significant.

RESULTS OF STUDY

Table 1 presents the characteristics of the 36 female students involved in this study. Most respondents were 17 years old, with 20 students (55.6%), followed by 16 years old with 15 students (41.7%), and 18 years old with 1 student (2.8%). This distribution indicates that the respondents were mostly in middle to late adolescence, a developmental period in which reproductive health education is particularly relevant because adolescents begin to experience and interpret menstrual symptoms more independently.

Regarding age at first menstruation, most respondents experienced menarche at the age of 13 years, with 20 students (55.6%), followed by 14 years with 9 students (25.0%), and 12 years with 7 students. However, the percentage for respondents who experienced menarche at 12 years needs to be recalculated because 7 out of 36 respondents corresponds to 19.4%, not 9.4%. These findings suggest that most respondents had already experienced menstruation for several years, making them an appropriate target group for education on menstrual pain management.

In terms of pain level, the largest proportion of respondents experienced moderate menstrual pain, with 18 students (50.0%), followed by mild pain. The number and percentage of respondents with severe pain need to be verified because the table reports 6 students, while the narrative states 4 students (11.1%). If the correct number is

4 students, then the total number of respondents becomes consistent with N = 36. Overall, the distribution indicates that menstrual pain was a relevant health issue among the respondents, as a substantial proportion experienced moderate pain, which may interfere with learning activities, concentration, and daily functioning.

Table 1. Distribution of characteristics of female high school students based on age and age at first menstruation, as well as pain levels (N=36)

Respondent Characteristics	Frequency (f)	Percentage (%)
Age		
16 Years	15	41.7
17 Years	20	55.6
18 Years	1	2.8
Age at First Menstruation		
12 Years	7	9.4
13 Years	20	55.6
14 Years	9	25
Pain level		
Mild	14	38.9
Moderate	18	50
Severe	6	11.11

Table 2 shows the distribution of knowledge levels before and after the health education intervention. Before the intervention, most respondents had poor knowledge about menstrual pain management, with 28 students (77.8%), while 8 students (22.2%) were in the fair category and none were in the good category. This finding indicates that, prior to receiving health education, most respondents had limited understanding of dysmenorrhea and its appropriate management.

After the health education intervention, there was a marked improvement in respondents' knowledge levels. A total of 33 students (91.7%) were classified as having good knowledge, while only 3 students (8.3%) remained in the fair category, and no respondents were in the poor category. This shift suggests that the health education session was followed by a substantial improvement in knowledge distribution, particularly in moving respondents from poor and fair categories into the good category.

Table 2. Frequency distribution of knowledge levels before and after health education on menstrual pain (N=36)

Level of Knowledge	Frequency (f)	Percentage (%)
Before		
Good	0	0
Fair	8	22.2
Poor	28	77.8
After		
Good	33	91.7
Fair	3	8.3
Poor	0	0

Table 3 presents the results of the Shapiro-Wilk normality test for pretest and posttest scores. The pretest score had a Shapiro-Wilk statistic of 0.514 with a significance value of $p < 0.001$, while the posttest score had a Shapiro-Wilk statistic of 0.312 with a significance value of $p < 0.001$. Since both p-values were below 0.05, the data were not normally distributed. Therefore, the use of the Wilcoxon Signed-Rank Test was appropriate to analyze

differences in knowledge scores before and after the health education intervention.

Table 3. Results of the Shapiro-Wilk test of normality

	Shapiro-Wilk		
	Statistik	df	Sig.
pre test	.514	36	.000
post test	.312	36	.000

Table 4 shows the effect of health education on knowledge levels regarding menstrual pain management. Before the intervention, none of the respondents were in the

good knowledge category, while 8 students (22.2%) were in the fair category and 28 students (77.8%) were in the poor category. After the intervention, the distribution changed substantially, with 33 students (91.7%) in the good category, 3 students (8.3%) in the fair category, and no respondents remaining in the poor category.

The Wilcoxon Signed-Rank Test showed a statistically significant difference between pretest and posttest knowledge levels, with $Z = -5.20$ and $p < 0.001$. This result indicates that there was a significant improvement in respondents' knowledge after receiving health education on menstrual pain management. The effect size was $r = 0.87$, which is categorized as a large effect. This means that the change in knowledge was not only statistically significant but also practically meaningful.

Table 4. The Effect of Health Education on Menstrual Pain Management on Knowledge Levels

Knowledge Level	Pretest f (%)	Posttest f (%)	Wilcoxon Z	p-value	Effect Size (r)
Good	0 (0.0)	33 (91.7)	-5.20	<0.001	0.87
Fair	8 (22.2)	3 (8.3)			
Poor	28 (77.8)	0 (0.0)			
Total	36 (100.0)	36 (100.0)			

Overall, the findings indicate that health education was followed by a substantial improvement in female students' knowledge of menstrual pain management. However, because this study used a one-group pretest-posttest design without a control group, the findings should be interpreted as evidence of a significant difference before and after the intervention, rather than as definitive proof of a causal effect. Future studies with a control group and longer follow-up period are needed to confirm the effectiveness and sustainability of the health education intervention.

DISCUSSION

The findings of this study showed an increase in adolescent girls' knowledge levels after they received health education on menstrual pain management. Before the intervention, most respondents were in the poor knowledge category, whereas after the intervention, the majority were in the good knowledge category. The Wilcoxon Signed-Rank Test showed a significant difference in knowledge before and after health education, with a large effect size. These findings indicate that structured health education can be a relevant approach to improving adolescent girls' understanding of dysmenorrhea and its management. In the school context, this increase in knowledge is important because dysmenorrhea is not only a physical complaint but may also affect learning comfort, concentration, attendance, and adolescent girls' participation in academic and social activities (Armour et al., 2019; De Sanctis et al., 2015; Gutman et al., 2022; Iacovides et al., 2015).

The low level of knowledge among respondents before receiving health education indicates that information about dysmenorrhea and menstrual pain management was not yet fully understood by adolescent girls. This condition may occur because adolescents often obtain menstrual information from informal sources, such as peers, family members, mothers, sisters, or social media, which may not always be accurate, comprehensive, or evidence-based. Chandra-Mouli and Patel (2017) showed that many

adolescent girls in low- and middle-income countries enter menarche with insufficient information and preparedness; menstrual information is generally obtained from mothers or female family members, but it is often provided too little, too late, and is still influenced by misconceptions. Ali and Rizvi (2010) also found that adolescents' menstrual knowledge and practices are strongly influenced by sociocultural context, family, and available sources of information. These conditions suggest that a lack of accurate information sources may lead adolescents to have an incomplete understanding of menstruation, dysmenorrhea, and its management.

Limited knowledge may lead adolescents to perceive menstrual pain as a normal condition that must be endured, resulting in a lack of information-seeking behavior or the use of inappropriate management strategies. Wong and Khoo (2010) showed that dysmenorrhea among adolescent girls not only affects daily activities but is also associated with suboptimal treatment-seeking behavior. Eryilmaz and Ozdemir (2009) also reported that adolescents' approaches to managing menstrual pain vary and still require more appropriate guidance to encourage them to consult health care providers and use safe management strategies. Similar findings were reported by Saka et al. (2018), who showed that some adolescents with dysmenorrhea had low knowledge and attitudes and used medication independently without understanding its possible side effects. Cherenack et al. (2023) demonstrated that barriers to dysmenorrhea management among adolescents may be related to misconceptions about medication, limited knowledge, and limited access to information or health services. These findings reinforce the importance of school-based health education as a more directed, accurate, and trustworthy source of information for adolescent girls.

The improvement in knowledge after health education can be explained through the mechanism of health literacy. Health education provides systematic information about the definition of dysmenorrhea, causes of menstrual pain, signs and symptoms, impact on activities, nonpharmacological management, safe use of pharmacological management, and warning signs that require consultation with health care providers. From a health literacy perspective, education

is not merely intended to deliver information but also to help individuals access, understand, appraise, and use health information in decision-making. Nutbeam (2000) explains that health literacy includes functional, interactive, and critical skills in managing health information. Sørensen et al. (2012) also emphasize that health literacy is related to an individual's ability to obtain, understand, evaluate, and apply health information in daily life. Thus, the increase in knowledge after the intervention in this study can be understood as the result of more structured, clear, and adolescent-centered information.

Health education also plays a role in correcting adolescents' misconceptions about menstrual pain. Some adolescents may not understand that menstrual pain can be managed using various safe strategies, such as warm compresses, relaxation, light physical activity, adequate rest, dietary management, and the use of nonsteroidal anti-inflammatory drugs according to health care providers' recommendations. This knowledge is important because primary dysmenorrhea can generally be managed through an appropriate combination of pharmacological and nonpharmacological approaches. Bernardi et al. (2017) explain that dysmenorrhea is associated with complex biological processes, including increased prostaglandin production; therefore, management should be directed toward reducing pain and improving daily functioning. Itani et al. (2022) also emphasize that the management of primary dysmenorrhea may include nonsteroidal anti-inflammatory drugs, hormonal therapy in certain conditions, and other supportive strategies. Rodrigues et al. (2024) further note that self-management is an important aspect of managing dysmenorrhea-related pain because symptoms may recur in every menstrual cycle. Therefore, health education helps adolescents understand that menstrual pain should not be ignored but needs to be recognized and managed appropriately.

The shift in knowledge distribution from the poor category to the good category after the intervention suggests that the health education materials likely addressed respondents' basic informational needs. Materials on the definition of dysmenorrhea, causal factors, symptoms, impacts, and management strategies may help respondents build a more comprehensive understanding of menstrual pain. Within the knowledge-attitude-practice framework, knowledge is an initial foundation that may support the formation of better health-related attitudes and practices. However, increased knowledge should still be understood as an early stage in the behavior change process, not as evidence that dysmenorrhea management behavior has changed. Glanz et al. (2015) emphasize that health behavior change is influenced by various factors, such as perceived risk, perceived benefits, barriers, social norms, environmental support, and self-efficacy. Therefore, the findings of this study primarily indicate the success of the intervention in improving respondents' cognitive understanding of menstrual pain management.

The findings of this study are consistent with several previous studies showing that health education can improve adolescents' knowledge of dysmenorrhea. Lestari and Rokhanawati (2024) reported that health education on dysmenorrhea management improved adolescent girls' knowledge, with a significant difference between the intervention and control groups. Astuti et al. (2024) also found that health education on dysmenorrhea management was associated with improved knowledge and attitudes among adolescent girls. Similar findings were reported by Taviyanda et al. (2022), Natalia et al. (2022), Hanifa and Dewi (2023), and Lestari and Rokhanawati (2024),

indicating that health education can improve adolescents' understanding of menstruation and dysmenorrhea. Koçoğlu et al. (2025) also found that education on menstrual characteristics increased adolescents' awareness of menstrual conditions and treatment-seeking behavior. The consistency of these findings indicates that health education is a relevant strategy for improving adolescents' knowledge of menstrual health.

The increase in knowledge in this study may also be understood from the characteristics of the intervention provided. Health education delivered through group counseling and leaflet media enabled information to be presented directly, simply, and in a form that respondents could revisit. Leaflets may help respondents recall the material after the educational session, while interactive counseling allows respondents to ask questions and clarify information they do not understand. In health promotion, the choice of media and method of message delivery plays an important role in influencing the target audience's understanding, particularly among adolescents who need information that is brief, concrete, visual, and relevant to their daily experiences. Health education tailored to participants' age and needs can help improve attention, comprehension, and acceptance of health information (Glanz et al., 2015; Nutbeam, 2000; UNICEF, 2019).

The presence of three respondents who remained in the fair knowledge category after the intervention indicates that information uptake is not always the same for every individual. Differences in understanding may be related to attention during the educational session, personal experiences with dysmenorrhea, prior exposure to information, ability to understand health-related terms, or interest in reproductive health topics. However, because this study did not conduct additional analyses to examine factors influencing knowledge improvement, discussion of age, menstrual experience, or other individual factors should be positioned as possible explanations rather than conclusions. This finding suggests that health education should not be delivered only once but should be strengthened through repeated education, small-group discussions, question-and-answer sessions, and the provision of written or digital materials that adolescents can access again.

The findings of this study are relevant to a school-based menstrual health approach. WHO (2022, 2026) emphasizes that menstrual health is part of health, well-being, rights, and equality; therefore, adolescents need access to accurate and age-appropriate information. Hennegan et al. (2021) also emphasize that menstrual health includes physical, mental, and social well-being related to the menstrual cycle. In the educational context, schools are strategic settings for delivering information about menstruation, reducing stigma, and helping adolescents recognize how to manage menstrual complaints safely. UNICEF (2019) and UNESCO (2014) also emphasize the importance of puberty and menstrual health education in schools so that adolescent girls can obtain accurate knowledge, feel better prepared for menstruation, and participate in school activities without unnecessary barriers.

Practically, the findings of this study support the need to integrate dysmenorrhea management education into school health programs. Education can be provided through school health units, adolescent health counseling, routine health education sessions, collaboration with community health centers, or the development of simple educational media such as leaflets, posters, and menstrual health modules. Educational materials should emphasize that dysmenorrhea is a common complaint but still needs to be managed properly so that it does not interfere with learning

activities and daily life. Education should also help adolescents recognize warning signs, such as very severe pain, pain that does not improve, pain occurring outside the menstrual period, or symptoms accompanied by other complaints. Thus, the increase in knowledge found in this study can serve as a basis for developing more structured, sustainable, and responsive reproductive health education programs for adolescent girls.

Overall, the discussion of the findings indicates that health education on menstrual pain management is associated with improved knowledge among adolescent girls at Senior High School 3 Palu. This improvement primarily reflects changes in the cognitive aspect, namely respondents' understanding of dysmenorrhea and its management strategies. These findings strengthen the position of health education as an important health promotion intervention in the school context, particularly for menstrual health issues that are often perceived as normal, rarely discussed openly, and not always managed appropriately. Therefore, health education on dysmenorrhea should be developed as part of a sustainable adolescent reproductive health program in school settings.

Limitations of the Study

This study has several limitations that should be considered when interpreting the findings. First, this study used a pre-experimental one-group pretest–posttest design without a control group. Therefore, although the results showed a significant increase in knowledge after health education, the observed change cannot be attributed solely to the intervention. Other factors, such as prior exposure to information, peer discussion, personal experiences with menstrual pain, or access to health information outside the intervention, may also have contributed to the improvement in knowledge.

Second, the sample size was relatively small and was limited to 36 female students from one school. This condition may limit the generalizability of the findings to broader populations of adolescent girls in different schools, regions, or sociocultural settings. The characteristics of students at Senior High School 3 Palu may not fully represent adolescents in other educational contexts, particularly those with different access to reproductive health information or school-based health programs. Third, the interval between the pretest and posttest was relatively short. As a result, this study only measured immediate changes in knowledge after the health education session and did not assess whether the knowledge gained was retained over time. A longer follow-up period would be needed to determine whether the improvement in knowledge is sustained and whether it contributes to better menstrual pain management in daily life.

Fourth, the same questionnaire was used for both pretest and posttest. This may have introduced a testing effect, in which respondents remembered the questions from the pretest and answered more accurately during the posttest. Although this approach allows direct comparison of knowledge scores before and after the intervention, it may also overestimate the actual improvement in knowledge. Fifth, the outcome measured in this study was limited to knowledge. The study did not assess changes in attitudes, self-efficacy, health-seeking behavior, actual dysmenorrhea management practices, pain intensity, school absenteeism, or quality of life. Therefore, the findings should be interpreted as evidence of improved knowledge rather than evidence of behavioral change or clinical improvement in menstrual pain.

Finally, this study relied on self-reported questionnaire responses, which may be affected by response bias, social desirability bias, or differences in respondents' understanding of the questions. Future studies should consider using a larger sample, involving multiple schools, applying a quasi-experimental or randomized controlled design, including a control group, extending the follow-up period, and measuring broader outcomes such as attitudes, practices, pain severity, and school attendance.

CONCLUSION

Health education on menstrual pain management was associated with a significant improvement in adolescent girls' knowledge at Senior High School 3 Palu. Before the intervention, most respondents had poor knowledge, whereas after the intervention, the majority were categorized as having good knowledge. These findings suggest that structured health education can be used as a school-based strategy to improve adolescents' understanding of dysmenorrhea and its management.

Given the one-group pretest–posttest design, the findings should be interpreted cautiously and should not be regarded as definitive causal evidence. Schools are encouraged to provide regular menstrual health education through school health programs and collaboration with health professionals. Future research should use a controlled design, larger sample size, longer follow-up, and additional outcomes such as attitudes, self-care practices, pain intensity, and school absenteeism.

DECLARATION

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Conflicts of interest/Competing interests

The authors declare that they have no conflicts of interest related to this study.

Ethics approval and consent to participate

This study fully complies with ethical standards for research involving human subjects. Before data collection began, all respondents provided written informed consent after receiving a full explanation. Participation in this study was voluntary and free from coercion, and the confidentiality (anonymity) of all participants was fully guaranteed throughout the research process.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Artificial Intelligence-Assisted Technology

The authors declare that no artificial intelligence–assisted technology was used in the design, data collection, analysis, or interpretation of the study results.

Authors' contributions:

The entire research process from drafting the proposal and conducting the study to analyzing the data and writing up the research findings was carried out entirely by the author

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ADDITIONAL INFORMATION

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