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Changes in Menstrual Pain Following Dysmenorrhea Exercise among Early-Adolescent Female Students at Two Elementary Schools: A One Group Pretest–Posttest Study

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ABSTRACT

Dysmenorrhea is a menstrual complaint among adolescent girls and may interfere with activities, school attendance, concentration, and academic performance. Dysmenorrhea exercise is a nonpharmacological approach that may support menstrual pain management. This study assessed changes in menstrual pain following a dysmenorrhea exercise program among early-adolescent female students at SDN 18 Kramat Jati, East Jakarta, and SDN Pengadilan 5 Bogor. A quantitative preexperimental study with a one-group pretest–posttest design was conducted from November to December 2025. Participants were selected using purposive sampling. A total of 106 female students aged 10 to 12 years who had experienced menarche and reported menstrual pain participated. The intervention consisted of dysmenorrhea exercise four times per week for three weeks, with each session lasting 30 minutes. Menstrual pain intensity was assessed before and after the intervention using the Numeric Rating Scale. Differences in preintervention and postintervention scores were analyzed using the Wilcoxon signed-rank test. At SDN 18 Kramat Jati, the mean pain score decreased from 6.85 ± 0.62 to 2.75 ± 0.55, corresponding to a mean change of 4.10 points. At SDN Pengadilan 5 Bogor, the mean score decreased from 7.01 ± 0.44 to 2.68 ± 0.49, corresponding to a mean change of 4.33 points. Postintervention scores were significantly lower than preintervention scores in the overall sample ($p < 0.001$). Lower pain scores were observed at both study sites. Dysmenorrhea exercise may be a useful, simple, low-cost, school-based self-care strategy, although the findings should be interpreted cautiously because the study did not include a control group.

Key Messages:

- A three-week dysmenorrhea exercise program was associated with a significant reduction in menstrual pain among early-adolescent female students, suggesting its potential as a practical, low-cost, school-based intervention; however, the absence of a control group necessitates further controlled studies to validate these preliminary findings

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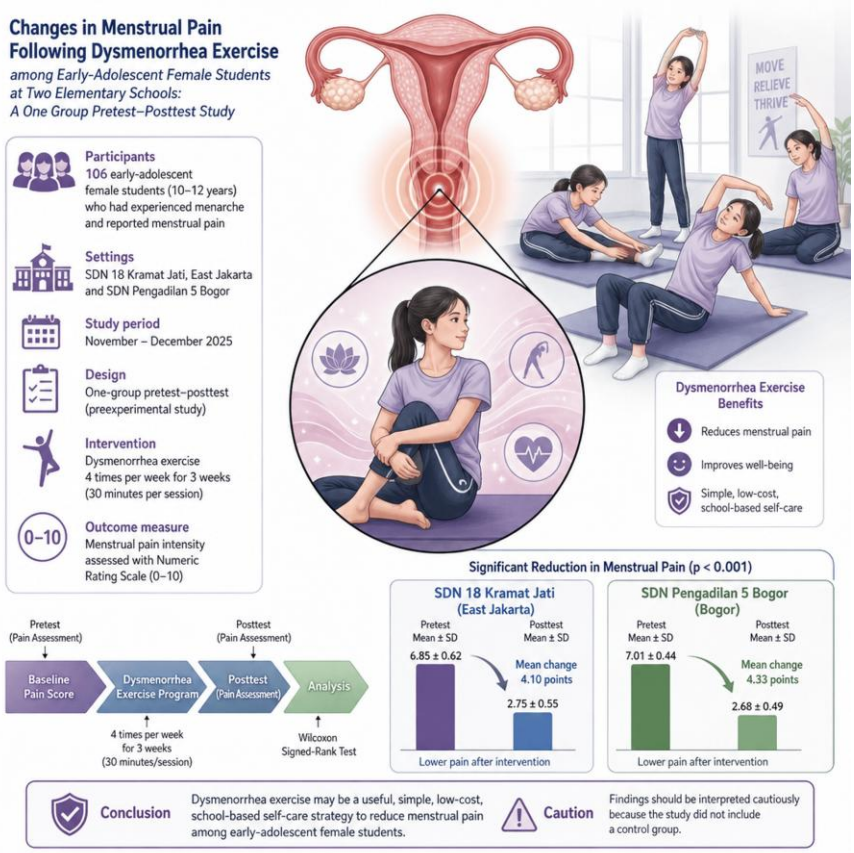
GRAPHICAL ABSTRACT



INTRODUCTION

Adolescence is a crucial transitional period in the human life cycle that bridges childhood and adulthood, characterized by significant physical, psychological, and social changes. During this phase, individuals undergo dramatic biological transitions, including hormonal, neural, and metabolic development, which interact with emotional and cognitive processes to shape well-being and identity formation (1,2). The World Health Organization (WHO) defines adolescents as individuals aged 10–19 years. Meanwhile, the National Population and Family Planning Board (BKKBN) extends this definition to the age of 24, provided the individual is unmarried (3,4).

One of the important biological events in adolescent girls is puberty, which is marked by the onset of menarche. Menarche refers to the first uterine bleeding resulting from the maturation of the female hormonal and reproductive systems. Although menstruation is a normal physiological process, many adolescent girls experience menstrual pain known as dysmenorrhea. This pain is often considered normal and therefore ignored, even though in some adolescents it can be severe enough to interfere with daily activities. Dysmenorrhea affects a high proportion of adolescents and young women, with a systematic review and meta-analysis reporting wide variations in prevalence across study populations. Many adolescents experience moderate to severe menstrual pain that can interfere with daily activities, school attendance, and academic performance (5).

Dysmenorrhea is one of the most common menstrual disorders experienced by women, particularly during adolescence. Clinically, it is characterized by pain in the lower abdomen that may radiate to the lower back and thighs, and is frequently accompanied by symptoms such as nausea, vomiting, diarrhea, headache, and fatigue (6). Dysmenorrhea is classified into two types: primary and secondary dysmenorrhea. Primary dysmenorrhea refers to menstrual pain without underlying pathological abnormalities in the reproductive organs and generally appears within a few years after menarche, while secondary dysmenorrhea is associated with identifiable gynecological conditions (7).

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A recent systematic review and meta-analysis in 70 countries estimated a combined global prevalence of 71.3% among women, although heterogeneity between studies is high (8). In Indonesia, the prevalence of dysmenorrhea was 64.25%, comprising 54.89% primary dysmenorrhea and 9.36% secondary dysmenorrhea (9). These figures demonstrate that dysmenorrhea is a significant reproductive health issue that requires specialized attention, particularly among the adolescent population.

Various studies in Indonesia also highlight the high prevalence of dysmenorrhea among adolescent girls. A previous study found that more than half of the female students experienced primary dysmenorrhea. These data indicate that dysmenorrhea is a common issue among adolescent girls and has the potential to interfere with their academic and social activities (10). Global research further reinforces the urgency of this intervention, as a systematic review highlights that dysmenorrhea remains a leading cause of school absenteeism worldwide, significantly disrupting the academic performance of adolescent girls. To address this, a randomized controlled trial published in 2024 demonstrated that structured physical exercise effectively reduces prostaglandin levels and pain intensity through consistent training. This is further supported by clinical findings in 2023, which emphasize that such physical interventions trigger the release of endorphins, functioning as natural analgesics that modulate the hormonal fluctuations and uterine contractions characteristic of early adolescence(5,11,12).

Learning activities involve not only physical presence but also mental engagement, which requires psychological comfort (13). Poorly managed dysmenorrhea is associated with reduced quality of life and impaired academic functioning, including disrupted concentration, daily activities, and absenteeism (14). Risk factors associated with primary dysmenorrhea include a lack of physical activity, prolonged menstrual cycles, and psychosocial stress. These factors indicate that dysmenorrhea is a multifactorial condition influenced by both biological predispositions and lifestyle choices (15,16)

Dysmenorrhea can be managed through pharmacological and nonpharmacological approaches. Nonsteroidal anti-inflammatory drugs are commonly used to relieve menstrual pain, but repeated use may cause adverse effects and may not always be preferred by adolescents or their parents (7). Nonpharmacological options, including warm compresses, massage, acupressure, and dysmenorrhea exercise, may provide safe, affordable, and practical alternatives (17). Dysmenorrhea exercise promotes muscle relaxation, improves pelvic circulation, and stimulates endorphin release, which may reduce pain perception (18). The Gate Control Theory provides an additional neurological explanation, suggesting that sensory stimulation generated through stretching and body movement may inhibit the transmission of pain impulses to the central nervous system and reduce pain perception (19).

Previous studies have reported lower menstrual pain intensity following Pilates, aerobic exercise, strength training, yoga, and relaxation exercise among adolescents and young women (11,20) . Most of the available evidence, however, has been generated among secondary school students, university students, and young adult women. These findings cannot be directly generalized to elementary school students aged 10 to 12 years because early adolescent girls may differ in reproductive maturity, duration since menarche, menstrual cycle regularity, physical exercise capacity, pain communication, and dependence on parents or teachers. Evidence regarding structured dysmenorrhea exercise among early adolescent girls attending elementary schools therefore remains limited.

Preliminary interviews conducted at SDN 18 Kramat Jati, East Jakarta, indicated that menstrual pain disrupted learning activities and occasionally contributed to school absenteeism, while most interviewed students had not previously received information about or practiced dysmenorrhea exercise. SDN Pengadilan 5 Bogor was included as the second study site because it had comparable grade levels, a similar school health context, administrative approval, and an adequate number of eligible female students, thereby supporting participant recruitment within comparable elementary school settings. Given the limited evidence on structured dysmenorrhea exercise among early adolescent elementary school students, this study aimed to assess changes in menstrual pain following a structured dysmenorrhea exercise program among female students at SDN 18 Kramat Jati, East Jakarta, and SDN Pengadilan 5 Bogor.

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METHODS

Research Design and Location

This study employed a quantitative pre-experimental design with a one group pretest posttest approach to assess within participant changes in menstrual pain following a structured dysmenorrhea exercise program. The study was conducted at SDN 18 Kramat Jati, East Jakarta, and SDN Pengadilan 5 Bogor from November to December 2025. The two schools were purposively selected because they had comparable grade levels, similar school health contexts, administrative approval, and adequate numbers of eligible female, similar school health contexts, administrative students who had experienced menarche and reported menstrual pain.

Population and Sample

The study population consisted of all female students in grades IV, V, and VI at SDN 18 Kramat Jati, East Jakarta, and SDN Pengadilan 5 Bogor, with a total of 342 students. These two public elementary schools were purposively selected because they had comparable grade levels, similar school-based health education contexts, administrative approval for implementing the intervention, and sufficient numbers of female students who had experienced menarche and reported menstrual pain. The inclusion of two study sites was intended to support the recruitment of eligible respondents while maintaining a comparable school-based intervention setting. Data were collected from November to December 2025, followed by data verification, coding, cleaning, and statistical analysis before manuscript submission.

Of the 342 female students, 176 students (51.5%) had experienced menarche and underwent initial screening. Respondents were selected using purposive sampling based on predetermined eligibility criteria. An a priori sample size calculation was not conducted; therefore, the final sample was determined based on eligibility, parental or guardian permission, and completion of the intervention protocol. Of the 176 students screened, 70 students (39.8%) were excluded, resulting in a final sample of 106 students (60.2%), comprising 56 students from SDN 18 Kramat Jati and 50 students from SDN Pengadilan 5 Bogor. The same eligibility criteria, intervention procedures, and pain assessment methods were applied at both study sites. Data from the two schools were combined for the primary analysis, while site specific changes in menstrual pain scores were examined to assess the consistency of findings across the two schools.

The inclusion criteria were female students who had experienced menarche, reported menstrual pain, were willing to participate, and obtained parental or guardian permission. Students were excluded if they were absent during data collection, had reproductive disorders or medical conditions that could affect pain assessment, used analgesics or other pain management methods during the assessment period, or did not complete the intervention protocol.

Procedure

The intervention consisted of structured dysmenorrhea exercise conducted four times per week for three weeks. Each session lasted approximately 30 minutes and was carried out in the afternoon in a designated room at the school. The intervention schedule was made consistent for all respondents to ensure uniform exposure to the exercise program.

The dysmenorrhea exercise consisted of three main stages: warm up, core movements, and cool down. Each session included approximately 5 minutes of warm up, 20 minutes of core movements, and 5 minutes of cool down**.** The warm up stage included light stretching of the neck, shoulders, arms, waist, and legs to prepare the body and reduce muscle stiffness. The core movements focused on abdominal, pelvic, and lower back stretching exercises, including pelvic tilting, knee to chest movement, lower abdominal stretching, waist rotation, and controlled breathing exercises**.** Each core movement was performed for 8 to 10 repetitions in two sets at mild to moderate intensity. The exercise intensity was maintained at a tolerable level for elementary school students to ensure safety and comfort. No exercise progression was applied during the three week intervention. The same exercise sequence, duration, number of repetitions, and intensity were maintained throughout the intervention period to ensure consistency among respondents**.** These movements were intended to promote pelvic muscle relaxation, improve blood circulation, and reduce pain perception during menstruation. The cool down stage

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included relaxation movements and deep breathing exercises to help respondents return to a relaxed condition after the session.

The exercise sessions were delivered and supervised by the principal researcher and four trained facilitators with professional backgrounds in nursing, with two facilitators assigned to each school. Before the intervention, all facilitators received standardized training on the exercise sequence, intensity, number of repetitions, session duration, safety procedures, and participant monitoring. The same standard operating procedure was applied at both schools to maintain consistency in intervention delivery and participant monitoring.

Compliance and Monitoring

Respondent compliance was monitored using an attendance checklist during each exercise session. Respondents were considered compliant if they attended and completed the scheduled exercise sessions according to the intervention protocol. The researcher and facilitators also observed whether respondents performed the movements correctly during each session. Respondents who did not complete the intervention process were excluded from the final analysis.

To minimize the influence of confounding factors, respondents were asked not to use analgesic medication, warm compresses, massage, or other non-pharmacological pain management methods during the pain assessment period. Respondents were also asked to maintain their usual daily activities and avoid additional structured physical exercise outside the intervention program. Information related to menstrual pain, medication use, and other pain management practices was monitored through respondent confirmation during data collection.

Data Collection

Data were collected using a respondent characteristics questionnaire and a menstrual pain assessment sheet. The respondent characteristics questionnaire included age, menstrual cycle regularity, menstrual cycle length, duration of menstruation, age at menarche, and onset of menstrual pain. Menstrual pain intensity was measured using the Numeric Rating Scale, with scores ranging from 0 to 10. A score of 0 indicated no pain, scores of 1 to 3 indicated mild pain, scores of 4 to 6 indicated moderate pain, and scores of 7 to 10 indicated severe pain. Preintervention pain intensity was assessed during the menstrual episode immediately preceding the three week dysmenorrhea exercise program, whereas postintervention pain intensity was assessed during the first menstrual episode after completion of the intervention. During both assessment periods, respondents recorded their pain intensity on the first, second, and third days of menstruation using the same Numeric Rating Scale measurement procedure. The daily measurements were used to describe changes in menstrual pain across the first three days of menstruation. A lower postintervention Numeric Rating Scale score indicated a reduction in menstrual pain intensity. Secondary data were obtained from school records to supplement the respondent characteristics data.

Operational Definitions

Menstrual pain intensity was operationally defined as the level of pain experienced during menstruation and reported using the Numeric Rating Scale ranging from 0 to 10. A score of 0 indicated no pain, scores of 1 to 3 indicated mild pain, scores of 4 to 6 indicated moderate pain, and scores of 7 to 10 indicated severe pain. Preintervention pain referred to menstrual pain assessed during the menstrual episode immediately preceding the exercise program, whereas postintervention pain referred to menstrual pain assessed during the first menstrual episode after completion of the three week intervention. A lower postintervention Numeric Rating Scale score indicated a reduction in menstrual pain intensity.

Data Analysis

Data were analyzed using SPSS software. Univariate analysis was used to describe respondent characteristics and menstrual pain intensity before and after the intervention. The normality of pain score

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data was tested using the Shapiro–Wilk test. Since the data were not normally distributed, the difference in menstrual pain scores before and after the intervention was analyzed using the Wilcoxon signed-rank test. The level of statistical significance was set at $p < 0.05$.

Code of Health Ethics

This study received ethical approval from the Health Research Ethics Committee of Poltekkes Kemenkes Jambi with approval number: LB.02.06/2/1865/2025

RESULTS

Characteristics of Respondent

Univariate analysis was employed to determine the frequency distribution of each research variable, specifically providing an overview of the effects of dysmenorrhea exercise before and after the intervention

Table 1. Characteristics of Respondents (n=106)

Characteristics	n	%
Grade level		
Grade IV	33	31.1
Grade V	35	33.0
Grade VI	38	35.8
Age (years)		
10	6	5.7
11	40	37.7
12	60	56.6
Age at menarche (years)		
9	14	13.2
10	21	19.8
11	30	28.3
12	41	38.7
Menstrual cycle length (days)		
Regular	90	84.9
Irregular	16	15.1
Duration of menstruation (days)		
3 to 4	12	11.3
5 to 7	84	79.2
> 7	10	9.4
Baseline physical activity level		
Low	21	19.8
Moderate	60	56.6
High	25	23.6
Menstrual cycle regularity (days)		
28	80	75.5
29	17	16
30	9	8.5
Day of Menstrual Pain Onset		
Day 1	80	75.5
Day 2	17	16.0
Day 3	9	8.5
Total	106	100

Table 1 shows that the largest proportion of respondents were in Grade VI (35.8%), were 12 years old (56.6%), and experienced menarche at 12 years of age (38.7%). Most respondents had regular menstrual cycles (84.9%), a menstrual cycle length of 28 days (75.5%), and a menstrual duration of 5 to 7 days (79.2%). Most respondents had a moderate baseline physical activity level (56.6%), and menstrual pain most commonly began on the first day of menstruation (75.5%).

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Table 2. Descriptive Statistics of Menstrual Pain Scores Before and After the Dysmenorrhea Exercise Program

Study site	n	Preintervention	Postintervention	Mean change
		mean ± SD	mean ± SD	
SDN 18 Kramat Jati	56	6.85 ± 0.62	2.75 ± 0.55	4.10
SDN Pengadilan 5 Bogor	50	7.01 ± 0.44	2.68 ± 0.49	4.33

Menstrual pain scores were lower after the dysmenorrhea exercise program at both study sites. At SDN 18 Kramat Jati, the mean pain score decreased from 6.85 ± 0.62 to 2.75 ± 0.55, with a mean change of 4.10 points. At SDN Pengadilan 5 Bogor, the mean pain score decreased from 7.01 ± 0.44 to 2.68 ± 0.49, with a mean change of 4.33 points. These descriptive findings indicate a generally similar direction and magnitude of change across the two schools.

Table 3. Distribution of Menstrual Pain Intensity Before and After Dysmenorrhea Exercise

Pain Intensity	Pre-Intervention (n=106)	Post-Intervention (n=106)
Mild (1–3)	0 (0.0)	80 (75.5%)
Moderate (4–6)	40 (37.7%)	26 (24.5%)
Severe (7–10)	66 (62.3%)	0 (0.0)

Postintervention pain intensity was assessed during the first menstrual episode after completion of the three-week exercise program. The distribution of pain intensity shifted from predominantly moderate and severe pain before the intervention to predominantly mild pain after the intervention. This categorical shift was consistent with the pain-score ranges presented in Table 2. Menstrual pain scores were further examined across the first, second, and third days of menstruation to describe the daily pattern of change and identify the day with the greatest reduction in pain intensity.

Table 4. Menstrual Pain Scores According to Day of Menstruation Before and After the Dysmenorrhea Exercise Program

Menstrual Day	Pre-Intervention (n=106)	Post-Intervention (n=106)	Change (%)
Day 1	7.0 ± 0.62	2.6 ± 0.55	62.9%
Day 2	6.5 ± 0.58	2.8 ± 0.50	56.9%
Day 3	6.2 ± 0.60	2.9 ± 0.52	53.2%

Based on the daily changes in menstrual pain scores, it is evident that the greatest reduction in pain intensity occurred on the first day of menstruation. Before the intervention, the average pain score on the first day was 7.0 ± 0.62, which decreased to 2.6 ±0.55 after the dysmenorrhea exercises, representing a percentage reduction of 62.9%. On the second day, the average pain decreased from 6.5 ±0.58 to 2.8 ±0.50 (56.9% decrease), while on the third day, pain decreased from 6.2 ±0.60 to 2.9 ±0.52 (53.2% decrease).

Table 5. Wilcoxon Signed-Rank Test of Menstrual Pain Scores Before and After Dysmenorrhea Exercise

Comparison	Rank category	n	Mean rank	Sum of ranks	p-value
Posttest Pretest	Negative ranks	106	53.50	5671.00	<0.001
	Positive ranks	0	0.00	0.00	
	Ties	0			

The Wilcoxon signed-rank test showed that postintervention menstrual pain scores were significantly lower than preintervention scores ($p < 0.001$).

DISCUSSION

Respondent Characteristics: Age, Menstrual Cycle Pattern, Cycle Length, and Onset of Menstrual Pain

Most respondents were 12 years old (56.7%), had regular menstrual cycles (85.0%), had a Menstrual cycle regularity of 28 days (75.4%), and reported the onset of menstrual pain most frequently on the first day of menstruation (75.5%). These characteristics indicate that the participants were in early adolescence, a developmental stage marked by reproductive maturation and the gradual establishment of menstrual patterns. Although menstruation is a normal physiological process, dysmenorrhea remains

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common during this stage and may interfere with daily activities, concentration, and participation in learning activities.

Early adolescence is characterized by hormonal changes, particularly fluctuations in estrogen and progesterone that regulate the menstrual cycle. Primary dysmenorrhea is associated with increased prostaglandin production in the endometrium. Elevated prostaglandin levels may stimulate uterine contractions, vasoconstriction, and reduced uterine blood flow, which can contribute to ischemia and pain, particularly during the early days of menstruation**.** A menstrual cycle of 21 to 35 days and a bleeding duration of 3 to 7 days are generally considered normal. Therefore, the predominant 28 day menstrual cycle observed in this study was within the normal range (22).

A previous study reported that approximately 59% of adolescent girls had regular menstrual cycles and 88% experienced dysmenorrhea (23). Other research has shown that menstrual pain commonly occurs immediately before or on the first day of menstruation among adolescent girls (24). This pattern may be related to increased prostaglandin release at the onset of menstruation, which may intensify uterine contractions and pain perception. The respondent characteristics observed in this study were therefore consistent with common menstrual patterns among early adolescent girls, in whom normal menstrual cycle development may still be accompanied by dysmenorrhea symptoms (25).

Mean Menstrual Pain Scores Before and After Dysmenorrhea Exercise

The mean menstrual pain scores were lower after the dysmenorrhea exercise program at both study sites. This pattern indicates that participation in the structured exercise program was associated with lower menstrual pain intensity among the respondents. The Wilcoxon signed rank test also showed a statistically significant difference between preintervention and postintervention scores in the overall sample. However, because the study did not include a control group, the observed change cannot be attributed exclusively to the exercise program.

Physiologically, dysmenorrhea exercise may reduce menstrual pain through several mechanisms. Physical activity can stimulate the release of endorphins, which function as natural analgesics in the body. In addition, exercise may improve blood circulation in the pelvic area, reduce muscle tension, and help decrease the effects of prostaglandins that trigger excessive uterine contractions during menstruation. Improved circulation and muscle relaxation may reduce uterine ischemia and lower pain perception, thereby contributing to a decrease in menstrual pain intensity (26).

The observed reduction in menstrual pain may be related to several physiological mechanisms associated with physical activity. Exercise may promote muscle relaxation, improve pelvic blood circulation, and support endorphin mediated pain modulation. These responses may reduce muscle tension, uterine ischemia, and pain perception during menstruation. However, prostaglandin and endorphin levels were not measured in this study; therefore, these mechanisms should be interpreted as physiologically plausible explanations rather than confirmed effects of the intervention (27).

The high pre-intervention pain scores may be related to limited use of structured non-pharmacological pain management strategies among adolescent girls. After the intervention, the reduction in pain scores may be explained by improved pelvic blood circulation, muscle relaxation, and increased endorphin release, which may reduce pain perception during menstruation. Following the performance of dysmenorrhea exercise, the researcher posits that the decrease in mean pain scores occurred due to increased muscle relaxation, improved blood circulation in the pelvic area, and the release of endorphins, which serve as the body's natural analgesics (11) (28).

Dysmenorrhea exercise intervention among adolescent girls using a pretest–posttest design Lower menstrual pain scores were observed after regular participation in the dysmenorrhea exercise program. levels after the exercises were performed regularly. This exercise can increase blood flow and stimulate the release of endorphin hormones, which function as the body’s natural analgesics, thereby reducing pain perception during menstruation (29).

The result of the quasi-experimental study evaluating Pilates exercise in adolescents with dysmenorrhea also demonstrated a significant reduction in menstrual pain after the exercise intervention ($p < 0.05$). The mechanism underlying this effect is increased muscle relaxation as well as stimulation of

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endorphin release, which helps reduce pain sensation (30). These findings support the role of physical exercise as a safe and practical non-pharmacological intervention for menstrual pain management. Physical activity can also improve blood circulation and reduce muscle tension in the pelvic area, which contributes to the reduction of menstrual pain (28).

The high mean pain score before the intervention may be related to the limited use of structured non-pharmacological pain management strategies among respondents. After the intervention, the reduction in pain score may be explained by the regular performance of dysmenorrhea exercise, which promoted relaxation, improved pelvic blood flow, and stimulated endorphin production. These mechanisms are relevant because menstrual pain is closely associated with uterine contractions, pelvic muscle tension, and pain sensitivity during menstruation.

Furthermore, physical exercise may modulate the central nervous system and endocrine responses involved in pain control. The release of endorphins can inhibit pain transmission and increase the pain threshold, while improved blood flow may help reduce excessive uterine contractions. Therefore, the decrease in mean menstrual pain scores in this study indicates that The observed findings suggest that dysmenorrhea exercise may be considered a potentially useful self-care strategy. as a simple, low-cost, and non-pharmacological self-care strategy to reduce menstrual pain among adolescent girls (31).

Distribution of Menstrual Pain Intensity

The distribution of menstrual pain intensity changed markedly following the dysmenorrhea exercise program. Before the intervention, respondents experienced moderate or severe pain, whereas most respondents were categorized as having mild pain after the intervention. This pattern indicates that lower pain intensity was observed following participation in the exercise program. The change may be associated with physiological responses to physical activity, including muscle relaxation, improved pelvic circulation, and endorphin mediated pain modulation. However, endorphin levels were not measured, and the absence of a control group prevents the observed change from being attributed exclusively to dysmenorrhea exercise (32) .

These findings are consistent with several studies showing that physical activity or specific exercise interventions can reduce the intensity of dysmenorrhea pain in adolescent girls. Regular physical exercise can reduce pain intensity in women with primary dysmenorrhea through increased blood circulation and muscle relaxation (21,33). Physiologically, physical activity can increase the release of beta-endorphins, which are endogenous opioids that function as the body's natural analgesics. The increase in endorphin levels can help suppress the transmission of pain signals and raise the pain threshold, thereby reducing the intensity of menstrual pain (34,35). In addition, exercise helps improve blood circulation in the pelvic area and reduces muscle tension, which ultimately contributes to decreased excessive uterine contractions and reduced menstrual pain. (33). Therefore, dysmenorrhea exercise can serve as an effective, safe, and easily implemented non-pharmacological approach to help adolescent girls manage menstrual pain (11,12).

Daily Changes in Menstrual Pain Scores

The greatest reduction in menstrual pain was observed on the first day of menstruation, followed by smaller reductions on the second and third days. This pattern may be related to the physiological characteristics of primary dysmenorrhea, as prostaglandin production and uterine contractions are generally more pronounced at the onset of menstruation. Physical exercise may support pain reduction through improved pelvic circulation, muscle relaxation, endorphin release, and modulation of pain transmission (12,21,22). These findings are consistent with previous evidence showing that structured physical activity is associated with lower menstrual pain intensity among adolescents and young women. However, the observed daily changes should be interpreted cautiously because the absence of a control group prevents the reduction from being attributed exclusively to the dysmenorrhea exercise program.

The Difference in Menstrual Pain Scores Before and After Dysmenorrhea Exercise.

The results of the Wilcoxon signed-rank test showed a statistically significant difference in

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menstrual pain scores before and after the dysmenorrhea exercise intervention ($p < 0.001$). All respondents experienced a decrease in menstrual pain scores after the intervention, with no respondents showing increased or unchanged pain scores. This finding indicates that dysmenorrhea exercise was associated with a significant reduction in menstrual pain intensity among female students at selected elementary schools.

From a physiological perspective, dysmenorrhea exercise may reduce menstrual pain through several mechanisms. Physical activity can stimulate the release of endorphins, which act as natural analgesics by binding to opioid receptors and reducing pain perception. Exercise may also improve blood circulation in the pelvic area, reduce muscle tension, and help decrease excessive uterine contractions associated with increased prostaglandin activity during menstruation. In addition, the gate control theory explains that physical stimulation during exercise may inhibit the transmission of pain impulses to the central nervous system, thereby reducing the perception of menstrual pain.

The findings of this study are consistent with previous studies showing that dysmenorrhea exercise and other structured physical activities can significantly reduce menstrual pain intensity in adolescent girls. Exercise is considered a safe, simple, low-cost, and non-pharmacological intervention for managing primary dysmenorrhea because it has minimal side effects and can be performed independently after proper instruction. Previous studies have also reported that abdominal stretching, aerobic exercise, Pilates, and structured dysmenorrhea exercise significantly decrease menstrual pain intensity among adolescents and young women with dysmenorrhea (36).

The significant decrease in pain scores observed in this study may be related to the regular implementation of the exercise program, respondent participation, and the use of structured exercise movements that focused on relaxation, stretching, and pelvic muscle activity. These movements may have contributed to improved circulation, reduced pelvic muscle tension, and increased comfort during menstruation. Therefore, dysmenorrhea exercise can be considered a practical self-care strategy to help adolescent girls manage menstrual pain and reduce disruption to learning activities during menstruation.

Because this study used a one-group pretest–posttest design without a control group, the findings should be interpreted with caution. Although the results showed a significant reduction in pain after the intervention, other factors such as individual pain tolerance, menstrual cycle variation, rest patterns, stress levels, or unreported pain management practices may also have influenced the results. Nevertheless, the consistent decrease in pain scores among all respondents supports the potential usefulness of dysmenorrhea exercise as a school-based non-pharmacological intervention for menstrual pain management.

Research Limitations

This study has several limitations. First, the one-group pretest–posttest design did not include a control group, making it difficult to fully determine whether the reduction in menstrual pain was solely caused by the dysmenorrhea exercise intervention or influenced by other factors. Second, the pretest–posttest design may be subject to measurement bias, because respondents might become more familiar with the pain assessment scale after repeated measurements. Third, although respondents were encouraged to follow the intervention protocol, external factors such as the use of analgesic medication, warm compresses, massage, other physical activities, stress levels, sleep patterns, and differences in menstrual onset could not be fully controlled. In addition, the relatively short intervention period limited the ability to observe the long-term effects of dysmenorrhea exercise. Therefore, future studies are recommended to use a more rigorous design, such as a quasi-experimental study with a control group or a randomized controlled trial, with longer follow-up periods and better control of potential confounding factors.

CONCLUSION

Dysmenorrhea exercise was associated with lower menstrual pain scores among early-adolescent female students aged 10 to 12 years at SDN 18 Kramat Jati, East Jakarta, and SDN Pengadilan 5 Bogor. At SDN 18 Kramat Jati, the mean pain score decreased from 6.85 to 2.75, while at SDN Pengadilan 5 Bogor, it

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decreased from 7.01 to 2.68. Postintervention pain scores were significantly lower than preintervention scores in the overall sample ($p < 0.001$). These findings suggest that structured dysmenorrhea exercise may be a potentially useful, simple, low-cost, school-based self-care approach for supporting menstrual comfort among early-adolescent girls. The findings should be interpreted cautiously because the study did not include a control group. Future studies should use controlled designs, longer follow-up periods, and consider dietary habits, sleep duration, psychological stress, baseline physical activity, menstrual characteristics, analgesic use, and other pain-management practices.

DECLARATION OF THE USE OF AI

The authors declare that no artificial intelligence (AI), AI-assisted technologies, or large language models (LLMs) were used in the conception of the study, data analysis, or the drafting, writing, and editing of this manuscript. The only exception is the graphical abstract, which was created using the design platform Illustrae (https://illustrae.co/). The authors take full responsibility for the content and accuracy of the graphical abstract and the entire manuscript

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CONFLICTS OF INTEREST

The authors declare no conflict of interest

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