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Article

Does Physical Activity and Age at Menarche Affect Dysmenorrhea In Addolescents: A Scoping Review

Rarania Tilana Wulandari[1], Mufdlilah[1], Farida Kartini[1]

[1]Master's Program in Midwifery, Faculty of Health Sciences, Universitas 'Aisyiyah Yogyakarta, Yogyakarta, Indonesia

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Abstract. Dysmenorrhea is one of the most common reproductive health problems experienced by adolescent girls and may affect daily activities, including decreased concentration, school absenteeism, and reduced quality of life. Recurrent menstrual pain is often considered a normal condition, resulting in inadequate recognition and management among adolescents. This scoping review aimed to explore the influence of exercise habits and age at menarche on the incide nce of dysmenorrhea among adolescents. This study used a scoping review approach by searching articles from PubMed, ScienceDirect, and Google Scholar databases. Articles were selected based on quantitative research designs, publication within the last ten years (2015–2025), language availability, and relevance to adolescent populations. Data extraction included article characteristics, research methods, and main findings. Of 662 records identified, 21 reports were included in the final synthesis. Physical-activity-related findings appeared in 11 of 21 studies (52.4%); five studies (23.8%) evaluated structured exercise interventions, five (23.8%) addressed nutrition/BMI/lifestyle factors, and four (19.0%) addressed psychological factors. Low physical activity generally corresponded with greater dysmenorrhea, whereas stretching, dysmenorrhea exercise, yoga, Pilates, and massage reduced pain. Associations with age at menarche and BMI were less consistent. Anemia, menstrual characteristics, stress, anxiety, and depression also contributed. JBI appraisal classified 17 studies (81.0%) as Grade A or B and four (19.0%) as Grade C or D. Overall, dysmenorrhea is multifactorial; regular physical activity and integrated physical-mental health support are reasonable priorities, although methodological heterogeneity limits certainty.

Corresponding Author :
Rarania Tilania Wulandari
Master's Program in Midwifery, Faculty of Health Sciences,
Universitas 'Aisyiyah Yogyakarta, Yogyakarta, Indonesia
Email: 2510102010@student.unisayogya.ac.id

1. Introduction

Dysmenorrhea is one of the most common menstrual disorders experienced by adolescent girls and remains an important reproductive health concern due to its impact on physical, psychological, and social well-being. Primary dysmenorrhea is characterized by recurrent lower abdominal pain during menstruation without underlying pelvic abnormalities and is commonly associated with increased prostaglandin production, which stimulates excessive uterine contractions and pain responses [1]. Although menstrual pain is often perceived as a normal physiological condition, severe and recurrent dysmenorrhea can interfere with daily activities, reduce learning concentration, increase school absenteeism, and decrease quality of life among adolescents [2].

The occurrence of dysmenorrhea is associated with various biological, physiological, and lifestyle-related factors. Physical activity has received increasing attention as a modifiable factor that may influence menstrual pain. Regular physical activity, including exercise and stretching, is suggested to improve blood circulation, regulate hormonal balance, stimulate endorphin release, and reduce pain perception [3]. However, previous studies have reported different findings regarding the relationship between physical activity levels and dysmenorrhea, indicating that menstrual pain may involve complex interactions among several contributing factors.

In addition to physical activity, age at menarche is considered one of the biological factors associated with dysmenorrhea. Menarche represents the beginning of reproductive maturity, and variations in the timing of menarche may influence menstrual characteristics and pain experiences among adolescents. Several studies reported that early menarche was associated with a higher risk of dysmenorrhea, while other findings showed inconsistent associations between age at menarche and menstrual pain severity [4]. These differences highlight the need for a broader understanding of available evidence regarding factors contributing to dysmenorrhea.

Recent evidence helps explain the inconsistent findings. Physical activity is measured as exercise frequency, sedentary time, or questionnaire-based intensity. Dysmenorrhea is measured with VAS, NRS, WaLIDD, or symptom scales [4-6]. Age, culture, BMI, stress, diet, and menstrual characteristics also differ between samples [6], [7], [8].These variations can produce significant or null associations.

Existing reviews mainly address exercise interventions or the broader bidirectional relationship between menstruation and physical activity [5], [9], [10]. They do not specifically integrate age at menarche with adolescent dysmenorrhea while mapping biological, nutritional, and psychological correlates. This review therefore combines those domains and reports JBI methodological quality. The update distinguishes consistent patterns from measurement-driven contradictions. Accordingly, this scoping review aims to synthesize evidence on physical activity, age at menarche, and dysmenorrhea among adolescents.

2. Experimental Section

2.1. Method

This study was conducted using a scoping review approach to identify and synthesize available evidence regarding the relationship between physical activity, age at menarche, and dysmenorrhea among adolescents. A scoping review method was selected because this approach enables comprehensive mapping of scientific evidence from various studies with different research designs and characteristics [11].

The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guideline and the methodological framework proposed by Arksey and O'Malley, consisting of five stages: identifying the research question, identifying relevant studies, selecting eligible articles, charting the data, and summarizing the findings [12]. The literature search was performed using several electronic databases, including PubMed, Scopus, Google Scholar, ScienceDirect, and University Libraries. The search strategy was developed using a combination of Boolean operators, Medical Subject Headings (MeSH), and truncation techniques. The keywords used in this review consisted of terms related to physical activity, age at menarche, dysmenorrhea, and adolescents, as presented in Table 1.

Table 1. Article Search Keywords

Focus	Search Series
Physical Activity	**Boolean:** (exercise habits) OR (physical activity)) OR (sport)) OR (physical exercise))
	Mesh : (exercise habit[MeSH Terms]) OR (physical activity[MeSH Terms])) OR (sport[MeSH Terms])) OR (physical exercise[MeSH Terms]))
	Truncation : ((((((((((((((exercise habit*) OR (physical activit*)) OR (sport*)) OR (physical exercise))
Age of Menarche	**Boolean:** (age at menarche)) OR (menarche age))) OR (onset of menstruation))
	Mesh : (age at menarche[MeSH Terms])) OR (menarche age[MeSH Terms]))) OR (onset of menstruation[MeSH Terms]))
	Truncation : AND (age* at menarche)) OR (menarche age*)) OR (onset of menstruation))
Dysmenorrhea	**Boolean:** (dysmenorrhea)) OR (menstrual pain) OR (menstrual cramps))
	Mesh : age at menarche[MeSH Terms])) OR (menarche age[MeSH Terms]))) OR (onset of menstruation[MeSH Terms]))
	Truncation : (dysmenorrhea)) OR (menstrual pain*)) OR (menstrual cramps))
Adolescents	**Bolean :** (adolescent girls))) OR (female adolescents)) OR (teenage girls))
	Mesh : (adolescent girls[MeSH Terms]))) OR (female adolescents[MeSH Terms])) OR (teenage girls[MeSH Terms]))
	Truncation : (adolescent girl*)) OR (female adolescent*)) OR (teenage girl*))

Articles were selected using predefined criteria. Eligible studies used quantitative designs, involved adolescent girls, were journal articles published in 2015-2025, and were available in Indonesian or English; reviews, editorials, opinions, case reports, non-adolescent populations, and unavailable full texts were excluded. The search identified 662 records. After 28 records were removed before screening, 634 records were screened, of which 522 were excluded. All 112 reports sought for retrieval were assessed for eligibility; 51 were excluded for irrelevant topics (n = 26), inappropriate populations (n = 15), or unsuitable publication types (n = 10). Figure 1 then records, 61 studies were included at the inclusion stage, and 21 reports were retained for the final synthesis and JBI appraisal.

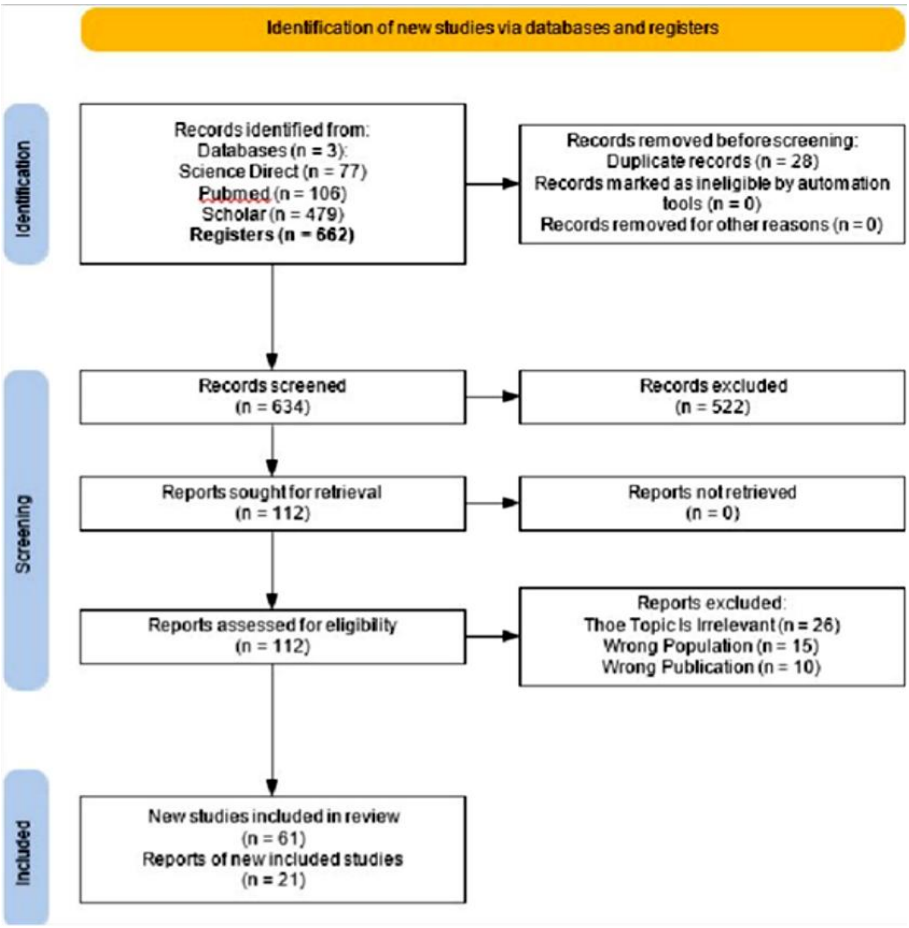

Figure 1. PRISMA-ScR Flow Diagram of Article Selection Process

The quality assessment of selected articles was performed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools according to each study design. Based on the critical appraisal results, eight articles were categorized as Grade A, nine articles as Grade B, three articles as Grade C, and one article as Grade D. The included studies consisted of four quasi-experimental studies, fourteen cross-sectional studies, and three controlled studies. The results of the critical appraisal are presented in Table 2.

Table 2. Critical Appraisal

Article code	Critical Appraisal Tools	Results
A1	JBI Tools for Quasi-Experimental Study	C
A2	JBI Tools for Cross-Sectional Study	B
A3	JBI Tools for Cross-Sectional Study	A
A4	JBI Tools for Quasi-Experimental Study	A
A5	JBI Tools for Quasi-Experimental Study	C
A6	JBI Tools for Cross-Sectional Study	B
A7	JBI Tools for Cross-Sectional Study	D
A8	JBI Tools for Cross-Sectional Study	B
A9	JBI Tools for Cross-Sectional Study	A
A10	JBI Tools for Cross-Sectional Study	B
A11	JBI Tools for Cross-Sectional Study	B
A12	JBI Tools for Cross-Sectional Study	C
A13	JBI Tools for Cross-Sectional Study	A
A14	JBI Tools for Quasi-Experimental Study	B
A15	JBI Tools for Cross-Sectional Study	B
A16	JBI Tools for Controlled Study	A
A17	JBI Tools for Controlled Study	A
A18	JBI Tools for Controlled Study	A
A19	JBI Tools for Cross-Sectional Study	B
A20	JBI Tools for Cross-Sectional Study	B
A21	JBI Tools for Cross-Sectional Study	B

Data extraction was conducted through a data charting process by identifying the title, authors, publication year, country or region, research objectives, study design, methodology, and main findings of each article. The extracted data were analyzed using descriptive synthesis by grouping similar findings into several themes related to physical activity, biological factors, lifestyle factors, psychological factors, and dysmenorrhea outcomes among adolescents.

3. Results and Discussion

A total of 21 reports were retained for the final synthesis. The methodological profile comprised 14 cross-sectional, four quasi-experimental, and three controlled studies. The studies represented Indonesia and several international settings, including India, Egypt, Nigeria, Sweden, and Iran. This mix broadened contextual coverage but also increased methodological heterogeneity. The findings were therefore synthesized thematically rather than pooled statistically.

The 21 reports generated six overlapping themes. Physical activity appeared in 11 studies (52.4%), exercise interventions in five (23.8%), nutrition/BMI/lifestyle in five (23.8%), psychological factors in four (19.0%), and quality-of-life impact in one (4.8%). Biological and reproductive factors appeared across several reports. Because themes overlap, percentages do not sum to 100%. Physical activity therefore dominates the literature, whereas direct quality-of-life evidence remains sparse.

Table 3. Summary of Previous Studies on Factors Associated with Dysmenorrhea

No	Author (Year)	Region	Study Design	Main Findings
1	Wildayani et al., (2023)	Indonesia	Cross-sectional	Physical activity was significantly associated with dysmenorrhea (p=0.044). Adolescents with low physical activity had a higher risk of dysmenorrhea [1].
2	Nur Rohmah & Sri Wijayanti, (2025)	Indonesia	Quasi-experimental	Dysmenorrhea: exercise and effleurage massage significantly reduced menstrual pain (p<0.05) [13].
3	Tantri et al., (2025)	Indonesia	Cross-sectional	Exercise habits and fat intake were associated with dysmenorrhea, while protein and carbohydrate intake were not significant [14].
4	Saida, (2024)	Indonesia	Cross-sectional	Age at menarche and exercise habits were significantly associated with primary dysmenorrhea [15].
5	Khotimah et al., (2020)	Indonesia	Cross-sectional	Exercise habits were associated with dysmenorrhea, while BMI showed no significant relationship [16].
6	Raissa Nurwany et al., (2025)	Indonesia	Cross-sectional	Physical activity was not significantly associated with dysmenorrhea severity, while menarche age and menstrual factors contributed as risks [17].
7	Wahyuni, (2025)	Indonesia	Cross-sectional	Fast food consumption and physical activity showed significant relationships with primary dysmenorrhea [18].
8	Puspitasari, (2025)	Indonesia	Cross-sectional	Menstrual irregularities were associated with health factors, depression, dietary intake, and lifestyle factors [19].
9	Rahmad et al., (2022)	Indonesia	Correlational study	Low physical activity was identified as a factor contributing to dysmenorrhea occurrence [20].
10	Khoirunnisa et al., (2025)	Indonesia	Cross-sectional	Stress levels and physical activity were significantly associated with primary dysmenorrhea [21].
11	Widyaningsih et al., (2023)	Indonesia	Quasi-experimental	Dysmenorrhea: physical exercise significantly reduced menstrual pain intensity [22].
12	Permana et al., (2024)	Indonesia	Experimental study	Ideal BMI and higher physical fitness contributed to reduced dysmenorrhea symptoms [23].
13	Ardianto & Elisanti, (2019)	Indonesia	Cross-sectional	Low physical activity and anemia increased the risk of dysmenorrhea among adolescents [24].
14	Emelya et al., (2023)	Indonesia	Pre-experimental study	Dysmenorrhea exercise significantly decreased menstrual pain scores after intervention [25].
15	Shah et al., (2016)	India	Experimental study	Stretching exercises significantly reduced primary dysmenorrhea severity [26].
16	Shah et al., (2016)	India	Randomized clinical trial	Stretching, massage, and combined interventions reduced dysmenorrhea pain intensity [26].
17	El Nahas et al., (2024)	Egypt	Randomized controlled trial	Pilates and yoga interventions significantly improved dysmenorrhea symptoms [27].
18	Maruf et al., (2013)	Nigeria	Cross-sectional	Physical activity level and adiposity were not associated with primary dysmenorrhea [28].
19	Gambadauro et al., (2025)	Sweden	Cross-sectional	Dysmenorrhea was associated with depression, anxiety, self-harm, and psychological symptoms [29].
20	Akbarzadeh et al., (2017)	Iran	Cross-sectional	Age at menarche was not significantly associated with dysmenorrhea incidence [30].

Six themes were identified from the included evidence. Physical activity was the dominant theme. Intervention studies focused on stretching, dysmenorrhea exercise, massage, Pilates, and yoga. Other themes covered nutrition/BMI/lifestyle, biological factors, psychological factors, and quality of life. Table 4 Summarizes the thematic distribution and contributing article codes.

Table 4. Themes and Sub-themes Identified from the Included Articles

No.	Theme	Sub-theme	References
1	Physical activity and the incidence of dysmenorrhea	Low physical activity increases the risk of dysmenorrhea	[1], [4], [5], [6], [7], [10], [11], [14], [16], [22], [31]
2	Effectiveness of physical interventions on menstrual pain	Physical exercise, dysmenorrhea exercises, stretching, massage, Pilates, and yoga reduce menstrual pain intensity	[12], [13], [15], [16], [17]
3	Nutrition, BMI, and lifestyle	Nutritional status, BMI, adiposity, and fast food consumption are associated with dysmenorrhea	[3], [4], [8], [9], [18]
4	Biological and reproductive factors of adolescents	Age at menarche, menstrual cycle, family history, and anemia are associated with dysmenorrhea	[2], [4], [20]
5	Psychological factors	Stress, depression, anxiety, self-injury, and suicidal ideation are associated with dysmenorrhea	[6], [9], [11], [19]
6	The impact of dysmenorrhea on adolescents' quality of life	School absenteeism, disruption of daily activities, and decreased quality of life	[19]

3.1 Physical Activity and Dysmenorrhea

Across the included studies, lower physical activity generally accompanied more frequent or severe dysmenorrhea, although several analyses were null. The inconsistency is meaningful. Exposure definitions ranged from exercise habits to daily activity and sedentary behavior. Pain outcomes also used different scales. Recent studies similarly report inverse associations, but effects can change after considering BMI, stress, or prostaglandin-related factors [6], [32-33]. Thus, physical activity is a modifiable correlate rather than an isolated determinant.

Intervention evidence is more consistent than observational evidence. Stretching, yoga, Pilates, and other structured exercise reduced pain in the included trials. Recent network meta-analyses also report meaningful pain reductions across several exercise modalities, although the optimal type and dose vary [9], [10], [34]. Prescribed exercise is easier to standardize than self-reported habitual activity. Therefore, intervention benefits should not be used to assume that every measure of routine activity predicts dysmenorrhea risk.

3.2 Effectiveness of Physical Interventions for Menstrual Pain

Five included studies reported pain improvement after structured physical or manual interventions. Recent meta-analytic evidence likewise supports relaxation, resistance, aerobic, yoga, and mixed exercise [9], [10], [34]. However, effect sizes vary by intervention duration, frequency, comparator, and adherence. Blinding is also difficult in exercise trials. The evidence therefore supports exercise as a useful non-pharmacological option, but not one universally superior protocol.

Yoga and Pilates may combine movement with relaxation and autonomic regulation, influencing both pain perception and stress. A recent randomized trial found lower menstrual pain and better quality of life after regular Hatha yoga [35]. Broader evidence also supports exercise and other non-pharmacological interventions while noting methodological limitations [36]. These findings strengthen the biological plausibility of benefit. Still, adolescents may respond differently according to baseline activity, adherence, and pain severity.

Taken together, the intervention findings are more coherent than the cross-sectional findings. Regularly prescribed activity can reduce pain even when habitual activity is not independently associated with dysmenorrhea. This distinction prevents causal overstatement. It also explains why observational null results do not invalidate intervention evidence. The practical implication is to recommend safe, structured activity while acknowledging uncertainty about the optimal regimen [9], [34].

3.3 Nutrition, Body Mass Index, and Lifestyle

Nutrition and lifestyle findings were heterogeneous. Several studies linked fast food, fat intake, or abnormal nutritional status with dysmenorrhea, whereas BMI alone was sometimes non-significant. BMI may be too crude to capture diet quality, body composition, and metabolic differences. Recent evidence also links menstrual disorders with BMI, unhealthy diets, sleep, and activity patterns [7], [8]. Nutritional interpretation should therefore prioritize patterns and context rather than a single anthropometric value.

Measurement quality may explain part of the nutritional disagreement. Dietary recall is vulnerable to memory error, while self-reported height and weight can misclassify BMI. Age also matters because body composition changes rapidly across adolescence. A recent adolescent study found substantially higher dysmenorrhea odds among underweight participants, while overweight was not independently associated[19]. This suggests that direction and magnitude can differ across BMI categories.

Sedentary behavior provides another explanation beyond exercise frequency. Longer sitting time has been associated with more frequent and severe menstrual symptoms after adjustment for physical activity and other risk factors [33]. An adolescent can therefore meet exercise targets yet remain highly sedentary. The apparent contradiction between active and inactive classifications may reflect different behavioral constructs. Lifestyle assessment should separate exercise dose, total movement, and sedentary time.

3.4 Biological and Reproductive Factors in Adolescents

Age at menarche showed mixed associations across the included studies. Earlier menarche may extend exposure to ovulatory cycles and prostaglandin-mediated pain, but age at menarche alone does not determine dysmenorrhea. Recent studies report both significant and context-dependent relationships [8], [37]. Differences in age groups, recall accuracy, and menstrual maturity may explain the disagreement. The evidence therefore supports age at menarche as a risk marker, not a deterministic cause.

Menstrual characteristics and anemia may modify this biological relationship. Longer or heavier bleeding can intensify symptom burden, while low hemoglobin may worsen fatigue and pain sensitivity. Recent adolescent data link earlier menarche, longer bleeding, and limited physical activity with higher dysmenorrhea severity [37]. The included anemia findings point in the same direction [31]. Clinically, these factors should be assessed together rather than interpreted separately.

3.5 Psychological Factors and Mental Health

Psychological factors were repeatedly associated with dysmenorrhea, especially stress, anxiety, and depression. The relationship is likely bidirectional rather than purely causal. Stress can heighten pain perception, while recurrent pain can worsen emotional distress and school functioning. Recent evidence shows strong stress-pain associations and places anxiety and depression within broader biopsychosocial models [6], [38]. Mental health is therefore part of the dysmenorrhea burden, not merely a secondary complaint.

Severe symptoms deserve particular attention because psychological comorbidity rises with pain burden. The included Swedish study linked dysmenorrhea with depression, anxiety, self-harm, and

suicidal ideation [29]. Recent evidence also identifies anxiety and emotional symptoms among common dysmenorrhea-related complaints [39]. However, most evidence remains cross-sectional, so directionality is uncertain. Integrated menstrual and mental-health screening is justified, while causal claims should remain cautious.

3.6 The Impact of Dysmenorrhea on Quality of Life in Adolescents

Several articles highlight the impact of dysmenorrhea on quality of life, including disruption of daily activities, school absences, decreased concentration in learning, and limited social participation. Untreated dysmenorrhea has the potential to reduce adolescent productivity and overall well-being. These findings reinforce the urgency of early promotive and preventive interventions, particularly in schools and adolescent health services. Only one article, Article 19, discusses the indirect impact of dysmenorrhea on quality of life in adolescents, primarily in the form of disruption of daily and school activities, such as limited mobility, decreased concentration in learning, and discomfort in participating in academic activities. However, this article does not outline specific interventions to improve quality of life, but rather discusses quality of life as one of the variables that is a side effect of dysmenorrhea. This discussion aligns with the results of research conducted by [2]. Women with dysmenorrhea experience a significant decline in quality of life, particularly during menstruation. This decline in quality of life scores encompasses physical health, mental health, and overall life satisfaction.

3.7 Limitations of the Review

This scoping review has several limitations. Restricting sources to Indonesian and English may have excluded relevant evidence from other languages. The search also included Google Scholar and university-library sources, which may increase retrieval variability. Publication bias is possible because studies with significant findings are more likely to be published. These factors may overrepresent positive associations.

Methodological heterogeneity also limits confidence in direct comparisons. Fourteen of 21 studies were cross-sectional, and activity, pain, BMI, and psychological factors were measured with different instruments. JBI appraisal identified four Grade C or D studies, indicating variable methodological quality. Self-reported exposure and outcome measures may add recall or classification bias. Accordingly, the synthesis maps patterns but should not be interpreted as pooled causal evidence.

4. Conclusion

Based on the results of a scoping review of 21 articles analyzed, it can be concluded that physical activity and age at menarche are significantly associated with the incidence of dysmenorrhea in adolescent girls. Adolescents with low levels of physical activity tend to experience dysmenorrhea more frequently and with higher pain intensity, while regular physical activity, including stretching exercises, dysmenorrhea exercises, yoga, and Pilates, has been shown to be effective in reducing menstrual pain intensity as a safe and easy-to-implement non-pharmacological intervention. Furthermore, age at menarche, particularly early menarche, was found to be a biological factor that increases the risk of dysmenorrhea, especially when combined with other factors such as irregular menstrual cycles, family history, and anemia.

The findings also indicate that dysmenorrhea is a multifactorial condition, influenced not only by physical and biological factors, but also by nutrition, lifestyle, and psychological conditions such as stress, anxiety, and depression. Untreated dysmenorrhea has a significant impact on adolescents' quality of life, including disruption of daily activities, school absence, and decreased concentration in learning.

Therefore, comprehensive promotive and preventive efforts are needed through adolescent reproductive health education, increased regular physical activity, and a holistic approach encompassing both physical and mental health, particularly in schools and Islamic boarding schools. This conclusion is supported by the majority of articles with good to excellent methodological quality; thus, the resulting evidence is considered strong enough to serve as a basis for developing future adolescent health interventions.

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