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FACTORS ASSOCIATED WITH MENSTRUAL CYCLE IRREGULARITY AMONG ADOLESCENT GIRLS: A LITERATURE REVIEW

Rizka Muharam Irawan[1*], Hana Haryani[2], Rosliana Dewi[3]

[1*]Sarjana Kebidananan, Sekolah Tinggi Ilmu Kesehatan Sukabumi, Indonesia
[2]Sarjana Administrasi Kesehatan, Sekolah Tinggi Ilmu Kesehatan Sukabumi, Indonesia
[3]Sarjana Keperawatan, Sekolah Tinggi Ilmu Kesehatan Sukabumi, Indonesia
Riskairawan681@gmail.com[1], hanaharyani@dosen.stikesmi.ac.id[2], roslianadewi@dosen.stikesmi.ac.id[3]*
**Corresponding author*

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ABSTRACT

Irregular menstrual cycles in adolescent girls represent a reproductive health issue that may involve several aspects of physical and psychological well-being. This review sought to examine the factors linked to menstrual irregularities by bringing together evidence from earlier research. A literature review was undertaken using the Population–Exposure–Outcome (PEO) framework, with article identification and selection guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Studies published between 2020 and 2026 were retrieved from Google Scholar, PubMed, ScienceDirect, and DOAJ. Following the eligibility assessment, 10 articles were included in the review. The evidence indicated that menstrual irregularities were linked to a combination of psychological stress, sleep quality, physical activity, nutritional status, dietary practices, reproductive characteristics, and existing health conditions. Nevertheless, the relationships reported across the studies differed, particularly for sleep, exercise, and nutritional factors. Such differences may reflect variations in participant characteristics, research procedures, and measurement approaches. Taken together, the findings suggest that menstrual cycle irregularities cannot be adequately explained by one factor alone. Understanding the interplay of these conditions may help inform reproductive health education and the early recognition of menstrual health problems among adolescent girls.

Keywords: *Adolescent girls, menstrual cycle, physical activity, sleep quality, stress.*

INTRODUCTION

During adolescence, individuals undergo substantial changes in their physical development, psychological functioning, and social interactions (Rahman et al., 2025). In girls, one important biological change is menarche, which marks the beginning of reproductive system maturity (Rowa et al., 2023; Syukaisih, 2025). Menstrual cycle patterns provide useful information about female reproductive health, particularly the hormonal processes involved in regulating reproductive function (United Nations Children's Fund, 2025). Menstrual cycles generally occur at intervals of 21–35 days. Changes in menstrual patterns may take the form of cycles that are too short or too long, or the absence of menstruation for a certain period (Lukman et al., 2025; Siregar et al., 2022). Menstrual irregularity is not merely a physiological concern; it may also

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be associated with ovulatory problems, anemia, fertility, and women's quality of life (Baadiah et al., 2021; Fadelina, 2021; Yuli Zuhkrina & Martina, 2023).

Irregular menstrual patterns continue to be reported among adolescent girls and women in early adulthood (Kong et al., 2023). In a study of adolescents and young adult women, Dhar et al. (2023) found that 44.83% of respondents had irregular menstrual cycles. Mittiku et al. (2022) also reported that 33.4% of female college students experienced menstrual cycle irregularity, which was associated with age, age at menarche, sleep duration, stress, and body weight status. These findings indicate that menstrual disorders are not isolated individual complaints but reproductive health concerns that can affect various groups of young women.

Studies have shown that menstrual cycle regularity is associated with a range of biological, psychological, and lifestyle factors (I. M. Dewi & Chasanah, 2023; Mau et al., 2020; Rahayu & Abror, 2024). Nutritional status and body mass index (BMI) are frequently studied because changes in body weight and nutritional status may be related to ovulation and hormonal regulation (Wahyuni et al., 2025). Stress and anxiety are considered relevant to menstrual health because psychological conditions may influence neuroendocrine processes that regulate reproductive function. In addition, menstrual patterns may be related to everyday behaviors, particularly levels of physical activity, sleep quality, and eating habits (Baadiah et al., 2021; Lukman et al., 2025).

Psychological conditions have been extensively examined in relation to menstrual health (Dhar et al., 2023). According to Amalia et al. (2023), menstrual disturbances were more frequently observed among adolescent girls experiencing stress, potentially reflecting changes in neuroendocrine processes involved in reproductive hormonal regulation. Supporting evidence was presented by Oktaviani et al. (2024), whose findings linked variations in stress levels to menstrual disturbances among adolescents. Mittiku et al. (2022) similarly identified perceived stress as a factor related to menstrual irregularity. Research involving female university students also reinforces the relevance of psychological well-being when evaluating menstrual health during adolescence and early adulthood (A. P. Dewi et al., 2023).

Evidence regarding sleep patterns and physical activity remains inconsistent across the reviewed studies. Siregar et al. (2022) reported that participants with poorer sleep quality were more likely to experience menstrual cycle disturbances. Dewi et al. (2023) also documented relationships involving sleep quality, psychological stress, and menstrual regularity, although their analysis did not establish a significant relationship with physical activity. Conversely, Baadiah et al. (2021) identified physical activity as a factor associated with menstrual disorders, whereas anxiety was not significantly related to these conditions. Differences in study populations, behavioral characteristics, and psychological circumstances may partly explain these contrasting observations.

Evidence concerning nutritional conditions, eating behaviors, and reproductive characteristics has produced differing conclusions. Lukman et al. (2025) reported relationships involving body mass index (BMI), medical history, and menstrual cycle

patterns, although stress was not significantly related to menstrual irregularity. Meanwhile, Rowa et al. (2023) found that dietary factors were not significantly linked to menstrual cycle patterns. Nisa et al. (2026) likewise reported no significant associations involving age at menarche, BMI, or sleep quality. In contrast, Mittiku et al. (2022) identified early menarche and excess body weight as factors linked to a higher likelihood of irregular menstruation.

Differences in the findings of previous studies suggest that the factors related to menstrual irregularity may vary across populations and research settings. While certain studies have identified significant relationships, others have reported contrasting results for similar variables. These inconsistencies indicate the need for a broader examination of existing evidence to clarify the factors most frequently linked to menstrual cycle disturbances. Instead of examining particular determinants within limited population groups, this review integrates findings from different studies to explore the roles of biological, psychological, and lifestyle-related factors in menstrual cycle irregularities among adolescent girls.

RESEARCH METHOD

Study Design

This literature review synthesizes existing research on factors linked to menstrual cycle irregularities among adolescent girls. Relevant publications were identified and selected through a systematic search process. The Population–Exposure–Outcome (PEO) framework guided the formulation of the research question and the assessment of potential factors related to menstrual irregularity in observational studies.

Literature Search Strategy

Relevant publications were identified through searches of Google Scholar, PubMed, ScienceDirect, and DOAJ conducted between August 1 and 25, 2026. Search terms were developed in accordance with the PEO framework, with Boolean operators AND and OR applied to combine related concepts and improve retrieval accuracy. The search included terms such as “adolescent girls,” “female adolescents,” “menstrual cycle,” “menstrual cycle disorder,” “menstrual irregularity,” and “associated factors.” Publications were restricted to those issued from 2020 to 2026 and written in either Indonesian or English.

Study Selection

Studies obtained from the selected databases underwent a screening process based on predefined eligibility requirements. After duplicate entries had been eliminated, the remaining titles and abstracts were reviewed to assess their suitability for the research objectives. Articles meeting the initial screening requirements underwent further evaluation based on their complete texts. e study selection stages, from identifying records to determining which articles qualified for inclusion, were

reported following the PRISMA 2020 guidelines. The screening and eligibility assessment resulted in ten articles being retained for analysis.

Eligibility Criteria

Studies were considered eligible when they involved adolescent girls, examined factors related to menstrual cycle irregularities, and reported menstrual disturbances as an outcome. Only observational studies published between 2020 and 2026, written in Indonesian or English, and accessible in full text were included. The review excluded secondary research articles, such as literature reviews, systematic reviews, and meta-analyses, as well as editorials, letters to the editor, conference proceedings, commentaries, theses, dissertations, and reports that had not undergone peer review. Duplicate records, publications lacking full-text access, and studies unrelated to the review objectives were also omitted.

Data Extraction

Information from the ten eligible articles was organized using a standardized extraction form developed before the review process. The recorded details covered the authors, publication year, study title, research design, population characteristics, sample size, principal findings, and conclusions. These data were examined to identify recurring relationships between the investigated factors and menstrual cycle irregularities, while also comparing differences in findings across the included studies. The extracted information was subsequently arranged in tables to support classification and synthesis. Figure 1 illustrates the article identification and selection stages through a PRISMA flow diagram.

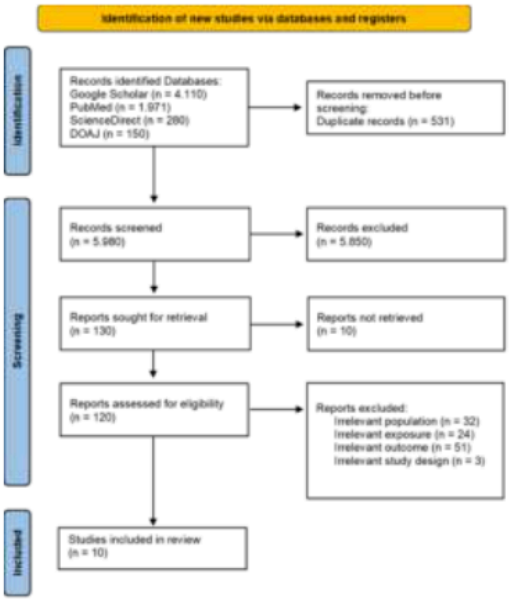


Figure 1. PRISMA Flow Diagram

RESULTS AND DISCUSSION

The review incorporated ten eligible studies examining factors related to irregular menstrual cycles in adolescent girls. The evidence covered psychological conditions, daily lifestyle behaviors, nutritional characteristics, and reproductive health factors, with differences observed in the reported findings. An overview of the selected publications, including their authors, methodological designs, participant characteristics, sample sizes, and principal results, is provided in Table 1.

Table 1. Data Extraction

Authors	Design	Population and Sample	Findings
Amalia et al. (2023)	Cross-sectional	The research involved 139 adolescent female students selected through proportional random sampling. Information was obtained using the Perceived Stress Scale (PSS) and a menstrual cycle questionnaire.	A statistically significant relationship was identified between psychological stress and menstrual cycle disturbances (p = 0.001)
Dewi et al. (2023)	Cross-sectional	A total of 75 adolescent girls participated through proportionate stratified random sampling. The instruments included the IPAQ, PSQI, DASS-42, and a menstrual cycle questionnaire.	Physical activity did not demonstrate a statistically significant relationship with menstrual cycle regularity (p = 0.723). In contrast, sleep quality (p = 0.000) and stress levels (p = 0.000) were significantly related to menstrual cycle patterns.
Nisa et al. (2026)	Cross-sectional	Thirty adolescent girls were recruited through purposive sampling. Data collection involved a weighing scale, stadiometer, menstrual cycle questionnaire, and Pittsburgh Sleep Quality Index (PSQI).	The analysis did not establish statistically significant relationships between menstrual cycle irregularity and age at menarche (p = 0.250), BMI (p = 0.766), or sleep quality (p = 0.820).
Oktaviani et al. (2024)	Cross-sectional	The investigation included 159 participants.	Statistical analysis indicated a significant relationship between stress levels and menstrual disorders (p = 0.000).
Lukman et al. (2025)	Cross-sectional	Seventy-five respondents were recruited through accidental sampling.	Menstrual cycle characteristics were significantly associated with BMI (p = 0.001) and medical history (p = 0.004). Poor sleep quality was reported by 59.6% of participants, while 22.9% experienced menstrual cycle abnormalities. The statistical test indicated a significant
Siregar et al. (2022)	Cross-sectional	The researchers recruited 109 female students using stratified random sampling.	

			relationship between sleep quality and menstrual cycle irregularity ($p = 0.005$; OR = 4.773).
Baadiah et al. (2021)	Cross-sectional	A total of 346 students participated in the investigation.	The correlation analysis indicated a weak positive relationship between physical activity and menstrual cycle disorders ($r = 0.032$; $p = 0.236$). Anxiety was not significantly related to menstrual cycle disorders ($p = 0.613$; $r = -0.056$).
Dhar et al. (2023)	Cross-sectional	The study involved adolescents and young women aged 10–29 years. Of 2,000 questionnaires distributed, 799 respondents were included in the analysis: 179 had not experienced menarche, 230 had diagnosed menstrual disorders, and 390 had no diagnosed menstrual disorders.	Irregular menstrual cycles were reported by 44.83% of participants. Significant associations were observed for moderate physical activity, shorter sleep duration, and stress-related factors. Several health conditions, including gastrointestinal problems, fatigue or dizziness, recurrent headaches, and anemia, were also significantly related to menstrual disorders.
Rowa et al. (2023)	Cross-sectional	The study included 138 female students from SMAN 13 Luwu.	Poor dietary habits were identified in 60.1% of participants, while 61.6% had normal nutritional status. Additionally, 78.3% reported regular menstrual cycles. The analysis did not identify a statistically significant relationship between dietary patterns, nutritional status, and menstrual cycle regularity.
Mittiku et al. (2022)	Cross-sectional	The study population consisted of 2,755 female students at Debre Berhan College, Ethiopia. From this population, 420 students were selected through systematic random sampling, with 395 completing the study (response rate: 93.6%).	A total of 132 students (33.4%) experienced menstrual irregularity, and 143 (36%) experienced stress. Stress was significantly associated with menstrual irregularity; students who experienced stress were twice as likely to have irregular menstruation (AOR = 2; 95% CI: 1.53–3.23).

The findings of this review indicate that menstrual irregularities among adolescent girls may be related to several interconnected factors, including psychological well-being, sleep habits, physical activity, nutritional conditions, dietary practices, and reproductive health characteristics. Although certain associations appeared repeatedly across the reviewed studies, others differed considerably. Such differences suggest that menstrual patterns cannot be explained by one determinant alone, as their relationships with various factors may vary according to participant characteristics and research settings.

Among the factors examined, psychological stress emerged as a recurring concern. Amalia et al. (2023) reported that menstrual disturbances among adolescent girls were associated with psychological stress. One possible explanation involves the physiological response to prolonged stress, which may interfere with hormonal processes responsible for ovulation and menstrual regulation. Evidence from Mittiku et al. (2022), involving 395 female students in Debre Berhan, Ethiopia, similarly indicated that participants experiencing stress were more likely to report menstrual irregularities. That study also identified younger age, early menarche, overweight status, and shorter sleep duration as factors associated with menstrual disturbances.

Dewi et al. (2023) similarly reported that psychological stress was associated with menstrual cycle regularity among female students in their first year of university. Academic responsibilities and the demands of adapting to university life may contribute to psychological strain and changes in daily routines. Nevertheless, the evidence regarding stress was not entirely uniform. Lukman et al. (2025) did not identify a significant association between stress and menstrual cycle characteristics, although BMI and medical history were significantly related to menstrual patterns. Differences in participant characteristics, stress assessment instruments, and study environments may partly explain these contrasting results. Therefore, associations between psychological stress and menstrual irregularities should be considered in relation to the specific characteristics and conditions of each study.

Sleep characteristics were also examined as potential contributors to menstrual cycle disturbances. According to Siregar et al. (2022), sleep quality was significantly associated with menstrual cycle irregularities, and inadequate sleep was reported by a substantial proportion of participants. Sleep disturbances may affect physiological processes involved in hormonal regulation, although the observational findings do not establish a direct causal pathway. Taken together, these results suggest that sleep quality deserves consideration when examining factors associated with menstrual cycle irregularities among adolescent girls.

The findings of Dewi et al. (2023) further indicate that sleep quality may be relevant to menstrual health, as disturbances in sleep were significantly associated with variations in menstrual cycle patterns. Dhar et al. (2023) found that menstrual disorders occurred more frequently among participants whose daily sleep duration was less than six hours. These observations suggest that insufficient sleep deserves attention when

assessing menstrual health. However, Nisa et al. (2026) reported no statistically significant relationship between sleep quality and menstrual irregularities. The contrasting findings may reflect differences in participants' psychological conditions, nutritional characteristics, physical activity, and reproductive health profiles.

The evidence concerning physical activity was similarly inconsistent. The study by Baadiah et al. (2021) did not establish a statistically significant association between physical activity and menstrual disorders in female students, suggesting that physical activity alone may not adequately account for menstrual disturbances. Dhar et al. (2023), however, reported that the association differed according to activity intensity. Light physical activity appeared to have a protective association, whereas moderate activity was linked to greater odds of menstrual disorders. These findings suggest that the relationship between physical activity and menstrual health may depend on the intensity and characteristics of the activities performed rather than simply whether individuals are physically active.

Nutritional factors represent another important area of investigation. Findings reported by Lukman et al. (2025) indicated that body mass index was significantly related to menstrual cycle characteristics, with irregular menstrual patterns observed in association with BMI values outside the normal range. Nutritional conditions may be relevant to reproductive function and menstrual regulation. Dhar et al. (2023) also reported associations involving dietary practices and menstrual disturbances, particularly unhealthy food consumption and the intake of certain foods.

However, the investigation conducted by Rowa et al. (2023) among students at SMAN 13 Luwu did not reveal statistically significant associations of dietary patterns or nutritional status with menstrual cycle characteristics. Most participants had normal nutritional status and regular menstrual cycles, which may have contributed to the absence of a detectable association. Consistent with these findings, Nisa et al. (2026) reported that BMI was not significantly associated with irregular menstrual cycles. These differences indicate that nutritional influences on menstrual health may vary across populations and may be affected by other individual characteristics.

Beyond psychological and lifestyle influences, the reviewed evidence also points to the relevance of reproductive history and existing health conditions. Mittiku et al. (2022) identified age and timing of menarche as factors related to menstrual irregularities. According to Lukman et al. (2025), participants' medical histories showed a statistically significant association with menstrual cycle characteristics. Dhar et al. (2023) further documented associations involving gastrointestinal complaints, recurrent headaches, anemia, and other health problems. These observations indicate that menstrual disturbances should be examined in relation to both reproductive characteristics and the broader health status of adolescent girls.

Across the reviewed studies, psychological stress and sleep characteristics appeared repeatedly as factors associated with menstrual irregularities, although the results were not uniform. Several investigations reported statistically significant

relationships, while others did not identify comparable associations. Evidence concerning physical activity, nutritional status, dietary behavior, and reproductive characteristics was similarly mixed. Differences in study populations, measurement approaches, and individual health conditions may help explain these variations. Rather than establishing a single dominant determinant, the available evidence suggests that menstrual irregularity may reflect the combined contribution of multiple factors. Accordingly, adolescent reproductive health assessment should consider psychological well-being, sleep patterns, physical activity, nutritional conditions, dietary practices, and relevant reproductive history. Such an approach may inform health education, early identification of menstrual concerns, and referral when further evaluation is needed.

An important contribution of this review is its integration of findings across psychological, lifestyle, nutritional, reproductive, and health-related domains. By examining these dimensions together, the synthesis provides a broader perspective than studies addressing individual factors separately. The findings also reveal inconsistencies that warrant further investigation, particularly regarding the relationships of stress and sleep quality with menstrual regularity. This integrated perspective may support the development of adolescent reproductive health education and preventive initiatives that address several relevant factors rather than concentrating on a single potential determinant (Seifu et al., 2025; Liu et al., 2025).

The findings may also inform practical strategies for promoting menstrual health among adolescents. Educational institutions and healthcare providers can incorporate menstrual health information into existing adolescent health programs, including discussions of stress management, sleep habits, balanced nutrition, and physical activity. Regular menstrual cycle monitoring and attention to accompanying symptoms may facilitate earlier recognition of potential reproductive health concerns. Adolescents experiencing persistent menstrual irregularities should be encouraged to seek appropriate healthcare assessment. These recommendations are consistent with the importance of school-based menstrual health education and early identification discussed by Seifu et al. (2025) and Rahman et al. (2026).

CONCLUSION

Based on the literature review, menstrual cycle irregularity among adolescent girls is a multifactorial condition associated with psychological, biological, lifestyle, reproductive, and health-related factors. Stress and sleep quality showed more consistent associations, whereas findings on physical activity, nutritional status, dietary patterns, age at menarche, and health conditions varied across studies. Therefore, adolescent reproductive health should be assessed comprehensively, with attention to stress management, healthy sleep patterns, adequate nutrition, and a balanced lifestyle to support the prevention and early detection of menstrual disorders.

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