

Associations of Physical Activity and Sleep Quality With Premenstrual Syndrome Severity Among Female Adolescents in Cimahi, IndonesiaDedeh Sri Rahayu¹, Murniati¹, Halimatusyadiah¹, Hilda Nurul Afidah¹¹STIKes Budhi Luhur Cimahi, Indonesia**ABSTRACT**

Premenstrual syndrome (PMS) is common among female adolescents and can interfere with learning, emotional well-being, and daily activities. Physical activity and sleep quality are modifiable lifestyle factors that may be associated with PMS severity. This study aimed to determine the associations between physical activity, sleep quality, and PMS severity among eleventh-grade female students at MAN Kota Cimahi in 2025. A quantitative correlational study with a cross-sectional design was conducted in March 2025. From a population of 205 students, 67 respondents were selected using proportional simple random sampling. Physical activity, sleep quality, and PMS were assessed using the IPAQ-SF, PSQI, and SPAF, respectively. Data were analyzed using Gamma correlation. Most respondents had low physical activity (82.1%), poor sleep quality (79.1%), and moderate PMS (65.7%). Physical activity was strongly and inversely associated with PMS severity ($\gamma = -0.787$; $p = 0.003$), whereas poor sleep quality was strongly and positively associated with PMS severity ($\gamma = 0.738$; $p = 0.004$). Physical activity and sleep quality were significantly associated with PMS severity. Higher physical activity was associated with lower PMS severity, whereas poorer sleep quality was associated with greater PMS severity. These findings support school-based nursing education that promotes regular physical activity, healthy sleep habits, menstrual symptom monitoring, and timely referral for adolescents with disruptive symptoms.

Keywords: female adolescents, physical activity, premenstrual syndrome, sleep quality

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INTRODUCTION

Premenstrual syndrome (PMS) comprises recurrent physical, emotional, cognitive, and behavioral symptoms that emerge during the late luteal phase and improve shortly after menstruation begins. Among female adolescents, symptoms such as abdominal discomfort, breast tenderness, fatigue, irritability, anxiety, sleep disturbance, and impaired concentration can disrupt school attendance, academic performance, social interaction, and quality of life (Itriyeva, 2022).

PMS is a substantial adolescent reproductive health problem, although its prevalence varies according to the population and diagnostic instrument. A 2024 study involving 417 adolescent girls reported a prevalence of 61.2%, while a prospective study among senior high school students documented PMS in 33.5% of participants (Akbulut *et al.*, 2024; Chen *et al.*, 2023). Indonesian evidence also shows that PMS remains common among female adolescents and that lifestyle characteristics, including insufficient physical activity, are associated with symptom severity (Maulidiana *et al.*, 2024). These findings indicate the need for context-specific school health assessments rather than assuming that PMS is a minor or unavoidable complaint.

Physical activity and sleep quality are two potentially modifiable factors. Regular physical activity supports endorphin release, circulation, stress regulation, and autonomic balance, whereas insufficient physical activity may increase fatigue, emotional instability, and discomfort. Adolescents are generally advised to undertake an average of at least 60 minutes of moderate-to-vigorous physical activity per day across the week (World Health Organization, 2020). Sleep also contributes to circadian, neuroendocrine, and emotional regulation; poor sleep quality may disturb melatonin and serotonin pathways, increase cortisol levels, lower pain tolerance, and intensify premenstrual complaints.

Previous studies have reported inverse relationships between physical activity and PMS and positive relationships between poor sleep quality and PMS severity (Chen *et al.*, 2023; Kawabe *et al.*, 2022; Lutfiyati *et al.*, 2021; Maulidiana *et al.*, 2024; Mighani *et al.*, 2025; Rindani *et al.*, 2022). However, many studies assessed these factors separately, involved university students or general school populations, or were conducted outside Indonesia. Evidence examining physical activity and sleep quality simultaneously among Indonesian senior high school students in an Islamic educational setting remains limited.

This study is novel because it simultaneously evaluates physical activity and sleep quality as correlates of ordinal PMS severity among students at MAN Kota Cimahi. The school was selected because students participate in regular academic activities alongside structured religious programs, a context that may influence daily physical activity, bedtime, and sleep duration. Preliminary observations conducted in December 2024 also identified recurrent reports of mood changes, breast discomfort, limited physical activity, and inadequate sleep before menstruation, indicating a locally relevant health concern.

Orem's Self-Care Deficit Theory provides the nursing framework for this study. Physical activity, sleep hygiene, symptom monitoring, and help-seeking are self-care behaviors through which adolescents can maintain physiological and psychological balance. When self-care demands exceed an adolescent's ability or available support, nursing guidance and school health interventions may be required (Muhlisin & Irdawati, 2009).

Accordingly, this study aimed to determine the associations between physical activity, sleep quality, and PMS severity among eleventh-grade female students at MAN Kota Cimahi in 2025.

METHODS

This quantitative analytical study used a cross-sectional design to examine the relationships between physical activity, sleep quality, and PMS severity among eleventh-grade female students at MAN Kota Cimahi, Indonesia. The overall study activities were conducted from December 2024 to April 2025, while recruitment and questionnaire administration were completed in March 2025 after ethical approval was obtained.

The population comprised 205 eleventh-grade female students. The minimum sample was calculated using the Slovin formula, $n = N/(1 + Ne^2)$, with $N = 205$ and an error tolerance of 10%, producing 67.21 and rounded to 67 respondents. The number selected from each class was allocated proportionally. An official student list served as the sampling frame, and eligible students

were selected using computer-generated random numbers until the required allocation for each class was reached.

The inclusion criteria were: (1) female students enrolled in grade XI at MAN Kota Cimahi; (2) having experienced menstruation for at least one year; (3) willing to participate by providing written informed consent; and (4) completing all questionnaires. Students were excluded when they were absent during data collection, submitted persistently incomplete questionnaires, reported a diagnosed gynecological disorder that could substantially affect menstrual symptoms, or withdrew before completing data collection.

Physical activity was measured using the International Physical Activity Questionnaire-Short Form (IPAQ-SF) and categorized as low (<600 MET-minutes/week), moderate (600-2,999 MET-minutes/week), or high ($\geq 3,000$ MET-minutes/week). Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI); global scores ≤ 5 indicated good sleep quality and scores > 5 indicated poor sleep quality. PMS severity was assessed using the Shortened Premenstrual Assessment Form (SPAF) and classified as normal (≤ 10), mild (11-30), moderate (31-40), severe (41-50), or extreme (≥ 51).

The psychometric evidence for the instruments was reviewed before use. The IPAQ demonstrated repeatability coefficients clustered around 0.80 and criterion validity correlations around 0.30 in a multicountry study (Craig *et al.*, 2003). The original PSQI showed good internal consistency (Cronbach's $\alpha = 0.83$) (Buysse *et al.*, 1989). The SPAF (also described as the PAF-SF in validation literature) was developed as a concise measure of premenstrual symptoms (Allen *et al.*, 1991), and a recent cross-cultural validation reported Cronbach's $\alpha = 0.845$ with an acceptable three-factor model (Dózsa-Juhász *et al.*, 2024). Standardized Indonesian-language questionnaire versions used in prior local research were applied; no new instrument-development procedure was undertaken in this study.

After school permission and ethical clearance were obtained, eligible students received information about the study, voluntary participation, confidentiality, and their right to withdraw. Questionnaires were self-administered under researcher supervision. Completeness was checked immediately; respondents were invited to complete unintentionally omitted items. Questionnaires that remained incomplete were excluded. All 67 selected respondents provided complete data. Ethical approval was granted by the Health Research Ethics Committee of STIKes Budi Luhur Cimahi (No. 25/D/KEPK-STIKes/III/2025, March 2025).

Frequencies and percentages were used for univariate analysis. Gamma correlation was selected because physical activity level, sleep-quality category, and PMS severity were treated as ordered categories. Gamma estimates the strength and direction of association from concordant and discordant pairs and is suitable for ordinal contingency tables. Statistical significance was set at $p < 0.05$, and both the Gamma coefficient (γ) and p -value were reported. Data were processed in IBM SPSS Statistics through editing, coding, entry, cleaning, tabulation, and analysis.

RESULTS

All 67 selected students completed the questionnaires and were included in the final analysis; therefore, the analytical dataset contained no missing values.

Physical Activity

Table 1. Distribution of Physical Activity Levels among Respondents (n = 67)

Physical Activity	Frequency (n)	Percentage (%)
Low	55	82.1%
Moderate	9	13.4%
High	3	4.5%
Total	67	100%

Most respondents had low physical activity (55; 82.1%). Moderate physical activity was reported by nine respondents (13.4%), and only three respondents (4.5%) had high physical activity. Thus, low activity was the dominant pattern in this sample.

Sleep Quality

Table 2. Distribution of Sleep Quality among Respondents (n = 67)

Sleep Quality	Frequency (n)	Percentage (%)
Good	14	20.9%
Poor	53	79.1%
Total	67	100%

Poor sleep quality was reported by 53 respondents (79.1%), compared with 14 respondents (20.9%) who had good sleep quality. The distribution shows that sleep problems were common among the participating students.

Premenstrual Syndrome Severity

Table 3. Distribution of Premenstrual Syndrome Severity (n = 67)

PMS Severity	Frequency (n)	Percentage (%)
Mild	15	22.4%
Moderate	44	65.7%
Severe	8	11.9%
Total	67	100%

No respondent was classified in the normal or extreme PMS categories. Moderate PMS was the most frequent category (44; 65.7%), followed by mild PMS (15; 22.4%) and severe PMS (8; 11.9%).

Relationship Between Physical Activity and Premenstrual Syndrome

Table 4. Gamma Correlation between Physical Activity and Premenstrual Syndrome

Physical Activity	Premenstrual Syndrome			Total	γ	p
	Mild	Moderate	Severe			
Low	8	39	8	55	-0.787	0.003
Moderate	5	4	0	9		
High	2	1	0	3		
Total	15	44	8	67		

Note. Gamma coefficient (γ) = -0.787; p = 0.003.

Gamma analysis showed a statistically significant strong inverse association between physical activity and PMS severity (γ = -0.787; p = 0.003). As the ordered physical-activity category increased, PMS severity tended to decrease. This association does not establish causality.

Relationship Between Sleep Quality and Premenstrual Syndrome

Table 5. Gamma Correlation between Sleep Quality and Premenstrual Syndrome

Sleep Quality	Premenstrual Syndrome			Total	γ	p
	Mild	Moderate	Severe			
Good	7	7	0	14	0.738	0.004
Poor	8	37	8	53		
Total	15	44	8	67		

Note. Gamma coefficient (γ) = 0.738; p = 0.004.

Gamma analysis showed a statistically significant strong positive association between poorer sleep quality and PMS severity (γ = 0.738; p = 0.004). Students in the poorer sleep category tended to have more severe PMS. This association does not establish causality.

DISCUSSION

Physical Activity among Female Students

The predominance of low physical activity indicates that most students were not achieving an activity pattern consistent with adolescent recommendations. Extended classroom time, screen-based leisure, and competing academic or religious schedules may reduce opportunities for purposeful movement. Similar inactivity patterns have been reported among female adolescents in Indonesia (Maulidiana *et al.*, 2024). Within Orem's framework, regular movement represents a self-care action that supports physical conditioning, emotional regulation, and adaptation to menstrual-cycle changes. School health programs should therefore address practical opportunities for movement rather than relying only on information about exercise.

Sleep Quality among Female Students

Poor sleep quality affected approximately four out of five students, suggesting that inadequate sleep is a prominent health issue in this setting. Adolescent sleep can be disrupted by academic workload, late-night device use, irregular schedules, and emotional stress. Physiologically, insufficient or fragmented sleep may alter circadian melatonin secretion, cortisol regulation, serotonin activity, inflammatory responses, and pain sensitivity. These pathways can contribute to fatigue, irritability, reduced concentration, and greater sensitivity to premenstrual symptoms. The high proportion of poor sleepers is consistent with Indonesian and international studies linking sleep disturbance with PMS (Lutfiyati *et al.*, 2021; Mighani *et al.*, 2025; Rindani *et al.*, 2022).

Premenstrual Syndrome among Female Students

Moderate PMS was the predominant category, and no participant was classified as normal or extreme. Moderate symptoms are clinically relevant because they may disturb concentration, attendance, interpersonal relationships, physical comfort, and daily functioning even when they do not meet criteria for a severe disorder. PMS is thought to involve sensitivity to cyclical estrogen and progesterone changes and their interaction with serotonergic and other neuroendocrine systems (Itriyeva, 2022). Lifestyle and psychosocial conditions may modify this sensitivity, which supports assessing symptoms together with sleep, activity, stress, diet, and functional impairment.

Relationship between Physical Activity and Premenstrual Syndrome

Physical activity had a strong inverse association with PMS severity. This result is consistent with prospective and cross-sectional evidence showing that adolescents and young women with greater activity tend to report fewer or less severe premenstrual symptoms (Chen *et al.*, 2023; Kawabe *et al.*, 2022; Maulidiana *et al.*, 2024; Thaher *et al.*, 2022). Several mechanisms may explain the finding. Regular activity promotes endorphin release, supports pelvic and systemic circulation, reduces stress responses, improves autonomic balance, and may reduce pain perception and emotional reactivity. From Orem's perspective, activity is an adaptive self-care behavior that helps adolescents maintain physiological balance and cope with cyclical symptoms. Nevertheless, the cross-sectional result indicates association, not proof that increasing activity alone will reduce PMS.

Relationship between Sleep Quality and Premenstrual Syndrome

Poorer sleep quality had a strong positive association with PMS severity. This finding agrees with studies reporting greater premenstrual complaints among students and young women with poorer sleep (Lutfiyati *et al.*, 2021; Mighani *et al.*, 2025; Rindani *et al.*, 2022). Sleep loss and fragmentation may increase cortisol, disrupt circadian melatonin secretion and serotonin metabolism, and heighten pain sensitivity, anxiety, fatigue, and emotional lability. Conversely, premenstrual pain and mood symptoms can also impair sleep, so the relationship may be bidirectional. Prospective recording of daily sleep and symptoms across several cycles is needed to clarify temporal sequence.

Strengths, Limitations, and Implications

A strength of this study was the simultaneous assessment of two modifiable lifestyle factors using standardized instruments and random selection from the school population. However, the single-school setting and modest sample limit generalizability. The cross-sectional design prevents causal inference, while self-reported activity, sleep, and premenstrual symptoms are susceptible to recall and social-desirability bias. Potential confounders, including stress, diet, body mass index, screen time, analgesic use, and family history, were not controlled, and PMS was not confirmed prospectively across multiple cycles. The findings therefore support school-based screening, counseling, and referral rather than claims that a specific intervention is effective. School nurses can use the results to prioritize education on regular movement, sleep hygiene, symptom monitoring, and timely help-seeking.

CONCLUSION

Among eleventh-grade female students at MAN Kota Cimahi, low physical activity, poor sleep quality, and moderate PMS predominated. Physical activity was strongly and inversely associated with PMS severity ($\gamma = -0.787$; $p = 0.003$), while poorer sleep quality was strongly and positively associated with PMS severity ($\gamma = 0.738$; $p = 0.004$). These findings identify physical activity and sleep quality as relevant modifiable correlates of PMS, although causal conclusions cannot be drawn from the cross-sectional design.

RECOMMENDATION

Schools and adolescent health services should provide practical education on regular physical activity, sleep hygiene, menstrual symptom tracking, and indications for seeking

professional care. Activities should be feasible within students' academic and religious schedules and should involve school personnel, parents, and healthcare providers.

Future studies should use larger multisite samples, prospective symptom diaries across at least two menstrual cycles, and longitudinal or interventional designs. Analyses should also account for stress, diet, body mass index, screen time, medication use, and other potential confounders.

REFERENCES

- Akbulut, Ö., Jafari, L., Aygün Arı, D., Pehlivan Türk Kızılkın, M., Derman, O., & Akgül, S. (2024). Prevalence of premenstrual syndrome in adolescent girls. *The Turkish Journal of Pediatrics*, 66(3), 340-345. <https://doi.org/10.24953/turkjpediatr.2024.4669>
- Allen, S. S., McBride, C. M., & Pirie, P. L. (1991). The shortened premenstrual assessment form. *Journal of Reproductive Medicine*, 36(11), 769-772.
- Buysse, D. J., Reynolds, C. F., III, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28(2), 193-213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Chen, Z., Imai, K., & Zhou, X. (2023). The relationship between physical activity and premenstrual syndrome in senior high school students: A prospective study. *Scientific Reports*, 13, 5881. <https://doi.org/10.1038/s41598-023-32357-2>
- Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & Science in Sports & Exercise*, 35(8), 1381-1395. <https://doi.org/10.1249/01.MSS.0000078924.61453.FB>
- Dózsa-Juhász, O., Makai, A., Prémusz, V., Ács, P., & Hock, M. (2024). Translation and validation of the Premenstrual Assessment Form-Short Form questionnaire in Hungarian. *Women's Health Reports*, 5(1), 286-292. <https://doi.org/10.1089/whr.2023.0107>
- Itliyeva, K. (2022). Premenstrual syndrome and premenstrual dysphoric disorder in adolescents. *Current Problems in Pediatric and Adolescent Health Care*, 52(2), 101187. <https://doi.org/10.1016/j.cppeds.2022.101187>
- Kawabe, R., Chen, C. Y., Morino, S., Mukaiyama, K., Shinohara, Y., Kato, M., Shimizu, H., Shimoura, K., Nagai-Tanima, M., & Aoyama, T. (2022). The relationship between high physical activity and premenstrual syndrome in Japanese female college students. *BMC Sports Science, Medicine and Rehabilitation*, 14, 175. <https://doi.org/10.1186/s13102-022-00569-0>
- Lutfiyati, A., Hutasoit, M., & Nirmalasari, N. (2021). Hubungan kualitas tidur dengan kejadian premenstrual syndrome (PMS) di SMAN 1 Godean Sleman. *Jurnal Kesehatan Madani Medika*, 12(1), 8-13. <https://doi.org/10.36569/jmm.v12i1.142>
- Maulidiana, A. R., Qomariah, P. N., Rahmawati, S. N., Airin, A., Nazifa, A., Nurazizah, D. M., Chrishargyantari, T. D., Ventiyarningsih, A. D. I., & Fahmi, I. (2024). Anthropometric indices and physical activity in relation to premenstrual syndrome among female adolescents. *Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition)*, 13(1), 35-41. <https://doi.org/10.14710/jgi.13.1.35-41>

- Rahayu *et al.* (2026): Associations of Physical Activity and Sleep Quality With Premenstrual Syndrome Severity Among Female Adolescents in Cimahi, Indonesia
- Mighani, S., Taghizadeh Shivyari, F., Razzaghi, A., Amerzadeh, M., Ranjbaran, M., Samavat, M., & Javadi, M. (2025). Association between sleep quality and premenstrual syndrome in young women in a cross-sectional study. *Scientific Reports*, 15, 6260. <https://doi.org/10.1038/s41598-025-90581-4>
- Muhlisin, A., & Irdawati. (2009). Teori self-care dari Orem dan pendekatan dalam praktik keperawatan. *Berita Ilmu Keperawatan*, 2(2), 97-100. <https://doi.org/10.23917/bik.v2i2.3800>
- Rindani, A. A., Saadah, N., Rahayu, T. P., & Santosa, B. J. (2022). The relationship between physical activity and sleep quality with premenstrual syndrome (PMS) in female students. *International Journal of Advanced Health Science and Technology*, 2(5), 329-334. <https://doi.org/10.35882/ijahst.v2i5.140>
- Thaher, M. I. T., Prautami, E. S., & Ulama, P. (2022). Hubungan aktivitas fisik terhadap kejadian premenstrual syndrome pada remaja putri siswi kelas XI SMA Assanadiyah Palembang tahun 2021. *KOLONI*, 1(2). <https://doi.org/10.31004/koloni.v1i2.291>
- World Health Organization. (2020). *WHO guidelines on physical activity and sedentary behaviour*. <https://www.who.int/publications/i/item/9789240015128>