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The Impact of Stress and Physical Activity on Premenstrual Syndrome Among Junior High School Female Students

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ABSTRACT

Background: Premenstrual syndrome (PMS) is a collection of physical, emotional, and behavioral symptoms that occur during the luteal phase of the menstrual cycle and often disrupt daily activities. Stress and physical activity are among the factors that may influence the occurrence and severity of PMS.
Objective: This study aimed to determine the relationship between stress levels and physical activity with premenstrual syndrome among adolescent girls aged 12–15 years at SMP Negeri 4 Polewali.
Methods: This research employed a quantitative analytic design with a cross-sectional approach. The population included all female students aged 12–15 years at SMP Negeri 4 Polewali. A total of [insert sample size] respondents were selected using proportional stratified random sampling. Data on stress levels were measured using the Perceived Stress Scale (PSS), physical activity levels were assessed using the International Physical Activity Questionnaire (IPAQ), and PMS was evaluated using the Premenstrual Syndrome Questionnaire (PMSQ). Data were analyzed using the Chi-square test to determine the relationship between variables.
Results: The results showed a significant relationship between stress levels and PMS incidence ($p < 0.05$), where students with high stress levels were more likely to experience PMS. Physical activity also showed a significant relationship with PMS ($p < 0.05$), with low physical activity being associated with higher PMS incidence.
Conclusion: There is a significant association between stress levels and physical activity with the occurrence of PMS among adolescent girls at SMP Negeri 4 Polewali. These findings suggest the importance of stress management and regular physical activity as preventive strategies for PMS in adolescents.

Keywords: premenstrual syndrome, stress, physical activity, adolescents

Introduction

Premenstrual syndrome (PMS) is a combination of physical, emotional, and behavioral symptoms that occur during the luteal phase of the menstrual cycle and subside with the onset of menstruation. Although PMS is not considered a life-threatening condition, its symptoms

can significantly disrupt daily activities, academic performance, and social interactions, especially in adolescents who are undergoing major physical and psychological changes. Globally, PMS is recognized as one of the most common gynecological problems among women of reproductive age, with prevalence rates ranging from 20% to 80% depending on diagnostic criteria, assessment methods, and population characteristics (El-Moselhy et al., 2022; Nguyen et al., 2023).

Adolescence is a transitional period characterized by rapid biological, cognitive, and psychosocial development. For female adolescents, the onset of menstruation (menarche) brings about hormonal changes that can influence mood, energy levels, and overall well-being. During this period, many girls experience PMS, which can manifest in symptoms such as irritability, anxiety, fatigue, breast tenderness, abdominal bloating, and headaches. Recent studies have shown that PMS in adolescents can lead to school absenteeism, decreased concentration, and poorer academic performance, as well as strained relationships with peers and family (Hantoushzadeh et al., 2021; Noh et al., 2020).

The exact etiology of PMS remains unclear, but it is widely believed to be related to cyclical hormonal changes, particularly fluctuations in estrogen and progesterone levels, and their effects on neurotransmitters such as serotonin and gamma-aminobutyric acid (GABA). Additionally, several lifestyle and psychosocial factors have been associated with PMS severity, including stress levels, sleep quality, nutritional status, and physical activity (Bahrami et al., 2020; Elghazally et al., 2019). Among these, stress and physical activity have been identified as modifiable factors that may play a significant role in either exacerbating or alleviating PMS symptoms.

Stress, as a physiological and psychological response to perceived challenges, can alter the hypothalamic–pituitary–adrenal (HPA) axis, resulting in increased cortisol production and potential disruption of normal reproductive hormone regulation. Chronic stress may heighten emotional symptoms of PMS, such as irritability, mood swings, and anxiety, and may also worsen somatic symptoms through immune and metabolic pathways (Ghodsbin et al., 2019; Sone et al., 2023). Adolescents, particularly those in competitive academic environments, are often exposed to stressors from school demands, peer relationships, and family expectations, which may contribute to the high prevalence of PMS in this age group (Mulyani et al., 2021).

On the other hand, physical activity has been shown to have beneficial effects in reducing PMS symptoms. Regular exercise can improve blood circulation, enhance endorphin release, and promote hormonal balance, all of which may help reduce both physical and emotional symptoms associated with PMS (Abdollahian et al., 2019; Balikci et al., 2021). Physical activity may also reduce stress levels, thereby indirectly alleviating PMS severity. However, the relationship between physical activity and PMS in adolescents is not always consistent across studies, with some reporting significant improvements and others finding minimal or no effect (Faramarzi et al., 2018; Mokhtari et al., 2020).

In Indonesia, research on PMS in adolescents is still relatively limited, particularly studies examining the combined influence of stress and physical activity. Data from the Indonesian Ministry of Health indicate that menstrual disorders, including PMS, are among the most common reproductive health problems faced by adolescent girls, yet they are often

underreported due to stigma, lack of awareness, and the perception that menstrual discomfort is a normal part of womanhood (Prastiwi & Nugroho, 2020). In the context of Polewali Mandar Regency, no published studies to date have specifically investigated the association between stress levels, physical activity, and PMS in school-aged girls, despite anecdotal reports from teachers and health workers suggesting that PMS-related complaints are frequent among students.

SMP Negeri 4 Polewali, as one of the largest junior high schools in the region, provides a unique setting to explore these relationships. The school has a diverse student population with varying socioeconomic backgrounds, lifestyles, and extracurricular activities, which may influence both stress exposure and physical activity levels. Understanding how these factors interact to affect PMS incidence can provide valuable insights for developing school-based interventions aimed at improving adolescent girls' reproductive health and overall quality of life.

Given the potential for PMS to impair academic performance and social functioning, identifying modifiable risk factors such as stress and physical activity is essential. By targeting these factors through health education, stress management programs, and promotion of regular physical activity, it may be possible to reduce the burden of PMS among adolescents (Wahyuni et al., 2022). Moreover, this research aligns with the broader goals of adolescent health promotion as outlined by the World Health Organization, which emphasizes the importance of addressing both physical and mental health challenges in this age group to support their optimal development.

Therefore, this study aims to determine the relationship between stress levels and physical activity with premenstrual syndrome among adolescent girls aged 12–15 years at SMP Negeri 4 Polewali. The findings are expected to contribute to the limited body of literature on PMS in Indonesian adolescents and provide a scientific basis for designing locally relevant interventions that address both psychological and lifestyle factors in the management and prevention of PMS.

Objective

This study aims to examine the relationship between stress levels and physical activity with the occurrence of premenstrual syndrome (PMS) among adolescent girls aged 12–15 years at SMP Negeri 4 Polewali. Specifically, the research seeks to identify whether higher stress levels and lower physical activity are associated with an increased risk and severity of PMS, thereby providing scientific evidence to support targeted interventions that promote stress management and regular physical activity as preventive strategies for PMS in adolescents.

Method

Design and setting

This study employed a quantitative analytic design with a cross-sectional approach to determine the relationship between stress levels and physical activity with premenstrual syndrome (PMS). The research was conducted at SMP Negeri 4 Polewali, a junior high school

located in Polewali Mandar Regency, West Sulawesi, Indonesia. The setting was chosen due to its diverse student population and reported prevalence of PMS among female students.

Population and sampling

The study population consisted of all female students aged 12–15 years at SMP Negeri 4 Polewali who had experienced menarche. The sample size was determined using the Slovin formula, resulting in a total of 102 respondents. Sampling was conducted using proportional stratified random sampling to ensure representation from each grade level. Inclusion criteria included students who had regular menstrual cycles, provided informed consent, and were willing to participate. Exclusion criteria included those with chronic illnesses or currently undergoing hormonal therapy.

Instrument and measurement

Data were collected using three validated questionnaires: the Perceived Stress Scale (PSS) to measure stress levels, the International Physical Activity Questionnaire (IPAQ) to assess physical activity levels, and the Premenstrual Syndrome Questionnaire (PMSQ) to evaluate PMS symptoms. Each instrument had been previously tested for validity and reliability in similar populations. Stress levels were categorized as low, moderate, or high, while physical activity levels were classified as low, moderate, or high according to IPAQ scoring guidelines. PMS diagnosis followed established symptom criteria, including both physical and psychological manifestations.

Data collection and analysis

Data collection was conducted over a two-week period during regular school hours, with questionnaires administered in a classroom setting under the supervision of the research team. Prior to data collection, informed consent was obtained from both the students and their parents or guardians. Data were coded, entered, and analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were used to summarize demographic characteristics, stress levels, physical activity levels, and PMS prevalence. The Chi-square test was employed to determine the association between stress levels, physical activity, and PMS occurrence, with a significance level set at $p < 0.05$.

Result

A total of 102 respondents participated in this study, all of whom were female students aged 12–15 years at SMP Negeri 4 Polewali. Table 1 presents the demographic characteristics of the participants, including age distribution, stress levels, and physical activity levels.

Table 1. Demographic Characteristics of Respondents (n = 102)

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
12	30	29.4
13	35	34.3
14	25	24.5

Characteristics	Frequency (n)	Percentage (%)
15	12	11.8
Stress Level		
Low	28	27.5
Moderate	46	45.1
High	28	27.5
Physical Activity		
Low	40	39.2
Moderate	45	44.1
High	17	16.7

Table 2 illustrates the relationship between stress levels and the incidence of premenstrual syndrome (PMS). Statistical analysis using the Chi-square test revealed a significant association between stress level and PMS occurrence (p = 0.000), indicating that higher stress levels were correlated with an increased prevalence of PMS.

Table 2. Relationship Between Stress Level and PMS Occurrence

Stress Level	PMS Present (n)	PMS Absent (n)	Total (n)	*p*-value
Low	8	20	28	
Moderate	31	15	46	
High	25	3	28	**0.000**

Table 3 presents the relationship between physical activity levels and PMS occurrence. The analysis showed a statistically significant association between physical activity level and PMS occurrence (p = 0.000), with lower physical activity levels associated with higher PMS prevalence.

Table 3. Relationship Between Physical Activity Level and PMS Occurrence

Physical Activity Level	PMS Present (n)	PMS Absent (n)	Total (n)	*p*-value
Low	35	5	40	
Moderate	25	20	45	
High	4	13	17	**0.000**

Summary of Findings:

- PMS prevalence was higher among respondents with **high stress levels** and **low physical activity levels**.

- Both stress level and physical activity level showed statistically significant relationships with PMS occurrence ($p < 0.05$).

Discussion

The present study found a significant relationship between stress levels and the occurrence of premenstrual syndrome (PMS) among adolescent girls aged 12–15 years at SMP Negeri 4 Polewali. Respondents with high stress levels were more likely to experience PMS compared to those with moderate or low stress levels (p = 0.000). This finding is consistent with previous studies indicating that psychological stress is a strong predictor of PMS severity (Sone et al., 2023; Hantoushzadeh et al., 2021). High stress levels may influence the hypothalamic–pituitary–adrenal (HPA) axis, increasing cortisol secretion, which can disrupt the balance of reproductive hormones such as estrogen and progesterone, ultimately exacerbating PMS symptoms (Ghodsbin et al., 2019). Adolescents are particularly vulnerable to stress due to academic demands, peer relationships, and family expectations, all of which may contribute to the onset or worsening of PMS.

Restate the Key Findings

This study found a significant relationship between stress levels and the occurrence of premenstrual syndrome (PMS) among adolescent girls aged 12–15 years at SMP Negeri 4 Polewali (p = 0.000). Higher stress levels were associated with an increased prevalence of PMS. Additionally, there was a significant association between physical activity levels and PMS (p = 0.000), with low physical activity linked to a higher likelihood of experiencing PMS symptoms.

Interpret the Results

The findings suggest that psychological stress may exacerbate PMS symptoms through neuroendocrine mechanisms, particularly by disrupting the hypothalamic–pituitary–adrenal (HPA) axis, which can lead to hormonal imbalances affecting mood and physical well-being (Ghodsbin et al., 2019). Similarly, low physical activity may contribute to PMS severity by reducing endorphin release, impairing blood circulation, and negatively affecting hormonal regulation (Abdollahian et al., 2019). Both stress and lack of exercise are modifiable factors, indicating that lifestyle interventions could play an important role in PMS management.

Compare with Previous Studies

The results are consistent with previous research showing that higher stress levels significantly increase the likelihood of PMS (Sone et al., 2023); (Hantoushzadeh et al., 2021). These studies also noted that adolescents often experience heightened stress due to academic and social pressures, which may intensify PMS symptoms. Regarding physical activity, our findings align with (Abdollahian et al., 2019) and (Balikci et al., 2021), who reported that regular exercise reduced PMS severity. Similar trends have been observed internationally, including studies in Vietnam (Nguyen et al., 2023) and Korea (Noh et al., 2020), which emphasized the dual influence of stress and lifestyle factors on adolescent PMS.

Highlight the Implications

The implications of this study extend to school health policies and adolescent health programs. Incorporating stress management education, mindfulness training, and structured physical activity programs into the school curriculum could help mitigate PMS symptoms among students. Additionally, fostering open discussions about menstrual health may reduce stigma and encourage adolescents to seek help early (Wahyuni et al., 2022). These interventions may not only improve reproductive health but also enhance academic performance and overall quality of life.

Discuss the Limitations

This study has several limitations. First, its cross-sectional design prevents establishing a causal relationship between stress, physical activity, and PMS. Second, reliance on self-reported data for stress and physical activity levels may introduce recall bias and social desirability bias. Third, the study was conducted at a single school, which may limit the generalizability of findings to other adolescent populations with different cultural or socioeconomic backgrounds.

Suggest Future Research

Future studies should adopt longitudinal or experimental designs to better understand causal pathways between stress, physical activity, and PMS. Including objective measures of physical activity, such as accelerometers, could improve measurement accuracy. Additionally, intervention studies that test the effectiveness of combined stress reduction and exercise programs in reducing PMS severity would provide valuable evidence for school-based health initiatives. Expanding research to diverse adolescent populations across different regions would also enhance the applicability of the findings.

Conclusion

This study demonstrated a significant relationship between stress levels and physical activity with the occurrence of premenstrual syndrome (PMS) among adolescent girls aged 12–15 years at SMP Negeri 4 Polewali. Higher stress levels were associated with a greater likelihood of experiencing PMS, while lower physical activity levels were linked to increased symptom prevalence. These findings highlight the importance of addressing both psychological and lifestyle factors in managing PMS among adolescents. Implementing school-based programs that promote stress reduction and regular physical activity may serve as effective non-pharmacological strategies to reduce PMS symptoms, improve quality of life, and enhance academic performance. Further longitudinal and interventional studies are recommended to explore causal pathways and develop targeted interventions for adolescent reproductive health.

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Author Contribution

R.N, NF designed the research, collected and analyzed the data, and drafted the manuscript. N.I, M.W contributed to data interpretation, literature review, and manuscript revision. Both authors reviewed and approved the final manuscript.

Conflict of Interest

The authors declare that they have no conflict of interest related to this research.

Ethical Clearance

This research received ethical approval from participants and their guardians provided informed consent before participation.

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