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Physical activity and menstrual cycle regularity among young women: A cross-sectional study

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Abstract

Background: Globally, around 14–25% of women have irregular menstrual cycles, characterized by heavier or lighter periods, or cycle lengths exceeding 35 days or shorter than 21 days. Irregular menstrual cycles have been linked to various diseases and medical conditions. Various factors can influence menstrual cycle, including age, body mass index, physical activity, diet, medical status, and overall lifestyle. WHO recommendation for adults aged 18-64 years should do at least 150 minutes of moderate-intensity physical activity per week. Excessive exercise can disrupt the balance of estrogen and progesterone and lead to irregular periods.
Purpose: To assess the influence of physical activity and menstrual cycle among female adolescent.
Method: A cross-sectional study was conducted to 111 students who met the criteria, such as had a record of the first day of her menstrual period since December 2024 until February 2025 and did not have reproductive system disorders. The physical activity measured by PAQ-A questionnaire, while menstruation cycle was collected by questionnaire. The data were analysed using Spearman test.
Results: Most of respondents were 19 years old (54.1%), had light physical activity (66.7%), and got regular menstrual cycle (58.6%). Spearman's rank correlation showed a significant negative association ($\rho = -0.558$, $p < 0.001$).
Conclusion: There was an association between physical activity with menstrual cycle.

Keywords: Menstrual Cycle; Physical Activity; Teenager.

INTRODUCTION

The menstrual cycle is aimed to prepare the uterus for potential pregnancy. A regular menstrual cycle is a marker of physical and mental well-being in all women of reproductive age that occurs periodically every 21–35 days. At first, menstrual cycles are frequently anovulatory, and even two years after menarche, as many as 85% of cycles may still lack ovulation. Regular ovulation is typically established by the end of puberty. Therefore, menstrual irregularities during the first two years after menarche generally do not require further evaluation (Anthon et al., 2024; Vena & Paschou, 2022).

Menstrual irregularities involve deviations in onset, frequency, flow, duration, or volume. It is estimated that around 14–25% of women have irregular menstrual cycles, characterized by heavier or lighter periods, or cycle lengths exceeding 35 days or shorter than 21 days. This problem is widespread among female students with prevalence rates ranging from 23% to 76.6%, reflecting an increasing trend in both developing and developed countries (Hussein et al., 2025; Vena & Paschou, 2022).

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Menstrual irregularities have been linked to a range of diseases and medical conditions, including anemia, metabolic syndrome, cardiovascular disease, type 2 diabetes mellitus, rheumatoid arthritis, osteoporosis, psychological disorders, reduced quality of life, and infertility. Furthermore, studies have demonstrated a significant association between irregular menstrual cycles and a higher risk of pregnancy-related hypertensive disorders, along with an increased likelihood of adverse obstetric and neonatal outcomes. Therefore, irregular menstruation is regarded as a key indicator of women's health (Attia et al., 2023; Hussein et al., 2025).

Irregularities in the menstrual cycle can result from various factors. A range of environmental factors can influence menstrual cycle characteristics, including age, body mass index, physical activity, diet, caffeine intake, smoking, exposure to organic solvents, occupation, workplace conditions, medical status, and overall lifestyle. Early menarche or menarche occurring at age 15 or later has been related to experiencing long and irregular cycles. Additionally, women with pregnancy, infections, malignancies, trauma, hormonal imbalances, and psychological stress tend to have irregular menstruation (Aryani et al., 2018; Attia et al., 2023; Vena & Paschou, 2022).

Endogenous estrogen and progesterone levels change in a predictable pattern throughout the menstrual cycle in women with normal and regular cycles. In addition to their role in reproduction, both hormones significantly influence various body tissues, including skeletal muscle, cardiac tissue, bones, connective tissues, as well as the central and peripheral nervous systems. Current evidence suggests that the association between the menstrual cycle and exercise training is complex and bidirectional, involving mutual influences and adaptations, along with significant variations both between individuals and within the same individual over time (Rocha-Rodrigues et al., 2021).

Physical activity refers to any bodily movement that requires energy expenditure and results in calorie expenditure. The World Health Organization recommends that adults aged 18–64 years engage in at least 150 minutes of moderate-intensity physical activity per week, at least 75 minutes of vigorous-intensity physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activities. For additional health benefits, adults should increase their moderate-intensity physical activity to 300 minutes per week or an equivalent combination of moderate- and vigorous-intensity activity. In addition, muscle-strengthening activities involving major muscle groups are recommended on at least 2 days per week (World Health Organization, 2026). Moderate-intensity physical activities include brisk walking at a speed of at least 2.5 miles per hour, water aerobics, dancing (ballroom or social), gardening, doubles tennis, and cycling at speeds below 10 miles per hour. In contrast, vigorous-intensity activities include hiking uphill or with a heavy backpack, running, swimming laps, vigorous aerobic dancing, heavy yard work involving continuous digging or hoeing, singles tennis, cycling at speeds of 10 miles per hour or faster, and jumping rope (American Heart Association, 2024).

Excessive exercise can disrupt the balance of estrogen and progesterone. Imbalances in these hormone levels can lead to irregular periods (Savitrie, 2022). Sports that promote a low body mass are associated with menstrual dysfunction and may also be associated with delayed puberty. Athletes, like swimmer have significantly delayed menstruation and a high prevalence and duration of menstrual irregularities. They start training at a very young age and live under intensive physical and mental stress. Their luteinizing hormone (LH) levels, LH/FSH (Follicle-stimulating hormone) ratio, and adrenal androgen levels (A and DHEA-S) were significantly higher in swimmers than the controls (Constantini & Warren, 1995).

The interaction between physical activity and the menstrual cycle does not occur in a single direction. Studies in the general population show that the menstrual cycle and its associated physical and psychological symptoms may negatively affect everyday activities as well as participation in physical exercise (Vena & Paschou, 2022). Physical activity being often associated to dysmenorrhea. It reduces cortisol and prostaglandins, and the need for nonsteroidal anti-inflammatory drugs or NSAIDS (Bougault et al., 2023).

Previous studies have reported inconsistent associations between physical activity and menstrual-cycle characteristics, particularly among young women. However, evidence among female midwifery students remains limited. Therefore, this study aimed to examine the association between physical activity level and menstrual-cycle regularity among second-year female midwifery students at Poltekkes Kemenkes Surakarta.

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RESEARCH METHOD

This study was a cross-sectional study in Poltekkes Kemenkes Surakarta and conducted in April 2025. The inclusion criteria were active student, willing to be a respondent, and had a record of the first day of her menstrual period since December 2024 until February 2025. While the exclusion criteria were students who took estrogen/progesterone hormone supplements and had been diagnosed by doctor with reproductive system disorders, such as Polycystic Ovary Syndrome (PCOS), Pelvic Inflammatory Disease (PID), fibroids, cancer, endocrine disorders, bleeding disorders, etc.

The samples were determined using purposive sampling with inclusion and exclusion criteria. The source population was all second-year students of midwifery department as 122 students. While the samples of this study were 111 students using purposive sampling who met the inclusion and exclusion criteria.

Before completing the questionnaires, the respondents had to filling out the informed consent after receiving an explanation by Google Form as a proof of their willingness to participate in the study. The data were analysed anonymously to protect their privacy.

The independent variable was physical activity measured by questionnaire that consist of 23 items. It was classified into 4 categories, (1) very light if the average score was ≤1,50; (2) light if the average score was >1,50-2,50; (3) moderate if the average score was >2,50-3,50; and (4) quite heavy if the average score was >3,50. While the dependent variable was menstruation cycle and collected by questionnaire. It was counted for the last three months (December 2024-Februari 2025). It classified into regular if the menstrual cycle does not advance or delay by more than 4 days from the expected cycle and irregular if the menstrual cycle advance or delay by more than 4 days from the expected cycle.

Univariate analysis was carried out to explain the characteristics of each research variable presented with frequency and percentage. While bivariate analysis explains the association of one independent variable on a dependent variable using the Spearman test with a 95% confidence level. The data were analysed using SPSS Statistics 21.

RESEARCH RESULTS

Table 1. Characteristic of Respondents (N=111)

Variable	Results
Age (Mean ± SD)(Range)(Years)	(19.48 ± 0.59) (18–21)
Age (n/%)	
18	1/0.9
19	60/54.1
20	46/41.4
21	4/3.6
Physical Activity Level in the Past 7 Days	
Very light	11/9.9
Light	74/66.7
Moderate	25/22.5
Quite Heavy	1/0.9
Menstrual Cycle (n/%)	
Regular	65/58.6
Irregular	46/41.4

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The respondents had a mean age of 19.48 ± 0.59 years, with an age range of 18–21 years. Most participants were aged 19 years (54.1%), followed by 20 years (41.4%), 21 years (3.6%), and 18 years (0.9%). Regarding physical activity over the previous seven days, the majority of participants reported light physical activity (66.7%), followed by moderate (22.5%), very light (9.9%), and vigorous physical activity (0.9%). In terms of menstrual cycle, 58.6% of participants had regular menstrual cycles, while 41.4% had irregular menstrual cycles.

Table 2. Correlation Between Physical Activity and Menstrual Cycle

Variable	Correlation coefficient	Sig. (2-tailed)
Physical Activity Menstrual Cycle	-.558	.000

Table 2 presents bivariate analysis of the effect of an independent variable on a dependent variable. Spearman test with ρ value < 0.05 so there was significant association between physical activity and menstrual cycle. Correlation coefficient was -.558 means that the strength of the association between physical activity and the menstrual cycle was strong and negative. The higher the level of physical activity, the more irregular the menstrual cycle becomes.

DISCUSSION

Physical activity helps to prevent and treat the most common diseases like heart disease, stroke, diabetes, and breast and colon cancers. Additionally, it can help to prevent hypertension and obesity, improve mental health and quality of life, and reduce mortality. In young women, studies revealed that exercise also reduces the likelihood of substance abuse and the risk of depression, and it improves self-esteem and academic performance (Passoni et al., 2024).

The reproductive function depends on energy availability and leads to hormonal impairments, caused by the suppression of the hypothalamic-hypo pituitary axis. This leads to reduced gonadotropin-releasing hormone (GnRH) pulsatility, which usually pulses every 30–60 minutes; driving to reduced production of luteinizing hormone (LH) and, to a lesser extent, follicle-stimulating hormone (FSH). There is a dose-response association between the frequency of menstrual irregularities and the magnitude of energy deficit (Passoni et al., 2024).

Menstruation is regarded as a normal process in women at the reproductive age and any disturbance could be debilitating for a woman. Menstruation demonstrates a specific function and interplay between several endocrine glands including the hypothalamus, pituitary, and ovaries. The regularity of the cycles reflects normal reproductive activity as well (Omidvar et al., 2019).

The menstrual cycle is a fundamental biological rhythmic cycle occurring in females of reproductive age, composed of the ovarian and uterine cycles. The ovarian cycle, consisting of follicular, ovulatory, and luteal phases, is concerned with oocyte maturation and release, while the uterine cycle, consisting of menstruation, proliferative, and secretory phases, is concerned with preparing the uterine lining for possible oocyte implantation in the event of fertilization. The ovarian cycle and uterine cycle occur in a coordinated and concurrent manner (Macgregor et al., 2021).

There was a association between physical activity and menstrual function. Physical activity pursuit was probably related to menstrual patterns such as the length of the cycles, menstrual regularity, the duration of bleeding, and the like. Women who are physically active have a higher percentage of regular menstruation. The length and regularity of the menstrual cycle reflect changes in ovarian steroid production (Omidvar et al., 2019).

Physical activity four hours per week or more is related to longer cycle length. Apparently, the longer duration of the cycles can have a relation with modifications in follicle stimulating hormone (FSH) pulses during the phase transition. On the other hand, the longer cycle length is related to late ovulation and longer follicular phase since luteal phases have a fixed duration which is limited to 14 days (Omidvar et al., 2019).

Regular aerobic exercise for 8 weeks in people with premenstrual syndrome causes a significant reduction in some of the physical symptoms of the

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syndrome, such as bloating, headache, fatigue, dizziness, breast tenderness, cramps, and pain. Therefore, a regular exercise program is recommended for all women of reproductive age (Agul et al., 2022).

Previous studies have consistently indicated an association between physical activity and menstrual cycle characteristics. Exercise during menstruation has been reported to provide positive effects, including improved emotional state, reduced menstrual pain, and increased feelings of accomplishment, suggesting that physical activity may help alleviate menstrual symptoms and support psychological well-being throughout the menstrual cycle (Kolić et al., 2021). Similarly, exercise frequency was significantly associated with menstrual cycle among adolescent girls participating in a Pencak Silat group in Purwokerto (Machmudah et al., 2017). Most participants practiced Pencak Silat up to four times per week, with each session lasting no more than 120 minutes. Furthermore, young women with light or vigorous physical activity were more likely to experience irregular menstrual cycles than those with moderate physical activity (Istibsaroh et al., 2022). These findings suggest that the relationship between physical activity and menstrual cycle may depend on the intensity and frequency of physical activity, with moderate levels potentially being more favorable for maintaining menstrual regularity.

This finding is consistent with a study involving 60 female athletes at the East Java Sports High School, which demonstrated a significant association between the duration of physical exercise and menstrual cycle ($p = 0.002$). Physical exercise performed for 20–60 minutes continuously may have positive effects on improving and maintaining physical fitness. In contrast, high-intensity physical exercise that is not accompanied by adequate energy intake may disrupt endocrine function and contribute to menstrual cycle abnormalities, including polymenorrhea and oligomenorrhea **(**Romadona, 2021**)**.

Previous studies have also demonstrated a significant association between physical activity and menstrual cycle. A significant association between physical activity and menstrual cycle was reported among women, with regular menstrual cycles observed among respondents with light (15.6%) and moderate (25.0%) physical activity, whereas irregular menstrual cycles were more frequently observed among those with moderate (40.6%) and vigorous (9.4%) physical activity (Djashar et al., 2022). These findings suggest that higher levels of physical activity may increase the likelihood of menstrual irregularities. High-intensity physical activity may contribute to menstrual disturbances through increased energy expenditure and inadequate energy availability, which can affect reproductive hormone secretion. Energy deficiency may increase ghrelin levels and subsequently suppress luteinizing hormone (LH) secretion, which plays an important role in ovulation and corpus luteum function (Djashar et al., 2022).

Similarly, a study involving 140 women in Bandar Lampung found a significant association between physical activity and menstrual cycle (Amir et al., 2024). The study reported that 46 respondents with low physical activity experienced normal menstrual cycles. Strenuous physical activity may suppress ovulation and disrupt menstrual regularity through alterations in hypothalamic function and gonadotropin-releasing hormone (GnRH) pulsatility. When energy expenditure exceeds energy intake, reduced GnRH secretion may impair reproductive hormonal regulation and subsequently affect the menstrual cycle (Amir et al., 2024).

High-intensity activity is associated with amenorrhea, oligomenorrhea, luteal phase deficiency, and anovulation. suppression of gonadotropin releasing hormone resulting from exercise-associated hypothalamic dysfunction can delay menarche and disrupt menstrual cycle patterns by limiting the secretion of luteinizing hormone (LH) and follicle-stimulating hormone (FSH). high levels of physical activity throughout the menstrual cycle were associated with lower concentrations of leptin and luteal progesterone (Ahrens et al., 2014).

Acute high intensity resistance exercise increases arterial stiffness. It was reported that changes in blood concentrations of estrogen and progesterone associated with the menstrual cycle affect the degree of arterial stiffness. Therefore, high-intensity resistance exercise was reported to affect arterial stiffness differently depending on the phase of the menstrual cycle (Agul et al., 2022).

While low physical activity levels are associated with higher mean estradiol levels across the menstrual cycle and higher progesterone levels during the luteal phase. This imbalance hormonal can cause irregular, heavy, or painful periods; breast

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tenderness; weight gain by increased appetite; and worsen conditions that affect reproductive health (Macgregor et al., 2021).

The findings of this study have practical implications for midwifery practice and adolescent reproductive health promotion. Assessment of physical activity patterns may be incorporated into adolescent health services to facilitate early identification of lifestyle factors potentially associated with menstrual-cycle disturbances. Midwives and other health professionals can provide individualized education regarding appropriate physical activity, balanced nutrition, adequate rest, and menstrual health monitoring. Furthermore, the findings may support the development of college-based health-promotion programs that integrate physical activity and menstrual health education. These interventions should emphasize maintaining an appropriate level of physical activity and a balanced lifestyle rather than promoting excessive exercise. The findings may also provide preliminary evidence for the development of promotive and preventive strategies aimed at improving menstrual health among adolescents.

This study has several limitations. The study used a cross-sectional design to analysed physical activity and menstrual cycle, and did not control for potential confounding factors. Further studies using longitudinal designs and incorporating BMI, dietary intake, energy availability, psychological stress, sleep, and hormonal factors are recommended. In addition, the physical activity was only observed over a 7-day period and the menstrual cycle over a 3-month period. This brief window limits data collection to short-term behaviours, misses long-term patterns or delayed effects, and increases the risk of observer bias and unrepresentative snapshots in time.

CONCLUSION

This study found a significant negative association between physical activity level and menstrual-cycle regularity among female midwifery students. They should stay active by exercising regularly, at least 150 minutes of moderate-intensity physical activity throughout the week. They can also incorporate simple activities into their daily routines, such as walking or biking to college, taking the stairs instead of the elevator, or doing chores.

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