

Correlation Between Exercise Frequency and Menstrual Cycle Characteristics in Perimenopausal Women Aged 45–50 Years

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Abstract

Background: During perimenopause, declining estrogen levels often lead to altered menstrual patterns and other age-related health concerns. Consequently, the role of physical activity warrants closer examination. This study investigated the correlation between exercise frequency and menstrual cycle characteristics in premenopausal women

Methods: A cross-sectional observational study was conducted in Singaraja City, Indonesia, from July to October 2024. A total of 150 premenopausal women aged 45–50 years were recruited through random sampling. Exercise frequency was measured using the World Health Organization's Global Physical Activity Questionnaire (GPAQ) and categorized as never, low (1–2 times/week), moderate (3–4 times/week), and high (>5 times/week). Menstrual cycle characteristics were assessed according to the International Federation of Gynecology and Obstetrics (FIGO) criteria, including cycle frequency, regularity, duration, and sanitary product use. Correlations between exercise frequency and menstrual parameters were analyzed using Spearman's Rho test.

Results: Almost half of the women (45.3%) exercised 1–2 times/week. Interestingly, 22.0% never exercised. Moderate negative correlations were observed between exercise frequency and menstrual cycle period ($r=-0.35$, $p<0.001$) as well as regularity ($r=-0.42$, $p<0.001$). However, no significant correlation was found between exercise frequency and menstrual duration, and only a weak negative correlation with sanitary product use ($r=-0.17$, $p=0.038$).

Conclusions: Physical activity appears to modulate menstrual cycle patterns during perimenopause. Consequently, regular exercise may facilitate hormonal homeostasis and support reproductive health throughout the menopausal transition, ultimately enhancing overall quality of life

Keywords: Aging, exercise, menstrual cycle, perimenopause, premenopausal women

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Introduction

Perimenopause is a significant life stage for women, typically occurring between the ages of 45 and 55.¹ This period, known as perimenopause, is characterized by fluctuating hormone levels, particularly estrogen, which can lead to various physiological changes.² These changes often manifest in alterations to

menstrual cycle patterns, including variations in frequency, regularity, and duration.³ Understanding the factors that influence menstrual health during this transition is crucial for developing strategies to support women's overall well-being and potentially mitigate some of the challenges associated with aging.⁴

Exercise has been recognized as a

cornerstone of healthy aging, with numerous studies demonstrating its benefits for cardiovascular health, bone density, cognitive function, and mood regulation.⁵ However, the specific effects of exercise on menstrual cycle characteristics, particularly in women approaching menopause, not well understood. While some research has explored the impact of physical activity on menstrual function in younger women and athletes,⁶ there is a notable gap in our knowledge regarding how exercise habits may influence menstrual patterns in the perimenopausal population.

The correlation between exercise and hormonal balance is complex and multifaceted. Regular physical activity has been shown to affect the production and metabolism of various hormones, including estrogen, progesterone, and follicle-stimulating hormone.⁷ These hormonal changes could potentially influence menstrual cycle characteristics.⁸ However, exercise frequency and intensity modulate menstrual cycle in women approaching menopause remains unclear. Additionally, the potential for exercise to serve as a non-pharmacological intervention for managing menstrual irregularities and other perimenopausal symptoms warrants further investigation.

Previous studies examining the correlation between exercise and menstrual health have primarily focused on younger populations and not specifically addressed the unique physiological context of perimenopause.⁹ This gap in the literature highlights the need for targeted research on premenopausal women in their late 40s and early 50s, as this group experiences significant hormonal shifts that may interact differently with physical activity compared to younger women.¹⁰ Furthermore, few existing research has been conducted in Asian populations, leaving a dearth of information on how these correlations may manifest in diverse cultural and geographical contexts.¹¹

This study aimed to investigate the correlation between exercise frequency and menstrual cycle characteristics in premenopausal women aged 45–50 years. By focusing on this specific age group, this research has offered a novel perspective on how physical activity might influence reproductive health during the perimenopausal transition in a non-Western population. Findings from this study may contribute valuable insights to the development of tailored exercise recommendations and interventions for women approaching menopause, ultimately

supporting healthy aging and quality of life in this critical life stage.

Methods

This observational analytical study employed a cross-sectional design and was conducted from July to October 2024. The study population comprised premenopausal women aged 45–50 years in Singaraja City, Indonesia. The minimum sample size was calculated using G*Power 3.1 software. Based on a previous study with similar variables and population,¹² an effect size correlation (r) of 0.3 was used. With a two-tailed correlation analysis, an alpha level of 0.05, and a power of 0.8, the minimum required sample size was determined to be 84 participants. To enhance statistical power and account for potential attrition, we increased the sample size to 150 respondents.

A simple random sampling technique was used to recruit participants from the eligible population. A list of all premenopausal women aged 45–50 years was obtained from local health registries, and participants were randomly selected using a computer-generated random number sequence until the target sample size of 150 was reached. Inclusion criteria were women aged 45–50 years who were still menstruating, had regular engagement in physical exercise, and absence of chronic diseases. Women who did not meet these criteria were excluded from the study. All participants provided written informed consent prior to enrollment.

Exercise habits were measured using the Global Physical Activity Questionnaire (GPAQ) developed by the World Health Organization (WHO) (Table 1). Participants completed a questionnaire about their physical activity patterns, with exercise frequency categorized into four levels: never exercise, low (1–2 times a week), medium (3–4 times a week), and high (>5 times a week). To ensure a representative assessment of typical activity levels, participants were instructed to consider their average exercise habits over the past three months when responding. The GPAQ has been shown to be valid and reliable, with statistical measures including an r count of 0.599–0.938, Kappa values of 0.67 to 0.73, and Spearman's rho values of 0.67 to 0.81.¹³ We conducted convergent validity and reliability assessment with 39 female respondents, yielding r values between 0.599 and 0.938 and Cronbach's Alpha of 0.77.

The menstrual cycle questionnaire was based on the four parameters of normal

Table 1 Exercise Habits Item Checklist (WHO GPAQ Adaptation)

Question	Response Options
In a typical week, how often do you exercise?	<ol style="list-style-type: none"> 1. Never exercise 2. Low (1–2 times per week) 3. Medium (3–4 times per week) 4. High (>5 times per week)

menstrual cycles in women of reproductive age, as defined by the International Federation of Gynecology and Obstetrics 2011 (FIGO) (Table 2). These parameters included menstrual frequency, regularity, duration, and sanitary.³ For menstrual cycle frequency, participants reported the average number of days between the start of one period and the next over the past six months, categorized as <24 days, 24–38 days, or >38 days. Cycle regularity was assessed by asking women about the variation in their cycle length, with responses grouped as no bleeding, variation of 2–20 days, or variation >20 days. Menstrual duration was recorded as <5 days, 5–8 days, or >8 days. The frequency of changing sanitary pads during menstruation was categorized as <2 times, 2–7 times, or >7 times per day. Interviewers were trained to ask probing questions and provide clarification to ensure accurate responses, and participants were encouraged to refer to their personal menstrual tracking methods when answering. The instrument was validated on 39 female respondents, with correlation values (r) of 0.68–0.88 and a Cronbach’s Alpha of 0.82.

Data analysis was performed using SPSS

version 26. Descriptive statistics were used to summarize participant age, exercise frequency, and menstrual cycle parameters. The correlation between exercise frequency and menstrual cycle characteristics was assessed using a nonparametric Spearman’s Rho correlation test. A p-value of less than 0.05 was considered statistically significant. The study protocol was approved by Ethics Committee of Faculty of Medicine, Universitas Udayana (Reference number: 2529/UN14.2.2.VII.14/LT/2023).

Results

Respondents were distributed across the ages of 45–50 years. Most respondent were exercised 1–2 times per week, fewer exercised 3–4 times, and only a small proportion reported never or high-frequency exercise. Menstrual cycles were generally within the normal 24–38-day range, with moderate variations in cycle length. Correlation analysis showed that higher exercise frequency was moderately associated with shorter and more regular cycles. No significant correlation was found with menstrual duration, and only a weak negative correlation appeared with sanitary product use.

Most respondents exercised at a low frequency. Nearly half reported exercising only 1–2 times per week, while smaller proportions engaged in medium-frequency exercise or reported no exercise at all. Only a few maintained a high-frequency routine of more than five times weekly. This pattern

Table 2 Menstrual Cycle Questionnaire (FIGO, 2011 Parameters)

Parameter	Question	Response Options
Frequency	Over the past six months, what was the average number of days between the start of one period and the next?	<ul style="list-style-type: none"> • <24 days • 24–38 days • >38 days
Regularity	How would you describe the variation in your cycle length?	<ul style="list-style-type: none"> • No bleeding • Variation of 2–20 days • Variation >20 days
Duration	On average, how many days did your menstrual bleeding last?	<ul style="list-style-type: none"> • <5 days • 5–8 days • >8 days
Sanitary practice	During menstruation, how often do you change sanitary pads per day?	<ul style="list-style-type: none"> • <2 times • 2–7 times • >7 times

Table 3 Respondents' Exercise Frequency Distribution

Exercise Frequency	n	%
Sedentary	33	22.0
Low (1-2 times per week)	68	45.3
Moderate (3-4 times per week)	42	28.0
High (>5 times per week)	7	4.7
Total	150	100

showed that regular physical activity was uncommon in the sample (Table 3).

Most respondents had menstrual cycles within the normal range of 24 to 38 days, while

Table 4 Frequency Distribution of Menstrual Frequency, Regularity, Duration, And Sanitary Practice

Category	n	%
Menstrual cycle		
<24 days	55	36.7
24-38 days	82	54.7
>38 days	13	8.7
Cycle regularity		
No bleeding	39	26.0
Variation of 2-20 days	64	42.7
Variation >20 days	47	31.3
Menstrual duration		
<5 days	107	71.3
5-8 days	41	27.3
>8 days	2	1.3
Sanitary practice		
<2 times	64	42.7
2-7 days	84	56.0
>7 days	2	1.3

Table 5 Correlation Coefficient Between Exercise Frequency and Menstrual Cycle

Variable		Menstrual frequency	Regularity	Menstrual Duration	Sanitary practices
Exercise frequency	r	-0.246	-0.259	-0.059	-0.170
	p	0.002*	0.001*	0.477	0.038*

* p<0.05

smaller groups reported shorter or longer cycles. Variations in cycle regularity were common, with many experiencing differences of 2 to 20 days, and some reporting greater irregularity or no bleeding. The majority had menstrual durations of less than five days, with few reporting longer durations. Sanitary practices were generally maintained for 2 to 7 days, though some used them for shorter or longer periods (Table 4).

Exercise frequency showed a moderate negative correlation with both menstrual cycle length ($r=-0.246$, $p=0.002$) and cycle regularity ($r=-0.259$, $p=0.001$). In contrast, the correlation with menstrual duration was very weak and not significant ($r=-0.059$, $p=0.477$). A weak negative correlation was also observed with sanitary practices ($r=-0.170$, $p=0.038$) (Table 5).

Discussion

This study has examined the correlation between exercise habits and menstrual cycle characteristics in premenopausal women aged 45–50 years. Our findings suggest that exercise frequency is associated with certain aspects of menstrual health. We have found moderate negative correlations between exercise frequency and both menstrual cycle period and regularity. This indicates that women who exercise more frequently tend to have shorter menstrual cycles and less variation in cycle length. However, no significant correlation between exercise frequency and menstrual duration has been found. Moreover, there is a weak negative correlation between exercise frequency and the use of sanitary products. These results contribute to our understanding of how physical activity may influence menstrual patterns in premenopausal women approaching menopause.

The age distribution of respondents showed that the largest group was 45 years old, comprising 22.7% of the sample. This age group typically experiences the early phase of menopause, known as perimenopause.¹⁴

At 45 years of age, the number of primordial follicles in the ovaries has significantly decreased. These remaining follicles are stimulated by follicle-stimulating hormone (FSH) and luteinizing hormone (LH), but estrogen production from the ovaries begins to decline.¹⁵ As estrogen levels fall below a critical threshold, they no longer inhibit the production of FSH and LH. Conversely, FSH production increases continuously after menopause. When the remaining primordial follicles become atretic, ovarian estrogen production drops to negligible levels.¹⁶ This hormonal shift results in menstrual cycle fluctuations due to decreased ovarian function, affecting ovulation regularity. Age is a key factor in these changes. While perimenopause typically occurs around 45, it can begin earlier or later based on individual variation. Respondents aged 45-50 have not reached menopause or ceased menstruating but experience perimenopause symptoms, with menstrual cycles becoming irregular.¹⁷

In this study, moderate negative correlation between exercise frequency and menstrual cycle period as well as regularity are significant contributions to our understanding of how physical activity may influence reproductive health in premenopausal women approaching menopause. This correlation suggests that women who exercise more frequently tend to experience shorter menstrual cycles and less variation in cycle length. These findings align with previous research that has shown exercise can influence hormonal balance,¹⁸ particularly in relation to estrogen and progesterone levels. Regular physical activity may lead to changes in the hypothalamic-pituitary-ovarian axis, potentially resulting in more consistent ovulation and, consequently, more regular menstrual cycles.¹⁹ Additionally, exercise-induced changes in body composition, such as reduced body fat percentage, could also play a role in modulating menstrual cycle characteristics.²⁰ However, it is important to note that while these correlations are moderate, they do not imply causation. Other factors not analyzed in this study, such as diet, stress levels, or genetic predisposition, could also influence both exercise habits and menstrual patterns. Furthermore, the specific age group studied (45-50 years) is approaching perimenopause, a time when menstrual cycles naturally become less regular.²¹

The lack of a significant correlation between exercise frequency and menstrual duration is an intriguing finding that warrants further investigation. This result suggests

that while exercise may influence cycle length and regularity, it may not have a substantial correlation on the duration of menstrual flow itself. This finding could indicate that the mechanisms by which exercise affects menstrual cycles primarily influence the follicular and luteal phases rather than the menstrual phase.²² The duration of menstrual flow might be more closely tied to factors such as endometrial thickness or hormonal levels at the time of menstruation,^{18,23} which may not be significantly altered by exercise frequency. Moreover, it is important to consider potential limitations in the study design that could have led to this result. For instance, the method used to measure menstrual duration may not have been sensitive enough to detect subtle changes. Additionally, the study focused on exercise frequency rather than intensity or type of exercise, which could potentially have different effects on menstrual duration. Future research could benefit from more detailed assessments of exercise habits and more precise measurements of menstrual flow duration to further explore this correlation.

A weak negative correlation between exercise frequency and the use of sanitary products, while minimal, raises interesting questions about the potential correlation between physical activity and menstrual flow volume. This weak association suggests that women who exercise more frequently might use slightly fewer sanitary products, potentially indicating a reduction in menstrual flow volume. Several physiological mechanisms could potentially explain this weak correlation. Regular exercise has been shown to influence hormonal balance,²⁴ which could, in turn, affect endometrial development and subsequent menstrual flow.⁸ Additionally, improved circulation and reduced body fat percentage associated with regular exercise might contribute to changes in menstrual flow volume.²⁵ However, it is crucial to interpret this finding with caution due to several limitations. Firstly, the correlation is weak, indicating that the relationship, if it exists, is not strong. Secondly, the use of sanitary products is an indirect measure of menstrual flow volume and may be influenced by individual preferences, comfort levels, and access to different types of products.²⁶ A more direct measure of menstrual flow volume would provide more reliable data.

Furthermore, the correlation between exercise frequency and menstrual cycle characteristics in premenopausal women aged 45–50 can be linked to the potential anti-aging

effects of exercise during the perimenopausal transition.²⁷ The correlations between exercise frequency and both menstrual cycle period and regularity suggest that physical activity may help stabilize hormonal fluctuations as women approach menopause. The stabilization of hormonal flu could contribute to the broader anti-aging benefits of exercise, such as maintaining bone density, cardiovascular health, and cognitive function.^{28,29} While the study found no significant correlation between exercise and menstrual duration, and only a weak correlation with sanitary product use, these results still support the idea that exercise's effects on menstrual health are part of its overall impact on hormonal balance and metabolic processes.³⁰ These findings underscore the significance of regular physical activity for overall health and possibly mitigating aging effects in women nearing menopause.

Limitations of this study include potential recall bias from self-reported data, limited generalizability due to the specific age group and location studied, broad categorization of exercise frequency, and lack of consideration for confounding factors like diet, stress, and body mass index. Future research should evaluate objective physical activity measures and detailed menstrual tracking, expand to diverse populations and age ranges, investigate specific exercise types and intensities, and control for potential confounding variables. Additionally, exploring long-term effects of exercise on menstrual health and related outcomes in perimenopausal women could provide valuable insights. These improvements would enhance our understanding of the correlation between exercise and menstrual health in women approaching menopause, potentially informing targeted health interventions and guidelines for promoting healthy aging in women approaching menopause.

In conclusion, exercise frequency is associated with menstrual cycle characteristics in premenopausal women aged 45-50. The observed correlations indicate women who exercise more tend to have shorter, more regular menstrual cycles, highlighting exercise's potential to support hormonal balance during the perimenopausal transition. While no significant links were found with menstrual duration or sanitary product use, these insights underscore the importance of exercise for maintaining women's health and moderating age-related changes. Future intervention and longitudinal studies incorporating objective activity measures

and detailed menstrual tracking could further elucidate the causal relationships and long-term effects, informing targeted health recommendations for women approaching menopause.

Authors' Contributions

N.K.A.A contributed to the conception, data acquisition, analysis, interpretation of data, drafting and reviewing the manuscript. L.A.A & L.Y.A participated in interpretation of data, drafting and reviewing the manuscript. K.H.P was involved in drafting and reviewing the manuscript. M.S.N.G contributed to data analysis, data interpretation, drafting and revising the manuscript. All authors have read and approved the final version and are accountable for the work.

Conflict of Interest

The authors declare no conflict of interest.

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Generative Ai Disclosure Statement

During the preparation of this work, the author(s) used Claude to assist with grammar correction, language refinement, and readability. After using this tool, the author(s) reviewed, edited, and verified the content as needed, and take(s) full responsibility for the accuracy and originality of the final publication.

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