Research Article

The Relationship between Nutritional Adequacy and Physical Activity with the Menstrual Cycle in Adolescents

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Abstract: Menstrual cycle disorders are still common in adolescent girls and can be influenced by various factors, including nutritional adequacy and physical activity. During adolescence, an imbalanced nutritional intake and inadequate physical activity can disrupt reproductive hormone regulation, potentially leading to menstrual irregularities. This study aims to determine the relationship between nutritional adequacy and physical activity and menstrual cycle disorders in adolescent girls. This study used a cross-sectional design involving 78 female adolescents aged 15–19 at SMKN 52 Jakarta, selected using a simple random sampling technique. Nutritional adequacy was assessed through a 24-hour food recall and classified based on the percentage of the Recommended Intake (RDA). Physical activity was assessed using the Physical Activity Questionnaire for Adolescents (PAQ-A). Menstrual cycle disorders were determined based on the average length of menstrual cycles over the past three months. Data analysis was performed using the chi-square test with a p-value <0.05. Most respondents had adequate nutritional intake (53.8%), while the majority demonstrated low levels of physical activity (57.7%). Abnormal menstrual cycles were reported by 56.4% of respondents. Bivariate analysis showed significant associations between nutritional adequacy and menstrual cycle patterns (p = 0.009), as well as between physical activity and menstrual cycle patterns (p = 0.001). In conclusion, nutritional adequacy and physical activity are associated with menstrual cycle among adolescent girls. Therefore, adequate nutritional intake and balanced physical activity should be considered important factors in maintaining regular menstrual cycles in adolescents.

Keywords: Adolescent Girls; Menstrual Cycle; Nutritional Adequacy; Physical Activity; Reproductive Health.

1. Introduction

Menstruation is a natural and regular physiological process characterized by cyclic uterine bleeding that occurs as a result of decreased estrogen and progesterone levels in women of reproductive age (Taheri et al., 2020). Although menstruation is a normal biological phenomenon, many women experience menstrual disorders that may interfere with daily activities, psychological well-being, and overall quality of life (Igbokwe & John-Akinola, 2021). Menstrual disorders are recognized as one of the most common gynecological problems in reproductive health, particularly among adolescents and young women (Novita, 2018).

Menstrual disorders refer to abnormalities in the menstrual cycle, including disturbances in cycle length, duration, volume of bleeding, and accompanying symptoms such

as lower abdominal pain, tenderness, excessive bleeding, or delayed menstruation (Taheri et al., 2020; Suleman et al., 2023). Common types of menstrual disorders include dysmenorrhea, premenstrual syndrome, oligomenorrhea, polymenorrhea, amenorrhea, and menorrhagia (Taheri et al., 2020). These conditions may negatively affect academic performance, productivity, and social functioning, particularly among adolescent girls and female students (Sitoayu et al., 2017; Igbokwe & John-Akinola, 2021).

Various factors are known to influence menstrual regularity, including age, nutritional status, energy intake, physical activity, stress levels, smoking habits, and disorders of the reproductive organs (Novita, 2018; Suleman et al., 2023). Among these factors, nutritional status plays a crucial role in regulating hormonal balance and reproductive function. Adequate intake of macronutrients and micronutrients is essential to maintain a normal menstrual cycle, especially during adolescence, a period marked by rapid physical and hormonal changes (Sitoayu et al., 2017; Taheri et al., 2020).

Several studies have demonstrated a significant relationship between nutritional intake and menstrual cycle regularity. Research conducted by Yuniyanti et al. (2022) reported that energy intake and nutritional status were significantly associated with menstrual cycle patterns among female university students. Similar findings were also reported by Novita (2018) and Suleman et al. (2023), who found that undernutrition and poor nutritional status increased the risk of menstrual disorders in adolescent girls. Inadequate energy intake may disrupt the hypothalamic–pituitary–ovarian axis, leading to hormonal imbalance and irregular menstruation (Taheri et al., 2020).

However, contrasting results have also been reported. A study by Purnasari and Illiyya (2023) found no significant association between nutritional status, protein intake, or iron intake and menstrual regularity among adolescent girls. These inconsistencies indicate that the relationship between nutrition and menstrual cycle may be influenced by other contributing factors, such as lifestyle and physical activity patterns (Bhandari et al., 2024).

In addition to nutritional factors, physical activity has been identified as an important determinant of menstrual health. Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure (Nurfadilah et al., 2022). While moderate physical activity is beneficial for overall health, excessive or strenuous physical exercise may negatively affect menstrual function. High-intensity physical activity can suppress gonadotropin-releasing hormone (GnRH) secretion, resulting in decreased estrogen levels and disruption of the menstrual cycle (Bhandari et al., 2024).

Several studies have reported a significant association between physical activity and menstrual cycle characteristics. Anggraeni et al. (2021) found that higher physical activity intensity was associated with longer or irregular menstrual cycles among female medical students. Similar findings were reported by Nurfadilah et al. (2022), who observed that intense physical activity combined with stress increased the likelihood of menstrual irregularities. Conversely, Lensy et al. (2023) reported no significant relationship between physical activity and menstrual cycle regularity among female students, suggesting that the impact of physical activity may vary depending on individual characteristics and contextual factors.

The variation in findings across previous studies highlights the need for further investigation into the combined effects of nutritional status and physical activity on menstrual cycle regularity. Adolescents and young women, particularly university students, are a vulnerable population due to lifestyle changes, academic stress, irregular eating patterns, and varying levels of physical activity (Sitoayu et al., 2017; Yuniyanti et al., 2022). Understanding these relationships is essential for developing effective health promotion and preventive strategies aimed at improving reproductive health among young women.

Therefore, this study aims to examine the relationship between nutritional status and physical activity with menstrual cycle regularity among female students. The findings of this research are expected to contribute to the existing body of knowledge on menstrual health and provide evidence-based recommendations for nutritional and lifestyle interventions to promote reproductive health and well-being.

2. Research Method

This study used a cross-sectional design involving 78 female adolescents aged 15–19 at SMKN 52 Jakarta, selected using simple random sampling. Nutritional adequacy was assessed through a 24-hour food recall and classified based on the percentage of the Recommended Intake (RDA). Physical activity was assessed using the Physical Activity Questionnaire for Adolescents (PAQ-A). Menstrual cycle was determined based on the average length of menstrual cycles over the past three months. Data analysis was performed using the chi-square test with a p-value <0.05.

The obtained data were then processed using SPSS and analyzed using the chi-square test with a significance level of p<0.05. This study has received ethical approval from the Research Ethics Committee of the Faculty of Medicine, Trisakti University, under Ethical Clearance number 014/KER/FK/04/2025.

3. Results and Discussion

Based on Table 1, the majority of respondents had good nutritional status (53.8%), thus their nutritional condition tended to be in the fairly adequate category. Physical activity data indicates that the majority of respondents were in the low physical activity category (57.7%). Based on the distribution of menstrual cycles, more respondents experienced abnormal menstrual cycles (56.4%) than normal menstrual cycles.

Table 1. Distribution of Respondent Characteristics (N=78).

Variable	Frequency	Percentage
Nutritional Adequacy		
Poor	17	21,8%
Good	42	53,8%
More	19	24,4%
Physical Activity		
Very Low	14	17,9%
Poor	45	57,7%
Moderate	19	24,4%
Menstrual Cycle		
Normal	34	43,6%
Abnormal	44	56,4%

Based on Table, in the group with inadequate nutrition, the majority experienced abnormal menstrual cycles (17.9%). In the well-nourished group, the majority had abnormal cycles (30.8%). In the overnourished group, the majority had abnormal cycles (24.4%). Bivariate analysis revealed a significant relationship between adequate nutrition and menstrual cycles, evidenced by a p-value of 0.009 (<0.05), indicating that adequate nutrition influences the likelihood of normal or abnormal menstrual cycles.

Table 2. Relationship between adequate nutrition and menstrual cycle disorders.

Nutritional Adequacy	Menstrual Cycle				Total		P-value
	Normal		Abnormal				
	n	%	n	%	n	%	
Less	3	3,8	14	17,9	17	21,8	
Better	18	23,1	24	30,8	42	53,8	0,009*
Better	13	16,7	19	24,4	19	24,4	
Total	34	34,6	44	56,4	78	100,0	

*Chi square test

Based on Table, the majority of respondents in the very low physical activity group had abnormal menstrual cycles (10.3%). In the low activity group, the majority experienced abnormal cycles (41.0%). In the moderate activity group, the majority had normal cycles (19.2%). A p-value of 0.001, or <0.05, indicates a significant relationship between physical activity and menstrual cycles in respondents.

Table 3. Relationship between physical activity and menstrual cycle disorders.

Physical Activity	Menstrual Cycle				Total		P-value
	Normal		Abnormal				
	N	%	N	%	N	%	
Less	6	7,7	8	10,3	14	17,9	
Better	13	16,7	32	41,0	45	57,7	0,001*
Better	15	19,2	4	5,1	19	24,4	
Total	34	34,6	44	56,4	78	100,0	

*Chi square test

The results of this study indicate a significant relationship between physical activity levels based on the PAQ-A and menstrual cycle patterns in respondents. This finding aligns with Bhandari's study, which reported that although there was no direct relationship between BMI and menstrual irregularities (p = 0.454), inadequate physical activity was significantly associated with menstrual cycle disorders (OR = 2.94; p = 0.042). The study also added that other lifestyle factors such as diet and sleep duration also play a role in influencing menstrual patterns. Thus, the consistency between this study and the study in Nepal confirms that physical activity is an important determinant in regulating adolescent menstrual cycles, even in geographically and socioculturally diverse populations.

Meanwhile, Nurfadilah's study showed no significant relationship between physical activity (p = 0.347) and menstrual cycles, although most respondents were in the low and moderate physical activity categories. In that study, 46.7% of respondents had low physical activity, 38.3% were in the moderate category, and only 15.0% had high activity. The distribution of menstrual disorders also did not show a consistent pattern with physical activity levels: 41.7% of respondents with low activity experienced irregular cycles, 39.1% in the moderate activity group experienced similar disorders, and 37.5% in the high activity group also reported menstrual irregularities. This lack of a clear gradient pattern led the researchers to conclude that physical activity is not a primary determinant of menstrual cycles in this population, and that other factors such as academic stress, sleep patterns, and lifestyle likely play a more dominant role.

This study demonstrated a significant relationship between nutritional adequacy and menstrual cycle patterns. This finding is consistent with Novita's study, which reported that 54.5% of undernourished adolescents, 38.1% of normally nourished adolescents, and 66.7% of overnourished adolescents experienced menstrual disorders. This relationship was statistically significant (p < 0.05). This study explained that undernourished adolescents are more susceptible to menstrual irregularities due to low energy reserves, fat mass, and leptin levels, which reduce GnRH stimulation, thereby decreasing FSH and LH secretion and inhibiting ovulation. Conversely, better nutritional status supports hormonal stability, thereby increasing the likelihood of a normal menstrual cycle. Therefore, the significant relationship found in this study has a strong empirical basis and aligns with previous literature.

In the study by Marques et al., nutritional status was assessed using Body Mass Index (BMI) to examine the possible relationship between nutritional status and menstrual patterns in adolescents. Statistical analysis showed that BMI was not significantly associated (p > 0.05) with any of the menstrual cycle variables studied, including cycle regularity, cycle length, bleeding duration, and the type of menstrual disorder experienced by the respondents. In other words, adolescents with low, normal, or high BMIs had a similar likelihood of experiencing normal or irregular cycles. This study confirms that nutritional status based on BMI is not a strong predictor of menstrual patterns in the adolescent population studied. The researchers concluded that menstrual irregularities are more likely influenced by other factors such as stress levels, physical activity, age at menarche, academic load, and hormonal imbalances that are not always directly related to body composition. These results differ from a number of studies that have found a significant association between nutritional status and menstrual cycle disorders.

4. Conclusion

The results of this study indicate a significant relationship between nutritional adequacy and the menstrual cycle. This study also shows a relationship between physical activity and the menstrual cycle.

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