
The Importance of Nutritional Intake and Nutritional Status to the Adolescent Menstrual Cycle: A Systematic Literature Review

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ABSTRACT

The menstrual cycle is the time between the beginning of menstruation in the previous period and the onset of the next period. One of the factors that affect the menstrual cycle is nutritional intake and nutritional status. This study aims to determine the importance of nutritional intake and nutritional status on the menstrual cycle in adolescents. This article uses a selection method based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram, in accordance with the inclusion criteria and predetermined keywords, and identified 10 articles to be analyzed. Based on the 10 articles analyzed, it was found that most show the importance of nutritional intake and nutritional status in affecting the regularity of the menstrual cycle. Several articles also demonstrate a relationship between both micro and macro nutritional intake and nutritional status on the menstrual cycle in adolescent girls. Nutritional intake and nutritional status play an important role in the regularity of adolescent menstrual cycles. These findings have important implications for public health policy, suggesting the need for comprehensive nutritional education programs targeting adolescent girls, healthcare providers, and educators. The evidence supports the development of school-based nutrition interventions and clinical guidelines for managing menstrual irregularities through nutritional approaches. Moreover, there is a clear relationship between nutritional intake and nutritional status and the menstrual cycle.

KEYWORDS menstrual cycle; nutritional status; nutritional intake; adolescents



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INTRODUCTION

Adolescence is a transition period from childhood to adulthood characterized by various changes, including hormonal, physical, psychological, and social changes. One of the main indicators of physiological changes in adolescent girls is the start of the menstrual cycle (Batubara, 2016). A regular menstrual cycle is an important indicator of women's reproductive health. It reflects a good balance of hormones and a healthy reproductive system (Irianto, 2015). Menstrual cycle irregularities can be an early detection of serious health problems such as primary ovarian insufficiency, thyroid disorders, or other hormonal disorders. Data from WHO (2020) shows that the prevalence of menstrual cycle disorders in women reaches around 45%. Based on Basic Health Research in 2018, it was also recorded that 11.7% of adolescents in Indonesia experience irregular menstruation (Roro Sekar Arum et al., 2019). The menstrual cycle is the time between the first day

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of menstruation of the previous period and the start of menstruation in the next period (Dars, Sayed, & Yousufzai, 2014). On average, a normal menstrual cycle occurs every 21 to 35 days and lasts about 5 to 7 days. The menstrual cycle is said to be abnormal if it is less than 21 days, which is called polymenorrhea, or more than 35 days, called oligomenorrhea (Supatmi et al., 2018).

The impact of a menstrual cycle shorter than 21 days is that adolescent girls will often experience menstruation and lose more blood, which can trigger iron deficiency anemia. If the menstrual cycle is longer than 35 days, there may be reproductive system disorders that prevent ovulation and cause fertility problems, resulting in delayed childbirth (Tetty Rihardini, 2019). In some cases, menstruation may occur with long intervals and blood loss exceeding 80 ml/day, a condition known as menorrhagia. Menstruation lasting more than seven days is called hypermenorrhea. Conversely, some women do not menstruate at all, a condition called amenorrhea. Oligomenorrhea refers to menstrual cycles longer than 35 days but with a normal amount of blood loss (Haripriya et al., 2025). Factors that can affect menstrual cycle irregularities include stress, nutritional intake, smoking habits, use of hormonal drugs, endocrine system disorders, and nutritional status (Belayneh & Mekuriaw, 2019).

Nutritional status and nutrient intake play important roles in regulating the hormonal functions underlying the menstrual process (Negi, Mishra, & Lakhera, 2018). Inadequate nutritional intake can cause irregularities in menstrual cycles in adolescent girls. Unbalanced nutritional intake, such as deficiencies in iron, vitamin B6, vitamin D, or energy imbalance, results in hormonal disorders impacting the menstrual cycle (Amperaningsih and Fathia, 2018).

Nutritional status also contributes to menstrual cycle disorders. Adolescent girls with overnutrition, such as overweight and obesity, are prone to chronic irregular periods due to excess fat cells triggering excess estrogen production (Kapper et al., 2024). Overweight or obese status can disrupt the balance between estrogen and progesterone, hormones critical to regulating the menstrual cycle (Fathia & Amperaningsih, 2018). Adolescent girls with overnutrition or obesity have a 1.89 times greater risk of irregular menstrual cycles compared to those with normal nutritional status (Rakhmawati & Fithra Dieny, 2013). Similarly, adolescent girls who are underweight tend to have low body weight and insufficient fat cells needed for estrogen production, leading to irregular menstrual cycles (Mai Revi et al., 2023). At least 22% body fat and a body mass index of 19 kg/m² are required for the ovulatory cycle to be maintained normally. A study on adolescent girls at PSIK FK UNSRAT Manado found that 66.7% of those with undernutrition experienced irregular menstrual cycles, while 81.8% of those with overnutrition also experienced irregularities (Felicita et al., 2015).

Nutritional status and nutritional intake are crucial for the adolescent menstrual cycle. Adolescent girls with good nutritional status and an ideal weight usually experience normal menstrual cycles without reproductive system disturbances. To improve reproductive system function, maintaining normal nutritional status is essential. This can be done by enhancing the quality of food consumed and including foods rich in folic acid, vitamin C, vitamin E, vitamin B6, iron, zinc, aluminum, and calcium. These nutrients are found in nuts, fruits, green vegetables, sea fish, and meat. Good nutritional intake and normal nutritional status support proper hypothalamic function, which regulates the reproductive hormones necessary for a regular menstrual cycle (Hikmatun et al., 2023). Untreated menstrual disorders can affect fertility, making conception more difficult (infertility), and can impact quality of life and daily activities (Mai Revi et al., 2023).

Research on the relationship between nutritional status and the menstrual cycle has been conducted in various contexts, with results varying depending on population, methods, and variables studied. A systematic study is needed to collect and evaluate existing scientific evidence

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for a comprehensive understanding. Unlike previous reviews focusing on single nutritional factors or specific populations, this systematic literature review synthesizes evidence on both macro- and micronutrient relationships with menstrual cycle patterns across diverse adolescent populations. The novelty of this review lies in its integrated analysis of nutritional intake adequacy, anthropometric status, and psychosocial factors as interconnected determinants of adolescent menstrual health. This review addresses methodological inconsistencies found in previous research by systematically evaluating study quality and providing standardized outcome interpretations.

Through this systematic literature review, the researcher aims to identify and analyze literature related to the importance of nutrient intake and nutritional status to the menstrual cycle in adolescents. The results are expected to provide a scientific basis for more appropriate nutritional interventions supporting adolescent reproductive health, as well as a reference for health policy formulation and nutrition education among adolescents. The findings are intended to offer evidence-based recommendations for healthcare practitioners developing nutritional interventions for adolescent reproductive health, inform educators about the importance of nutrition education in schools, and guide policymakers in formulating comprehensive adolescent health campaigns addressing nutritional factors affecting menstrual health.

METHOD

In this study, the authors used a Systematic Literature Review (SLR) study to examine the relationship between nutrient intake, nutritional status, and menstrual cycle in adolescent girls. This approach is carried out systematically by identifying, evaluating, and synthesizing relevant research results from various sources of scientific literature, namely PubMed and *Google Scholar*. The literature search was conducted using a combination of keywords such as "*menstrual cycle*", "*nutritional status*", "*nutritional intake*", and "*adolescent*". The articles included in this study were obtained from 10 articles published in the last 10 years (2015 - 2025), written in Indonesian or English and were original research articles that discussed the relationship between nutrients, nutritional status, and menstrual cycles in adolescent girls. Quality assessment of selected articles was conducted using the Critical Appraisal Skills Programme (CASP) checklist for observational studies, evaluating study design appropriateness, sample representativeness, measurement validity, confounding control, and result reliability. Each article was independently assessed by two reviewers, with disagreements resolved through discussion.

The article selection process is carried out through several stages, namely article identification based on keywords, filtering by title and abstract, assessment of the feasibility of the content of the article as a whole, and determining the final article that is suitable for analysis. Data extraction was performed using a standardized form capturing study characteristics (author, year, location, design), participant demographics (age, sample size), nutritional assessment methods (dietary intake measurement tools, anthropometric indices), menstrual cycle parameters (regularity, length, symptoms), and key findings. Qualitative synthesis was employed using thematic analysis to identify common patterns and relationships across studies, with findings grouped into major themes including macronutrient effects, micronutrient influences, anthropometric status impacts, and psychosocial factors. The entire selection process is presented using a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart.

RESULTS AND DISCUSSION

The results of a literature study search from several databases such as PubMed and Google Scholar, found a total of 539 articles. The articles were then screened based on inclusion criteria and assessed their eligibility process based on exclusion criteria due to the incompatibility of titles and abstracts for the purpose of the research. Based on the PRISMA PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram, 10 articles were obtained that will be reviewed in this study. The process of searching for articles can be seen in figure 1 below:

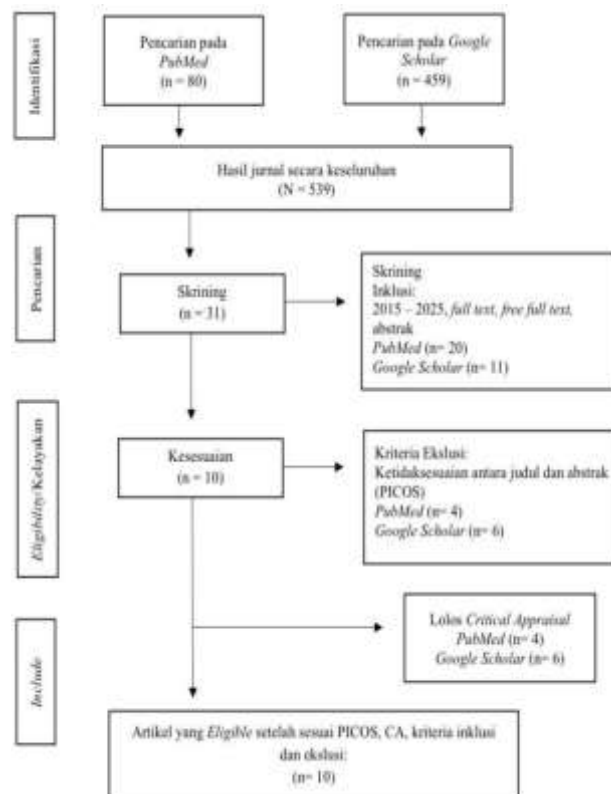


Figure 1. PRISMA Diagram (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

Several studies have been conducted to determine the relationship between nutritional status, nutrient intake, physical activity, and other factors with the menstrual cycle in adolescent girls in various regions in Indonesia. Research by Nurul Hidayah, M. Zen Rahfiludin, and Ronny Aruben (2016) at the Salafiyah Islamic Boarding School Kauman, Pemalang Regency with 108 female students showed a relationship between nutritional status, protein intake, fat, energy, and calcium with the adolescent menstrual cycle, although physical activity was not significantly related to the menstrual cycle. Meanwhile, research by Dita Noviyanti, Endo Dardjito, and Bambang Hariyadi (2018) in Kedungbanteng District, Banyumas Regency with 69 adolescent female respondents found that nutritional status and the level of energy, carbohydrate, and protein intake were not related to the menstrual cycle, but there was a relationship between the level of fat intake and the menstrual cycle.

Laras Sitoayu, Dewi Ayu Pertiwi, and Erry Yudhya Mulyani (2017) studied 83 adolescents of SMA Negeri 21 Jakarta and found that the adequacy of macronutrient intake, nutritional status, and stress have a meaningful relationship and are the dominant factors that affect the menstrual

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cycle in adolescents. Research by Galih Purnasari and Luluk Illiyya (2023) at SMAN 1 Jatiroto with 52 female students concluded that there was no significant relationship between nutritional status, protein intake, and iron on the menstrual cycle, although there is a tendency that malnutrition and insufficient protein and iron intake can cause abnormal menstrual cycles.

Research by Yulia Wahyuni and colleagues (2020) at Gatra Junior High School, Kohod Village, Tangerang Regency with 60 students in grades VII to IX using an independent t-test showed that there were significant differences in carbohydrate, fat, and calcium intake based on normal and deficient nutritional status, but no significant differences were found in protein, magnesium, and iron intake based on nutritional status and menstrual cycle. Yuliati Amperaningsih and Nurul Fathia (2018) in their study of 62 adolescents in Bandar Lampung found a relationship between nutritional status and menstrual cycle.

Research by Vidi Posdo A Simarmata and colleagues (2023) with 57 respondents found that nutritional status is related to the regularity of the menstrual cycle, where nutritional status is less or more at risk of experiencing irregular menstrual cycles compared to normal nutritional status. A study by Hadeel A. Ghazzawi and team (2023) on 204 women who experienced regular menstruation aged 18-40 years showed that there is a correlation between menstrual symptoms and nutrient intake, so women need to pay attention to the type of food consumed during the menstrual phase. Liton Chandra Sen and colleagues (2024) studied 385 college student respondents and found that vitamin A intake from plant-based sources was associated with a reduced risk of dysmenorrhea and premenstrual syndrome (PMS), while being overweight/obese and under-physical activity may increase the risk of menstrual disorders.

In addition, Mana Miyamoto and colleagues (2021) in 104 young athletes aged 16-23 years stated that macronutrient intake and anxiety are strong factors causing menstrual irregularities in women with high immunity. Anxiety of the state showed a strong association with menstrual irregularities, while body mass was significantly negatively associated with menstrual cycle irregularities (Ciołek et al., 2024).

Overall, the results of these studies show that nutritional status and intake of certain nutrients, especially fats, proteins, energy, and vitamins, as well as psychological factors such as stress and anxiety, play an important role in influencing the menstrual cycle in adolescent girls (Dars, Sayed, & Yousufzai, 2014). However, the relationship between physical activity and menstrual cycle still has various results that need to be further researched.

The discussion from the journals that have been analyzed is as follows:

According to the study entitled "The Relationship between Nutritional Status, Nutrient Intake and Physical Activity with the Menstrual Cycle of Adolescent Girls of the Salafiyah Islamic Boarding School Kauman Pemalang Regency in 2016" discusses the influence of various health factors on the regularity of the menstrual cycle in adolescent girls. The results show that most adolescent girls have under- or over-nourished status, as well as insufficient nutritional intake, especially in protein, fat, energy, and calcium. From statistical analysis, it was found that nutritional status and nutrient intake (protein, fat, and energy) have a significant relationship with the regularity of the menstrual cycle. Insufficient protein intake can reduce the frequency of LH peaks which has an impact on shortening the follicular phase. Meanwhile, less fat intake will affect a decrease in gonadotropin levels which results in a decrease in FSH and LH so that the hormones estrogen and progesterone are disrupted. Meanwhile, physical activity did not show a significant relationship with the menstrual cycle but it was found that energy and calcium intake were related to physical activity levels.

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Research by Dita Noviyanti, Endo Dardjito, and Bambang Hariyadi entitled "The Relationship Between Nutritional Status and Nutrient Intake with Menstrual Cycles in Adolescent Girls in Kedungbanteng District, Banyumas Regency" examined that most adolescent girls have normal menstrual cycles and nutritional status. However, nutritional intake such as carbohydrate, protein, and fat intake is mostly abnormal according to the body's needs. This study concluded that nutritional status with the menstrual cycle had no relationship because adolescent girls mostly had normal nutritional status.

The journal "Macronutrient Adequacy, Nutritional Status, Stress and Menstrual Cycle in Adolescents" discusses the relationship between macronutrient intake (carbohydrates, proteins, and fats), nutritional status, stress levels, and menstrual cycle regularity in adolescent girls. This study shows that imbalances in nutritional intake and abnormal nutritional status (such as underweight or overweight) as well as high stress levels play a role in menstrual cycle disruption. The results of the study concluded that efforts to maintain nutritional balance and manage stress effectively are essential in determining the menstrual cycle.

Research conducted by Galih Purnasari and Luluk Illiyya (2023) analyzed the relationship between nutritional status, protein intake, and iron with the menstrual cycle in adolescent girls. This study showed that most of the respondents had normal nutritional status, although some had less or more nutritional status, and most also experienced normal menstrual cycles. This study did not find a significant relationship between nutritional status, protein intake, and iron intake with menstrual cycle in adolescent girls at SMAN 1 Jatiroto. However, there is a tendency that female students with poor nutritional status and lack of protein and iron intake, are more likely to experience abnormal menstrual cycles.

The journal "The Relationship between Nutritional Status and Menstrual Cycle in Adolescents in Bandar Lampung" examines the relationship between nutritional status and menstrual cycle regularity in adolescent girls at one MAN in Bandar Lampung. The results showed a significant relationship between nutritional status and menstrual cycle, where adolescents with nutritional status or Body Mass Index (BMI) were less or less likely to experience irregular menstrual cycles. This disorder is thought to be caused by hormonal imbalances due to abnormal nutritional status. Therefore, it is important for adolescents to maintain their nutritional status in the normal category to support reproductive health and a regular menstrual cycle.

The journal *"Menstrual Cycle Symptoms are Associated with Nutrient Intake: Results from Network Analysis from an Online Survey"* examined the relationship between nutrient intake and menstrual symptoms in 204 Jordanian women aged 18–40 years through an online survey. The results of the analysis showed that high intake of polyunsaturated fatty acids (PUFAs) and thiamine (vitamin B1) was associated with a decrease in physical, psychological, and functional symptoms during the menstrual cycle, while the consumption of saturated fats, iron, and niacin (vitamin B3) actually increased the risk of psychological symptoms. Some other nutrients such as riboflavin (vitamin B2), vitamin B6, and zinc show mixed effects depending on the type of symptoms. Factors such as smoking status, body mass index (BMI), and physical activity level did not show a significant influence. The study concludes that diet plays an important role in influencing menstrual symptoms, so nutrition education can help women manage symptoms and improve their quality of life.

The journal *"Food Craving, Vitamin A, and Menstrual Disorders: A Comprehensive Study on University Female Students"* examined the relationship between the desire to eat certain foods, vitamin A intake, and menstrual disorders in 391 female college students in Bangladesh. The study found that dysmenorrhea (68.3%), PMS (33.8%), and irregular menstrual cycles (24.3%) were

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common disorders. Strong cravings for high-fat and sugary foods significantly increase the risk of a third. While consumption of plant foods rich in vitamin A reduces the risk of dysmenorrhea and cycle irregularities, the consumption of animal sources actually increases the risk of BMI. Other factors such as abnormal body mass index, low physical activity, early menarche age, unmarried status, and family history also contribute to increased risk. This study emphasizes the importance of a healthy diet and an active lifestyle in maintaining the reproductive health of young women.

The journal titled "*Relationship among Nutritional Intake, Anxiety, and Menstrual Irregularity in Elite Rowers*" examined the relationship between nutritional intake, anxiety levels, and menstrual irregularities in 104 elite female rowing athletes aged 16–23 years. The results showed that high levels of anxiety were significantly associated with menstrual irregularities, as was low body mass, while calcium intake showed a marginal relationship. These findings highlight the importance of monitoring the psychological aspects and nutritional status of female athletes to maintain their reproductive health and performance, as well as the need for support for stress management and comprehensive nutrition monitoring in female athlete training programs.

The research entitled "Analysis of Differences in Nutrient Intake Based on Nutritional Status and Menstrual Cycle in Adolescent Girls in Junior High School Gatra Kohod Village, Tangerang Regency" discussed the differences in the intake of macro and micronutrients such as carbohydrate intake, protein intake, fat intake, calcium intake, magnesium intake, and iron intake on the menstrual cycle of adolescent girls. There are significant differences in carbohydrate, fat and calcium intake based on normal and deficient nutritional status. There was no difference in protein, magnesium and iron intake at normal and deficient nutritional status. There was no significant difference in macro and micronutrient intake based on normal and abnormal menstrual cycles.

The journal entitled "*The Relationship Between Nutritional Status and Menstrual Cycle Regularity*" discusses the relationship between nutritional status and menstrual cycle regularity of medical students. This study explains that there is a relationship between nutritional status and the regularity of the menstrual cycle in these female students so that female students need to start getting to know themselves and their bodies, and start paying attention to every body change that occurs by recording the menstrual cycle every month. College students with more or less nutritional status tend to have a greater risk of experiencing menstrual cycle irregularities compared to students with normal nutritional status. Therefore, female students need to maintain their weight always ideal to reduce the impact of menstrual cycle irregularities.

CONCLUSION

This systematic literature review concludes that both nutritional status and intake of macronutrients—carbohydrates, proteins, and fats—are crucial for maintaining regular menstrual cycles in adolescent girls. Those with normal nutritional status typically experience regular cycles, whereas deviations from adequate nutrition increase the likelihood of menstrual irregularities. To promote menstrual health, it is essential for adolescents to receive balanced micro- and macronutrient intake. Future research should explore the specific mechanisms linking different nutrient types to hormonal regulation in diverse adolescent populations and investigate effective nutritional interventions tailored to prevent menstrual disorders.

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