Vol. 8 No.1 (2026) Page. 165-179

HealthCare Nursing Journal
available on : https://journal.umtas.ac.id/index.php/healtcare
e-ISSN : 2655-6812

Research Article

Unhealthy Food and Beverage Consumption and The Menstrual Cycle Among Female Adolescents

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Article Information

Received: 3 November 2025
Revised: 30 December 2025
Accepted: 10 January 2026
Available online: 31 January 2026

Keywords

adolescents, menstrual cycle, unhealthy beverage, unhealthy food

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Website
https://journal.umtas.ac.id/index.php/healtcare/index

Doi
https://doi.org/10.35568/healthcare.v8i1.7334

ABSTRACT

Menstrual cycle disorders are among the most common reproductive health issues experienced by adolescent girls and may affect future fertility. One factor influencing menstrual cycle regularity is the consumption of unhealthy foods and beverages, including foods high in fat, sugar, and salt, and sugary, carbonated, and caffeinated drinks. These dietary habits can disrupt hormonal balance through metabolic and endocrine mechanisms. This study aimed to determine the relationship between unhealthy food and beverage consumption and the menstrual cycle among female adolescents at SMAN Tanjungsari. A quantitative approach with a cross-sectional design was used. The sample consisted of 272 respondents selected through proportional random sampling. Research instruments included a Food Frequency Questionnaire (FFQ) and a menstrual cycle questionnaire. Data were analyzed using univariate and bivariate techniques with the Spearman Rho test. The results showed significant relationship between unhealthy food consumption and the menstrual cycle ($p < 0,001$), with strong positive rho value of 0,715. In addition, significant relationship was found between unhealthy beverage consumption and the menstrual cycle ($p < 0,001$), with a moderate positive rho value of 0,612. Therefore, the higher the frequency of consuming unhealthy foods and beverages, the greater the likelihood adolescents will experience menstrual cycle disorders.

INTRODUCTION

Adolescence is a transitional period from childhood to adulthood characterized by various significant changes, including sexual maturity and reproductive organ development (Habibah et al., 2024). Menstruation is a key indicator of reproductive health in adolescent girls. However, adolescents often experience menstrual disorders such as irregular menstrual cycles. Generally, a normal menstrual cycle ranges from 21–35 days with a bleeding duration of 3–7 days, but it can also experience disruptions such as polymenorrhea (cycle < 21 days), oligomenorrhea (cycle > 35 days), and amenorrhea (no menstruation for > 3 months) (Villasari, 2021). The disorder occurs due to an imbalance in the reproductive hormones that regulate the menstrual cycle.

According to the World Health Organization (WHO) in 2020, approximately 45% of women worldwide experience menstrual cycle disorders (WHO, 2020). In Indonesia, the prevalence of women aged 10–29 experiencing irregular menstrual cycles is 16.4% (Izzah et al., 2024). Data from the Sumedang District Health Office (2024) indicates that approximately 732 adolescent girls (10–19 years old) experience menstrual cycle disorders, with the highest prevalence in Tanjungsari District at 332 cases. The high incidence of menstrual cycle disorders indicates that adolescent reproductive health issues still require special attention.

One of the factors that plays a role in influencing the menstrual cycle is nutrient intake from daily food and drink consumption (Tambunan & Siregar, 2024). According to the Indonesian Health Survey (SKI) 2023, adolescents in Indonesia show a high prevalence of consuming unhealthy foods and beverages. The types of unhealthy foods and beverages frequently consumed include high-fat foods (54,2%), sugary foods (52%), salty foods (46,5%), grilled foods (47,1%), processed meat/chicken/fish products containing preservatives (19%), instant foods (18,2%), excessive use of flavor enhancers (86,5%), sugary drinks (60,3%), carbonated drinks (10%), and energy or high-caffeine drinks (8,5%).

Consuming such foods can increase body fat levels and affect the secretion of Gonadotropin-Releasing Hormone (GnRH), Follicle-Stimulating Hormone (FSH), and Luteinizing Hormone (LH), thereby disrupting the ovulation process and menstrual regularity (Srour et al., 2019). Additionally, beverage consumption can also cause fluctuations or changes in insulin levels in the body, which downregulates Sex Hormone Binding Globulin (SHBG) and regulates Insulin-like Growth Factor binding protein-1 (IGF-1) (Husni et al., 2022). If insulin is uncontrolled and SHBG performance declines, it will affect the production of other hormones such as progesterone, which plays a role in the menstrual cycle and causes premenstrual syndrome (PMS) symptoms (Zahra et al., 2023).

Research conducted by Habibah et al. (2024) and Rohmah et al. (2025) shows that fast food consumption is related to the menstrual cycle ($p < 0,001$). Additionally, studies by Ainayah (2023) and Zahra et al. (2023) also state that there is a significant relationship between sweetened beverage consumption and PCOS and premenstrual syndrome (PMS) ($p = < 0,05$). However, research by Husni et al. (2022) shows no relationship between fast food consumption and menstrual disorders (dysmenorrhea) ($p = 0,279$), nor is there a relationship between fast drink consumption and menstrual disorders (dysmenorrhea) ($p = 0,582$). Most previous studies have only examined the relationship between food or beverages separately and the menstrual cycle. Subsequently, studies that examined food and beverages simultaneously focused on PMS or dysmenorrhea, not on the menstrual cycle itself. Therefore, this research is novel in

that it examines both variables simultaneously in relation to the menstrual cycle in adolescent girls, which is still very limited and has not been widely studied in the same subjects.

The results of a preliminary study at SMAN Tanjungsari show that many female students still frequently consume unhealthy foods and drinks, accompanied by irregular menstrual cycles. Based on this phenomenon, the researcher is interested in conducting research on the relationship between unhealthy food and beverage consumption and the menstrual cycle in female adolescents at SMAN Tanjungsari.

METHOD

This study uses a quantitative approach with a non-experimental (analytical observational) method and a cross-sectional design, aiming to measure independent and dependent variables thru a single data collection at one point in time (Zulfikar et al., 2024).

This research was conducted at SMAN Tanjungsari, Sumedang Regency, with a population of 801 and a sample of 272, over 2 days on September 19, 2025, and September 26, 2025. Samples were taken based on the calculation method of Isaac and William B. Michael with a 5% error rate.

The sample selection technique used was the proportional random sampling method, which involves sampling proportionally based on the number of students in each class, where every member of the population has an equal chance of being selected as a sample. The sample selection was done randomly from a list of female students who met the criteria to be research participants, using the Spin Wheels website according to the required sample size.

The inclusion criteria are as follows:

1. Has experienced menstruation for at least the past year.
2. Is willing to be a respondent by completing an informed consent form.
3. Has a mobile phone and adequate internet access to complete the online questionnaire.

The data collection instrument for unhealthy food and beverage consumption was measured using the Food Frequency Questionnaire (FFQ), which was modified and adapted to the research needs and focus, particularly in classifying the types and frequency of consumption. Meanwhile, menstrual cycle instruments are measured based on the parameters of regularity, frequency, and duration of bleeding.

Bivariate analysis in this study was conducted to determine the relationship between unhealthy food and beverage consumption and the menstrual cycle. The statistical test used is the Spearman's rank correlation test or Spearman's Rho, which was chosen because the variables being analyzed are ordinal-ordinal, meaning both the independent and dependent variables are measured in the form of rankings or categories (Sugiyono, 2023).

RESULTS

Respondent Characteristics

Table 1. Frequency Distribution of Respondent Characteristics

Respondent Characteristics		F	%
Age	15	74	27,2%
	16	84	30,9%
	17	94	34,6%
	18	20	7,4%
Age at First Menstruation (Menarche)	9	2	0,7%
	10	11	4,0%
	11	66	24,3%
	12	105	38,6%
	13	65	23,9%
	14	18	6,6%
	15	5	1,8%
Unhealthy Food Consumption	Yes	222	81,6%
	No	50	18,4%
Unhealthy Beverage Consumption	Yes	142	52,2%
	No	130	47,8%
Usually Consuming These Foods/ Beverage Before or	Yes	209	76,8%
	No		

Respondent Characteristics	F	%
During Menstruation	63	23,2%

Source : Primary Data, 2025

Table 1. almost half of the respondents were 17 years old, totaling 94 people (34,6%). Furthermore, based on the age at first menstruation (menarche), almost half of the respondents experienced menarche at the age of 12, which is 105 people (38,6%). Regarding dietary habits, almost all respondents frequently consumed unhealthy foods, totaling 222 people (81,6%), and almost half frequently consumed unhealthy beverage, which is 142 people (52,2%). Additionally, almost all respondents frequently consumed these unhealthy foods and drinks before or during menstruation, totaling 209 people (76,8%).

Unhealthy Food Consumption

Table 2. Frequency Distribution of Unhealthy Food Consumption by Category

Category		F	%
Unhealthy Food	Low (< 115)	72	26,5%
	Moderate (115 ≤ 195)	115	42,3%
	High (> 195)	85	31,3%
Total		272	100%

Source : Primary Data, 2025

Table 2. it is known that the frequency of unhealthy food consumption among adolescents at SMAN Tanjungsari is almost half in the moderate category, with 115 people (42,3%).

Unhealthy Beverage Consumption

Table 3. Frequency Distribution of Unhealthy Beverage Consumption by Category

Category		F	%
Unhealthy Beverage	Low (< 90)	122	44,9%
	Moderate (90 ≤ 170)	135	49,6%
	High (> 170)	15	5,5%
Total		272	100%

Source : Primary Data, 2025

Table 3. it is known that the frequency of unhealthy beverage consumption among adolescents at SMAN Tanjungsari is almost half in the moderate category, with 135 people (49,6%).

Menstrual Cycle

Table 4. Frequency Distribution of Menstrual Cycle by Category

Category		F	%
Menstrual Cycle	Normal	74	27,2%
	Abnormal	198	72,8%
Total		272	100%

Source : Primary Data, 2025

Table 4. it is known that the majority of female adolescents at SMAN Tanjungsari experience irregular menstrual cycles, totaling 198 people (72,8%).

Relationship between Unhealthy Food Consumption and Menstrual Cycle

Table 5. Frequency Distribution of Unhealthy Food Consumption Levels by Menstrual Cycle

Category	Menstrual Cycle				Total	
	Normal		Abnormal			
	F	%	F	%	F	%
Low	65	23,90 %	7	2,57 %	72	26,47%
Moderate	7	2,57%	108	39,71%	115	42,28%
High	2	0,74%	83	30,51%	85	31,25%
Total	74	27,21%	198	72,79%	272	100 %

Table 6. Statistical Test Values for the Correlation of Unhealthy Food Consumption with Menstrual Cycle

Variable	p-value	rho
Relationship between Unhealthy Food Consumption and Menstrual Cycle	<,001	0,715

The results of the Spearman's statistical test analysis showed that the p-value was < 0,001 with a Spearman's rho value of 0,715.

Relationship between Unhealthy Beverage Consumption and Menstrual Cycle

Table 7. Frequency Distribution of Unhealthy Beverage Consumption Levels by Menstrual Cycle

Category	Menstrual Cycle				Total	
	Normal		Abnormal			
	F	%	F	%	F	%
Low	71	26, 10%	51	18, 75%	122	44, 85%
Moderate	3	1, 10%	132	48, 53%	135	49, 63%
High	0	0%	15	5, 51%	15	5, 51%
Total	74	27, 21%	198	72, 79%	272	100%

Table 8. Statistical Test Values for the Correlation of Unhealthy Beverage Consumption with Menstrual Cycle

Variable	p-value	rho
Relationship between Unhealthy Beverage Consumption and Menstrual Cycle	<,001	0,612

The results of the Spearman's statistical test analysis showed that the p-value was < 0.001 with a Spearman's rho value of 0,612.

DISCUSSION

Respondent Characteristics

The age characteristics in this study show that the respondents are classified as middle adolescents, aged 15–18 years, with the largest proportion being 17 years old, totaling 94 people (34,6%). During middle adolescence (15–18 years), the endocrine system begins to reach a more optimal level of maturity, resulting in more stable hormonal function. This condition occurs due to increased ovarian sensitivity to the hormonal stimulation of FSH and LH, which play a role in ovulation and regulate the menstrual cycle (Hamidah & Rizal, 2022). This aligns with the research by Gruber & Modan-Moses (2021), which states that as women age, the frequency of ovulation increases and menstrual cycles become more regular, indicating the maturation of the hormonal system in the hypothalamic-pituitary-ovarian (HPO) axis. Therefore, age plays an important role in the regularity of menstrual cycles; adolescents in the middle to late stages generally have more mature hormonal function and more stable menstrual cycles compared to adolescents in the early stages.

Based on the characteristics of the age at first menstruation (menarche), the results of this study show that almost half of the respondents experienced menarche at < 12 years of age, specifically 79 people (29%). Menarche occurring earlier than normal, i.e., at < 12 years of age, often indicates accelerated maturation of the hypothalamic-pituitary-ovarian (HPO) axis, but this does not necessarily always lead to mature and regular ovulation, as most early cycles are anovulatory (Shim et al., 2024). This is supported by research by Haryani et al. (2025), which states that the most common age for menarche is 12 – 14 years, and adolescents who experience menarche too early tend to have irregular menstrual cycles (p = 0,001). Thus, the age at menarche is not only an early sign of reproductive function, but also an important indicator of long-term hormonal stability and menstrual cycle health.

Based on the habit of consuming unhealthy foods/drinks before or during menstruation

in this study, it was found that the majority of respondents tended to consume unhealthy foods and drinks both before and during their menstrual period, totaling 209 respondents (76,8%). According to Anggadiredja et al. (2021), fluctuations in estrogen and progesterone levels during the luteal phase leading up to menstruation can increase the desire to consume high-fat, sweet, and salty foods. The increase in progesterone hormone causes an increase in appetite, while the decrease in estrogen levels affects serotonin levels in the brain, leading to food cravings. This aligns with Tambunan & Siregar (2024), who stated that adolescents with a healthy diet including fruits, vegetables, protein, and complex carbohydrates tend to have stable hormone levels, resulting in more regular menstrual cycles (p value < 0,001).

Unhealthy Food Consumption

In this study, almost half of the respondents who consumed unhealthy foods were in the moderate category, meaning they consumed them with a frequency that was neither too often nor too rarely. This condition indicates that unhealthy food is still part of adolescents' social lifestyle, due to its easy access and availability in the surrounding environment, especially in urban areas (Huwaida et al., 2022). This consumption pattern is influenced by internal factors such as habits, perceptions, and taste preferences, while external factors include the social environment, family, and food availability. During middle adolescence, awareness of health and physical appearance begins to increase, leading to a tendency to reduce unhealthy food consumption to a moderate level (Mc Carthy et al., 2022). This aligns with research conducted by Intorre et al. (2025) in Italy, which showed that nearly half (47,8%) of adolescents with low physical activity due to a sedentary lifestyle (>3 hours/day) were at a moderate level of unhealthy food consumption, influenced by social media's impact on food choices and urban lifestyles (p = 0,001).

Unhealthy foods in this study were examined using consumption frequency indicators consisting of 6 types of unhealthy foods. The most frequently consumed type of unhealthy food by female adolescents in this study was instant or fast food, with 94 respondents (34,6%). This high consumption rate is due to several factors, including easy access to products, the savory taste that is liked, the convenience of preparation, the influence of the social environment and promotions on digital media, and the availability of fast-food restaurants, which also contribute to increased consumption of this type of food. Instant or fast food falls into the category of foods high in calories, saturated fat, and sodium, but low in the fiber, vitamins, and minerals the body needs.

High consumption of high-fat and high-calorie instant foods can increase the accumulation of adipose tissue, especially in the visceral region, which can affect the regulation of reproductive hormones thru increased aromatase activity and elevated levels of free estrogen. This condition can disrupt the hypothalamic-pituitary-ovarian (HPO) axis, leading to dysregulation of GnRH release, which in turn affects ovulation and disrupts menstrual cycle regularity. Additionally, the high sodium and trans fat content in this food can also trigger chronic inflammation and oxidative stress, which can damage ovarian and endometrial cells. Exposure to additives and antibiotics in fast food is also an endocrine disruptor, which can worsen hormonal imbalances (Lestari & Amal, 2019).

This result is consistent with the findings of Suryatno et al. (2023), who found that the most frequent category of fast food consumption was moderate, with the most commonly consumed types of food being instant noodles, fried foods, and crispy chicken. The habit of teenagers choosing fast food because it's easily accessible and

convenient, but it can still lead to hormonal imbalances and irregular menstrual cycles (p = 0,002). Thus, although the consumption rate of fast food among adolescent girls is generally in the moderate category, this consumption pattern is already having a significant impact on reproductive health because its saturated fat, sodium, and additive content can affect hormonal balance and worsen the symptoms of menstrual disorders.

Additionally, this research also found that the least frequently consumed unhealthy food type by female adolescents at SMAN Tanjungsari is processed meat/chicken/fish products, with only 4 respondents (1,5%) never consuming them at all. This indicates that although consumption of processed animal products persists, its frequency is relatively lower compared to other types of unhealthy foods. Processed meat/chicken/fish products are foods that have undergone various industrial processes such as preservation, salt addition, smoking, and the addition of other food ingredients to improve shelf life, flavor, or texture (Patriani et al., 2020).

The high saturated fat and cholesterol content in this type of food can trigger excessive fat tissue accumulation and impact increased estrogen levels due to the activity of the aromatase enzyme in adipose tissue. This hormonal imbalance can disrupt the HPO axis, which can affect the GnRH, FSH, and LH hormones in the ovulation and menstrual cycle process (Lestari & Amal, 2019). Additionally, the high sodium and MSG content in these processed products can trigger systemic inflammation and oxidative stress, thereby worsening endometrial conditions and disrupting follicle maturation. Preservatives like nitrites and nitrates used in this food can also form carcinogenic and toxic nitrosamine compounds to ovarian cells (Irianti et al., 2017). This is in line with the research by Palupi et al. (2022), which showed that consuming animal-based side dishes such as meat, chicken, and fish can lead to irregular menstrual cycles compared to those who rarely consume them (p = 0,057). Therefore, the consumption of processed animal products should be limited and replaced with fresh protein sources such as fresh fish, tofu, or tempeh, which are richer in nutrients and contain minimal synthetic additives.

Unhealthy Beverage Consumption

In this study, almost half of the respondents consumed unhealthy beverages in the moderate category, meaning they consumed them with a frequency that was neither too often nor too rarely. Just like unhealthy food, unhealthy beverage also show consumption patterns that are still part of adolescents' social lifestyles, influenced by trends, sweet tastes, and massive product promotions (Huwaida et al., 2022). This consumption pattern is influenced by internal factors such as habits, perceptions, taste preferences, and affordability. External factors include the social environment, family, and the availability of food and ease of access, especially in urban areas, although still within moderate limits (Mc Carthy et al., 2022). This is supported by research by Trijayanti & Gani (2023), which reviewed the effectiveness of unhealthy consumption marketing policies and found that constant exposure to unhealthy beverages in the media can influence adolescents' consumption patterns, most of whom tend to fall into the moderate category, meaning consumption is not very frequent but is quite consistent.

Unhealthy beverages in this study were examined using the consumption frequency indicator, which consists of 5 types of unhealthy beverages. The results of this study indicate that sugary drinks or Sugar-Sweetened Beverages (SSBs) are the most frequently consumed type of unhealthy beverage by female adolescents at SMAN Tanjungsari, with 91 respondents (33,5%).

High consumption of sugary drinks is caused by easy access to products, the preferred sweetness, practicality and convenience, peer influence, social media promotion, and widespread availability in school environments and other locations (Huwaida et al., 2022).

Sweetened beverages contain empty calories from added sugar, and some products also contain caffeine, artificial colors, phosphoric acid, and carbonation. The WHO recommends a maximum daily intake limit of added sugars of 10% of total daily energy needs, or about 50 grams per day, with the ideal being to reduce it to below 25 grams per day for optimal health (Istianah & Rolag, 2023). High added sugar content can lead to blood glucose spikes, a drastic increase in insulin levels, insulin resistance, and a decrease in SHBG levels. This decrease in SHBG increases free estrogen levels in the bloodstream, which can disrupt hormonal regulation in the HPO axis and impact ovulation and menstrual cycle regularity (Tambunan & Siregar, 2024). This result is consistent with Ainayah (2023) research, which showed a significant relationship between sweet beverage consumption and the occurrence of premenstrual syndrome (p = 0,028 and OR = 2,86). Thus, the high frequency of sugary drink consumption among adolescent girls, primarily due to a preference for sweetness, not only increases excessive calorie intake but can also disrupt the balance of reproductive hormones.

Additionally, the results of this study indicate that the least frequently consumed unhealthy beverage type by female adolescents at SMAN Tanjungsari is energy drinks, with 107 respondents (41,5%) never consuming them at all. This shows that although many do not consume it, this type of drink is still part of the consumption patterns of adolescents, and some have consumed it because it can quickly help increase energy, concentration, and physical and mental (Anggadiredja et al., 2021). This beverage contains high levels of caffeine, typically between 100–200 mg per serving, which exceeds the safe daily caffeine consumption limit for adolescents. Additionally, this beverage also contains high doses of additives such as taurine, guarana, ginseng, and B-complex vitamins, which can have a synergistic stimulant effect on the central nervous system (Garcia, 2023). Additional ingredients like taurine and guarana can also increase blood pressure, speed up heart rate, and cause sleep disturbances, ultimately negatively impacting the function of the endocrine system (Novita, Lenny, 2017).

This result is supported by the research of Ibrahim et al. (2024), which states that long-term consumption of energy drinks can increase blood glucose, cholesterol, triglycerides, and insulin resistance levels, accompanied by a decrease in the hormones leptin and ghrelin, which play a role in endocrine balance. Therefore, the consumption of energy drinks needs to be limited, especially among teenage girls, and it is recommended to replace them with healthier sources of fluids such as plain water, low-fat milk, or fruit juice without added sugar.

Menstrual Cycle

The results of this study indicate that the majority of female adolescents at SMAN Tanjungsari experience irregular menstrual cycles, with 198 individuals (72,8%) having abnormal cycles. Abnormal menstrual cycles can be influenced by a variety of interconnected factors, both physiological, psychological, and situational. These factors include age, age at menarche, nutritional status, stress, sleep quality, anxiety levels, physical activity, smoking habits, and nutrient intake and dietary patterns. Disruptions in any of these factors can lead to an imbalance of estrogen and progesterone hormones, thereby disrupting the ovulation process and causing changes in menstrual regularity, frequency, duration,

and bleeding volume (Shim et al., 2024). These findings are supported by research by Ayuk Candra et al. (2024), which states that excessive intake of macronutrients such as energy, protein, carbohydrates, and fats can cause irregular menstrual cycles (p < 0,05), as this nutritional imbalance can suppress reproductive hormone activity and inhibit ovulation.

The menstrual cycle in this study was examined using three indicators or parameters of the menstrual cycle according to the International Federation of Gynecology and Obstetrics (FIGO), namely frequency, regularity, and duration of bleeding. The results of this study indicate that the majority of respondents experience irregular menstruation each month, with 155 people (57,0%) reporting this. Among them, 91 people experienced delays of > 35 days (33,5%). Based on the frequency of intervals between menstrual cycles, almost half of the respondents were in the < 21 days range, with 107 people (39,3%), and 65 people in the > 35 days range (23,9%). Additionally, 26 people had bleeding durations of 1 – 2 days (9,6%), and 56 people had durations > 7 days (20,6%).

According to FIGO, the three menstrual parameters of frequency, regularity, and duration of bleeding serve as the main indicators of a normal menstrual cycle, while the indicator of bleeding volume acts as an indirect additional parameter. These indicators highlight important aspects of physiological function in the female system. If any of these indicators are not met, it suggests an abnormality in the menstrual cycle, so all three main indicators must be met for the menstrual cycle to be considered normal (Jain et al., 2023).

This result is consistent with research conducted by Fadillah et al. (2022), which examined the menstrual cycle based on the parameter of regularity. The results showed that the majority of respondents had irregular periods each month (p < 0,05). Then, in the study by Tambunan & Siregar (2024), the frequency or interval between menstrual cycles was examined, and it was found that most respondents had an interval between cycles of > 35 days (oligomenorrhea). Additionally, this study also examined menstrual delays of > 35 days, and it was found that very few respondents experienced delays (p < 0,05). Meanwhile, the study by Widyasari et al. (2025) examined the duration of menstrual bleeding, with results showing that almost half of the respondents had a bleeding duration of > 7 days.

The high number of abnormal menstrual cycles among adolescent girls in this study indicates that menstrual disorders are still a fairly common problem among teenagers. Therefore, it is important to monitor menstrual patterns from adolescence as an early detection effort for reproductive system and hormonal balance disorders. Therefore, continuous education is needed regarding the importance of maintaining a healthy lifestyle, including consuming nutritious foods and managing stress, so that adolescent girls can have more regular menstrual cycles.

Relationship between Unhealthy Food Consumption and Menstrual Cycle

Based on the data from this study, it shows that unhealthy food has a p-value < 0,001. It can be concluded that H1 is accepted and H0 is rejected, meaning there is a significant relationship between unhealthy food consumption and the menstrual cycle in adolescent girls. Then, the Spearman's rho value in this analysis is 0,715, which means the relationship between unhealthy food consumption and the menstrual cycle has a positive and strong correlation.

Nutritional intake and daily consumption patterns play a significant role in maintaining the stability of the menstrual cycle because both directly influence the balance of reproductive hormones, the body's energy reserves, and ovarian function (Palupi et al., 2022). Imbalances in

both macronutrients and micronutrients such as energy, protein, essential fats, iron, zinc, vitamin B6, vitamin D, and calcium can inhibit the production of reproductive hormones like GnRH, FSH, LH, estrogen, and progesterone. Nutrient intake and consumption patterns based on unhealthy food types such as high-fat foods will increase body fat accumulation and leptin levels in adipose tissue, which triggers excessive estrogen production. This can then lead to dysfunction in the HPO axis, inhibiting follicle maturation and ovulation, resulting in irregular menstrual cycles (Palupi et al., 2022). This result is consistent with the study by Nahdah et al. (2022), which showed that high fat intake has a significant relationship with abnormal menstrual cycle disturbances (p = 0,007).

In sweet foods, excessive sugar consumption will trigger a surge in glucose and insulin, leading to hyperinsulinemia, which lowers SHBG, causing free estrogen and androgen levels to increase and disrupt the balance of reproductive hormones. This condition hinders follicle maturation and ovulation, leading to irregular menstrual cycles and an increased risk of PCOS (Zahra et al., 2023). These results are consistent with the study by Sen et al. (2024), which found that consumption of sugary foods and high-fat cravings were significantly associated with an increased risk of dysmenorrhea and menstrual cycle irregularities (p < 0,001). Additionally, consuming foods high in salt and MSG can trigger sodium and fluid retention, leading to electrolyte imbalances. This condition increases blood pressure and physiological stress, which can activate the RAAS system and lead to excessive cortisol release. High cortisol inhibits GnRH, thus reducing FSH and LH, and disrupting ovulation (Herawati & Irawan, 2021). This result aligns with research Güzeldere et al. (2024) stating that sodium consumption higher than national recommendations can cause menstrual disorders.

Grilled foods contain PAH and HCA compounds that can cause oxidative stress and systemic inflammation, which then damage ovarian cells, leading to ovulation disorders and ovum maturation problems, resulting in irregular menstrual cycles (Saputro et al., 2021). These findings are consistent with the study by Rafiee et al. (2024), which showed that exposure to PAH is associated with ovulation disorders and menstrual irregularities thru oxidative stress. Meanwhile, processed meat/chicken/fish products, in addition to being high in fat, sodium, and MSG, also contain nitrites and nitrates that can form toxic (carcinogenic) nitrosamines for the ovaries, leading to impaired ovum maturation and ovulation (Irianti et al., 2017). These findings are consistent with the study by Sheng et al. (2025), which showed that the nitrite/nitrate content in processed products and their toxicity (nitrosamines) are associated with cell and endocrine system damage, resulting in reproductive hormone disorders.

Then, in instant or fast food, beside having high fat, sodium, and MSG content, these foods also contain additives and antibiotics that can disrupt the endocrine system. This condition can worsen hormonal imbalances and trigger damage to the ovaries and endometrium (Lestari & Amal, 2019). This result is supported by research by Rohmah et al. (2025), which showed a relationship between fast food consumption and the menstrual cycle (p = 0,000).

Thus, unhealthy food consumption plays a significant role in the regularity of menstrual cycles in adolescent girls. The higher the frequency of unhealthy food consumption, the greater the likelihood of menstrual cycle irregularities in adolescent girls. Therefore, limiting the consumption of unhealthy foods is an important step in maintaining reproductive health and regulating menstrual cycles in adolescent girls.

Relationship between Unhealthy Beverage Consumption and Menstrual Cycle

Based on the data from this study, it shows that unhealthy beverages have a p-value < 0,001. It can be concluded that H1 is accepted and H0 is rejected, meaning there is a significant relationship between unhealthy beverage consumption and the menstrual cycle in adolescent girls. Then, the Spearman's rho value in this analysis is 0,612, which is < 0,6, meaning there is a positive and moderate (fair) correlation between unhealthy beverage consumption and the menstrual cycle.

Beside food, daily nutrient intake and drinking patterns also play an important role in maintaining the stability of the menstrual cycle because they affect the balance of reproductive hormones, energy reserves, and ovarian function (Putri et al., 2024). In sweet drinks, excessive sugar consumption will trigger a surge in glucose and insulin, leading to hyperinsulinemia, which lowers SHBG, causing free estrogen and androgen levels to increase and disrupt the balance of reproductive hormones. This condition hinders follicle maturation and ovulation, leading to irregular menstrual cycles and an increased risk of PCOS (Zahra et al., 2023). This result is similar to Ainayah (2023) research, which stated a significant relationship between sweet beverage consumption and PMS incidence in female students (p = 0,028).

In addition to having a high sugar content, carbonated beverages also contain phosphoric acid, which can potentially inhibit calcium absorption, cause uterine contractions, and destabilize hormones (Mutia & Putriana, 2023). This result aligns with the research by Wang et al. (2024), which explains that there is a relationship between the consumption of carbonated soda and the occurrence of dysmenorrhea (p = 0,040). Additionally, caffeinated beverages with very high caffeine content will increase cortisol and adrenaline hormones. This condition can disrupt the function of GnRH, FSH, and LH, leading to suboptimal ovulation and irregular menstrual cycles (Utami & Ummah, 2023). This result is supported by the study by Liu et al. (2024), which found that high caffeine consumption is a risk factor for dysmenorrhea (p < 0,001).

Then, in energy drinks that are high in sugar and caffeine, these drinks also contain taurine or guarana. This content will overstimulate hormones and cause oxidative stress, which can activate the RASS. This leads to increased cortisol and decreased FSH and LH, disrupting follicle maturation and ovulation (Anggadiredja et al., 2021). This is supported by the research of Ibrahim et al. (2024), which showed a relationship between energy drinks and endocrine balance (p < 0,05). Instant and packaged beverages (fast drinks) contain a combination of ingredients from previous beverages, including high levels of sugar and artificial sweeteners, trans fats, dyes, synthetic preservatives, and high sodium, which can disrupt gut microbiota, trigger inflammation and oxidative stress, leading to damage to endometrial and ovarian tissues, thereby inhibiting follicle maturation and ovulation (Husni et al., 2022). This result is similar to the study by Syifa & Stefani (2024), which stated that ready-to-drink beverages are significantly associated with menstrual cycle disorders (p = 0,034) and with dysmenorrhea (p = 0,050).

Thus, the consumption of unhealthy beverages plays a significant role in the regularity of menstrual cycles in adolescent girls. The higher the frequency of unhealthy beverage consumption, the greater the likelihood of irregular menstrual cycles in adolescent girls. Therefore, although the consumption level of unhealthy beverages in this study was in the moderate to low category, it still needs to be limited to support reproductive health and maintain menstrual cycle regularity in adolescent girls.

CONCLUSIONS AND RECOMMENDATION

Based on the research conducted on female adolescents at SMAN Tanjungsari, it can be concluded that the frequency of unhealthy food consumption among female adolescents is moderate to high, while the frequency of unhealthy beverage consumption is moderate to low. Additionally, most respondents have irregular menstrual cycles because they scored less than four parameters of the menstrual cycle that must be met to be considered a normal menstrual cycle.

The results of the statistical test analysis show a significant relationship between unhealthy food consumption and the menstrual cycle with a p-value < 0,001 with a strong positive correlation of 0,715, thus H1 is accepted and H0 is rejected. Additionally, a significant relationship was also found between unhealthy beverage consumption and the menstrual cycle with a p-value < 0,001 with a moderate positive correlation of 0,612, thus H1 is accepted and H0 is rejected. This means that the higher the frequency of unhealthy food and beverage consumption, the greater the likelihood of menstrual cycle irregularities in adolescent girls.

This finding implies that nutritional intake, particularly from unhealthy foods and beverages, can disrupt hormonal mechanisms involved in reproductive function and menstrual cycle regulation. Additionally, this research emphasizes the importance of establishing healthy eating habits from adolescence as a preventive measure for maintaining reproductive health, thru increased knowledge, school environmental support, and continuous health education.

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