

Association between Stress Levels, Sleep Quality, and Menstrual Cycle among Female Adolescents

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ABSTRACT

Introduction: Adolescence is a period of rapid physical and psychological changes that may increase vulnerability to stress and sleep problems, which can affect reproductive health. Menstrual cycle disorders are common among adolescent girls and are often associated with hormonal imbalance triggered by stress and poor sleep quality. Preliminary observations at SMAN 1 Belinyu showed several students experienced irregular menstrual cycles. Therefore, this study aimed to examine the relationship between stress levels and sleep quality and menstrual cycles among adolescent girls.

Objective: This study aimed to determine the relationship between stress level and sleep quality with the menstrual cycle among female adolescents at SMAN 1 Belinyu in 2025.

Method: This study employed a cross-sectional design. The population consisted of 147 female students at SMAN 1 Belinyu, with a sample size of 66 respondents. The research was conducted on November 24, 2025, at SMAN 1 Belinyu.

Result: The results of the study using the chi-square test showed that stress level obtained a p-value of $0.000 < \alpha (0.05)$, and sleep quality also obtained a p-value of $0.000 < \alpha (0.05)$. These results indicate that there is a significant relationship between stress level and sleep quality with the menstrual cycle among female adolescents at SMAN 1 Belinyu in 2025.

Conclusion: The conclusion of this study is that there is a relationship between stress level and sleep quality with the menstrual cycle among female adolescents at SMAN 1 Belinyu in 2025. The recommendation of this study is that it is expected to serve as a reference for schools to collaborate with health centers in providing educational materials on stress management and maintaining good sleep quality in order to prevent irregular menstrual cycles.

Keywords: menstrual cycle, sleep quality, stress level

Introduction

Mental health is a state of mental, physical, spiritual, and social development, enabling individuals to recognize their own abilities, manage stress, be productive at work, and exert influence within their communities. Mental health encompasses all aspects of individual development from pregnancy through adolescence to adulthood (Enopadria et al., 2023). Adolescence can be defined as a period of rapid physical, psychological, and intellectual growth and development. Psychological changes, such as emotional instability, often occur during adolescence, which impacts how adolescents face and resolve problems. Emotional situations can often be erratic, making it difficult for adolescents to understand themselves. Unresolved issues can also trigger stress. Stress in adolescent girls can lead to reproductive system problems related to menstruation (Anjarsari N, 2020).

According to the World Health Organization (WHO), in 2020, the prevalence of menstrual cycle disorders in women was approximately 45%. According to Basic Health Research data (Riskasdas, 2018), the highest number of irregular menstruation was found in the Gorontalo region at around 23.3%, while the second region was the Bangka Belitung Islands with around 20.3% (Riliantri, S. et al., 2025). According to a study entitled *The Relationship between Sleep Quality and Menstrual Cycles in Final Year Students of the Faculty of Nursing*, menstruation can be defined as bleeding caused by the shedding of the inner wall of the uterus, also called the endometrium. Periodic bleeding occurs with a distance between periods can also be called one cycle. It is said to be regular if one menstrual cycle occurs three times evenly every month. It is said to be normal if the menstrual cycle is, for example, an average distance of 21 to 35 days and the menstrual range is 3 to 7 days. Signs that a woman is experiencing a normal and regular menstrual cycle are good reproductive function and development, on the other hand, if the menstrual cycle is irregular it can be a sign of menstrual disorders. Menstrual disorders are caused by various factors, including hormonal imbalance, stress, anxiety, physical activity, and sleep quality (Wahyu W. et al. 2024).

One factor contributing to menstrual disorders is stress, a non-specific condition in which the body responds to demands through physiological, psychological, and behavioral reactions as it attempts to regulate and adapt to both internal and external pressures. Menstrual cycle disorders are likely related to stress. Stress can create new demands, which can increase the length of the menstrual cycle, resulting in delayed periods. Stress can cause the body to release the hormone cortisol, which regulates various body systems, including the heart, lungs, circulation, metabolism, and the immune system. Generally, cortisol levels are an indicator of a person's stress level. When stress increases, cortisol levels in the body also increase (Larasati N, 2023).

In addition to stress, sleep quality can also lead to menstrual cycle disorders. Sleep quality is a measure of a person's ability to initiate and maintain sleep. Healthy individuals typically sleep 6 to 9 hours a day, with an average of 6-8 hours. Sleep quality encompasses qualitative (depth of sleep) and quantitative (hours of sleep) aspects, such as the time it takes to fall asleep, the length of sleep, how often a person wakes up, and personal factors such as sleep satisfaction. Sleep is considered good quality when a person shows no evidence of sleep deprivation or experiences sleep disturbances (Wahyu W. et al. 2024). Poor quality sleep can prevent the body from producing the hormone melatonin. A study titled *"The Relationship between Sleep Quality and the Menstrual Cycle in Final Year Nursing Students"* revealed that melatonin influences the menstrual cycle because this hormone is synthesized by several female reproductive organs such as the ovaries, placenta, and uterus. Furthermore, this hormone is released by the pineal gland at night, which also plays a role in regulating sleep,

pubertal development, and adaptation to the environment. Melatonin plays an important role in estrogen production.

Based on the initial results of a survey conducted by researchers on September 25, 2025, through short interviews and questionnaires with 5 female teenagers at SMAN 1 Belinyu, data was obtained that some teenagers experienced irregular menstrual cycles, experienced stress due to the demands of study hours and study materials, difficulty sleeping at night due to doing study assignments and focusing on using mobile phones. Of the 5 female teenagers were given questionnaires about stress levels, sleep quality and menstrual cycles. From the stress level, the results showed that 3 people did not experience stress, 2 people experienced mild stress due to the demands of study hours and a lot of study materials. From the sleep quality, the results showed that 2 people experienced good sleep quality, 3 people experienced poor sleep quality due to staying up late working on assignments, staying up late during exams and sometimes focusing on playing with mobile phones until they lost track of time. From the menstrual cycle, the results showed that 3 people had irregular menstrual cycles, 2 people had regular menstrual cycles. Based on the problems found in the field and previous research references, the researcher was interested in raising the issue of the menstrual cycle and its relationship with stress levels and sleep quality. Therefore, the researcher will conduct research with the title "The Relationship between Stress Levels and Sleep Quality with Menstrual Cycles in Adolescent Girls at SMAN 1 Belinyu".

Objective

This study aimed to determine the relationship between stress level and sleep quality with the menstrual cycle among female adolescents at SMAN 1 Belinyu in 2025.

Method

A research design is a structured plan for answering research questions. This plan defines the procedures to be followed during the research process and serves as a guideline for achieving the research objectives. Therefore, the chosen research design must be the most effective approach to answering the objectives and research questions. This study used an analytical design with a cross-sectional method to examine the relationship between risk factors (independent variables) and their consequences (dependent variables). Data collection was conducted simultaneously (a point-in-time approach). This ensures that all independent and dependent variables are measured at the same time. This study employed a cross-sectional design. The population consisted of 147 female students at SMAN 1 Belinyu, with a sample size of 66 respondents. The research was conducted on November 24, 2025, at SMAN 1 Belinyu. Bivariate analysis is used to analyze the relationship between two different variables. The main goal of this analysis is to understand the relationship between the independent and dependent variables. The chi-square test is often used with a 95% confidence level. If the p-value is less than 0.05, the null hypothesis is rejected. If it is greater than 0.05, the null hypothesis is accepted.

Result

Table 1. The Relationship between Stress Levels and Menstrual Cycles in Adolescent Girls

Stress Level	Menstrual Cycle				Total		p-value	POR (CI 95%)
	Regular		Irregular		n	%		
	n	%	n	%				
Normal	22	91.7	2	8.3	24	100	0.000	35.2 (7,020-176,506)
Experiencing stress	10	23.8	32	76.2	42	100		
Total	32	48.5	34	51.5	66	100		

Based on Table 1, it can be seen that 22 (91.7%) of adolescent girls with regular menstrual cycles and normal stress levels were more numerous than those experiencing stress. Meanwhile, the number of adolescent girls with irregular menstrual cycles was higher. There were 32 (76.2%) adolescent girls experiencing stress. The analysis using the Chi-Square test yielded a p-value (0.000) < α (0.05), thus concluding that there is a relationship between stress levels and menstrual cycles in adolescent girls at SMAN 1 Belinyu in 2025, with a Prevalence Odds Ratio (POR) of 35,200 (95% CI: 7,020-176,506). This means that adolescent girls experiencing stress are 35,200 times more likely to have irregular menstrual cycles compared to adolescent girls with normal stress levels.

Table 2. The Relationship between Sleep Quality and Menstrual Cycles in Adolescent Girls

Sleep Quality	Menstrual Cycle				Total		p-value	POR (CI 95%)
	Regular		Irregular		n	%		
	n	%	n	%				
Good	15	83.3	3	16.7	18	100	0.000	9.118 (2.309-36.007)
Poor	17	35.4	31	64.6	48	100		
Total	32	48.5	34	51.5	66	100		

Based on Table 2, it can be seen that 15 (83.3%) of adolescent girls with regular menstrual cycles and good sleep quality outnumbered those with poor sleep quality. Meanwhile, 31 (64.6%) of adolescent girls with irregular menstrual cycles outnumbered those with poor sleep quality. The chi-square analysis yielded a p-value (0.000) < α (0.05), concluding that there is a relationship between sleep quality and menstrual cycles in adolescent girls at SMAN 1 Belinyu in 2025. The prevalence odds ratio (POR) was 9.118 (95% CI: 2.309-36.007). This means that adolescent girls with poor sleep quality are 9.118 times more likely to have irregular menstrual cycles than those with good sleep quality.

Discussion

Stress is a physical and mental response to pressure or demands that exceed an individual's coping capacity (Indah, A. et al. 2024). Stress can create new demands, which can affect the length of the menstrual cycle, resulting in delayed periods. Stress can cause the body to release the hormone cortisol, which regulates various body systems, including the heart, lungs, blood circulation, metabolism, and immune system. When stress increases, cortisol levels also increase (Larasati, N. 2023).

The results of the study revealed that irregular menstrual cycles were more common in adolescent girls experiencing stress (32 women (76.2%) compared to adolescent girls experiencing normal stress levels. While regular menstrual cycles were more common in adolescent girls experiencing normal stress (22 women (91.7%). Based on the results of research conducted on 66 respondents, the results of the study showed that there was a relationship between stress levels and menstrual cycles in female adolescents at SMAN 1 Belinyu in 2025 with the Chi-Square test value obtained p-value (0.000) smaller than α (0.05) then H_0 was rejected. It was concluded that there was a relationship between stress levels and menstrual cycles in female adolescents at SMAN 1 Belinyu in 2025. Based on further analysis, the POR (Prevalence Odds Ratio) value was obtained = 35,200 (95% CI = 7,020-176,506) meaning that female adolescents who experience stress are at risk of 35,200 times having irregular menstrual cycles compared to female adolescents who have normal stress levels. This research aligns with research conducted by Darmiati (2022), entitled "The Relationship between Stress Levels and Menstrual Cycles During the Pandemic in Female Students at SMK Negeri 1 Makassar in 2022." The results were analyzed using the Chi-Square test. This study revealed a significant relationship between stress levels (p-value: 0.000) and menstrual cycles in female students at SMK Negeri 1 Makassar.

Furthermore, this study aligns with research conducted by Nurhalyzah et al. (2025), entitled "The Relationship between Stress Levels, Sleep Quality, and Dietary Patterns and Menstrual Cycles in Public Health Faculty Students in 2024." The results were analyzed using the Chi-Square test. The results showed a significant relationship between stress levels (p-value: 0.000), sleep quality (p-value: 0.002), and diet (p-value: 0.000) and menstrual cycles in students at the Faculty of Public Health.

According to researchers, the research findings indicating a close relationship between stress levels in adolescents and menstrual regularity in young women are closely linked to interconnected biological and psychological mechanisms. Stress experienced by adolescents, whether mild, moderate, or severe, can trigger activation of the hypothalamic-pituitary-adrenal (HPA) axis, thereby increasing cortisol production. Continuously elevated cortisol levels can disrupt the balance of reproductive hormones such as Gonadotropin-Releasing Hormone (GnRH), Luteinizing Hormone (LH), and Follicle-Stimulating Hormone (FSH), which play a vital role in ovulation and regulating the menstrual cycle. Disruptions in these hormones are assumed to cause irregular, longer, shorter menstrual cycles, and even temporary amenorrhea.

Researchers also assume that young women are an age group vulnerable to stress due to the various changes they experience, including physical, emotional, social, and academic demands. Academic pressure, schoolwork, exams, conflicts with peers, and family problems are assumed to be the main factors that increase stress levels in adolescents. When stress is not managed properly, it can worsen hormonal imbalance and indirectly affect menstrual cycle regularity. Based on the results of this study, researchers conclude that stress management efforts in adolescent girls are an important step in maintaining reproductive health. Educational programs on stress management are expected to help reduce the risk of menstrual cycle disorders in adolescents.

Sleep quality refers to a person's good and bad sleep habits, encompassing both qualitative (sleep depth) and quantitative (sleep hours) aspects (Azzura, F. et al. 2023). Sleep quality is a measure of how well a person can initiate sleep. Sleep is considered good quality when a person shows no evidence of sleep deprivation or experiences sleep disturbances. Poor sleep quality can inhibit melatonin production. Melatonin influences the menstrual cycle

because it is synthesized by several female reproductive organs. This hormone is released by the pineal gland at night, which also plays a role in regulating sleep. When melatonin levels decrease, it can lead to increased estrogen levels, potentially affecting the menstrual cycle (Wahyu, W. et al. 2024).

The results of the study showed that irregular menstrual cycles were more common in adolescent girls with poor sleep quality (31 women (64.6%) compared to adolescent girls with good sleep quality. While regular menstrual cycles were more common in adolescent girls with good sleep quality (15 women (83.3%). Based on the results of a study conducted on 66 respondents, the results showed a relationship between sleep quality and menstrual cycles in adolescent girls at SMAN 1 Belinyu in 2025. The Chi-Square test obtained a p-value (0.000) smaller than α (0.05), so H_0 was rejected. It was concluded that there was a relationship between sleep quality and menstrual cycles in adolescent girls at SMAN 1 Belinyu in 2025. Based on further analysis, the POR (Prevalence Odds Ratio) value was obtained = 9.118 (95% CI = 2.309-36.007), meaning that adolescent girls who experience poor sleep quality are 9.118 times more likely to have irregular menstrual cycles compared to adolescent girls who have good sleep quality.

This study is in line with the study conducted by Wahyu, W. et al. (2024) entitled "The Relationship between Sleep Quality and Menstrual Cycles in Final Year Female Students of the Faculty of Nursing" which showed research results from the study using the Chi-Square test. The results of the study showed a significant relationship between sleep quality (p-value: 0.000) and the menstrual cycle in final-year female students of the Faculty of Nursing.

The researchers hypothesize that the relationship between sleep quality and the menstrual cycle in adolescent girls is due to the important role sleep plays in maintaining the balance of the body's hormonal system. Poor sleep quality, such as insufficient sleep duration, difficulty falling asleep, frequent nighttime awakenings, or restless sleep, can disrupt the regulation of hormones involved in the menstrual cycle, particularly melatonin, cortisol, and reproductive hormones such as Gonadotropin-Releasing Hormone (GnRH), Luteinizing Hormone (LH), and Follicle-Stimulating Hormone (FSH). An imbalance in these hormones is thought to cause ovulation disorders and impact menstrual cycle irregularities.

Researchers also believe that significant biological and psychological changes occur during adolescence, making young women more susceptible to sleep disorders. Excessive gadget use, late-night studying, academic pressure, and emotional stress are believed to be major factors contributing to decreased sleep quality in adolescents. Exposure to blue light from screens at night is also thought to inhibit melatonin production, disrupting the body's circadian rhythm and indirectly affecting the menstrual cycle.

Furthermore, researchers believe that poor sleep quality can reduce immunity and impact overall physical condition. Fatigue and fatigue due to lack of sleep can worsen the body's response to hormonal changes during the menstrual cycle, increasing the risk of symptoms such as delayed menstruation, longer or shorter cycles, and more severe menstrual pain. Based on the results of this study, researchers assume that improving sleep quality through health education, managing study time, limiting gadget use at night, and adopting a healthy lifestyle are crucial for maintaining a regular menstrual cycle.

Conclusion

The conclusion of this study is that there is a relationship between stress level and sleep quality with the menstrual cycle among female adolescents at SMAN 1 Belinyu in 2025. The recommendation of this study is that it is expected to serve as a reference for schools to

collaborate with health centers in providing educational materials on stress management and maintaining good sleep quality in order to prevent irregular menstrual cycles

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Authors' contribution

Each author contributed equally in all the parts of the research. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper. This research was conducted independently without any financial, commercial, or personal relationships that could be construed as a potential conflict of interest. All processes, including study design, data collection, analysis, and manuscript preparation, were carried out objectively and without external influence.

Ethical consideration

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