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The Correlation Between Body Mass Indeks and Menstrual Cycle Among Adolescent Girls

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ABSTRACT

Background: Menstruation refers to the regular and cyclical bleeding originating from the uterus, usually accompanied by the shedding of the endometrial lining inside the womb. When an adolescent experiences an abnormal menstrual cycle (< 21 days), it can cause more frequent bleeding from the body. As a result, increased blood loss may trigger iron deficiency anemia. **Object:** To analyze whether there is a relationship between body mass index (BMI) and the menstrual cycle among adolescent girls. **Method** This study applied an observational analytic design using a correlational study method with a cross-sectional approach. The sample consisted of 95 female students from the Midwifery Department of Health Polytechnic of Surabaya who met the predetermined criteria and were selected using a simple random sampling technique. Data were analyzed using the chi-square test with a significance level of 0.05. **Results:** Based on the chi-square statistical test, the obtained p-value was 0.000 with $\alpha = <0.05$. This indicates that there is a significant relationship between body mass index (BMI) and the menstrual cycle among adolescent girls in the Midwifery Department of Health Polytechnic of Surabaya. **Conclusion:** This finding indicates that abnormalities in body mass index, either underweight or overweight, may affect the regularity of the menstrual cycle. Therefore, maintaining an ideal body mass index through a balanced diet and healthy lifestyle is important to support hormonal balance and normal menstrual function in adolescent females.

Keywords: Body Mass Indeks, Menstrual Cycle, Adolescent Girls

BACKGROUND

Menstruation refers to the regular and cyclical bleeding originating from the uterus, typically accompanied by the shedding of the endometrial lining within the uterine cavity (Purnasari & Illiyya, 2023). An abnormal menstrual cycle is defined as polymenorrhea when it occurs at intervals shorter than 21 days, or oligomenorrhea when it exceeds 35 days (Supatmi et al., 2018). When an adolescent experiences an abnormal menstrual cycle of less than 21 days, the increased frequency of menstruation leads to more frequent blood loss. Consequently, this heightened blood loss can trigger iron deficiency anemia (Nofianti et al., 2021).

According to a report from the Surabaya Health Office (January–June 2023), there were 153,476 residents at risk of health disorders due to being overweight, while in 2022, 259,436 residents were identified as being at risk of obesity. A preliminary study conducted in May 2024 involving 10 female adolescents from the Midwifery Department of Poltekkes Kemenkes Surabaya in the 2023/2024 academic year revealed that eight adolescents experienced menstrual cycle disorders. Among them, three adolescents with a low BMI experienced oligomenorrhea, and two experienced amenorrhea. Within the normal BMI

category, one out of three adolescents reported polymenorrhea. Furthermore, among adolescents with high BMI, two reported menstrual irregularities such as oligomenorrhea and amenorrhea.

Stress serves as a major contributing factor, as it can influence prolactin levels, which subsequently elevate basal cortisol activity and lead to a decrease in luteinizing hormone (LH) levels. Another contributing factor is physical activity, where moderate to high-intensity exercise is often associated with oligomenorrhea due to the suppression of gonadotropin-releasing hormone (GnRH), resulting in reduced follicle-stimulating hormone (FSH) and LH secretion. Additionally, nutritional deficiencies can negatively affect reproductive function, as low body weight or malnutrition can alter hormonal balance, disrupt ovulation cycles, and potentially lead to infertility (Utami et al., 2022). Conversely, overweight or obese women tend to have elevated fat levels, which reduce sex hormone-binding globulin (SHBG), while increasing testosterone and insulin levels, thereby affecting the menstrual cycle (Bae et al., 2018).

Body Mass Index (BMI) serves as a metric to estimate the proportion of body fat in humans, calculated by dividing body weight in kilograms by the square of height in meters (Sutanto, 2019). BMI is used to assess nutritional status and is categorized into three groups: underweight, normal weight, and overweight. Moreover, prolonged irregular menstrual cycles exceeding 35 days among adolescents may disrupt the reproductive system and inhibit ovulation. Persistent irregularities can contribute to fertility problems, potentially impairing an individual's ability to conceive in the future (Tetty Rihardini, 2019). Recognizing the significance of maintaining an ideal BMI, researchers are increasingly motivated to explore the relationship between body weight records and menstrual health, given that physical well-being is a global concern that

profoundly impacts human health, particularly female reproductive well-being.

RESEARCH METHODS

Research Design

This study employed an observational analytic design utilizing a correlational study method with a cross-sectional approach. The sample consisted of 95 female students from the Midwifery Department of Health Polytechnic of Surabaya who met the inclusion criteria: having experienced menstruation for more than two years, willingness to participate in the study, and being adolescent females aged 12–24 years. The exclusion criteria included the use of hormonal medications, the presence of reproductive disorders, and smoking habits. Sampling was conducted using a simple random sampling technique, and the data collection was carried out from August to September 2024.

Instruments and Equipment

The research instruments included a calibrated weighing scale, a calibrated height measuring device, an anthropometric data form, and a validated and reliable menstrual cycle questionnaire.

Data Collection Methods and Research Procedure

Data collection was conducted through questionnaires, beginning with the measurement of participants' anthropometric data to determine Body Mass Index (BMI), which was then classified into underweight, normal, and overweight categories. Participants subsequently completed a questionnaire containing information regarding respondent characteristics, inclusion criteria, and menstrual cycle patterns. A normal menstrual cycle was defined as occurring every 21–35 days with a menstrual duration of 3–7 days, whereas a cycle of <21 days or >35 days, or a

menstrual duration of <3 days or >7 days, was categorized as abnormal.

Data Analysis

Data analysis consisted of descriptive analysis presented in frequency distribution tables and bivariate analysis using the chi-square test with a significance level of $p < 0.05$. The statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) software.

Research Ethics:

This study has been conducted in accordance with ethical principles for research involving human subjects and has obtained approval from the relevant research ethics committee.

RESULT AND DISCUSSION

Based on the results of the research data collected regarding Body Mass Index (BMI), the findings are presented in the table below.

Table 1.

Distribution of Respondents Based on Body Mass Index (BMI)

Body Mass Index (BMI)	Frequency (n)	Percentage (%)
Underweigh	9	10
Normal	60	63
Overweight	26	27
Total	95	100.0

Menstrual Cycle	Frequency (n)	Percentage (%)
Normal	57	60
Abnormal	38	40
Total	95	100.0

The distribution of respondents based on BMI shows that the majority of female adolescents (63%) had a normal BMI. The distribution of respondents based on BMI shows that the majority of female adolescents (63%) had a normal BMI.

Table 2.

Distribution of Respondents Based on Menstrual Cycle

Menstrual Cycle	Frequency (n)	Percentage (%)
Normal	57	60
Abnormal	38	40
Total	95	100.0

The distribution of respondents based on menstrual cycles indicates that most adolescent girls (60%) had normal menstrual cycles. The analysis of the relationship between body mass index and menstrual cycle among female adolescents in the Midwifery Department of Poltekkes Surabaya is presented in the table below.

Table 3.

Analysis of the Relationship Between Body Mass Index and Menstrual Cycle Among Female Adolescents

BMI Category	Menstrual Cycle				Total		p-value
	Normal		Abormal		Frequency (n)	Percentage (%)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Underweight	4	67	2	33	6	100	
Normal	48	80	12	20	60	100	0,00
Overweight	5	17	24	83	29	100	0
Total	57	60	38	40	95	100	

The table above shows that female adolescents with an underweight BMI tend to have a higher proportion of abnormal menstrual cycles (67%) compared to those with a normal BMI (28%) or overweight BMI (58%). Statistical analysis using the Chi-square test obtained a *p*-value of 0.000 ($p < 0.05$), indicating a significant relationship between body mass index and menstrual cycle among female adolescents in the Midwifery Department of Health Polytechnic of Surabaya.

Discussion (required)

Based on the results of the Chi-Square analysis conducted to determine the relationship between Body Mass Index (BMI) and menstrual cycle among adolescent girls in the Midwifery Department of Poltekkes Kemenkes Surabaya, it can be concluded that there is a statistically significant association between the two variables.

According to Ayulia (2023), Body Mass Index (BMI) is one of the standard measures used to monitor nutritional status, particularly in relation to underweight and overweight conditions (Ayulia et al., 2023). BMI serves as a predictor of body fat percentage, which influences the production of estrogen. Estrogen synthesis is affected by the amount of body fat, and since estrogen is a dominant hormone regulating the menstrual cycle, imbalances in fat levels may lead to menstrual irregularities.

A previous study examining the relationship between mental health and menstrual irregularities among adolescents found that psychological distress, high stress levels, depressive mood, and the need for psychological counseling were associated with an increased risk of menstrual irregularities. Other studies have shown that nutritional status and stress levels are the two most influential factors affecting menstrual cycle regularity, together explaining up to 40.2% of menstrual irregularities.

In the present study, adolescent girls with underweight BMI who experienced abnormal menstrual cycles accounted for one respondent. This finding indicates that menstrual irregularities are not solely determined by BMI, but may also be influenced by other factors such as physical activity. Physical activity represents body movement caused by muscle contractions that expend energy. BMI is inversely related to physical activity increased physical activity tends to normalize BMI, whereas reduced activity contributes to a higher BMI (Yolandiani et al., 2021).

Among respondents with normal BMI, 14 adolescent girls experienced abnormal menstrual cycles. This suggests that menstrual cycles are influenced not only by BMI but also by hormonal regulation and possible reproductive organ abnormalities (Wasiah & Darwati, 2023). In contrast, 48 respondents with normal BMI exhibited regular menstrual cycles, indicating that maintaining normal body weight may help prevent menstrual disorders. Adequate and balanced nutritional intake supports hormonal stability, enabling the hypothalamus to regulate reproductive hormones effectively, which in turn ensures regular menstruation (Wijaya et al., 2021).

Menstrual cycles are influenced by various factors, including nutritional status, physical activity, hormonal contraceptive use, stress, and BMI, which reflects the ratio of body weight (kg) to height (m²). Women with underweight or overweight BMI are at higher risk of experiencing menstrual disorders such as amenorrhea, polymenorrhea, dysmenorrhea, or oligomenorrhea. BMI affects the menstrual cycle through the role of estrogen, which is produced by the ovaries, placenta, adrenal glands, and adipose tissue. Abnormal BMI, whether low or high, alters fat mass and consequently affects estrogen production. Increased adipose tissue elevates blood estrogen levels, which may cause negative

feedback on gonadotropin-releasing hormone (GnRH) secretion. This disrupts the normal hypothalamic-pituitary-ovarian axis and may lead to ovulatory dysfunction (Septiani et al., 2023).

Body fat plays a central role in reproductive hormone secretion. Low body fat leads to decreased estrogen levels, which are linked to infertility, while excessive fat elevates estrogen levels and lengthens the menstrual cycle. Both undernutrition and overnutrition can interfere with hypothalamic function, reducing the stimulation of the anterior pituitary to produce follicle-stimulating hormone (FSH) and luteinizing hormone (LH) (Andini, 2022). Factors influencing body mass index (BMI) are fundamentally determined by both internal and external determinants. Internal factors include genetics, dietary intake, and infectious diseases, while external factors encompass agricultural conditions, economic status, sociocultural influences, and nutritional knowledge. In addition to these, various other aspects also contribute to the overall nutritional status of individuals. Technological factors have likewise become an increasingly important determinant, as advancements in technology may influence adolescents' lifestyle patterns, physical activity levels, and food consumption behaviors, thereby affecting their nutritional status and body mass index (Ayulia et al., 2023).

The present study also found that 24 respondents with overweight BMI experienced abnormal menstrual cycles. This supports the notion that excess adipose tissue increases estrogen levels, which can prolong menstrual cycles. In women with higher body fat percentages (obesity), increased androstenedione production occurs an androgen precursor for estrogen synthesis. Through aromatization in granulosa cells and adipose tissue, elevated androgen conversion leads to excessive estrogen, disrupting hormonal balance and causing menstrual irregularities.

From a theoretical perspective, the findings of this study reinforce the established theory that BMI balance is closely related to hormonal function and menstrual regularity. Imbalances in BMI—either underweight or overweight—may disrupt the secretion of gonadotropin-releasing hormone (GnRH), luteinizing hormone (LH), and follicle-stimulating hormone (FSH), which are essential for ovulation and menstruation. This contributes to the growing body of knowledge in midwifery and adolescent reproductive health, particularly in the context of hormonal regulation influenced by nutritional status.

From a practical standpoint, this study emphasizes the importance of maintaining an ideal BMI as part of promotive and preventive efforts in adolescent reproductive health. Midwives, school health professionals, and nutrition educators can use these findings as a foundation for counseling adolescents on balanced nutrition, appropriate physical activity, and stress management to maintain normal menstrual cycles. The study's findings have implications for public health practice and policy interventions. They may serve as a basis for developing adolescent nutrition education programs in schools or communities, emphasizing the interconnection between nutritional status, ideal body weight, and reproductive health.

Furthermore, the results can inform evidence-based strategies in anemia prevention and menstrual health programs integrated into adolescent health services at primary health centers. From a policy perspective, these findings can support the development of adolescent reproductive health policies that integrate nutritional monitoring, such as regular BMI assessments and reproductive health education in school curricula. Programs such as "Healthy and Productive Adolescents" could adopt these findings to strengthen interventions aimed at reducing

menstrual disorders caused by nutritional imbalance

This study acknowledges certain limitations. The cross-sectional design only captures associations at a single point in time, making it impossible to infer causality between BMI and menstrual cycle irregularities. Future research is recommended to employ longitudinal or cohort designs to track BMI and menstrual cycle changes over time. Additionally, the study was conducted at a single educational institution, which may limit the generalizability of the findings. Expanding research to include multiple schools or regions could improve external validity and broaden the applicability of the results.

CONCLUSION

Based on the results and discussion of the study entitled “The Relationship Between Body Mass Index (BMI) and Menstrual Cycle Among Female Adolescents” in the Midwifery Department of Health Polytechnic of Surabaya, the findings are as follows:

1. The majority of female adolescents in the Midwifery Department of Health Polytechnic of Surabaya were found to have a normal body mass index (BMI).
2. Most respondents also experienced a normal menstrual cycle.
3. There was a significant relationship between body mass index (BMI) and menstrual cycle among female adolescents in the study. It can be concluded that the better the BMI status of an individual, the more regularly and healthy her menstrual cycle tends to be. Conversely, higher BMI values are associated with an increased risk of menstrual irregularities.

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INFORMED STATEMENT

Informed consent was obtained from all participants prior to their inclusion in the study. Participants were informed about the purpose, procedures, potential risks, and benefits of the study, and they voluntarily agreed to participate.

CONFLICTS OF INTEREST

All authors have reviewed and approved the final version of the manuscript and declare that there are financial or personal relationships that could inappropriately influence the work reported in this paper.

REFERENCES

- Andini, H. Y. (2022). Hubungan Indeks Massa Tubuh (IMT) Dengan Siklus Menstruasi Pada Mahasiswa Tingkat I D III Kebidanan Poltekes TNI AU Ciembuleuit Bandung. *Jurnal Ilmiah JKA (Jurnal Kesehatan Aeromedika)*, 8(2), 21–26.
<https://doi.org/10.58550/jka.v8i2.149>
- Ayulia, S., Siagian, B., Irwandi, S., Fakultas, M., Universitas, K., Sumatera, I., Fakultas, D., Universitas, K., Sumatera, I., Artikel, H., Kunci, K., Tubuh, I. M., Ayulia, S., & Siagian, B. (2023). *KEDOKTERAN FK UISU THE RELATIONSHIP OF BODY MASS INDEX TO MENSTRUAL CYCLE UISU MEDICAL PENDAHULUAN Menstruasi merupakan proses perdarahan normal yang terjadi akibat proses peluruhan dinding rahim saat tidak terjadinya proses pembuahan . Adanya produksi ho. VI(i)*.
- Bae, J., Park, S., & Kwon, J. W. (2018). Factors associated with menstrual cycle irregularity and menopause. *BMC Women's Health*, 18(1), 1–11.
<https://doi.org/10.1186/s12905->

- 018-0528-x
Nofianti, I. G. A. T. P., Juliasih, N. K., & Wahyudi, I. W. G. (2021). Hubungan Siklus Menstruasi Dengan Kejadian Anemia Remaja Putri Di Smp Negeri 2 Kerambitan Kabupaten Tabanan. *Jurnal Widya Biologi*, 12(01), 58–66. <https://doi.org/10.32795/widyabiologi.v12i01.1324>
- Purnasari, G., & Illiyya, L. (2023). Hubungan antara Status Gizi, Asupan Protein dan Zat Besi Terhadap Siklus Menstruasi Remaja Putri di SMAN 1 Jatiroto. *Muhammadiyah Journal of Nutrition and Food Science (MJNF)*, 4(1), 56. <https://doi.org/10.24853/mjnf.4.1.56-64>
- Septiani, D., Wirniaty, D., Nur, F., Siregar, M., Kedokteran, F., Muhammadiyah, U., & Utara, S. (2023). *Hubungan Indeks Massa Tubuh Dengan Siklus Menstruasi Mahasiswi Angkatan 2019 Fakultas Kedokteran Universitas Muhammadiyah Sumatra Utara*. 1(4).
- Supatmi, Yusliana, A., W, Y., & LY, F. (2018). Dosen Fakultas Ilmu Kesehatan Universitas Muhammadiyah Surabaya Mahasiswa Fakultas Ilmu Kesehatan Universitas Muhammadiyah Surabaya. *Jurnal Kebidanan*, 1(1), 14–20.
- Sutanto, L. B. (2019). PENGUKURAN STATUS GIZI BAGI PEMULA. In *Ukrida Press*.
- Tetty Rihardini. (2019). MENGENALI KETERATURAN SIKLUS MENSTRUASI UNTUK MENDETEKSI GANGGUAN KESEHATAN REPRODUKSI PADA REMAJA DI
KELURAHAN GUNUNG
ANYAR TAMBAK
SURABAYA. *SNHRP-II : Seminar Nasional Hasil Riset Dan Pengabdian*, 2, 266–274.
- Utami, R. W., Sumaningsih, R., Sunarto, & Nugroho, H. S. W. (2022). Indeks Massa Tubuh dan Siklus Menstruasi. *Jurnal Elektronik*, 12(1), 301–306.
- Wasiah, A., & Darwati, L. (2023). Prevalensi Kejadian Gangguan Menstruasi Berdasarkan Indeks Masa Tubuh (IMT) Pada Siswi Kelas VII Mts Hasyim Asy'ari Kedungmegarih, Kec. Kembangbahu, Lamongan. *Jurnal Keperawatan Muhammadiyah*, 8(1). <https://doi.org/10.30651/jkm.v8i1.15423>
- Wijaya, O. G. M., Meiliana, M., & Lestari, Y. N. (2021). Pentingnya Pengetahuan Gizi Untuk Asupan Makan Yang Optimal Pada Atlet Sepak Bola. *Nutrizione: Nutrition Research And Development Journal*, 1(2), 22–33. <https://doi.org/10.15294/nutrizione.v1i2.51832>
- Yolandiani, R. P., Fajria, L., & Putri, Z. M. (2021). Faktor-faktor yang mempengaruhi ketidakteraturan Siklus menstruasi pada remaja Literatur Review. *E-Skripsi Universitas Andalas*, 68, 1–11.