Majalah Ilmiah Fisioterapi Indonesia
Indonesian Scientific Journal of Physiotherapy

Original Research Articles
ISSN (Print): 2303-1921
ISSN (Online): 2722-0443
Volume 13, Number 01, Pages 137–142 (2025)
DOI: https://doi.org/10.248437mifi.000632

Association Between Body Mass Index and Menstrual Pain: A Cross-Sectional Study Among Female Students

Ketut Teni Arya Putri[1*], Anak Agung Gede Angga Puspa Negara[2], Ni Komang Ayu Juni Antari[3], Ni Wayan Tianing[4]

[1]Undergraduate and Professional Program in Physiotherapy, Faculty of Medicine, Udayana University, Denpasar, Bali
[2,3,4]Department of Physiotherapy, Faculty of Medicine, Udayana University, Denpasar, Bali

*Correspondence author:
E-mail address: ketutteny14@gmail.com

Received 18 November 2024; Revised in revised form 21 December 2024; Accepted 23 December 2024; Published 01 January 2025

Abstract

Introduction: Menstrual pain or dysmenorrhea is a common complaint among female students and may be influenced by various factors, including body mass index (BMI). Understanding this relationship is essential for early management and prevention strategies.
Methods: This analytical observational study with a cross-sectional design involved 60 female students selected through purposive sampling. BMI was calculated based on weight and height measurements, while dysmenorrhea intensity was assessed using the Numeric Rating Scale (NRS).
Results: Spearman's rho correlation analysis showed a significant positive relationship between BMI and menstrual pain intensity ($p = 0.003$, $r = 0.377$), indicating that higher BMI is associated with greater pain levels.
Conclusion: There is a significant, albeit low, positive correlation between BMI and dysmenorrhea intensity in female university students. These findings suggest the importance of maintaining a healthy BMI to potentially reduce menstrual pain severity.

Keywords: body mass index, dysmenorrhea, female students, menstrual pain, cross-sectional study

Introduction

University students are individuals actively engaged in higher education, either at public or private institutions. Typically ranging in age from 18 to 24 years, they are in a transitional phase between adolescence and adulthood, characterized by various psychological, biological, and social changes.[1] For female students, one of the key biological developments during this stage is menstruation. Menstruation is the periodic and cyclic shedding of the endometrial lining, involving the discharge of blood, cellular debris, and mucus, which generally occurs 14 days after ovulation.[2]

Menstruation occurs when fertilization does not take place, leading to the breakdown and shedding of the endometrial lining. Normally, menstruation happens every 28 to 35 days and lasts about 3 to 7 days. The interval between the first day of menstruation and the start of the next cycle is referred to as the menstrual cycle. A cycle is considered abnormal if it occurs in less than 21 days or exceeds 41 days.[3]

Menstruation is often accompanied by symptoms such as anxiety, mood changes, headaches, and pain in the lower abdomen and back. Menstrual pain, also known as dysmenorrhea, is one of the most commonly reported conditions among female university students in Indonesia. Dysmenorrhea results from intense uterine muscle contractions that cause tension, cramps, and subsequent pain.[3,4] The International Association for the Study of Pain (IASP) defines pain as a sensory and emotional experience associated with actual or potential tissue damage.[5] Globally, the prevalence of dysmenorrhea is estimated to be around 50%, making it a significant reproductive health issue among women. A study by Oktafiani found that approximately 64.25% of Indonesian adolescents experience dysmenorrhea of varying intensities, with 54.89% classified as primary dysmenorrhea and 9.36% as secondary dysmenorrhea.[6]

According to the Multidimensional Scoring System of Andersch and Milsom, dysmenorrhea intensity can be categorized as mild, moderate, or severe. Mild pain does not interfere with daily activities, moderate pain can disrupt daily functioning, and severe pain can result in substantial limitations to daily activities.[7] The severity of dysmenorrhea differs among individuals and can be influenced by several risk factors, including early menarche (before age 11), smoking, alcohol consumption, lack of physical activity, family history, irregular menstrual cycles, body mass index (BMI), and stress.[8]

Nutritional status is considered one of the risk factors associated with dysmenorrhea. Both undernutrition and overnutrition can disrupt hormonal balance and menstrual function.[9] Nutritional status can be assessed using BMI, a simple metric calculated by dividing weight in kilograms by height in meters squared (kg/m^2).[10] Based on Asia-Pacific guidelines, BMI is classified as underweight, normal, or overweight. A BMI below normal reflects low body fat and caloric intake, potentially impairing the pulsatile secretion of pituitary gonadotropins necessary for reproductive hormone

production, thereby increasing the risk of dysmenorrhea. Conversely, an above-normal BMI is associated with elevated prostaglandin levels, which can trigger intense uterine muscle contractions and pain.[11]

Given these findings, the nutritional status of adolescents warrants serious attention, as it plays a role in hormonal regulation linked to menstruation.[12] Although some studies support the association between BMI and dysmenorrhea, others have found no significant relationship.[13] Therefore, further investigation is warranted to explore this correlation, especially among female university students. This study aims to provide evidence on the association between BMI and menstrual pain intensity, contributing to preventive strategies and serving as a reference for health professionals.

Methods

This study employed an analytical observational design with a cross-sectional approach. The research was conducted at the Faculty of Medicine, Udayana University (FK Unud), during the period of September to October 2022. Participants were selected using a purposive sampling technique based on predefined inclusion and exclusion criteria.

The inclusion criteria were as follows: female students aged 18–24 years; actively enrolled at FK Unud; a history of dysmenorrhea; classified as having low to moderate levels of physical activity; and willingness to participate by signing an informed consent form. The exclusion criteria included female students with a history of serious illness or diagnosed reproductive organ infections, and those currently using analgesic medications.

A total of 60 respondents met the eligibility criteria and were included in the study. The independent variable was body mass index (BMI), and the dependent variable was the intensity of dysmenorrhea. Physical activity and age were controlled as confounding variables. Physical activity levels were assessed using the International Physical Activity Questionnaire (IPAQ) to determine the physical activity category during the sample selection phase. The IPAQ consists of seven items assessing the respondents' physical activity over the past seven days. This questionnaire has a validity of 0.30 and a reliability of 0.80, and is internationally recognized for assessing physical activity among adults aged 15–49 years.[14] Only respondents categorized as having low to moderate physical activity levels were included in the study.

BMI was calculated using measurements of height and weight, recorded using a stadiometer and a digital weighing scale, respectively. BMI was determined using the standard formula: weight (kg) divided by height squared (m^2).[15] The intensity of dysmenorrhea was measured using the Numerical Rating Scale (NRS)**.** NRS is a pain assessment tool that quantifies pain intensity on a scale of 0 to 10. Dysmenorrhea was classified into four categories based on NRS scores: no pain (score 0), mild pain (scores 1–3), moderate pain (scores 4–6), and severe pain (scores >7). The NRS has been validated for clinical use and is considered reliable and sensitive, with a sensitivity of 93%, specificity of 31.7%, and overall accuracy of 50%.[16]

To minimize potential bias, several variables such as age and physical activity level were controlled. The inclusion of the IPAQ ensured that BMI measurements were not confounded by increased muscle mass due to high physical activity levels (e.g., athletes). Therefore, only respondents with low to moderate physical activity were included. Statistical analysis included both univariate and bivariate analyses. Univariate analysis was used to describe the distribution of age, BMI, and dysmenorrhea intensity. Bivariate analysis was conducted using Spearman's rho correlation test to examine the relationship between BMI and dysmenorrhea intensity. This study received ethical approval from the Ethics Committee of the Faculty of Medicine, Udayana University / Sanglah General Hospital Denpasar under ethical clearance number 2425/UN14.2.2.VII.14/LT/2022.

Results

The characteristics of the study participants, including age, physical activity level, body mass index (BMI), and menstrual pain intensity, are presented in Table 1. These descriptive data provide an overview of the distribution of the variables within the study sample.

Table 1. Characteristics of Study Subjects

Characteristics	Frequency (n)	Percentage (%)
Age		
18	14	23.3
19	3	5.0
20	22	36.7
21	15	25.0
22	6	10.0
Physical Activity		
Low	44	73.3
Moderate	16	26.7
Body Mass Index		
Underweight	21	35.0
Normal weight	7	11.7
Overweight	17	28.3
Obesity Class I	12	20.0
Obesity Class II	3	5.0
Menstrual Pain Intensity		
Mild	6	10.0

Continuation of Table 1. Characteristics of Study Subjects

Characteristics	Frequency (n)	Percentage (%)
Moderate	10	16.7
Severe	44	73.3

As shown in Table 1, the majority of participants were 20 years old (n = 22; 36.7%), while the smallest proportion were 19 years old (n = 3; 5.0%). In terms of physical activity, most participants had low physical activity levels (n = 44; 73.3%), while 16 participants (26.7%) were categorized as having moderate physical activity. Regarding body mass index (BMI), the majority were underweight (n = 21; 35.0%), followed by overweight (n = 17; 28.3%), obesity class I (n = 12; 20.0%), normal weight (n = 7; 11.7%), and obesity class II (n = 3; 5.0%). For menstrual pain intensity, the majority of participants reported severe pain (n = 44; 73.3%), followed by moderate pain (n = 10; 16.7%) and mild pain (n = 6; 10.0%). The results of the Spearman's rho correlation analysis, which examines the relationship between BMI and menstrual pain intensity, can be seen in Table 2.

Table 2. Spearman's Rho Correlation Between Body Mass Index (BMI) and Menstrual Pain Intensity (Dysmenorrhea)

Variable Correlation	Correlation Coefficient (r)	*p*-value
Body Mass Index (BMI)	0.377	0.003
Menstrual Pain Intensity		

The results of the Spearman's rho correlation test in Table 2 show a *p*-value of 0.003 ($p < 0.05$), indicating a statistically significant correlation between BMI and menstrual pain intensity among the study subjects. Furthermore, the correlation coefficient (r = 0.377) indicates a positive and direct relationship of low strength, as it falls within the range of 0.20–0.399. This may be attributed to the lack of specific analysis by BMI category, which could result in uneven data distribution.

Discussion

Participant Characteristics

This study was conducted between September and October 2022 by recruiting female medical students from Udayana University (FK UNUD) who met the inclusion and exclusion criteria. Data collection took place on the 3rd floor of the Physiotherapy Building, FK UNUD. In 2022, the total population of female medical students at FK UNUD was 1,965. From this population, 109 students met the inclusion and exclusion criteria, but only 60 were selected as study participants using purposive sampling, which involves selecting individuals based on specific considerations aligned with the inclusion and exclusion criteria.

As shown in Table 1, the participants' ages ranged from 18 to 22 years, with a mean age of 19.93 years and a standard deviation of 1.287. The average physical activity score among participants was 458.76 with a standard deviation of 508.888. To ensure the accuracy of age-related data, participants were required to upload their birth certificates when completing the sample selection questionnaire. Menstrual pain (dysmenorrhea) is influenced by age, as reported by Handayani et al., who found that as women age, the frequency of menstruation increases, leading to cervical dilation, which in turn reduces the frequency of dysmenorrhea in older women. Conversely, those who experience menarche at an earlier age may suffer from menstrual pain due to the reproductive system not being fully functional. In addition to age, physical activity is also known to affect the occurrence of menstrual pain.[17]

Table 2 indicates that the majority of participants had low levels of physical activity, which may be attributed to a demanding academic schedule that acts as a stressor. Age was not found to influence physical activity levels, as individual habits vary and are more likely to impact physical activity. Similarly, gender does not significantly affect physical activity, which may be explained by the relatively homogenous academic lifestyle shared among university students. Furthermore, participation in student organizations may reduce time available for physical activity due to increasingly tight academic schedules.[18] Regular physical activity provides numerous health benefits. A lack of physical activity may increase the severity of dysmenorrhea, and conversely, higher levels of activity may alleviate it.[19]

Table 3 shows that most participants had an abnormal body mass index (BMI)—classified as underweight, overweight, or obese (type 1 & 2)—with 53 students (88.3%) falling into these categories. Only 7 participants (11.7%) had a normal BMI. These findings may be related to time constraints due to academic responsibilities and involvement in university organizations, which limit opportunities for physical activity and may lead to weight fluctuations resulting from stress during academic activities.[20] Widianingsih et al. similarly found that the majority of respondents in their study had abnormal weight, with 64.4% categorized as such.[21] This result is consistent with the findings of Oktorika et al., who also reported a higher prevalence of abnormal weight among participants than normal weight.[22]

Table 4 reveals that the majority of participants experienced severe menstrual pain, with 44 students (73.3%) reporting high-intensity dysmenorrhea. Ten students (16.7%) reported moderate intensity, and six students (10.0%) reported mild pain. This condition may be associated with the high proportion of abnormal BMI and elevated stress levels among FK UNUD students, both of which are contributing factors to the severity of menstrual pain. Low physical activity levels may also contribute to higher pain intensity. According to a 2022 study by Sari, all participants experienced dysmenorrhea with varying intensity—12 respondents (48%) reported moderate pain, 9 respondents (36%) reported mild pain, and 4 respondents (16%) experienced severe pain.[23]

Association Between Body Mass Index (BMI) and Menstrual Pain (Dysmenorrhea) Among Female Medical Students at Udayana University

Based on the Spearman's rho correlation test (Table 5), a significant association was found between BMI and menstrual pain intensity among FK UNUD female medical students, with a p-value of 0.003 ($p < 0.05$) and a correlation coefficient (r) of 0.377. This positive correlation indicates a direct relationship, though the strength is low, as the r-value falls between 0.20 and 0.399.

These results are in line with the study by Oktorika et al., which found that the majority of participants (53.4%) had abnormal BMI, and only 46.6% had normal BMI. Participants with abnormal BMI were more likely to experience dysmenorrhea. Statistical analysis in their study yielded a significant p-value of 0.001 ($p \leq 0.05$), suggesting a strong relationship between BMI and dysmenorrhea. Higher incidence of dysmenorrhea among women with abnormal BMI may be due to hormonal imbalances, specifically elevated levels of prostaglandins, which cause uterine muscle spasms due to their similarity to natural fats in uterine tissue.[22]

Nuraini et al. also found a significant relationship between nutritional status and dysmenorrhea ($p = 0.042$). Their results indicated that moderate-intensity dysmenorrhea was predominantly observed in overweight participants, who were 5.508 times more likely to experience dysmenorrhea than those with normal nutritional status.[24] Being overweight may increase dysmenorrhea risk because excess adipose tissue can cause hyperplasia of blood vessels in female reproductive organs, impeding blood flow during menstruation. Additionally, high levels of fatty acids in the body may inhibit progesterone production during the luteal phase, leading to elevated prostaglandin levels and resulting in uterine muscle spasms.[25]

Harahap et al. also reported a significant correlation between BMI and dysmenorrhea ($p = 0.000$). Women with low BMI tend to have lower body fat, calorie intake, and weight, which may disrupt the pulsatile secretion of gonadotropin from the pituitary gland, essential for reproductive hormone production, leading to dysmenorrhea. Conversely, elevated BMI is associated with increased prostaglandin levels, which in turn cause uterine muscle spasms. Additionally, excess body fat may lead to elevated estrogen levels due to androgen conversion.[26]

Women with low BMI may experience dysmenorrhea due to insufficient caloric intake and low fat mass, which impair gonadotropin secretion. Meanwhile, those with high BMI often show elevated prostaglandin levels and increased estrogen production due to adipose tissue–induced conversion of androgens. Estrogen, which is synthesized in the ovaries, adrenal glands, placenta, and adipose tissue, can increase with body weight. As fat mass increases, so does androgen production, which is converted into estrogen. This elevation stimulates GnRH secretion, subsequently increasing LH and FSH levels, which trigger follicular development and ovulation. Hormonal imbalances during this process can interfere with ovulation, increasing the risk of dysmenorrhea. Low BMI may lead to insufficient estrogen levels due to reduced fat mass, further exacerbating menstrual pain intensity.[27]

This study has several limitations. First, the sample size of only 60 participants may not accurately represent the broader population. Additionally, coordinating participants from the larger population was challenging, resulting in uneven questionnaire distribution during the sample selection phase. The use of a cross-sectional design also limits the ability to assess causality, as exposure and outcomes are measured simultaneously.

To address these limitations, future research should consider increasing the sample size to better represent the broader population, improving coordination for more equitable questionnaire distribution, and adopting a longitudinal study design to allow for deeper exploration of the temporal relationship between variables.

The findings of this study may not be generalizable to female students in other universities or to the general female population. Although a significant association was found between BMI and dysmenorrhea, with a positive direction and low correlation strength, broader generalizations require further studies involving more representative and diverse samples. Such research would provide more accurate insights into the relationship between BMI and dysmenorrhea among female university students and women in general.

Conclusion

There is a significant relationship between body mass index (BMI) and the intensity of menstrual pain (dysmenorrhea) among female students of the Faculty of Medicine at Udayana University. The direction of this relationship is positive, indicating that a higher BMI is associated with increased dysmenorrhea intensity. However, the strength of the correlation falls within the low category. These findings suggest that students with higher BMI tend to experience more intense menstrual pain. This implication underscores the need for more effective prevention and management strategies for dysmenorrhea among female students.

It is important for students, faculty members, and healthcare providers to increase awareness regarding the importance of maintaining a healthy body weight and adopting an active lifestyle to help reduce the risk of experiencing more severe dysmenorrhea. Furthermore, this study highlights the necessity of an interdisciplinary approach—encompassing medicine, nutrition, and reproductive health—to holistically optimize female students' reproductive health.

Author Contribution

Ketut Teni Arya Putri: Conceptualization, methodology, data collection, data analysis, and manuscript drafting.

Anak Agung Gede Angga Puspa Negara: Supervision, guidance on research design, and critical review of the manuscript.

Ni Komang Ayu Juni Antari: Supervision, validation, and manuscript editing.

Ni Wayan Tianing: Supervision, methodological consultation, and final manuscript review.

Acknowledgments

The authors would like to express their gratitude to the Faculty of Medicine, Universitas Udayana, for providing the academic support and facilities necessary for conducting this study.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study.

Funding Sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethics Statement

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was not required as the study involved only non-invasive procedures (blood pressure measurement and questionnaire surveys) and posed minimal risk to participants. Informed consent was obtained from all participants prior to their inclusion in the study, and confidentiality was strictly maintained.

References

1. Hulukati W, Djibran MR. Analisis tugas perkembangan mahasiswa Fakultas Ilmu Pendidikan Universitas Negeri Gorontalo. Bikotetik (Bimbingan dan Konseling Teori dan Praktik). 2018;2(1):73.
2. Pramesti AAIS. Tingkat stres dengan gangguan siklus menstruasi pada remaja putri [repository]. Denpasar: Universitas Udayana; 2014.
3. Setiawati SE. Pengaruh stres terhadap siklus menstruasi pada remaja. J Majority. 2015;4(1):94–8.
4. Sinaga E, Saribanon N, Suprihatin, Sa'adah N, Salamah U, Murti YA, et al. Manajemen kesehatan menstruasi. Jakarta: Global One; 2017.
5. Satya Sai Shita N, Purnawati S. Prevalensi gangguan menstruasi dan faktor-faktor yang mempengaruhi pada siswi peserta ujian nasional di SMA Negeri 1 Melaya Kabupaten Jembrana. E-Jurnal Med Udayana. 2016;5(3):1–9.
6. Oktafiani H, Susiarno H, Murniati V. Spinning exercise intensitas sedang menurunkan gejala dismenore primer mahasiswa DIII kebidanan. J Ilm Ilmu Kesehatan. 2020;8(1):92–103.
7. Tsamara G, Raharjo W, Putri EA. Hubungan gaya hidup dengan kejadian dismenore primer pada mahasiswi Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Tanjungpura. J Natl Ilmu Kesehatan. 2020;2(3):130–40.
8. Irianti B. Faktor-faktor yang mempengaruhi kejadian dismenore pada remaja. Menara Ilmu. 2018;7(10):8–13.
9. Novita R. Hubungan status gizi dengan gangguan menstruasi pada remaja putri di SMA Al-Azhar Surabaya. Amerta Nutr. 2018;2(2):172.
10. Harahap A, Oktaviani J, Kusdiyah E, Indah E, Tan A, Dwi A. Hubungan indeks massa tubuh (IMT) dengan derajat dismenore pada mahasiswi kedokteran Fakultas Kedokteran dan Ilmu Kesehatan Universitas Jambi. e-SEHAD. 2021;1(2):18–24.
11. Utami D, Setyarini GA. Faktor-faktor yang mempengaruhi indeks massa tubuh pada remaja usia 15–18 tahun di SMAN 14 Tangerang. J Ilmu Kedokteran dan Kesehatan. 2017;4(3):207–15.
12. Utari N. Hubungan antara status gizi dengan kejadian dismenore pada mahasiswi yang sedang mengerjakan skripsi di Universitas Muhammadiyah Surakarta [skripsi]. Surakarta: Universitas Muhammadiyah Surakarta; 2016.
13. Widianingsih NK, Rahim AF, Windarti W, Bidan K, Tegal Mukti-Lampung M. Hubungan indeks massa tubuh terhadap kejadian nyeri desminore primer pada remaja perempuan. J Fisioter Rehabil. 2023;7(1):84–91.
14. Dharmansyah D, Budiana D. Indonesian adaptation of the International Physical Activity Questionnaire (IPAQ): psychometric properties. J Pendidikan Keperawatan Indones. 2021;7(2):159–63.
15. Situmorang M. Penentuan indeks massa tubuh (IMT) melalui pengukuran berat dan tinggi badan berbasis mikrokontroler AT89S51 dan PC. J Teor Apl Fis. 2017;3(2):102–10.
16. Merdekawati D, Dasuki, Melany H. Perbandingan validitas skala ukur nyeri VAS dan NRS terhadap penilaian nyeri di IGD RSUD Raden Mattaher Jambi. Riset Informasi Kesehatan. 2018;7(2):114–21.
17. Handayani, Lasma. Faktor-faktor yang berhubungan dengan nyeri menstruasi (dismenorea) pada remaja putri di beberapa SMA di Kabupaten Rokan Hulu. J Maternity Neonatal. 2014;1(4):161–71.
18. Riskawati YK, Prabowo ED, Al-Rasyid H. Physical activity level of the second, third, and fourth years students at Study Program of Medicine. Majalah Kesehatan FK Universitas Brawijaya. 2018;5(1):26–32.
19. Mizam AK. Pengaruh hipnoterapi terhadap penurunan skala nyeri dismenore. Media Husada J Nurs Sci. 2021;1(1):69–72.

20. Hamisah H, Mustari Y, Chaerul PIS. Hubungan indeks massa tubuh dan aktivitas fisik dengan performa akademik mahasiswa selama pandemi COVID-19. J Ilm Kesehatan Sandi Husada. 2022;11:226–32.
21. Widianingsih NK, Rahim AF, Windarti W, Bidan K, Tegal Mukti-Lampung M. Hubungan indeks massa tubuh terhadap kejadian nyeri desminore primer pada remaja perempuan. J Fisioter Rehabil. 2023;7(1):84–91.
22. Oktorika P, Indrawati, Sudiarti PE. Hubungan indeks massa tubuh (IMT) dengan skala nyeri dismenorea pada remaja putri di SMA Negeri 2 Kampar. J Ners Res Learn Nurs Sci. 2020;4(23):122–9.
23. Sari H, Hayati E. Gambaran tingkat nyeri dismenorea pada remaja putri. BEST J Biol Educ Sci Technol. 2020;3(2):226–30.
24. Nuraini S, Sa'diah YS, Fitriany E. Hubungan usia menarche, status gizi, stres dan kadar hemoglobin terhadap kejadian dismenorea primer pada mahasiswi Fakultas Kedokteran, Universitas Mulawarman. J Sains Kesehatan. 2021;3(3):443–50.
25. Hartono B, Leuhery FC. The relationship between body mass index with the incidence of dysmenorrhea in students of Faculty of Medicine. J Kedokteran Meditek. 2020;26(1):17–22.
26. Harahap A, Oktaviani J, Kusdiyah E, Indah E, Tan A, Dwi A. Hubungan indeks massa tubuh (IMT) dengan derajat dismenore pada mahasiswi kedokteran Fakultas Kedokteran dan Ilmu Kesehatan Universitas Jambi. e-SEHAD. 2021;1(2):18–24.
27. Simbolon P, Sukohar A, Ariwibowo C, Susianti. Hubungan indeks massa tubuh dengan lama siklus menstruasi pada mahasiswi angkatan 2016 Fakultas Kedokteran Universitas Lampung. Majority. 2018;7(2):164–70.