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The relationship of routine exercise and body mass index to dysmenorrhea severity among young women

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ABSTRACT

Background: There are several risk factors for dysmenorrhea, including high body mass index (BMI) and lack of exercises. The study's goal was to determine the relationship between routine exercises and body mass index with the levels of primary dysmenorrhea pain in young women.

Methods: This study was conducted among 514 young women in Surakarta used a cross-sectional design. Inclusion criteria were females aged 15–24 years with regular menstruation and no use of medications affecting the menstrual cycle, while exclusion criteria included a history of reproductive organ surgery, ongoing treatments affecting the cycle, or abnormal uterine bleeding. This study used questionnaires developed by the researcher to collect patients' characteristics, pain level, and frequency of exercise data. Data were analyzed using the Chi-Square Test.

Results: The majority of respondents were aged 17–18 years, experienced menarche at 12–14 years, had normal BMI, and reported primary dysmenorrhea with moderate pain intensity. The Chi-square test between routine exercises and degrees of dysmenorrhea showed a value of p-value < 0.001, and between BMI and degrees of dysmenorrhea showed a value of p-value = 0.537, where the results of the Chi-square test was different between them. The routine exercise was related to the levels of primary dysmenorrhea pain, but the BMI was not related to the levels of primary dysmenorrhea pain.

Conclusion: There was a significant relationship between routine exercises with the degrees of primary dysmenorrhea pain, but no significant relationship was found between BMI and degrees of primary dysmenorrhea pain.

Keywords: body mass index, dysmenorrhea, routine exercises, young women.
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INTRODUCTION

Puberty represents a critical stage in human development, marking the transition from childhood to adulthood through the maturation of the reproductive system. This phase is characterized by a range of physiological, psychological, and emotional changes. In females, puberty is indicated by the emergence of primary and secondary sexual characteristics, including breast development, the growth of pubic and axillary hair, and widening of the hips. A key milestone in this process is menarche, the onset of the first menstrual period. Puberty also entails the formation of personal identity and heightened awareness of bodily changes. These developmental changes can influence various aspects of adolescent health, particularly in relation to reproductive function and the occurrence of menstrual-related disorders such as dysmenorrhea.[1,2]

Dysmenorrhea is a disorder that occurs during menstruation in the form of severe pain/cramps in the lower abdomen and is usually accompanied by sweating, tachycardia, headaches, nausea, vomiting, and diarrhea.[3,4] According to studies that various countries have conducted, dysmenorrhea inthe world shows a reasonably high prevalence. The incidence of dysmenorrhea in England is 45-97% in the community and 41-62% in hospitals. In European countries, highest in Finland at 94% in women aged 10-20 years. In the Americas, the prevalence of dysmenorrhea reached 85%, in Italy, it was 84.1%, and in India, 40.7%.[5] For the prevalence of women experiencing dysmenorrhea in Indonesia is 54.89% for primary dysmenorrhea and 9.36% for secondary dysmenorrhea events. In Surakarta, there are 87.7% of young women experience dysmenorrhea.[6]

Dysmenorrhea is divided into two categories, namely primary dysmenorrhea (menstrual pain without being caused by other diseases) and secondary dysmenorrhea (menstrual pain associated with other diseases such as endometriosis, myoma, and endometrial polyps).[7] The incidence of primary dysmenorrhea ranges from 25% for all women to 90% for young women.[8] Adolescent girls often experience primary dysmenorrhea with 60-90%.[9] Primary dysmenorrhea begins when adolescent girls experience menarche and its prevalence will continue to increase at the age of 15-17 years and reach the peak at the age of 20-24 years.[10]

Symptoms caused by dysmenorrhea are a health burden for women, especially young women, because it disrupts daily activities, especially learning in school due to poor concentration and decreased academic ability. Many teenagers who

have the status of respondents cannot attend class. An estimated 140 hours are lost each year due to dysmenorrhea, so causing dysmenorrhea is one of the common problems that occur in the world. Young women commonly experience dysmenorrhea on the first or second day of menstruation.[11]

Various factors that cause dysmenorrhea are young age, low body mass index, smoking, early menstruation, prolonged or deviant menstrual flow, pelvic infections, psychological disorders, genetic influences, and a history of sexual violence.[12] A study conducted in Vietnam showed the age and educational status are related to dysmenorrhea.[13] The study conducted in Iran shows that regular routine exercises can significantly reduce dysmenorrhea.[10] Another study has also shown that risk factors associated with dysmenorrhea are heavy and prolonged menstrual blood, young age, nulliparity (women who have not given birth), smoking, early menarche, and low body mass index (BMI).[14]

BMI is one of the risk factors for dysmenorrhea, the state of body consumption, absorption, and use of food nutrients. Excess BMI obesity in young women is correlated with the excess of adipose tissue, which affects the increased production of estrogen and progesterone. High estrogen degrees in the luteal phase during menstruation affect the increase in prostaglandins that will stimulate uterine contractions that result in an ischemic uterus and cause pain.[15,16] The next cause of dysmenorrhea is less routine exercises. Enough routine exercises is known to stimulate the brain to produce endorphins that can reduce stress, increase the threshold of pain, and raise mood to reduce pain or discomfort when dysmenorrhea.[10]

Research on the factors influencing primary dysmenorrhea is essential due to its high prevalence among adolescent girls and its significant impact on daily functioning and academic performance. While previous studies have examined the association between BMI and physical activity with the severity of dysmenorrhea, the findings remain inconsistent and inconclusive. Moreover, most of the existing literature focuses on populations outside Indonesia, resulting in a lack of context-specific data, particularly in regions such as Surakarta, where the prevalence of dysmenorrhea is notably high. Therefore, this study was necessary to provide understanding of the relationship between BMI, regular physical activity, and the severity of primary dysmenorrhea among Indonesian adolescents, and to inform targeted health interventions in local settings. The purpose of the study was to determine the relationship between BMI, routine exercises, and primary dysmenorrhea degrees in young women at young women.

METHODS

The design of this study is observationally analytical using a cross-sectional design. The study place is Surakarta city, Central Java Province, Indonesia. This study was conducted in February-March 2021. The population in this study is a young woman who has live in Surakarta City, which is as many as 516 subjects. The subject of this study was obtained by non-probability sampling with purposive sampling, taking into account inclusion and exclusion criteria. The inclusion criteria in this study were 15-24 years old, menstruating regularly, after having menstruation, not taking drugs that interfere with the menstrual cycle. The exclusion criteria in this study were having a history of reproductive organ surgery, routine treatment that interferes with the menstrual cycle, and bleeding outside menstruation. The number of study subjects who met the criteria was 404 subjects.

This study has obtained ethical eligibility permission from the medical faculty of the Universiti Kebangsaan Malaysia with registration number of UKM/PPI/111/8/JEP-2020-179 dated 15 June 2020 and from Dr. Moewardi Surakarta Hospital with number 561/II/HPEC/2020 on 10 March 2020. The study used author-developed (WW) questionnaire to determine the characteristics of respondents, dysmenorrhea levels, and pain levels. This questionnaire has been tested to be reliable and valid. The demographic data of age, age of menarche, duration of menstruation (days), BMI, exercise frequency, and the level of pain during menstruation were collected for the analysis.

According to the World Health Organization (WHO), the BMI was categorized as underweight (<18.5 kg/m^2), normal (18.5 – 24.9 kg/m^2), overweight (25.00 - 29.9 kg/m^2), and obese (≥30 kg/m^2).[17] BMI is calculated by dividing weight in kilograms by height in meters squared (kg/m^2). The degrees of dysmenorrhea pain was measured using the Numeric Rating Scale (NRS), which consists of 11 points starting from 0 to 10. A score of 0 indicates no pain, 1–3 indicates mild dysmenorrhea, 4–6 indicates moderate dysmenorrhea, and 7–10 indicates severe dysmenorrhea. The participants were considered to perform a routine exercise by asking whether they carried out exercises at least three times over the past week. Pain measurement was measured by asking the sample to choose a number from 0 to 10 that best suit the dysmenorrhea pain level.

The data was analyzed using IBM SPSS Statistics, USA. This study performed the univariate analysis, consists of age, age of menarche, length of menstruation, type of dysmenorrhea, levels of primary dysmenorrhea, BMI, and frequency of exercise. Bivariate analysis is performed with a chi-square test to determine the relationship between BMI, routine exercises, and levels of primary dysmenorrhea. Test results were interpreted as statistically significant if the p-value < 0.050, indicating a meaningful relationship.

RESULTS

Based on Table 1, the prevalence of dysmenorrhea among respondents in Surakarta was 78.3%. The respondents ages ranged from 15 to 24 years, with the majority aged 17–18 years (31.2%). Most respondents did not engage in regular exercise, with 87.1% reporting no routine physical activity. The age at menarche was within the typical range of 12–14 years for the majority of respondents (70.3%). The duration of menstruation was predominantly within 3–8 days (90.1%). In terms of pain intensity, 143 respondents (35.4%) experienced mild pain, 196 (48.5%) reported moderate pain, and 65 (16.1%) experienced severe pain. Additionally, 257 of respondents reported experiencing anger during menstruation.

Table 1. Characteristics of study subjects (n = 404)

Characteristics	Frequency (%)
Age, years	
15-16	38 (9.4)
17-18	126 (31.2)
19 -20	117 (29)
21-22	80 (19.8)
23-24	43 (10.6)
Age of menarche, years	
9-11	78 (19.4)
12-14	284 (70.3)
15-17	42 (10.4)
Duration of menstruation, days	
< 3	5 (1.2)
3 – 8	364 (90.1)
> 8	35 (8.7)
BMI, kg/m^2	
Underweight (< 18.5)	93 (23)
Normal (18.5 – 24.9)	270 (66.8)
Overweight (25.00–29.9)	33 (8.2)
Obesity (≥ 30)	8 (2)
Exercise routine	
No exercise routine	352 (87.1)
Exercise routine	52 (12.9)
The Pain's level	
10-30	143 (35.4)
40-60	196 (48.5)
70-100	65 (16.1)

BMI, body mass index; kg/m^2, kilogram per square meter

Table 2. The correlation between routine exercises, BMI, and pain intensity

	Pain Intensity			*p*-value
	Mild	Moderate	Severe	
Routine Exercises				
No	112	178	62	<0.001
Yes	31	18	3	
BMI, kg/m^2				
Underweight	31	39	12	0.537
Normal	92	109	38	
Overweight	13	7	7	
Obesity	4	3	1	

BMI, body mass index; kg/m^2, kilogram per square meter

Based on Table 2, the chi-square test results showed that there was no significant relationship between BMI and the levels of primary dysmenorrhea (p = 0.527). In contrast, there was a statistically significant relationship between routine exercise and the levels of primary dysmenorrhea (p < 0.001).

DISCUSSION

There was no significant association between BMI and the levels of primary dysmenorrhea pain, suggesting that nutritional status variations may not directly influence menstrual pain intensity in young women. In contrast, routine exercise showed a strong relationship with the levels of primary dysmenorrhea pain. Engaging in routine exercise enabled young women to experience milder symptoms, likely due to the analgesic effects of endorphins released during physical activity.

The prevalence of normal BMI among the respondents (66.8%) aligns with the findings of prior studies. This healthy weight status was generally attributed to balanced dietary habits, including regular consumption of essential food groups such as grains, vegetables, proteins (e.g., tofu, tempeh, eggs, meat), fruits, and dairy.[18] An analysis of dysmenorrhea severity across BMI categories showed that among participants with severe pain, 2.97% were underweight, 9.4% had a normal BMI, and 2% were overweight or obese. Notably, 26.7% of those experiencing moderate dysmenorrhea also had a normal BMI. Despite these figures indicating a high concentration of dysmenorrhea among adolescents with a normal BMI, the overall statistical analysis did not establish a significant relationship between BMI and the severity of the condition.

The lack of a significant association between BMI and the levels of primary dysmenorrhea pain may be influenced by several dietary factors beyond simple body weight. For instance, excessive sugar intake can impair the absorption of essential vitamins and minerals, which may lead to muscle spasms and increased menstrual pain.[19] Additionally, low fish consumption among participants may have elevated prostaglandin synthesis. This is because omega-3 fatty acids, which are known for their anti-inflammatory properties, help to inhibit this process. Omega-3s compete with omega-6 fatty acids in the phospholipid membrane, resulting in less potent prostaglandins and a reduction in myometrial and vascular contractions during menstruation. Furthermore, both omega-3 and omega-6 fatty acids can inhibit arachidonic acid pathways, which are otherwise stimulated by animal fats to promote uterine contractions.[20]

These findings are supported by previous research, including a study among high school students in Pontianak, which also found no significant association between BMI and the severity of dysmenorrhea.[21] This indicates that dysmenorrhea is not limited to a specific BMI category but is commonly observed among individuals classified as underweight, normal weight, and obese. Although commonly assumed that abnormal BMI increases the risk, dysmenorrhea may occur regardless of body weight. Women with higher BMI may exhibit elevated estrogen levels due

to increased cholesterol, a precursor in estrogen synthesis.[22] Adipose tissue also contributes to hormonal imbalance by producing estrogen independently of the ovaries, potentially enhancing uterine contractility and menstrual pain.[23] Furthermore, excessive nutritional intake can trigger vascular hyperplasia, in which fat compresses reproductive blood vessels, reducing blood flow and exacerbating pain.

Conversely, underweight individuals may experience more severe dysmenorrhea due to poor nutritional intake, particularly iron deficiency. Inadequate iron levels may lead to anemia, which diminishes physical resilience and increases sensitivity to pain.[24,25] Both undernutrition and overnutrition can deplete nutrient reserves, impair immune function, and lower pain tolerance.[18] Additionally, the lack of correlation observed in this study could be attributed to unmeasured variables such as genetic predisposition, premenstrual syndrome (PMS), and psychological stress.

In addition, 87.1% of respondents reported not engaging in routine exercise. Most of these respondents experienced primary dysmenorrhea. Chi-square analysis demonstrated a significant association between routine exercise with the levels of primary dysmenorrhea pain. In line with these findings, prior research demonstrated significant associations between nutritional status, junk food consumption, and exercise habits with the incidence of primary dysmenorrhea among adolescent girls in Jakarta.[26]

According to previous study, there is a significant association between routine exercise and the severity of primary dysmenorrhea, particularly when exercise is defined as a structured physical activity with specific goals and intensity.[27] Physical activity stimulates the release of endorphins endogenous opioid peptides such as beta-endorphins, enkephalins, and dynorphins that bind to opioid receptors in the spinal cord and brain, thereby modulating pain perception and producing analgesic effects. Regular physical activity improves oxygen delivery to vasoconstricted blood vessels, potentially alleviating dysmenorrhea-related pain. Routine exercise may also reduce inflammation and enhance endorphin production, both of which contribute to pain relief.[28]

Furthermore, the physiological mechanisms underlying the association between physical activity and primary dysmenorrhea are multifactorial. Regular exercise plays a pivotal role in regulating the hypothalamic pituitary gonadal (HPG) axis, which is essential for maintaining hormonal balance and menstrual cycle regularity. Dysregulation of this axis has been implicated in increased menstrual pain and cycle disturbances.[29,30] Moreover, physical activity exerts anti-inflammatory effects by reducing the production of prostaglandins pro-inflammatory mediators responsible for uterine contractions and menstrual pain. Elevated prostaglandin levels are commonly observed in individuals with primary dysmenorrhea. By decreasing prostaglandin synthesis and enhancing systemic circulation, regular exercise contributes to both pain relief and improved menstrual health, further reinforcing its role as a protective factor against dysmenorrhea severity.[31,32]

This study has several limitations. This study has several limitations. The cross-sectional design limits the ability to establish causal relationships; however, appropriate statistical analyses such as the Chi-square test were used to examine associations between variables. The use of self-administered questionnaires may introduce subjective bias, but the instruments had been tested for validity and reliability. Additionally, although objective tools for measuring physical activity were not used, the researchers addressed this by clearly defining routine exercise and collecting detailed self-reported data on exercise frequency to enhance the accuracy of the information obtained.

CONCLUSION

This study demonstrated a significant association between routine exercise and the levels of primary dysmenorrhea pain in young women. In contrast, body mass index was not significantly associated with the levels of primary dysmenorrhea pain. Given the high prevalence of primary dysmenorrhea and its impact on daily activities, these findings emphasize the importance of promoting regular physical activity as part of menstrual health interventions.

Future research is encouraged to adopt longitudinal or interventional study designs to better determine causality. It is also recommended that future studies include objective instruments for measuring physical activity, such as wearable activity trackers, and use validated clinical tools for assessing pain. Furthermore, investigating the influence of hormonal fluctuations, psychological conditions, and lifestyle factors may provide a more comprehensive understanding of primary dysmenorrhea among adolescent females.

CONFLICT OF INTEREST

None declared.

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The study received no funding.

AUTHOR CONTRIBUTIONS

WW, designed the study, collected and processed the data, and drafted the initial manuscript; NAMN assisted with data collection and analysis; MM participated in manuscript revisions.

ETHICAL CONSIDERATION

This study was conducted after obtained ethical eligibility permission from the medical faculty of the Universiti Kebangsaan Malaysia with registration number of UKM/PPI/111/8/JEP-2020-179 dated 15 June 2020 and from Dr. Moewardi Surakarta Hospital with number 561/II/HPEC/2020 on 10 March 2020.

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