



The relationship between physical activity level on the severity of dysmenorrhea

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Abstract: Dysmenorrhea is a disorder in which women experience pain or cramping in the abdominal region throughout the menstrual cycle. It has been noted that physical activity and psychological variables can exacerbate dysmenorrhea. The purpose of this study was to examine the association between physical activity level and the severity of dysmenorrhea in late adolescence. This cross-sectional study involved 126 late female adolescents aged 17 to 25 years experiencing dysmenorrhea. The independent variable was physical activity, which was measured using the International Physical Activity Questionnaires (IPAQ), categorized into high and low physical activity levels. The dependent variable was dysmenorrhea, measured using the working ability, location, intensity, days of pain, and dysmenorrhea (WaLIDD), which was categorized into severe and mild dysmenorrhea. The association between physical activity and dysmenorrhea was analysed using simple binary logistic regression analysis. The findings indicated that mild dysmenorrhea was 93.65% and severe dysmenorrhea was 6.35%. Adolescents who engage in high physical activity were more likely to experience severe dysmenorrhea than adolescents who engage in light physical activity (OR= 5.11; p= 0.032; 95% CI= 1,15 to 22,72). The probability of adolescents who participated in high physical activity in experiencing severe dysmenorrhea was 14.70%. It can be concluded that high physical activity level is correlated to higher risk of experiencing severe dysmenorrhea.

Keywords: physical activity, exercise, stress, dysmenorrhea, determinant of dysmenorrhea.

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INTRODUCTION

Young women's quality of life is negatively impacted by dysmenorrhea, a symptom that is frequently misdiagnosed. One of the most prevalent gynecological conditions, primary dysmenorrhea, is defined as lower abdominal cramps or pain during menstruation that does not result from pelvic pathology (Hernanto et al., 2022). Every month during menstruation, primary dysmenorrhea occurs and is not an underlying condition. During ovulation, this issue frequently arises in the first and second year following the start of menstruation (Maity et al., 2022).

Menstrual cramps that start in the uterus are called dysmenorrhea, and they are one of the most prevalent gynecological illnesses affecting women who are fertile. Because most women do not seek medical attention, this illness is typically underdiagnosed (Martire et al., 2023). Pain associated with dysmenorrhea typically lasts up to 72 hours and is most acute on the first day of menstruation. This pattern is cyclical and distinct. It is categorized as either primary or secondary dysmenorrhea based on its etiology (Itani et al., 2022).

One of the most prevalent complaints among young and adult women is primary dysmenorrhea, which is described as spasmodic and cramping discomfort in the lower abdomen that starts just before or at the commencement of menstruation in the absence of pelvic disease. It usually manifests six to twenty-four months following menarche, throughout adolescence (Wang et al., 2023). Early menarche age, excessive menstrual flow, nulliparity, a family history of dysmenorrhea, and stress are risk factors for primary dysmenorrhea. With age, parity, and oral contraceptive use, primary dysmenorrhea improves. The evidence supporting the link between primary dysmenorrhea and modifiable factors such as food, weight, smoking, depression, and abuse is erratic and contradictory (Kulkarni & Deb, 2019).



Primary dysmenorrhea has been linked to elevated levels of leukotrienes, elevated amounts of prostaglandins and vasopressin, and psychosocial variables. According to Macedo et al. (2023), prostaglandins increase uterine tone and contractions, which results in pain. Dysmenorrhea has a detrimental effect on missing work and school, and studies on this issue in teenagers and young people have found that this is the case. At least one in three young women must miss work on menstruation days because of severe pain or report being unable to do everyday tasks (McKenna & Fogleman, 2021).

The suprapubic region is where dysmenorrhea pain most frequently originates, and it can radiate to both thighs and/or the lumbosacral region. Sometimes this illness is accompanied with headache, diarrhoea, nausea, and vomiting symptoms. Starting during menarche, pelvic pain is thought to have a role in obstructive abnormalities of the genital tract. Vasopressin or antidiuretic hormone plasma concentrations are higher in patients with primary dysmenorrhea (Macedo et al., 2023).

Primary dysmenorrhea risk rises with vasopressin and estradiol but falls with oxytocin and PGF2 α levels. There is a correlation between a higher frequency of dysmenorrhea and higher estradiol levels in primary dysmenorrhea. Likewise, increased discomfort is linked to elevated estradiol levels in cases of primary dysmenorrhea. High hormone levels are statistically significant for this disorder. Primary dysmenorrhea is more likely to occur in women with higher serum concentrations of vasopressin and estradiol and lower levels of oxytocin and PGF2 α . When it comes to the frequency and intensity of pain, estrogen exhibits an inverse U-shaped association in patients with primary dysmenorrhea (Jiang et al., 2023).

The most significant physiological event linked to dysmenorrhea is the "uterine wind," or increased myometrial activity that occurs along with uterine ischemia and activates type C pain afferent neurons. Progesterone levels in a normal menstrual cycle drop as the corpus luteum regresses near the conclusion of the luteal phase, following nonfertilization of the ovum. Progesterone withdrawal is the source of endometrial shedding and a rise in inflammatory cytokines, vascular endothelial growth factor, and matrix metalloproteases throughout the process of its destruction (Jiang et al., 2023). Menstrual bleeding results from this, along with vascular integrity loss, deterioration, and disintegration of the uterine interstitial matrix. Disintegration of endometrial cells releases Prostaglandin F2- α (PGF2 α), which causes uterine contraction and vasoconstriction. Uterine contractions and ischemia resulting from decreased blood flow cause uterine pain (Kulkarni & Deb, 2019).

Without any underlying illness, menstrual cramps mostly affect the pelvis and/or thigh region. Pain can peak on the first or second day of menstruation and can start several hours before or at the start of the period. The degree of prostaglandin release determines the pathophysiology of primary dysmenorrhea (Sharma et al., 2023). The intricate molecular interactions among the immunological, endocrine, and circulatory systems are demonstrated by earlier studies. Although cytokines and other proinflammatory variables have not received much attention, prostaglandins continue to be a prominent player in the pathomechanism of dysmenorrhea (Pertiwi et al., 2022). According to Barcikowska et al. (2020), primary dysmenorrhea negatively impacts a woman's life by causing her to miss job, education, and/or social activities.

Dysmenorrhea is diagnosed clinically. Some studies assess severity and use numerical pain ratings to identify instances; others include criteria such as pain intensity, difficulty performing daily activities, or need for systemic or local analgesic therapy (Bavil et al., 2018). To reduce or completely eradicate these issues, there are a number of pharmaceutical and non-pharmacological options. Changing one's diet to include less salt and animal fats, more complex carbs and fiber-rich meals, and increased physical exercise are among non-drug treatments for primary dysmenorrhea (López-Liria et al., 2021).

Exercise causes the blood to have more endocannabinoids and endorphins. Exercise for a brief period of time reduces cortisol production and acts as a general analgesic. In order to get rid of menstrual symptoms, people with dysmenorrhea actively seek out and use non-pharmacological and pharmaceutical intervention therapy. One of the non-pharmacological treatments suggested to address the issue of dysmenorrhea is regular, measured exercise (Kovács et al., 2024). By decreasing renin levels and raising estrogen and progesterone, physical exercise lowers serum aldosterone levels, which helps to alleviate the symptoms of physical complaints (Barcikowska et al., 2020). The study's findings indicate that early menstrual dysmenorrhea and excessive menstrual bleeding can be managed or avoided with consistent, routine aerobic activity (Eldawaty, 2020).

Physical activity is defined by the World Health Organization (WHO) as any movement of the body that is powered by the skeletal muscles and involves the use of energy. Any movement, whether

it is for recreation, transportation exercise to get "to and from" a location, or work-related movement, is considered physical activity. Physical activity of both moderate and high intensity is beneficial to health (WHO, 2018). Nonetheless, figures from throughout the world currently indicate that 81% of teenagers and one in four adults do not get enough physical activity. Additionally, due to shifting patterns of exercise, increased use of technology for work and play, cultural values, and an increase in sedentary behavior, inactivity rates rise and can approach 70% in nations with developing economies. One of the biggest risk factors for dying from non-communicable diseases is not exercising. Less active individuals have a 20% to 30% increased risk of death compared to people who are moderately active (WHO, 2022).

Frequent physical activity has major health advantages. Examples of this include walking, cycling, wheeling, exercises, and active recreation (Fauzi et al., 2023; WHO, 2022). According to a study of the literature, aerobic exercise has been shown to be useful in lowering pain brought on by primary dysmenorrhea (Sharma et al., 2023). It has been suggested that exercise can raise blood levels of endocannabinoids and endorphins. Exercise for a brief period of time can have non-specific analgesic benefits and reduce cortisol production. According to Kovács et al. (2024), the rise in progesterone levels will lessen the synthesis of prostaglandins and pro-inflammatory cytokines, which will lessen the sense of pain. Every organ in the body experiences an increase in blood flow during redistribution following exercise. The uterine blood flow reaction that takes place as a result of exercise is the same as the response that occurs in visceral tissue (Kovács et al., 2023).

Psychological disorders including stress, depression, and anxiety can influence dysmenorrhea through a two-way relationship. When menstrual pain occurs it increases the risk of experiencing stress, depression and anxiety, and vice versa (Guimarães & Póvoa, 2020). In several studies, this psychological disorder can worsen the severity of menstrual pain. Clinical reviews show that patients with severe dysmenorrhea have increased pain sensitivity, whereas increased prostaglandin production alone cannot explain this condition (Sachedina & Todd, 2020).

The nature of the menstrual cycle as well as the experience of recurrent uterine inflammation led to the hypothesis that dysmenorrhea is caused by increased sensitivity to pain. Research evidence has shown that psychological distress is related to further explanations (Pakpour et al., 2020). The most common disorders of the menstrual cycle are dysmenorrhea, secondary amenorrhea, excessive menstruation during puberty, and pathologies such as menarche, and often occur in adolescence. Studies state that young women will experience menstrual disorders as a result of prolonged stress, lack of physical activity, and nutritional problems. Better self-control over the menstrual cycle was also linked to mothers with higher educational levels (Mykolayivna et al., 2023). The study, therefore, aimed to examine the association between physical activity level and the severity of dysmenorrhea in late adolescence.

METHODS

Design

This research was an observational analytical study using a cross sectional study approach. This research has received ethical approval from the Health Research Ethics Committee of the Poltekkes Kemenkes Surakarta with number DP.04.04/F.XXV.1/7914/2023. Data collection in this research was carried out through a survey using the interview method. Interviews were conducted directly using a questionnaire.

Subject

The population of this study were late adolescents or aged 17 to 25 years. The research sample was determined using a simple random sampling approach, consisting of 126 late adolescents aged 17 to 25 years who experienced dysmenorrhea. The inclusion criteria for this study were female adolescents aged 17 to 25 years willing to contribute to this research by agreeing to informed consent. The exclusion criteria for this study were having a history of comorbidities related to the reproductive system. Independent variables were physical activity levels, categorized into low and high physical activity level. The dependent variable was dysmenorrhea, categorized into mild and severe according to the symptoms.

Instrument

The body mass index, or BMI, is a measurement of a person's weight that is based on their height in meters and body weight in kilograms. Body weight was measured with weight scales, and height was measured with metlines. The measurement values are tallied using the WHO formula and classified into underweight, normalweight, overweight, and obesity.

Physical activity was a structured and planned physical activity with the aim of getting a fit body. Physical activity level in this study was measured based on WHO recommendations, namely doing physical activity for at least 150-300 minutes per week, both aerobic and anaerobic, with light, moderate and heavy intensity (WHO, 2022). The measurement results were categorized into light physical activity and heavy physical activity.

Dysmenorrhea was a symptom of cramping pain in the stomach that appears in women who are menstruating. A working ability, location, intensity, days of pain, dysmenorrhea score or WaLIDD score was an instrument designed to diagnose dysmenorrhea (Teherán et al., 2018). The measurement results were categorized into mild dysmenorrhea and severe dysmenorrhea.

Data Analysis

The research data that has been collected is processed and analyzed univariately and bivariately using the STATA application. Univariate analysis used to describe frequency descriptions of sample characteristics, were body mass index, stress, physical activity level, and severity of dysmenorrhea. Bivariate analysis was carried out with simple binary logistic regression to describe the estimated effect of physical activity level on the severity of dysmenorrhea in late adolescence.

RESULT AND DISCUSSION

According to body mass index measurements, the research sample had a BMI in the underweight category of 5.56%, the normal weight category of 80.16%, the overweight category of 8.73%, and the obesity category of 5.56%. The minimum BMI index was 15, the maximum was 35, and the average was 21.611 (Table 1).

Table 1. Participants Characteristics

Item	Frequency (n)	Presentage (%)	Mean	SD	Min	Max
Body Mass Index (BMI)						
Normal Weight	101	80.16	21.611	4.016	15	35
Underweight	7	5.56				
Overweight	11	8.73				
Obesity	7	5.56				
Physical Activity						
Low	92	73.02	-	-	-	-
High	34	26.98				
Dysmenorrhea						
Mild	118	93.65	4.167	1.677	0	9
Severe	8	6.35				

Table 2. Simple Binary Logistic Regression of Bivariate Analysis for The Relationship Between Physical Activity and Dysmenorrhea

Dysmenorrhea	OR	Coefficient	SE	p	95% CI	
					Lower	Upper
Physical Activity	5.115	1.632	3.892	0.032	1.151	22.728
Constant	0.034	-3.390	0.019	<0.001	0.011	0.106

OR= Odds Ratio; SE= Standard Error; CI= Confidence Interval

The bivariate analysis test findings demonstrate that adolescent who engage in heavy physical activity have a 5.11-unit higher risk of dysmenorrhea severity than those who engage in light physical activity and its statistically significant. The logistic regression equation formula below was used to determine estimates of the probability of severe dysmenorrhea occurring.

$$\ln \frac{p}{1-p} = a + b_1x_1$$

$$\ln \frac{p}{1-p} = (-3.390) + 1.632 \text{ physical activity}$$

Futhermore, formula below was a derivative of the formula above which can also be applied to determine estimates of the probability or likelihood of severe dysmenorrhea occurring.

$$p = \frac{\text{Exp}(a + b_1x_1)}{1 + \text{Exp}(a + b_1x_1)}$$

$$p = \frac{\text{Exp}(-3.390 + 1.632 \text{ physical activity})}{1 + \text{Exp}(-3.390 + 1.632 \text{ physical activity})}$$

$$p = \frac{\text{Exp}\{-3.390 + 1.632(1)\}}{1 + \text{Exp}\{-3.390 + 1.632(1)\}}$$

$$p = 0.147041$$

If a late adolescent girl in heavy physical activity was 1 applied to the formula. The probability value was 0.1470, meaning that if a adolescent did heavy physical activity, then the percentage chance of participants in this study experiencing severe dysmenorrhea was 14.70%. The purpose of Dehnavi and Jafarnejad's study is to ascertain how eight weeks of aerobic exercise affects the intensity of primary dysmenorrhea. According to the findings, the intervention group did not exhibit significant differences from the control group at the 4-week mark ($p = 0.423$); however, at the 8-week mark, the intervention group did exhibit significant differences from the control group ($p = 0.041$). Finally, aerobic activity helps alleviate the symptoms of primary dysmenorrhea (Dehnavi & Jafarnejad, 2018).

In their study, Babil et al. looked at the connection between diet and exercise and primary dysmenorrhea in college students. With an average nutritional score of 57.91 in the group with dysmenorrhea and 61.68 in the group without, as well as an average physical activity intensity of 5518.75 metric in the group with dysmenorrhea and 4666.42 metric in the group without, the results indicated significant differences in both groups' diet and physical activity levels. Girls who follow a more suitable diet and engage in regular physical activity have a reduction in the severity of dysmenorrhea (Babil et al., 2018).

The goal of research by Sari et al. is to ascertain the relationship between the degree of dysmenorrhea in teenage girls in Bengkulu City, ages 15 to 17, whose families are classed as middle-class to upper-class, and their nutritional quality and physical activity. 43% of teenage women report having mild dysmenorrhea, 35% report having moderate dysmenorrhea, and 22% report having severe dysmenorrhea. Bivariate analysis reveals statistically, with a value of 0.430, a substantial association between the degree of dysmenorrhea and nutritional status. A higher nutritional status is associated with a reduced degree of dysmenorrhea. Conversely, the degree of dysmenorrhea and physical activity show a weak connection (-0.612). Three variables: degree of physical activity, nutritional status, and physical activity level (Sari et al., 2021).

During menstruation, the prostaglandin hormone is responsible for the painful vasoconstriction of blood vessels in the abdomen region and uterine contractions. The study's findings demonstrated that women with severe dysmenorrhea had higher levels of prostaglandins in their menstrual fluid (Lockinger & Gagnon, 2023). The first two days of menstruation are primarily explained by these findings. Dysmenorrhea can impact the body's cellular and biochemical functions, as well as mental and psychological functions. The body will overproduce progesterone, estrogen, prostaglandin, and adrenaline while under stress. Increased uterine contractions are caused by a rise in the hormone estrogen. Furthermore, a rise in adrenal hormones causes the uterine muscles to tense up, which hurts (Matsumura et al., 2023).

The goal of research by Sumarni and Intasir is to ascertain how worry and physical activity relate to dysmenorrhea. P values of 0.01 ($p < 0.01$) were found in the data analysis pertaining to dysmenorrhea

and anxiety, and 0.06 ($p>0.06$) was found in the data analysis pertaining to physical activity and anxiety. The findings indicate that there is no significant correlation between physical activity and anxiety and that there is a strong association between dysmenorrhea and anxiety in students (Sumarni & Intasir, 2022).

Mykolayivna et al., conducted an investigation into the peculiarities of menstrual cycle changes in adolescents. Results of analysis of the frequency of menstrual cycle disorders was 65.8% and dysmenorrhea was most frequently reported with 45.6% of cases. Adolescent girls who experience stress will affect menstruation and reproductive diseases later in life. Therefore, it is necessary to carry out early examination regarding psychoemotional and metabolic conditions to maintain physical and emotional health (Mykolayivna et al., 2023).

Dysmenorrhea often causes absence from school or work. These reproductive system disorders are often considered "normal" and do not require medical treatment. Bivariate analysis studies showed that dysmenorrhea and early menarche were associated with the diagnosis of endometriosis and proved to be statistically significant. Dysmenorrhea and the onset of dysmenorrhea during menarche in adolescents are strong predictors of the development and diagnosis of endometriosis. Therefore, it is necessary to have early and careful examination of dysmenorrhea in adolescents regarding the possibility of endometriosis (El-Hadad et al., 2023).

Since primary dysmenorrhea cases are on the rise worldwide, a thorough bibliometric analysis is required to spot and investigate any new trends in the condition. The findings of the examination of 903 publications demonstrate how research on primary dysmenorrhea cases has changed over time, moving from traditional epidemiological studies to a more diverse field of study, with studies focusing on the variety and polymorphism of dysmenorrhea circadian rhythm genes (Wang et al., 2023).

Only the sample's daily level of physical activity was measured in this study. The exact physical activity that the sample engaged in to get over their dysmenorrhea was not evaluated in this study. Therefore, imperative that future study investigate the impact of physical activity during the menstrual cycle on the severity of dysmenorrhea.

CONCLUSION

According to the results, 6.35% of women had severe dysmenorrhea and 93.65% of women had mild dysmenorrhea. Adolescents who participated in heavy physical activity had a 5.11 unit higher risk of dysmenorrhea than those who participated in mild physical activity. It has been established that physical activity significantly affects dysmenorrhea. Adolescents who engage in high levels of physical exercise have a 14.70% higher chance of developing severe dysmenorrhea. The findings of this study recommend that young women should do early screening dysmenorrhea, regular and measurable physical activity, and take effective steps to control stress. This action will be able to prevent and suppress cases of dysmenorrhea.

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