Research Article

Physical Activity Impact on Severity of Dysmenorrhea among Junior High School Students: A Cross Sectional Study

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Abstract

Objective: To identify the prevalence of dysmenorrhea, the level of physical activity, the risk factors for dysmenorrhea and to determine the relationship between physical activity and the severity of dysmenorrhea among junior high school students.

Method: This is a cross-sectional, observational analytical study on the population of adolescence, junior high school students, conducted from July to December 2023 in Palembang. Primary data were obtained using Physical Activity Questionnaire for Older Children (PAQ-C) and working ability, location, intensity, days of pain, dysmenorrhea (WaLIDD) score.

Results: About 88.9% of students experienced primary dysmenorrhea, with 34.4% experiencing mild dysmenorrhea, 38.9% experiencing moderate dysmenorrhea, and 15.6% experiencing severe dysmenorrhea. The level of daily physical activity performed by the students was 43.3% low activity, 55.6% moderate activity, and 1.1% high activity. There was no significant relationship between physical activity and the degree of dysmenorrhea (p=0.459; PR=0.828; 95% CI: 0.558-1.230). Menarche age <12 years (PR=1.186), a family history of dysmenorrhea (PR=1.225), and irregular menstrual cycles (PR=1.283) are risk factors for higher degree of dysmenorrhea.

Conclusion: There is no relationship between physical activity and the degree of dysmenorrhea. Female students mostly experience moderate primary dysmenorrhea, with the dominant level of physical activity being moderate. Menarche age <12 years, a family history of dysmenorrhea, and irregular menstrual cycles are risk factors for the higher degree of dysmenorrhea.

Keywords: adolescents, physical activity, primary dysmenorrhea.

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INTRODUCTION

Adolescence is the period of transition from childhood to adulthood, marked by puberty. Menarche, the first menstrual period, typically occurs around 2.6 years after the onset of puberty.[1,2] On average, menarche tends to occur at the age of 12 with common complaint during menstruation that is menstrual pain or dysmenorrhea. Dysmenorrhea experienced by 60-70% of young women, and characterized by pain that naturally occurs 6-24 months after menarche.[3] The results of a cross-sectional study in the high school adolescent population in Ethiopia stated that the prevalence of dysmenorrhea is 70%, with 22.4% experiencing severe pain.[4] Although the prevalence of dysmenorrhea is high enough to have a negative impact on daily activities, the majority of women do not seek medical attention because they consider menstrual pain as a normal thing that can be treated with pharmacological therapies such as NSAIDs (e.g., ibuprofen or mefenamic acid) and non-pharmacological approaches such as warm compress, herbal drinks, or supplements.[5]

During puberty, adolescence experience a significant growth in height and weight which requiring higher energy, protein, and

micronutrient intake. Therefore, sports and physical activities have a positive impact on the health of adolescent bodies, including possibility in reducing the intensity of dysmenorrhea. The World Health Organization (WHO) states that the majority of adolescent females and males worldwide aged 11-17 spend less than 60 minutes in moderate to vigorous physical activity, with females being less active than males in most countries. According to a systematic review and meta-analysis, light-intensity exercises such as yoga and stretching have a significant effect in reducing the level of menstrual pain.[6]

While dysmenorrhea is known to significantly impact the daily activities and academic performance of adolescents in school, there hasn't been much research on the relationship between physical activity and the severity of dysmenorrhea in early adolescence, particularly among junior high school students. Therefore, this study aims to the prevalence of dysmenorrhea, the level of physical activity, the risk factors for dysmenorrhea and to determine the relationship between physical activity and the severity of dysmenorrhea among junior high school students.

METHODS

This research is an observational analytical study with a cross-sectional design conducted in three junior high schools in Palembang. The sample selection and size are determined using multistage random sampling method and Leme show formula from three junior high schools in Palembang City, Indonesia. The inclusion criteria for this study include female students aged 11-15 years, enrolled in grades 1-3 in the academic year 2023/2024, who have experienced menarche, and are willing to participate in the study with parental permission. Students with history of gynaecological conditions diagnosed by gynecologist such as endometriosis, endometrial polyps, or pelvic inflammatory disease were excluded. The research protocol has been approved by the Ethics Committee of Medical Faculty of Sriwijaya University.

The level of physical activity was assessed using the Physical Activity Questionnaire for Older Children (PAQ-C) with a classification of 5 levels of physical activity: very low (0.0-1.0), low (1.1-2.0), moderate (2.1-3.0), high (3.1-4.0), and very high (4.5-5.0). The degree of dysmenorrhea was evaluated using the Working ability, Location, Intensity, Days of pain, Dysmenorrhea (WaLIDD) score with categories of no dysmenorrhea (0), mild dysmenorrhea (1-4), moderate dysmenorrhea (5-7), and severe dysmenorrhea (8-12). Physical activity and dysmenorrhea risk factors such as age of students, age of menarche, family history of dysmenorrhea, and menstrual cycle were consider independent variables, while the severity degree of dysmenorrhea was the dependent variable. Univariate analysis was conducted in the form of descriptive analysis to provide a frequency distribution overview of each variable. Bivariate analysis was performed using the chi-square test and Spearman correlation test, with the criterion that there is a significant relationship and correlation if the p-value is < 0.05.

RESULTS

A total of 90 respondents or subjects participated that met the inclusion and exclusion criteria for this research. Table 1 presents the characteristics of the junior high school female respondents in this study. The majority of subjects were ≤ 12 years old (40%) and grade 9 (43.3%) students. A total of 88.9% of female students experienced dysmenorrhea, with the most common severity degree was moderate dysmenorrhea (38.9%). Moderate physical activity was the most frequently performed activity by students (55.6%). Most students had their menarche before age 12 (74%), had a history of dysmenorrhea in the family (79%), and experience regular menstrual cycle (46%).

Table 1. Demographic Characteristics

Characteristic	Total	
Age (y o)	**N**	**%**
≤ 12	36	40
13		
≥ 14		
Class		
7	33	36.7
8	18	20
9	39	43.3
Dysmenorrhea		
Yes	80	88.9
No	10	11.1
Dysmenorrhea degree		
No	10	11.1
Mild	31	34.4
Moderate	35	38.9
Severe	14	15.6
Physical activity level		
Low	39	43.3
Moderate	50	55.6
High	1	1.1
Menarche age (y o)		
< 12	67	74.4
≥ 12	23	26.6
Family history of dysmenorrhea		
Yes	79	87.8
No	11	12.2
Menstrual cycle (days)		
Regular (21-35)	46	51.1
Irregular (< 21 or > 35)	44	48.9

Bivariate analysis results are presented in Tables 2 and 3. Out of 51 students with moderate-high physical activity levels, more students experience moderate to severe pain (58,8%). Low physical activity has the potential to be 0.828 times less likely to experience moderate to severe dysmenorrhea (PR: 0.828; 95% CI: 0.558-1.230). Both variables have a very weak and positively directed correlation strength (r=0.138), meaning that the degree of dysmenorrhea will increase if physical activity increases.

Among the 56 students aged ≤ 13 years, moderate to severe pain was more experienced by 51.8% students. Adolescents ≤ 13 years old are 0.88 times less likely to experience moderate to severe dysmenorrhea compared to those aged >13 years (PR: 0.88; 95% CI: 0.603-1.285). A total of 38 (56%) students experienced moderate to severe pain out of 67 students with early menarche (< 12 years old). The PR value of 1.186 (95% CI: 0.737-1.908) indicates that adolescents with early menarche (<12 years old) are 1.186 times more likely to experience moderate to severe dysmenorrhea compared to those with menarche ≤ 12 years old. Students with a family history of dysmenorrhea were more dominant in experiencing moderate to severe pain (55.7%) out of 79 students. The PR value of 1.225 (95% CI: 0.623-2.410) indicates that adolescents with a family history of dysmenorrhea are at 1.225 times the risk of experiencing moderate to severe dysmenorrhea. In the group of 44 students with irregular menstrual cycles, 61.4% experienced moderate to severe pain. Irregular menstrual cycles were not significantly associated with the degree of dysmenorrhea (p=0.281). Adolescents with irregular menstrual cycles are at 1.283 times the risk of experiencing moderate to severe dysmenorrhea (PR:1.283; 95% CI: 0.876-1.880).

There is a very weak positively directed correlation between severity of dysmenorrhea with students' age (r=0.072), family history of dysmenorrhea (r= 0.067), and irregular menstruation ((r=0.136), implying that later age, having family history of dysmenorrhea, and irregular menstrual cycles are associated with an increased risk of severity degree of dysmenorrhea. A very weak negatively directed correlation (r=-0.071) was found, meaning that the earlier the age of menarche, the higher the degree of dysmenorrhea.

Table 2. Bivariate relationship between dysmenorrhea degree and physical activity level, age, menarche age, family history of dysmenorrhea, and menstrual cycle.

Characteristic	Menstrual pain degree (dysmenorrhea)				Total	*P-value*	*PR (95% CI)*
	Moderate and severe pain		Without pain and with mild pain				
	n	%	n	%	n		
Physical activity level							
Low	19	48.7	20	51.3	39	0.459	0.828
Moderate-high	30	58.8	21	41.2	51		(0.558-1.230)
Age (y o)							
≤ 13	29	51.8	27	48.2	56	0.666	0.880
> 13	20	58.8	14	41.2	34		(0.603-1.285)
Menarche age (y o)							
< 12	38	56.7	29	43.3	67	0.620	1.186
≥ 12	11	47.8	12	52.2	23		(0.737-1.908)
Family history of dysmenorrhea							
Yes	44	55.7	35	44.3	79	0.752	1.225
None	5	45.5	6	54.5	11		(0.623-2.410)
Menstrual cycle (days)							
Irregular (< 21 or > 35)	27	61.4	17	38,6	44	0.281	1.283
Regular (21-35)	22	47.8	24	52.2	46		(0.876-1.880)

Table 3. Bivariate correlations between dysmenorrhea degree and physical activity level, age, menarche age, family history of dysmenorrhea, and menstrual cycle

Characteristic	Menstrual pain severity degree (dysmenorrhea)	
	Spearman's rho	*P-value*
Physical activity level	0.138	0.195
Age	0.072	0.499
Menarche age	-0.071	0.506
Family history of dysmenorrhea	0.067	0.528
Menstrual cycle	0.136	0.202

DISCUSSION

In 2016, more than 80% of adolescent girls in 141 countries were reported to have insufficient physical activity.[7] This aligns with the findings of this study, which indicate a dominance of moderate and low physical activity based on the average PAQ-C scores, consistent with other research showing moderate physical activity.[8] Perceptions of overweight or obesity can be associated with a decrease in physical activity among adolescent girls. Those who perceive themselves as overweight may experience high social anxiety and lack confidence in engaging in physical activities in public. Other barriers may include laziness, time constraints, a lack of friends, and menstruation.[9]

The prevalence of primary dysmenorrhea in reproductive-aged women worldwide ranges from 45% to 95%, with a higher prevalence (70%) found in women under the age of 24.[10] In this study, 88.9% of female students experienced primary dysmenorrhea. Technology advancement leads to lifestyle changes, particularly the easier access to fast food. The high percentage of trans fat in fast food might raise prostaglandin levels in the body, causing uterine contractions and discomfort during menstruation. Additionally, stress among school-aged students is a common occurrence in developing countries, as indicated by studies in Ethiopia. Poor self-assessment of menstrual pain, the underreporting of menstrual disturbances often overlooked, the tendency of most students not to seek medical advice considering it a common occurrence, the lack of a universal standard tool to measure the severity of dysmenorrhea, diverse definitions of menstrual complaints, and variations in the age range of the population can affect the prevalence and severity of dysmenorrhea in different studies.[11,12]

Dysmenorrhea can be caused by excessive uterine myometrium contractions and the action

of prostaglandins in the uterus. A study indicates higher levels of prostaglandins in women with severe dysmenorrhea compared to those with mild dysmenorrhea.[13] Prostaglandin F2 and E2 (PGF2 and PGE2) enhance uterine motility. PGF2 and PGE2 binding to their receptors, such as FP and EP1, respectively, will increase calcium mobilization in smooth muscle cells like the uterine myometrium, leading to an increase in intracellular calcium concentration.[2] The increased Ca2+ in the cytosol plays a role in initiating a series of biochemical events that result in smooth muscle contraction. The vascular diameter decreases as uterine muscle contraction increases, restricting blood flow and resulting in decreased oxygen delivery and increased lactic acid generation. This lactic acid enhances the sensitivity of nociceptors, or pain nerves, causing a perceived increase in the severity of dysmenorrhea.[14,15] Arachidonic acid, the main substance in prostaglandin production through the cyclooxygenase pathway, is only released from cell membranes when progesterone levels begin to decrease.[14] Aerobic activity is known to increase progesterone levels, especially during the luteal phase, inhibiting prostaglandin production. Regular exercise reduces the release of pro-inflammatory cytokines (IL-6, TNF-), which can activate nociceptors, and increases anti-inflammatory cytokines such as Interleukin-10 (IL-10), thereby reducing the severity of dysmenorrhea.[16] In addition to prostaglandins, stress can worsen menstrual pain by increasing sympathetic activity, causing increased uterine muscle contractions. Light physical activity such as stretching has the potential to reduce sympathetic activity and alleviate stress through the release of endorphins, substances produced by the brain that enhance pain tolerance, thereby reducing perceived pain symptoms.[17]

Pain is a multidimensional concept influenced by factors such as physical, psychological, socio-cultural, and subjective elements, leading to different perceptions of pain in individuals.[18] Adolescents perceive pain severity differently due to variances in descriptions, experiences, and pain tolerance levels. Variations in pain perception are also influenced by education level and age, as the adolescent phase, being a transitional period towards adulthood, involves the process of becoming independent decision-makers. Consequently, compared to adults, adolescents may struggle to precisely articulate the characteristics and causes of pain.[19,20] The stigma surrounding reproductive and sexual health among adolescent girls can result in a lack of knowledge about the detection and management of dysmenorrhea. These factors can influence the determination of the perception of dysmenorrhea severity in adolescence.[21]

Dysmenorrhea typically appears around 6 months after menarche, which on average begins at the age of 12.[3] Adolescents with an early menarche experience longer menstruation and increased exposure to prostaglandins, making them more likely to experience more severe dysmenorrhea.[22] A meta-analysis study indicates that women with a family history of dysmenorrhea more likely to experience dysmenorrhea due to the presence of a genetic connection between the child and mother who experiences dysmenorrhea. An adolescent can also inherit behaviours such as lifestyle and dietary patterns from a family with a history of dysmenorrhea, potentially influencing the severity of dysmenorrhea experienced by the adolescent.[23]

Adolescents with irregular menstrual cycles are more likely to experience moderate to severe dysmenorrhea.[24] Most female adolescents will have a regular menstrual cycle length by the third year after menarche.[25] The main cause of irregular menstrual cycles is hormonal imbalance, which can be triggered by environmental stressors such as changes in energy balance (excessive physical activity and insufficient energy intake), exposure to pollution (air pollution and cigarette smoke), and psychosocial stress.[26] This hormonal imbalance occurs due to dysregulation of the HPA axis and reduced secretion of GnRH from the hypothalamus.[27] Ovulation disruption caused by FSH and LH hormone production dysregulation causes unnecessary oestrogen exposure, interrupting endometrial epithelial regeneration, particularly following endometrial shedding.28 The disturbed process of ovulation and endometrial regeneration leads to irregular menstrual cycles and poorly controlled bleeding, triggering continuous inflammation in the endometrial tissue. Phospholipase, triggered by tissue damage and the inflammatory response, releases arachidonic acid, ultimately leading to increased prostaglandin production. Prostaglandins cause ischemia of the uterine myometrium and sensitize pain nerve fibers, resulting in an increase in the severity of dysmenorrhea.[28]

This study has several limitations. The physical activity levels were not classified according

to the intensity (for example, in METs/week), making specific levels of physical activity unclear. This study also excludes factors such as BMI, nutritional status and eating habits, including fast food consumption, which are known to influence dysmenorrhea.[29] There was also the possibility of data inaccuracy in physical activity results due to the city's severe air pollution situation, which caused school exercise activities to be temporarily resumed for several weeks, resulting in increased sedentary activity on students. A multicentre study with wider variety of samples characteristics with cohort perspective design are recommended for future research.

CONCLUSION

There is no significant relationship between physical activity and the severity of dysmenorrhea. Most students experience moderate primary dysmenorrhea, while the dominant level of physical activity is moderate. Risk factors for the severity of dysmenorrhea include age at menarche <12 years, a family history of dysmenorrhea, and irregular menstrual cycles.

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