Research Article

The Relationship of Physical Activity with Menstrual Patterns of Adolescents Senior High School in Bogor West Java

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Abstract

Menstruation is a series of physiological processes that allow disruption of the menstrual pattern, such as the menstrual cycle, menstrual duration, the amount of menstrual blood, and pain during menstruation (dysmenorrhea). One of the factors which affect the disruption of menstrual patterns is physical activity. Physical activity is any movement of the body produced by skeletal muscle that requires energy expenditure. According to WHO (World Health Organization) 2018 data, 84% of women do less physical activity than men. Female adolescent still pays less attention to physical activity and disturbances during menstruation. This study aims to find out the menstrual pattern of female adolescent, depicting of physical activity, and to find out the relationship between physical activity and menstrual patterns of female adolescent at 1 Cibinong Senior High School in Bogor Regency. This research is a quantitative study with a cross sectional design. Random sampling technique is used to gather the sample. The sample in this study consist of 75 students on 11th grade at 1 Cibinong Senior High School. Questionnaire is used as data collection instrument. Bivariate and multivariate are used to analyze the data. Based on the results of the bivariate test, there was a significant relationship between physical activity and menstrual patterns, namely the menstrual cycle p = 0.000 < 0.05 (alpha) and disorders during menstruation with dysmenorrhea p = 0.019 < 0.05 (alpha). There is a relationship between physical activity and menstrual patterns. Education about the importance of paying attention to physical activity every day is needed, so that adolescents can prevent experiencing disturbances in menstrual patterns.

Keywords: Physical Activity; Menstrual Patterns; Menstrual Disorders

Abbreviations

BSA: Body Surface Area; BMI: Body Mass Index; CRH: Corticotropic Releasing Hormone; DASS: Depression Anxiety Stress Scale; GPAQ: Global Physical Activity GPAQ

Introduction

Adolescence is a time of transition from childhood to adulthood. At this time, adolescents experience puberty and maturity of the reproductive organs as well as endocrinological, metabolic, somatic, and psychological changes. Teenage girls will have their periods. Menstruation is a regular bleeding of the uterus as a sign that the female reproductive organs have matured [1,2].

At the time of menstruation there can be several things that may be able to worry adolescent girls, namely menstrual disorders. Disorders that may occur are changes in the menstrual cycle, changes in the amount of menstrual blood, and dysmenorrhea [1].

Factors that can affect the menstrual cycle, such as hormonal abnormalities, physical health disorders, mental pressure problems, and emotions. Physical activity is one of the factors that can interfere with the menstrual cycle [3,4].

Dysmenorrhea is a sense of discomfort or pain during menstruation. In the world, the incidence of dysmenorrhea is very large. 50% of women on average experience pain during menstruation. One of the factors that cause dysmenorrhea is physical activity. Menstrual pain (dysmenorrhea) will increase if women lack physical activity whose impact is the lack of oxygen circulation and blood flow in the uterus [5,6].

Physical activity according to WHO 2010 in the study Novietta., *et al*. (2014) is any body movement produced by skeletal muscles that requires energy expenditure. Physical activity is divided into three, namely low, medium, and high. In 2018, residents over the age of 10 years in West Java were lacking in physical activity found from the results of basic health research in 2018. Lack of physical activity in question is a cumulative activity that is less than 150 minutes a week [4,7].

Menstrual disorders have a certain relationship to the physical and psychological condition of women. Menstrual disorders are affected by weight, frequency of exercise, physical activity, stress, diet, environmental exposure, working conditions, synchronization of menstrual processes, and endocrine disorders. One of the important parameters used to find out the condition of a person's body is weight. Weight is calculated in colloquial units (kg) used for body measurements. Information to analyze body conditions such as body surface area (BSA) and body mass index (BMI) can be known through weight [1,8].

BMI is one measure to predict the percentage of fat in the human body. BMI that a person has in the high or low category can cause menstrual disorders, including not having menstruation (amenorrhea), irregular menstruation, and pain during menstruation. Adolescents who have more nutrition can cause menstruation due to a continuous increase in estrogen production which indirectly leads to an increase in androgen hormones that can interfere with follicle development so that they cannot produce mature follicles [9,10].

Disruption of menstrual patterns can be caused by stress. Excessive stress can affect the hypothalamus, the part of the brain that plays a role in controlling hormones that regulate menstrual cycle [11].

Disorders of menstrual patterns involve integrative regulatory mechanisms that affect biochemical and cellular processes throughout the body including the brain and psychological. The hypothalamus-pituitary-ovary is a pathway in which hormonal reactions occur caused by brain influences that include multi-effects and reverse control mechanisms. In stressful situations, the amygdala in the limbic system experiences activity that stimulates the release of hormones from the hypothalamus, namely corticotropic releasing hormone (CRH) [10,12].

The purpose of this study was to find out the relationship between physical activity and the menstrual patterns of young women at SMAN 1 Cibinong Bogor Regency.

Materials and Methods

This study is a quantitative study with cross sectional that looks at 3 cycles of menstruation. The sample was a student of senior high School Cibinong, sampling with simple random sampling techniques as many as 75 people.

Physical activity data collection uses a GPAQ questionnaire developed by to measure physical activity levels based on Mets (Metabolic Equivalents). Dysmenorrhea using the Numeric Rating Scale (NRS) questionnaire, stress participants were seen using the Depression Anxiety Stress scale (DASS) questionnaire consisting of 14 questions, with the normal category if the score <18 and 19-25 and severe stress if the score >26.

Results and Discussion

Result

Univariate results

Variable	Sum	Percentage (%)
Menarche age		
<13 Years	69	92
13-14 years old	6	8
Physical Activity		
Low level	40	53.3
Heavy	35	46.7
Menstrual Cycle		
Orderly	38	50.7
Irregular	37	49.3
Duration of Menstruation		
Normal	61	81.3
Abnormal	14	18.7
Menstrual Volume		
Normal	42	56
Abnormal	33	44
Dysmenorrhea		
No	42	56
Yes	33	44

Weight Loss (BMI)		
Normal	48	64
Abnormal	27	36
Stress Levels		
Normal	58	77.3
Heavy	17	22.7

Table 1: Characteristics of Respondent.

Based on table 1, 69 participants (92%) experienced menarche at the age of < 13 years, most of them did light physical activity as many as 40 people (53.3%), most experienced regular menstruation cycles of all the 75 participants as many as 38 people (50.7%), experienced a normal menstrual duration of 61 people (81.3%), mostly with a normal menstrual volume of 42 people (56%), as many as 33 people (44%) had Dysmenorrhea, some With a normal BMI of 48 participants (64 %) and with normal stress levels of 58 people (77.3%).

Bivariate results

Physical Activity	Menstrual Cycle				p
	Orderly		Irregular		
	f	%	f	%	
Low level	29	72.5	11	27.5	0.000
Heavy	9	25.7	26	74.3	
Chi square Statistical Test					

Table 2: Relationship of Physical Activity with the Menstrual Cycle.

Based on table 2, it can be known that participants who have irregular menstrual cycles are more experienced by participants who do strenuous physical activity, namely as many as 26 participants (74.3%). In the Chi Square test, a p-value of 0.000.

Physical Activity	Duration of Menstruation				p
	Normal		abnormal		
	f	%	f	%	
Low level	29	72.5	11	27.5	0.42
Heavy	32	91.4	3	8.6	
Chi square Statistical Test					

Table 3: Relationship of Physical Activity with Menstrual Duration.

Based on table 3, it is known that participants who have an abnormal menstrual duration are more experienced by participants who do light physical activity, namely as many as 11 participants (27.5%) and p-value 0.42.

Physical Activity	Menstrual Volume				p
	Normal		Abnormal		
	f	%	f	%	
Low Level	25	62.5	15	37.5	0.252
Heavy	17	48.6	18	51.4	
Chi square Statistical Test					

Table 4: Relationship of Physical Activity with Menstrual Volume.

Based on table 4, it is known that participants who have abnormal menstrual volume are more experienced by participants who do heavy physical activity, namely as many as 18 participants (51.4%), dan p-value 0.252.

Physical Activity	Dysmenorrhea				p
	Yes		No		
	f	%	f	%	
Low level	17	42.5	23	57.5	0.019
Heavy	25	71.4	10	28.6	
Chi square Statistical Test					

Table 5: Relationship of Physical Activity with Dysmenorrhea.

Based on table 5, it can be known that participants who are impaired during menstruation, namely experiencing dysmenorrhea/abdominal pain are more experienced by participants who do light physical activity, namely as many as 12 participants (70.6%). In the Chi Square test, a p-value result of 0.019.

BMI	Menstrual Cycle				p
	Orderly		Irregular		
	f	%	f	%	
Normal	29	60.4	19	39.6	0.024
Abnormal	9	33.3	18	66.7	
Chi square Statistical Test					

Table 6: Relationship of BMI with the Menstrual Cycle.

Based on table 6 shows that participants who have a weight with abnormal BMI have irregular menstrual cycles as many as 18 participants or 66.7%. In the Chi Square test, a p-value result 0.024.

BMI	Duration of Menstruation				p
	Normal		Abnormal		
	f	%	f	%	
Normal	39	81.3	9	18.8	0.980
Abnormal	22	81.5	5	18.5	
Chi square Statistical Test					

Table 7: Relationship of BMI with Menstrual Duration.

Based on table 7, it is known that there is no difference in the duration of menstruation between normal and abnormal BMI. In the Chi-Square test, a p-value of 0.985.

BMI	Menstrual Volume				p
	Normal		Abnormal		
	f	%	f	%	
Normal	29	60.4	19	39.6	0.340
Abnormal	13	48.1	14	51.9	
Chi square Statistical Test					

Table 8: Relationship of BMI with Menstrual Volume.

In table 8, participants who had abnormal menstrual volume were more experienced by abnormal BMI, namely as many as 14 participants (51.9%). In the Chi-Square test, a p-value result of 0.304.

BMI	Dysmenorrhea				p
	Yes		No		
	f	%	f	%	
Normal	29	60.4	19	39.6	0.028
Abnormal	13	48.1	14	51.9	
Chi square Statistical Test					

Table 9: Relationship of BMI with Dysmenorrhea.

Based on table 9 shows that participants who have a weight with a normal BMI that is not have dysmenorrhea as much as 29 (60.4%) and abnormal BMI that is not dysmenorrhea as much as 13 (48.1%). In the results of the chi-square statistical test

obtained indigo p-value 0.028 < 0.05 (alpha) then statistically there is a significant association between weight and disorders of menstruation (dysmenorrhea).

Stress Levels	Menstrual Cycle				p
	Orderly		Irregular		
	f	%	f	%	
Normal	32	55.2	26	44.8	0.176
Heavy	6	35.3	11	64.7	
Chi square Statistical Test					

Table 10: The Relationship of Stress Levels with the Menstrual Cycle.

In the Chi-Square test, a p-value of 0.176 > 0.05 (alpha) was obtained so that it can be concluded that there is no significant relationship between stress and the menstrual cycle.

Stress Levels	Duration of Menstruation				p
	Normal		Abnormal		
	f	%	f	%	
Normal	49	84.5	9	15.5	0.286
Heavy	12	70.6	5	29.4	
Chi square Statistical Test					

Table 11: Relationship of Stress Levels with Menstrual Duration.

In the Chi-Square test, a p-value of 0.286 > 0.05 (alpha) was obtained so that it can be concluded that there is no significant relationship between stress and menstrual length.

Stress Levels	Menstrual Volume				
	Normal		Abnormal		p
	f	%	f	%	
Normal	34	58.6	24	41.4	0.420
Heavy	8	47.1	9	52.9	
Chi square Statistical Test					

Table 12: Relationship of Stress Levels with Menstrual Volume.

In the Chi-Square test, a p-value of 0.420 > 0.05 (alpha) was obtained so that it can be concluded that there is no significant relationship between stress and menstrual volume.

Stress Levels	Dysmenorrhea				p
	Yes		No		
	f	%	f	%	
Normal	35	60.3	23	39.7	0.178
Heavy	7	41.2	10	58.8	
Chi square Statistical Test					

Table 13: The Relationship of Stress With Dysmenorrhea.

In the Chi-Square test, a p-value of 0.178 > 0.05 (alpha) was obtained so that it can be concluded that was rejected which means there is no significant relationship between stress and menstrual length.

Discussion

Relationship of physical activity with menstrual patterns

In this study, physical activity was categorized into 2, namely light and heavy. Physical activity with a mild category, has a met value of ≤600 and MET 600-3000 while heavy physical activity has a value of ≥3000. In the results of research on students of class XI SMAN 1 Cibinong consisting of 75 students showed that most had heavy physical activity as much as 46.7% because SMAN 1 Cibinong had active non-academic activities. One of the non-academic activities is the extracurricular activities of sports, such as basketball, volleyball, karate, taekwondo, and badminton. From the results of the interview, some participants are routinely doing workouts to maintain their body image and there are participants who are cricket athletes who are doing routine exercises with high intensity to prepare for tournaments between regions.

From the results of this study showed that the proportion of students who experience menstrual pattern disorders, namely the menstrual cycle is included in the category of heavy physical activity, which is as much as 74.3%, while students with light physical activity 27.5%. From this data it can be seen that there is a tendency to get heavier in doing physical activity then the menstrual cycle will become irregular. Physical activity can cause disruption to the physiological menstrual cycle if done with severe intensity. Excessive physical activity can lead to hypothalamic dysfunction leading to impaired secretion of GnRH. This leads to delayed menarche and disruption of the menstrual cycle. The main factor causing GnRH suppression is excessive energy use. Nutritional deficiency factors are an important factor causing the

state of hypoestrogenism in women. Respondent who has heavy physical activity can increase the risk of menstrual disorders because women who exercise too often or too heavily will affect fat burning in the body. When fat levels in the body decrease below 20 percent so that the menstrual cycle becomes irregular [1,4].

The relationship of weight with menstrual patterns

The percentage of body fat affects the menstrual cycle, namely those who experience obesity has a greater 1.86% chance in experiencing menstrual cycle disorders. In women, obesity can pose a risk of menstruation disorders and other diseases such as the increasing prevalence of cancer that is closely related to female hormones. Fat cells are not only useful as energy storage but also act as active endocrine organs so that they are susceptible to disease in obesity [13].

According to Kurnia's 2019 study, there is a significant association between BMI and dysmenorrhea with mild levels. Women who have abnormal BMI, namely underweight or overweight are at risk of dysmenorrhea. Excess nutrition will have an impact on the decline of hypothalamic function which has an impact on FSH (Follicle Stimulating Hormone) and LH (luteinizing Hormone). Dysmenorrhea occurs because it is caused by increased levels of prostaglandin and vasopressin [13].

The relationship of stress with menstrual patterns

When viewed from the volume of menstruation, duration of menstruation, and dysmenorrhea pain, the results of a study conducted on 75 participants at SMAN 1 Cibinong obtained the results of the statistical test p value 0.341 > 0.05 (alpha) so that there is no relationship between stress and the duration of menstruation. While the volume of menstruation was found to be a p value of 0.700 > 0.05 (alpha) which means there is no relationship between the level of stress and the volume of menstruation. Likewise with dysmenorrhea pain which is a disorder during menstruation found the results of the statistic test with the chi square test with Pearson p value test results of 0.060 > 0.05 (alpha) there is no relationship between stress levels and dysmenorrhea pain.

In contrast to Mugiati's 2015 study which showed results there was a relationship between stress and changes in menstrual patterns with a p value of 0.000 < 0.05 (alpha). Stress is a factor that affects the menstrual cycle. In stressful conditions caused by

stressors, axial HPA will become active and cause the hypothalamus to excrete (corticotropic releasing hormone). The secretion of CRH will stimulate the release of ACTH (Adrenocorticotropin Hormone) by the anterior pituitary which will further ACT will stimulate the adrenal glands to excrete cortisol. LH secretion is inhibited by cortisol in the brain activity center by inhibiting the anterior pituitary response to GnRH [11,14].

Every woman's first human being will feel a change in her life that can cause stress. Young women are a period of transition from children to adults so that there needs to be self-adjustment in carrying out the transition period of their lives. Normal stress occurs naturally because everyone must have experienced stress. Therefore, midwives as the forefront must be able to provide counselling or health education to the public related to handling stress and the dangers of stress for women's reproductive health.

From the discussion above it can be concluded that physical activity greatly affects the menstrual patterns of young women. The role of health workers, especially midwives, is needed to monitor the physical activity and menstrual patterns of young women so that young women can go through each reproductive cycle healthily. Health workers need to provide counselling, especially to routinely do physical activity at least 30 minutes/day so that young women can do it and avoid disruptions to their menstrual patterns.

Conclusion

From the results of research that have been carried out regarding the relationship between physical activity and menstrual patterns in adolescent girls at Senior High School 1 Cibinong, Bogor Regency, West Java in 2021, 75 participants were found:

- Adolescent girls who had heavy physical activity experienced irregular menstrual cycles as many as 26 people (74.3%).

- Adolescent girls who have low levels of physical activity experience menstrual disorders, namely dysmenorrhea with dysmenorrhea pain as many as 23 people (57.5%).

- There is a significant relationship between the relationship of physical activity with menstrual patterns, namely the menstrual cycle $p = 0.000 < 0.05$ (alpha) and disturbances during menstruation Dysmenorrhea $p = 0.019 < 0.05$ (alpha).

Conflict of Interest

All authors declared no conflicts of interest.

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