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The Relationship Between Stress Levels and Physical Activity and the Incidence of Primary Dysmenorrhea in Female Students

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ABSTRACT

Background: The presence of abdominal cramps during menstruation defines dysmenorrhea. Dysmenorrhea is caused by increased levels of prostaglandin (PG) F2-α, which belongs to the category of cyclooxygenase (COX-2) enzymes. Dysmenorrhea causes psychological impact in the form of anxiety and stress and physical impact in the form of impaired physical activity. To reduce these negative effects, the role of midwives as educators is very important. The objective of this study was to evaluate the association between reported stress levels, physical activity engagement, and the incidence of primary dysmenorrhea among female students at Sunan Kalijogo High School in the Jabung District of Malang Regency. **Methods:** The method used by researchers is quantitative with a correlational analysis design. This research design uses cross-sectional approach and bivariate analysis with the Spearman Rank test. This study employed probability sampling, specifically using the cluster sampling technique. **Results:** The analysis yielded a p-value (Sig. 2-Tailed) of 0.012 for stress levels in relation to the incidence of primary dysmenorrhea, indicating a highly statistically significant relationship. The analysis produced a two-tailed p-value of 0.025 for physical activity and dysmenorrhea, indicating a statistically significant association between these variables, as this value is below the 0.05 threshold. **Conclusion:** Dysmenorrhea will increase pain because a lack of physical activity can inhibit blood and oxygen circulation, which can inhibit the production of endorphins. This can cause stress, which has an impact on increasing the incidence of primary dysmenorrhea. When stressed, the body produces excessive estrogen and prostaglandin hormones that cause an excessive increase in uterine contractions, leading to pain during menstruation.

Keywords: Stress, physiological; exercise; physical activity; dysmenorrhea

1. INTRODUCTION

Adolescence represents a transitional stage that bridges childhood and adulthood, a developmental phase experienced by all individuals. During adolescence, an event called puberty will occur. In women, puberty is characterized by menstruation. Menstruation /menstruation in adolescent women can cause many problems, one of which is dysmenorrhea or painful menstruation.(1)

According to Juliana et al., The incidence of dysmenorrhea in the world is very high; on average, <50% of women in each country experience menstrual pain (dysmenorrhea).(2) According to WHO data, patients with severe

dysmenorrhea in 90% of women are around 1,769,425.[3] The prevalence of menstrual problems in adolescents is menstrual pain (89.5%). In Indonesia, the incidence of dysmenorrhea is relatively high, known from a study conducted by Ningsih R in Tsamara (2020), which found that dysmenorrhea in Indonesia was 64.25%, consisting of 9.36% secondary dysmenorrhea and 54.89% primary dysmenorrhea.[4]

In general, dysmenorrhea is caused by increased levels of prostaglandin (PG) F2-α, which is found in the cyclooxygenase (COX-2) enzyme category. This mechanism triggers vasoconstriction and hypertonus in the uterine muscle (myometrium), which can cause abdominal pain and ischemia.[5] Dysmenorrhea causes psychological impact in the form of anxiety and stress and physical impact in the form of impaired physical activity and work. Lack of physical activity can interfere with oxygen circulation and blood circulation, resulting in interruption of blood and oxygen supply to the uterus.[6] The stress it causes can lead to an increase in the incidence of primary dysmenorrhea and result in menstrual cramps caused by intense uterine contractions.[7] The level of pain experienced by some people varies depending on how much stress they are under.[8]

Adolescent girls who experience stress are characterized by several symptoms in terms of physical, psychological, and behavioral. Adolescent girls who experience stress will result in an imbalance of hormones produced by their bodies. Moreover, the hormones produced can affect the increase in uterine contractions.[9] Researchers also argue that an adolescent who experiences stress both at normal and very severe levels will equally affect the incidence of dysmenorrhea. The reason adolescents experience stress is that, at that time, they feel pressure to achieve high grades and high academic expectations, then the fear of not being able to meet the expectations of parents, teachers, and themselves towards success to determine the future, including the opportunity to enter college or choose work.

Research by Putri et al. corroborates the findings of this study, indicating that a majority of female students (65.9%) experience moderate dysmenorrhea, with the most frequently observed stress level being mild (45.5%).[10] Although the interplay between physical and psychological factors may contribute to the development of dysmenorrhea, the investigation conducted at the Faculty of Medicine, Al Azhar Mataram Islamic University revealed no statistically significant correlation between physical activity and the incidence of primary dysmenorrhea. This is evidenced by a two-tailed p-value of 0.892 ($p \geq 0.05$) along with a correlation coefficient of 0.012, which suggests a very weak and unidirectional (positive) relationship. Furthermore, the data analysis indicated that stress level did not exhibit a significant association with primary dysmenorrhea, as demonstrated by a p-value of 0.295 ($p \geq 0.05$) and a correlation coefficient of 0.091, reflecting an equally negligible relationship.[4]

This research differentiates itself from earlier studies by focusing on a specific respondent group—young women who are enrolled as students and serve as santriwati at the Sunan Kalijogo Islamic Boarding School, Jabung District, Malang Regency, so this is the difference where previous research was conducted on young women who only went to school and did not become santriwati. The method in this study used Probability Random Sampling, namely Cluster Sampling, while previous studies, on average, used Purposive Sampling. Based on the introductory context, the researcher intends to examine whether empirical evidence supports a significant association between stress levels, physical activity, and the occurrence of primary dysmenorrhea among adolescent girls, especially in the high school area of Malang Regency. With the benefit of reducing the adverse effects of dysmenorrhea, the role of midwives as educators is vital because we must teach adolescent girls about reproductive health, especially dysmenorrhea so that they can make decisions and take action to overcome or prevent reproductive health problems that they will face during the menstrual process.

2. METHODS

A quantitative method using an analytic survey design was implemented in this study. Researchers used this design to observe and analyze the relationship between the variables studied at one point in time. The research was conducted at Sunan Kalijogo High School (also called *SMA Sunan Kalijogo*) Jabung-Malang, focusing on a population of 12th-grade students from SMA Sunan Kalijogo. The study encompassed a total of 62 participants who had reached menarche and reported experiences of dysmenorrhea. In this study, the sample comprised 12th-grade students from SMA Sunan Kalijogo, Sukolilo Village who fulfilled the established

selection criteria. The inclusion criteria for the sample were as follows: female students in the 12th grade at Sunan Kalijogo High School, Jabung District, Malang Regency; aged 17–18 years; had already experienced menstruation; were experiencing primary dysmenorrhea; and were willing to participate as respondents. The exclusion criteria included all female students in grades 10 and 11 who were aged 15–16 years, and those experiencing secondary dysmenorrhea or diagnosed with specific gynecological diseases.

This study calculated the sample size using the Slovin formula and obtained a sample of 54 female students. For sampling techniques, it used probability sampling with a cluster sampling approach. In this method, respondents are selected based on criteria predetermined by the researcher so that each member of the population has the same chance of being selected as a sample.

Data collection used three measuring instruments. To measure stress levels, researchers used the Depression Anxiety Stress Scale (DASS 42) questionnaire, which has 14 questions. Physical activity was measured using the GPAQ (Global Physical Activity Questionnaire) has 16 questions. To measure dysmenorrhea, researchers used the Comparative Pain Scale dysmenorrhea questionnaire specifically designed to classify the level of pain experienced by respondents. Data collection was carried out by distributing questionnaires to respondents who had met the inclusion criteria. Researchers conveyed the purpose and management of the study to respondents before they filled out the questionnaire. In this study, privacy was ensured by keeping the identity of respondents confidential by using different numbers or codes for each respondent. The results of data collection are only used for research purposes and are kept confidential by storing the documents in a safe place. After the data were collected, an analysis was conducted to examine the correlation between stress levels, physical activity, and the incidence of primary dysmenorrhea using the Spearman Rank test with a p-value <0.05. The results of this analysis will be used to test the hypothesis that has been proposed.

3. RESULTS

The research was conducted at SMA Sunan Kalijogo, Jabung District, Malang Regency, which had a population of 62 XII science class students aged 17-18 years with a sample of 54 students who fit the inclusion criteria.

Table 1 illustrates that the most represented age group among the respondents was 18 years old, with 37 individuals (68.5%), while the smallest proportion belonged to the 17-year-old group, comprising 17 individuals (31.5%). For the frequency of the first child, there were 31 respondents (57.4%), and there was only 1 (1.9%) child with more than five siblings. In the employment status of parents, the majority are private employees, with as many as 18 respondents (33.3%), and the most minor frequency is civil servants, totaling one respondent (1.9%). Based on parental income, the majority is low, with a frequency of 32 respondents (59.3%) and high income as many as four respondents (7.4%). For students who study while working, the majority are only learning and not working, with a frequency of 53 respondents (94.4%), and those who study while working are three respondents (5.6%).

Table 1. Frequency of respondents' general data

Characteristics	Frequency (f)	Percent (%)
Age		
17 years	17	31.5%
18 years	37	68.5%
How many child		
1st child	31	57.4%
2nd child	13	24.1%
3rd child	9	16.7%
Child > out of 5	1	1.9%
Parent's occupation		
Private job	18	33.3%
Entrepreneur	11	20.4%
Civil servant	1	1.9%
Farmer	12	22.2%
Other	12	22.2%
Parent's income		
Low	32	59.3%
Medium	11	20.4%
High	4	7.4%
Very high	7	13.0%
School and work		
Yes	3	5.6%
No	51	94.4%

Based on Table 2, characteristics based on special data show among the 54 respondents, the majority reported experiencing menarche before the age of 13. As many as 26 respondents (48.1%), at the time of dysmenorrhea, most students experienced

dysmenorrhea after menstruation, with a total of 31 respondents (57.4%), while those who experienced dysmenorrhea before menstruation were 23 respondents (42.6%). Stress level characteristics showed that the majority experienced heavy stress with a frequency of 17 respondents (31.5%), and the minority experienced moderate stress with a frequency of 4 respondents (7.4%). Based on physical activity, many female students experienced low physical activity, with a total of 37 respondents (68.5%) related to the level of dysmenorrhea pain showed that most experienced severe pain, namely 22 respondents (40.7%), and those who experienced mild pain were 15 respondents (27.8%).

Based on Table 3 shows that the majority of respondents who experienced severe stress were 17 respondents (31.5%), who experienced very severe stress levels were 12 respondents (22.2%), normal stress levels were 11 respondents (20.4%), mild stress levels were 10 respondents (18.5%) and who experienced moderate stress four respondents (7.4%). Drawing on the findings from the bivariate analysis conducted using the Spearman rank test, a statistically significant relationship between stress levels and the incidence of dysmenorrhea was observed, yielding a p-value of 0.012—which is below the conventional 0.05 threshold—this result is statistically significant.

Table 2. Frequency of special data

Characteristic	Frequency	Percent
Age menarche		
<13 years	26	48.1%
13 years	13	24.1%
>13 years	15	27.8%
Dysmenorrhea time		
Before	23	42.3%
After	31	57.4%
Stress level		
Normal (0-14)	11	20.4%
Mild (15-18)	10	18.5%
Moderate (19-25)	4	7.4%
Severe (26-33)	17	31.5%
Very severe (>34)	12	22.2%
Physical activity		
Low (< 600 MET)	37	68.5%
Medium (600 –3000 MET)	7	13.0%
High (>3000 MET)	10	18.5%
Dysmenorrhea pain		
Mild (1-3)	15	27.8%
Moderate (4-6)	17	31.5%
Severe (7-10)	22	40.7%

MET: Metabolic Equivalent of Task

Table 3. Bivariate analysis of the relationship between stress levels and the incidence of primary dysmenorrhea

Stress level	Dysmenorrhea at Sunan Kalijogo High School								*p*-value
	Mild (1-3)		Moderate (4-6)		Severe (7-10)		Total		
	N	%	N	%	N	%	N	%	
Normal	4	7.4%	5	9.3%	2	3.7%	11	20.4%	0.012
Mild	5	9.3%	5	9.3%	0	0%	10	18.5%	
Moderate	0	0%	1	1.9%	3	5.6%	4	7.4%	
Severe	2	3.7%	6	11.1%	9	16.7%	17	31.5%	
Very severe	4	7.4%	0	0%	8	14.8%	12	22.2%	
Total	15	27.8%	17	31.5%	22	40.7%	54	100%	

According to Table 4, 37 out of 54 respondents, equivalent to 68.5%, were found to have low activity levels, seven respondents (13.0%) experienced moderate activity, and 10 respondents (18.5%) experienced high activity. Based on the Spearman rank correlation analysis, a 2-tailed significance level of 0.025 (< 0.05) was obtained, which confirms a statistically significant relationship between physical activity levels and the occurrence of primary dysmenorrhea.

Based on statistical analysis using the Spearmen rank test with SPSS to determine this research investigates the association between stress levels, physical activity, and the prevalence of primary dysmenorrhea among high school students and obtained a p-value of 0.012 at the stress level and 0.025 in physical activity. Where these results are <0.05, it can be concluded that there is a relationship between the two independent variables.

Table 4. Analysis of the relationship between physical activity and the incidence of primary dysmenorrhea a

Physical activity	Dysmenorrhea at Sunan Kalijogo High School								*p*-value
	Mild (1-3)		Moderate (4-6)		Severe (7-10)		Total		
	N	%	N	%	N	%	N	%	
Low	12	22.2%	15	27.8%	10	18.5%	37	68.5%	0.025
Medium	0	0%	1	1.9%	6	11.1%	7	13.0%	
High	3	5.6%	1	1.9%	6	27.3%	10	18.5%	
Total	15	27.8%	17	31.5%	22	40.7%	54	100%	

4. DISCUSSION

According to the information provided in Table 2 regarding dysmenorrhea pain, the varying intensity levels of pain are clearly outlined, shows that the majority experienced severe pain, namely 22 respondents (40.7%), moderate pain in as many as 17 respondents (31.5%), and mild pain, as many as 15 respondents (27.8%). This occurs due to various factors such as the age of menarche stress and physical activity carried out by respondents. The results of data collection based on the age of menarche show that of the 54 respondents that the age of menarche was primarily obtained when they were <13 years old, namely 26 respondents (48.1%), age> 13 years, 15 respondents (27.8%) and age of menarche when 13 years old there were 13 respondents (24.1%).

Research conducted by Rusydi et al. (2022) is in line with this study, involving 113 female respondents with an age range of 16-18 years, where as many as 64 respondents (48.1%) experienced early menarche. The results showed that menarche that occurs at a younger age can increase the risk of menstrual pain (dysmenorrhea).[11] Early menarche has the potential to cause more intense menstrual pain because the adolescent reproductive organs have not fully developed and reached functional maturity. At this age, the cervix tends to still be in a narrow condition and has not yet reached its optimal shape, so uterine contractions that occur during menstruation can cause sharper pain. This condition occurs because the reproductive system does not have optimal readiness to deal with hormonal and mechanical changes that occur during the first menstruation.[12]

It is theorized that inactivity during menstruation can reduce oxygen supply and blood flow circulation in the body. This can trigger dysmenorrhea or menstrual pain. Therefore, to prevent dysmenorrhea, it is recommended that women, especially female students, do regular physical activities, such as exercising or walking. These physical activities play an essential role in maintaining smooth blood circulation, thus reducing the risk of pain during menstruation.[13] In addition to physical activity, stress is also a factor that affects the onset of menstrual pain. When stressed, the body can produce more hormones than before, such as estrogen, prostaglandins, and adrenaline. Prolonged uterine contractions are caused by excessive production of estrogen hormones, thus triggering pain.[14] On the other hand, increased levels of adrenaline can cause tension in the body's muscles, including the uterine muscles. As a result, uterine muscle contractions become stronger during menstruation, which in turn can increase the intensity of pain.[15]

Based on Table 2, the characteristics related to stress levels show that of the 54 respondents, the majority experienced severe stress with a frequency of 17 respondents (31.5%), very severe stress with a total of 12 respondents (22.2%), normal stress of 11 respondents (20.4%), mild stress 10 respondents (18.5%), moderate stress with a frequency of 4 respondents (7.4%). Several factors trigger stress in 12th-grade high school students, namely, environment, mind, and self.

The researcher assumes that severe stress can increase because they are female students who are also santriwati at the Sunan Kalijogo hut; they are required to complete school assignments and final exams at school while at the hut, they have to take part in a series of activities such as reciting the Koran and even from 3 am already waking up to carry out activities that have been scheduled from the hut. Not only that but there are many other factors that researchers explore. Namely, the number of children in the family has the potential to affect children's stress levels through family dynamics and resource distribution; the more children in the family, usually family resources such as time, attention, and finances must be shared who are in families with many siblings may feel they have to help more at home, adding to their pressure and stress.[16]

On the other hand, parental employment can also affect various aspects of the respondents, including stress levels, Education, and the family economy. Questionnaire data showed that most parents had low incomes (<1.5 million rupiahs), and a small number had moderate to very high incomes. Combined with their employment, this could affect access to resources and child well-being, including stress levels and health issues such as pain and dysmenorrhea.[17] Age at menarche was also a factor, as the majority of respondents experienced menarche at age 13, and this data could be related to the measured levels of stress and dysmenorrhea. So, the age of menarche does not directly cause stress. Still, the changes that accompany this period and how individuals adjust to these changes can be a contributing factor to increased stress.

Research conducted by Putri et al. (2021) provides support for these observations, Statistical analysis indicates a significant association between stress levels and the incidence of dysmenorrhea in adolescent girls at MAN 1 Madiun City, with a correlation coefficient value of 0.656 and a p-value of 0.000 <0.05. Similarly, in this study, of the 54 respondents studied, the Spearman rank test revealed a statistically significant correlation between stress levels and dysmenorrhea incidence, with a p-value of 0.012—well below the 0.05 threshold.[18]

Based on table 3, related to physical activity, shows that out of 54 respondents, the majority have low physical activity 37 respondents (68.5%), high physical activity with a frequency of 10 respondents (18.5%), and moderate activity totaling 7 respondents (13.0%). Low physical activity is one of the problems experienced by many women. According to research conducted by Lestari et al.,[19] the majority of women tend to have low levels of physical activity, which is often caused by a sedentary lifestyle. This lifestyle is characterized by the amount of time spent sitting or lying down, both at home and at work.[20] This habit can reduce physical fitness levels and negatively impact health, including an increased risk of obesity, metabolic disorders, as well as various other health problems, such as dysmenorrhea and premenstrual syndrome (PMS). In addition, physical inactivity can also affect mental health, lower productivity, and impair overall quality of life.[21]

The cause of low activity is that Sunan Kalijogo High School students sit more at school and the cottage during Quranic activities; respondents said that school starts at 07.00 and lasts until 14.00, then returns to the cottage, walking only about 1 minute from their school. At the cottage, their lack of movement and laziness to exercise can cause pain to become more intense. According to Kusumo 2020, 150-300 minutes of moderate-intensity physical activity should be done. This is influenced by if someone lacks physical activity, the level of dysmenorrhea pain will increase, this condition impedes the transfer of oxygen to the blood vessels in the reproductive organs due to vasoconstriction, subsequently causing pain.[22] The chi-square results obtained a significance value of 0.403, which means less than <0.05. Specifically, the results indicate a correlation between physical activity levels and the occurrence of primary dysmenorrhea.

Consistent with the study by Kusumo et al. (2023) that examined the link between physical activity and its incidence of dysmenorrhea in adolescent girls at SMK Kesehatan Tangerang City, it shows a significant relationship.[22] Based on the results of the Chi-Square test with the Likelihood Ratio method, a p-value of 0.030 <0.05 was obtained. This indicates that there is a significant relationship between physical activity and the incidence of dysmenorrhea in the group of adolescent girls at the school. The results of this study using bivariate analysis of the Spearman rank analysis revealed a significant association between physical activity and the occurrence of primary dysmenorrhea. A two-tailed p-value of 0.025—below the usual 0.05 threshold—confirms the statistical significance of this relationship.

Drawing on their experiences during the research process, the investigators recognized certain limitations in expertise that future researchers should consider when refining study methodologies. Acknowledging that this study has inherent shortcomings, addressing these issues will be essential for continuous improvement in subsequent research. Some of the limitations of the study include the fact that there may be some respondents who are not open and do not guarantee honesty in answering the questionnaire provided by the researcher.

5. CONCLUSION

Based on research conducted at Sunan Kalijogo High School, Jabung District, Malang Regency, the analysis leads to the conclusion that primary dysmenorrhea is significantly related to both stress levels and physical activity. The outcomes of this analysis indicate that a similarity between the Theory and the problems that exist in the field. Dysmenorrhea caused by stress factors and lack of physical activity is very

influential in this study; the higher the level of stress and lack of physical activity, the more pain the level of dysmenorrhea is felt. For further researchers, additional analysis may focus on the direct and indirect contributors to the intensity of dysmenorrhea pain experienced by adolescent girls. It is recommended for health workers as educators to provide Education/information about the importance of physical activity and stress management. Teach relaxation techniques such as meditation or yoga that can help reduce stress. For schools, creating a Wellness Program that includes activities such as sports, gymnastics, or yoga classes can help students. It is essential to build a supportive school environment where students feel safe and comfortable to share their concerns. Provide counseling if needed. For Parents, provide emotional support to the child, talk to them about their feelings and stress, and encourage them to share their problems. Encourage the child to participate in physical activities together, such as exercising, taking a walk, or playing outside. This not only improves physical health but also strengthens family bonds.

Ethical Approval

This study has been declared ethically sound by the ITSK RS Dr. Soepraoen Health Research Ethics Committee in Malang, with reference number KEPK-EC/235/III/2025.

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Competing Interests

All the authors declare that there are no conflicts of interest.

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Underlying Data

Derived data supporting the findings of this study are available from the corresponding author on request.

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