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Research

Relationships between Body Mass Index, Psychological Stress, Physical Activity, and Oligomenorrhea in Adolescents at Yasinat Islamic Boarding School, Surabaya

Silvi Dina[1)], Ashon Sa'adi[2)], Bambang Purwanto[3)]

[1)]Study Program of Midwifery, Faculty of Medicine, Airlangga University, Surabaya
[2)]Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Airlangga/ Dr. Soetomo Hospital, Surabaya
[3)]Department of Physiology, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia

ABSTRACT

Background: Oligomenorrhea is one of the most common types of menstrual cycle disorders. Cases have increased in recent decades. Women with oligomenorrhea have menstrual intervals of more than 35 days and less than 90 days. Oligomenorrhea is common in adolescents, particularly 75% of women in late adolescence suffer from oligomenorrhea. The study aims to analyze the effect of BMI, psychological stress, and physical activity on the incidence of oligomenorrhea in young women in Yasinat Islamic Boarding School.
Subjects and Method: This was an analytical observational study with a cross-sectional design. The study sample was adolescents aged 17-19 years with a total of 82 students at Yasinat Islamic Boarding School. The dependent variable was oligomenorrhea. Independent variables were BMI, stress psychology, and physical activity. The study instrument was a questionnaire. The study data were analyzed using the Chi-Square.
Results: BMI <18.5 kg/m^2 and BMI >25 kg/m^2 or 24.4% experienced oligomenorrhea, 3.7% of subjects with light activity experienced oligomenorrhea, while subjects with physical activity of more than 40% experienced oligomenorrhea, 21.7 % of subjects with the normal category experienced oligomenorrhea, 27.8% mild stress, 47.1% moderate stress experienced oligomenorrhea. BMI had a significant effect on oligomenorrhea (p= 0.006). Psychological stress (p= 0.227) and physical activity (p= 0.224) showed no significant influence on oligomenorrhea.
Conclusion: There is a relationship between BMI and oligomenorrhea incidence. However, there is no relationship between psychological stress, physical activity, and oligomenorrhea.

Keywords: physical activity, body mass index, oligomenorrhea, psychological stress.

Correspondence:
Silvi Dina. Study Program of Midwifery, Faculty of Medicine, Universitas Airlangga. Jl. Mayjen Pro. Dr. Moestopo No. 47, Surabaya 60132, East Java, Indonesia. Email: silvi.dina.rosida-2019@-fk.unair.ac.id. Mobile: +6282140485431.

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BACKGROUND

Oligomenorrhea is one of the most common types of menstrual cycle disorders and is increasing in recent decades. Women with oligomenorrhea have menstrual intervals of more than 35 days and less than 90 days (Deligeoroglou and Tsimaris, 2010) or have a total of 5-7 cycles a year (Cardigno, 2009). Oligomenorrhea is prevalent among adolescents, seventy-five percent of women in late

adolescence or advanced adolescence suffer from oligomenorrhea (Felicia et al., 2015). The prevalence of Oligomenorrhea has increased considerably in the last decade ranging from 12%-15. 3% according to various studies around the world (Yavari et al., 2014). In a study conducted in India, a total of 13. 73% of young women with a menstrual cycle of 36 - 45 days and 8. 38% of those with more than 45 days (Dambhare et al., 2012).

Data from basic health research (Rikesdas, 2018) 14.5% of women aged 10-59 years do not menstruate regularly. More precisely, 11. 7% of adolescents aged 15-19 years in Indonesia suffer from oligomenorrhea. Dysfunction of the hypothalamus, pituitary and ovarian axes is the main cause of oligomenorrhea, which can be influenced by various factors (He et al., 2020). Several studies have identified factors related to menstrual cycle irregularities such as age (Rowland et al., 2002), menarche age (De Souza et al., 2010), body mass index (BMI) (Kato et al., 1999), physical activity (De Souza et al., 2010), and stress (Bethea et al., 2005).

A study in China states that 11.14% of young women with stress experience stress-related Oligomenorrhea can result in a decrease in GnRH activity, which leads to a decrease in LH (Luteinizing Hormone) and FSH (Follicle Stimulating Hormone) levels in the pituitary and a decrease in ovarian function (Dobson et al., 2003). Physical activity can trigger fatigue, in a state of fatigue, there is a dysfunction of LH (Luteinizing Hormone) which causes the occurrence of oligomenorrhea (Nose-Ogura et al., 2018). A study in China states that 51.25% of adolescents with high physical activity or fatigue experience oligomenorrhea. BMI that is less than 18.5 kg/m 2 and more than 25 kg/m^2 can result in menstrual cycle disorders (He et al., 2020). A study conducted in China, states that adolescents with Oligomenorrhea had an average BMI of more than 23.57 kg/m^2. According to a study by Arents, lifestyle improvements especially nutritional habits, diet, physical activity, and resting patterns can improve the menstrual cycle (Arentz et al., 2014).

Indonesia has thousands of Islamic Boarding Schools with a large number of young female students, whereas young women in Islamic Boarding Schools easily experience stress due to interpersonal and intrapersonal pressures, diverse BMI, irregular physical activity, and even fatigue. Therefore, they can experience menstrual cycle disorders and Oligomenorrhea. A preliminary study on female late adolescents at Yasinat Islamic Boarding School conducted through direct interviews with 14 female adolescents, obtained 9 young women who experienced menstrual cycle disorders with a cycle length of more than 45 days. A study was subsequently carried out on 9 female adolescents with menstrual cycle disorders, and it discovered that the adolescents had very low weight, stress, and fatigue due to a lot of activities in Islamic Boarding Schools.

The study aims to analyze the effect of BMI, psychological stress, and physical activity on the incidence of oligomenorrhea in female adolescents in Yasinat Islamic Boarding Schools.

SUBJECTS AND METHOD

1. Study Design

This study used an observational analytical design using a cross-sectional approach because it will analyze the effect of nutritional status, stress, and physical activity on the incidence of oligomenorrhea at a single point in time. The subjects in this study were adolescents aged 17-19 years at Yasinat Islamic Boarding School.

2. Population and Sample

The size of the sample of this study was

calculated using Slovin's formula and obtained a large sample of 82 students. The sampling technique used was probability sampling in the form of simple random sampling, which was carried out randomly toward all populations of 102 students who had the same opportunity to be included in 82 samples. The study used the SPSS application to conduct random sampling in determining research samples. The subjects in this study were 82 students who had met the inclusion criteria, namely female adolescents aged 17-19 years, who already had their menstruation. The exclusion criteria were students who were incomplete in filling out the questionnaire, undergoing treatment, had chronic diseases such as tuberculosis, and heart disease, and were not willing to sign informed consent.

3. Study Variable

The dependent variable was oligomenorrhea. The independent variables were oligomenorrhea factors consisting of nutritional status, psychological stress, and physical activity.

4. Operational Definition of Variables

Oligomenorrhea was a menstrual cycle with a length of more than 35 days

Body mass index (BMI) was a heuristic proxy for a person's body fat based on weight and height.

Psychological stress was the body's reaction/ response to psychosocial stressors (Priyoto, 2014).

Physical activity was any bodily movement produced by skeletal muscles that require energy expenditure.

5. Study Instrument

This study used a questionnaire method that was distributed offline to female adolescents aged 17-19 years old at Yasinat Islamic Boarding School Wuluhan Jember to obtain primary data. The measurement scale used for the stress questionnaire was the Depression Anxiety Stress Scale (DASS 42) and the scale used for the Physical Activity questionnaire was the PAQ-A scale (Peter, 2014). Before the subjects filled out the questionnair and informed consent**.**

6. Data Analysis

The data were analyzed univariately to discover the distribution of each variable. Bivariate chi-square analysis was performed to determine the effect of BMI, psychological stress, and physical activity on oligomenorrhea.

7. Research Ethics

The study obtained an agreement between the researcher and the research subject, guaranteeing anonymity, and confidentiality of the data. The study also obtained a statement of ethical clearance No. 85/-EC/KEPK/FKUA/2021 from the Faculty of Medicine, Universitas Airlangga.

RESULTS

1. Sample Characteristics

Table 1 shows that the majority of the adolescents were 17-year-old with 68 people (79. 5%). The majority of adolescents experienced menarche at the age of 12 with 37 people (46. 3%) and it is considered the normal menarche age.

2. Univariate Analysis

Table 2 indicates the majority of subjects had a normal category BMI (18.5 – 25.0) of 62 people (75.6%), with a normal psychological stress level of 29 people (50.9%) and had a very light level of physical activity of 54 people (65.9%).

3. Bivariate Analysis

Table 3 showed the results of bivariate analysis showing that there was a significant effect of BMI on oligomenorrhea (p= 0.006). While psychological stress (p= 0. 227), and physical activity (p= 0. 516) had no significant effect associated with the occurrence of oligomenorrhea in students at the Yasinat Islamic Boarding School.

Table 1. Sample characteristics

Sample Characteristics	Frequency (n)	Percentage (%)
Age (years)		
17	68	79.5
18	12	17.6
19	2	2.9
Menarche Age (years)		
10	2	2.4
11	5	6.1
12	37	46.3
13	18	20.7
14	13	15.9
15	7	8.5

Table 2. Univariate Analysis

Variables	Frequency (n)	Percentage (%)
Body mass index		
<18.5 (Underweight)	12	14.6
18.5 – 25.0 (Normal weight)	62	75.6
25.1 - 27.0 (Overweight)	5	6.1
>27.0 (Obese)	3	3.7
Psychological Stress		
Normal	29	50.9
Mild	11	19.3
Moderate	16	28.1
Severe	1	1.8
Physical activity		
Very light	54	65.9
Light	17	20.7
Moderate	8	9.8
Vigorous	1	1.2
Very vigorous	2	2.4

Table 3 The Relationship between BMI, psychological stress, physical activity, and oligomenorrhea at Yasinat Islamic Boarding School

Independent Variables	Oligomenorrhea				p
	Yes		No		
	n	%	n	%	
Body mass index (BMI)					
18.5-25 kg/m²(Normal)	13	20.0	50	79.4	
<18.5 kg/m² (Underweight)	6	50.0	6	50.0	0.006
25.1-27 kg/m² (Overweight)	1	25.0	3	25.0	
>27 kg/m² (obese)	3	100	0	0	
Psychological Stress					
Normal	10	21.7	36	78.3	
Mild	5	27.8	13	72.2	
Moderate	8	47.1	9	52.9	0.227
Severe	0	0	1	100	
Physical activity					
Very light	15	27.8	39	72.2	
Light	4	23.5	13	76.5	
Moderate	4	50	4	50	0.516
Vigorous	0	0	1	100	
Very Vigorous	0	0	2	100	

DISCUSSION

1. Parents' role

Parents have a responsibility to provide early education to their children, this includes providing information about reproductive health to girls or young women. Young women have unique growth compared to young men, especially in the reproductive organs. The changes in young women can be very disturbing if they don't understand what they are going through. The role of parents in providing reproductive health information to adolescents such as menarche, the importance of maintaining cleanliness during menstruation, dating, free sex, abortion, early marriage, sexually transmitted diseases, pornography, drugs, alcohol, smoking and others will greatly assist adolescents in making decisions right in terms of reproductive health. Reproductive education for adolescents is very effective if it is provided by those closest to them such as parents and family members to prevent adolescent sexual deviant behavior (Maesaroh et al., 2020).

1. The relationship between Body mass index (BMI) and oligomenorrhea incidences in Yasinat Islamic Boarding School

This study is in line with a study by Dars et al. (2014), in five schools in Hyderabad, which shows that there is an influence of BMI on menstruation (p= 0. 001) which means it correlates with oligomenorrhea (menstrual cycle >35 days). This is also in line with a study by Novita (2018), at Al-Azhar High School Surabaya showing that BMI correlates with the incidence of oligomenorrhea (p=0.035). BMI is associated with body fat by checking the body mass index (BMI). BMI is often associated with nutritional status, poor nutritional status in adolescents can interfere with their reproductive system (Juliawan et al., 2022).

Women with high weight are more likely to have a high prevalence of oligomenorrhea incidence. Overnutrition in female adolescents triggers the hormone estrogen in the blood increases the amount of body fat. High levels of the hormone estrogen negatively affect the secretion of the GnRH which can inhibit the anterior pituitary from secreting the FSH. Inhibition of the secretion of the FSH disrupts follicular growth hence mature follicles are not formed. This is what underlies the mechanism of the duration of the menstrual cycle or the delay in menstruation. Female adolescents with less BMI will also experience hindrances with menstruation. Massive weight loss can lead to a decrease in gonadotropin hormones for the release of LH and FSH resulting in a decrease in estrogen levels thus negatively impacting the menstrual cycle and ovulation (Gil et al., 2009).

A further study showed that being overweight has a 15% chance of having a menstrual cycle of more than 35 days (Harlow and Matanoski, 1991). Being overweight is associated with increased estrogen levels through the conversion of peripheral androgens into estrogen specifically androstenedione in adipose tissue by-s aromatase (Siiteri, 1987). It is proven in a study by Harlow and Matanoski (1991) which showed that weight change (OR= 1.90) and overweight of 15% above the standard weight for height (OR= 1. 20) can be associated with the possibility of a long cycle or oligomenorrhea.

2. The Relationship between Psychological Stress and oligomenorrhea incidences in Yasinat Islamic Boarding School

The results of the Chi-Square test between psychological stress and oligomenorrhea incidence indicated that there was no significant relationship between psychological stress and oligomenorrhea (p= 0.227). This

is in line with a study by He et al. (2020), where stress levels are not related to the incidence of oligomenorrhea in adolescents in China. In contrast to the study conducted by Toduho et al. (2014) which indicated that there was a relationship between psychological stress and the incidence of oligomenorrhea in Tidore high school (p <0.001).

Stress can result in oligomenorrhea due to the stress state increasing CRH and AVP in the pituitary portal system, thus resulting in an increase in ACTH and an increase in cortisol secretion which results in menstrual cycle disorders, namely Oligomenorrhea. During acute stress, the amplitude and synchronization of CRH and AVP pulsations in the system's pituitary portal noticeably increase resulting in increased ACTH and increased cortisol secretion (Breen and Karsch, 2006). CRH plays an important role in inhibiting the secretion of GnRH during stress thereby suppressing reproductive hormones.

Differences in the results of this study can be due to the individual characteristics of the region, and different environments. In addition, oligomenorrhea can result from various factors such as menarche age (De Souza et al., 2010) , body mass index (BMI), and physical activity (De Souza et al., 2010). The results of Robertinson's study (2011) reveal that women who experience stress have twice the risk of experiencing a shortening of the menstrual cycle because each exposure to stress can reduce the menstrual cycle for 1 day of the average normal menstrual cycle experienced.

1. The Relationship between Physical Activity and Oligomenorrhea in Yasinat Islamic Boarding Schools

The results of the Chi-Square test between physical activity and the incidence of oligomenorrhea indicated that there was no significant relationship between physical activity and the incidence of oligomenorrhea in the Yasinat Islamic Boarding School (p= 0.516). From the measurement results in this study, it was discovered that the average subjects had a very light intensity of physical activity. It was because the subjects were still young students that the burden of physical activity carried out is still relatively light such as learning activities, light boarding school chores, and rest. This is in line with a study by Hidayah et al. (2016) at the Salafiyah Islamic Boarding School, Kauman Kamelang Regency in 2016 which discovered p= 0.228, which means it has no correlation or relationship between Physical activity and the incidence of oligomenorrhea. However, this is not in line with a study by Arum et al. (2019) at SMK Brebes in 2018 which indicated a p-value was 0.035 which meant that there was a relationship between physical activity and oligomenorrhea incidences. During fatigue will experience significant menstrual cycle changes between the follicular phase and the luteal phase According to a study at the time of fatigue, the follicular phase, and the luteal phase have a very long and irregular phase due to the suppression of the hormone GnRH so that the hormone estrogen decreases which disrupts the menstrual cycle (Pereir et al., 2020). Fatigue due to physical activity can increase levels of endorphins and dopamine, which can interfere with the pulse of gonadotropin-releasing hormone (GnRH), thereby inhibiting the production of follicle-stimulating hormone (FSH) that generates menstrual disorders (Rahayu et al. , 2021) .

The absence of a direct relationship between physical activity and the menstrual cycle can be due to the subject's activity load, which is mostly relatively light, and the occurrence of other factors that accompany physical activity in influencing the menstrual cycle. These factors include

abnormal nutritional status and insufficient nutrient intake.

AUTHOR CONTRIBUTION

In this study, Ashon Saadi and Silvi Dina collaborated to create a conceptual framework and research methodology. Silvi Dina Rosida collected data. Ashon Saadi, Silvi Dina Rosida, and Bambang Purwanto collaborated to analyze the data.

FUNDING AND SPONSORSHIP

The study was self-funded.

CONFLICT OF INTERESTS

There is no conflict of interest in this study.

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