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Relationship Between Obesity and Menstrual Cycle Disorders in Adolescent Girls at SMP Al-Izzah International Islamic Boarding School Batu in 2021

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ABSTRACT

Background: Results of the Riskesdas Nasional 2010 stated that as many as 13.7% of Indonesian women experienced menstrual cycle disorders. Menstrual cycle disorders in women, particularly in adolescent girls, needs special attention because they can have a long-term impact on their reproductive health. The most influential cause of menstrual cycle disorders is hormonal imbalance. This may be caused by several factors, including obesity. Therefore, this research is conducted to analyze the relationship between obesity and menstrual cycle disorders in adolescent girls. ***Method:*** This is observational analytic research with a cross-sectional research design. In 2021, 7th and 8th grade adolescent girls at SMP Al-Izzah International Islamic Boarding School Batu were sampled using the total sampling technique. A questionnaire with multiple questions about characteristics, nutritional status, and the menstrual cycle was used to gather the information needed for this research. ***Result:*** From a total of 202 respondents who filled out the research questionnaire, 19.8% were obese and 43.1% had menstrual cycle disorders. As many as 65% of 40 obese respondents suffered from menstrual cycle disorders. Hypothesis testing reveals a significant relationship between obesity and menstrual cycle disorders in adolescent girls ($p = 0.002$). ***Conclusion:*** Obesity influences the occurrence of menstrual cycle disorders in adolescent girls, and obese adolescent girls are up to 3.075 times more likely to have menstrual cycle disorders than non-obese adolescent girls.

Keywords: obesity; menstrual cycle disorders; adolescent girls

INTRODUCTION

Menstruation is a physiological condition characterized by the periodic release of blood and cell debris from the uterine mucosa at about 28-day intervals from menarche to menopause, except during birth and lactation [1]. Menstrual cycles are not always normal and regular, some women encounter menstrual cycle disorders. As many as 13.7% of Indonesian women aged 10-59 years had menstrual cycle disorders [2]. The disruption of the menstrual cycle, particularly in adolescent girls, deserves special attention since it might have long-term consequences for their reproductive health, such as an increased chance of infertility [3].

Hormonal imbalance is the most significant cause of menstrual cycle disorders [4]. This may be caused by several reasons, including obesity. Obesity is a condition in which the body accumulates excessive fat due to an imbalance between the quantity of incoming and outgoing energy [5].

Obesity in women influences the occurrence of menstrual cycle disorders through adipose tissue, which actively impacts the androgen-to-estrogen ratio [6]. Androgens are converted to estrogens in the granulosa cells of the ovaries and adipose tissue. Thus, the higher the percentage of body fat in women, the greater the amount of estrogen released [7]. If excessive estrogen is released, the feedback mechanism to FSH might be disturbed, preventing FSH from reaching peak levels. Consequently, follicular development is interrupted, which inhibits the regular ovulation process [8]. Eventually, this circumstance will disrupt the menstrual cycle.

Several similar studies have been conducted before, but the correlation between body composition and pubertal development, including the menstrual cycle is still quite controversial [9].

Understanding the connection between obesity and menstrual cycle disorders is crucial for women, particularly adolescent girls, so that they may be more concerned about the impact of obesity on their reproductive health and learn to improve their nutritional status. Therefore, we conducted this research to analyze the relationship between obesity and menstrual cycle disorders in adolescent girls.

METHOD

This research is an observational analytic kind and has a cross-sectional research design. The total sampling approach was utilized in this research's sampling. This research was carried out by concurrently collecting primary data using a questionnaire with multiple questions about characteristics, nutritional status, and menstrual cycle to determine if there is a connection between obesity and menstrual cycle disorders in adolescent girls at SMP Al-Izzah International Islamic Boarding School Batu in 2021. The collected data will be analyzed using the Chi-Square test, which will be processed using the IBM SPSS Statistics program.

RESULTS

Two hundred and two subjects who fulfilled the inclusion and exclusion criteria were selected as respondents in this research.

The characteristics of the respondents are provided in Table 1.

TABLE 1: Characteristics of Respondents.

Characteristics	Frequency (n)	Percentage (%)
Class		
7	103	51
8	99	49
Age		
12 years old	84	41.6
13 years old	92	45.5
14 years old	26	12.9
Menarche Age		
9 years old	5	2.5
10 years old	25	12.4
11 years old	99	49
12 years old	56	27.7
13 years old	14	6.9
14 years old	3	1.5

From a total of 202 respondents, 103 respondents (51%) came from 7th grade, while the remaining 99 respondents (49%) came from 8th grade. Respondents' ages varied from 12-14 years old, most were 13 years old and only a few were 14 years old. The average age of the respondents was 12.71 ± 0.68 years old. Respondent's menarche ages also varied from 9-14 years old, most were 11 years old and only a few were 14 years old. The average menarche age of the respondents was 11.29 ± 0.91 years old.

The nutritional status of respondents are provided in Table 2.

TABLE 2: Nutritional Status of Respondents.

Nutritional Status	Frequency (n)	Percentage (%)
Weight		
31-40 kg	44	21.8
41-50 kg	76	37.6
51-60 kg	45	22.3
61-70 kg	29	14.4
71-80 kg	8	3.9
Height		
140-144 cm	6	2.9
145-149 cm	28	13.9
150-154 cm	65	32.2
155-159 cm	58	28.7
160-164 cm	36	17.8
165-169 cm	9	4.5
BMI (kg/m2)		
<18,5	60	29.7
18,5-22,9	82	40.6
23,0-24,9	20	9.9
≥25,0	40	19.8
Obesity Prevalence		
Obese	40	19.8
Non-obese	162	80.2

Respondents' weight varied from 31-80 kg. Most respondents weighed 41-50 kg and only a few weighed 71-80 kg. The average weight of the respondents was 49.61 ± 10.99 kg. Respondents' height also varied from 140-169 cm. Most respondents had a height of 150-154 cm and only a few had a height of 140-144 cm. The average height of the respondents was 154.90 ± 5.76 cm. From a total of 202 respondents, only 82 respondents (40.6%) had normal nutritional status because they had a BMI of 18.5-22.9 kg/m^2, while the rest were underweight, overweight, or obese. In this research, obesity occurred in 40 respondents (19.8%).

The menstrual cycle of respondents is provided in Table 3.

TABLE 3: Menstrual Cycle of Respondents

Menstrual Cycle	Frequency (n)	Percentage (%)
Menstrual Cycle Disorders Prevalence		
Experienced menstrual cycle disorders	87	43.1
Did not experience menstrual cycle disorders	115	56.9
Menstrual Cycle Type		
Normal	115	56.9
Polymenorrhea	55	27.2
Oligomenorrhea	21	10.4
Secondary amenorrhea	11	5.5

From a total of 202 respondents, 115 respondents (56.9%) did not experience menstrual cycle disorders because they had a normal type of menstrual cycle, while the remaining 87 respondents (43.1%) experienced menstrual cycle disorders with details of 55 respondents (27.2%) had the polymenorrhea, 21 respondents (10.4%) had oligomenorrhea, and 11 respondents (5.5%) had secondary amenorrhea.

The relationship between obesity and menstrual cycle disorders of respondents are provided in Table 4.

TABLE 4: Relationship Between Obesity and Menstrual Cycle Disorders of Respondents.

Obesity Prevalence	Menstrual Cycle Disorders Prevalence		p-value	Odds Ratio
	Experienced menstrual cycle disorders	Did not experience menstrual cycle disorders		
Obese	26 (65%)	14 (35%)	0.002	3.075
Non-obese	61 (37.7%)	101 (62.3%)		

From 40 obese respondents, 26 respondents (65%) experienced menstrual cycle disorders, while the remaining 14 respondents (35%) did not. In sharp contrast, among non-obese respondents, 101 respondents (62.3%) did not experience menstrual cycle disorders, whereas 61 respondents (37.7%) did.

These statistics demonstrate that obesity experienced by adolescent girls at SMP Al-Izzah International Islamic Boarding School Batu is related to menstrual cycle disorders experienced by these adolescent girls. This result is supported by the findings which reveal that the value of p = 0.002 (<0.05), indicates that a significant relationship exists between obesity and menstrual cycle disorders. A 3.075 Odds Ratio value was also obtained, indicating that the risk of experiencing menstrual cycle disorders among obese adolescent girls is 3.075 times greater than among non-obese adolescent girls.

DISCUSSION

The results revealed that the number of respondents who were obese (19.8%) was less than a quarter of the number of respondents who were not (80.2%). However, this cannot be considered negligible because the number is substantially greater, nearly four to five times compared to the number of obese women in East Java Province, Indonesia, and in Indonesian Country. Results of the Riskesdas Provinsi Jawa Timur 2018 indicated that 5.11% of East Java Province, Indonesia women were obese. Meanwhile, the results of Riskesdas Nasional 2018 revealed a smaller number, 4.3% [10].

The results also revealed that a greater proportion of respondents (56.9%) did not experience menstrual cycle disorders, compared to those who did (43.1%). Periodically, the prevalence of menstrual cycle disorders among Indonesian women can be claimed to have risen. The Riskesdas Nasional 2010 results indicated that 13.7% of Indonesian women had menstrual cycle disorders [2]. Meanwhile, the results of this research conducted in 2021 reveal a significantly larger percentage. The ability to regulate body weight, frequency and intensity of physical exercise, stress levels, and sleep length have a substantial impact on the prevalence of menstrual cycle disorders in adolescent girls [11].

Polymenorrhea was the most prevalent menstrual cycle disorder among respondents in this research. It is common in the first gynecological years of a woman's life because of immature hypothalamic-pituitary-ovarian regulation [12]. Therefore, a bias may arise in this research because some of the respondents are just entering the first years of menstruation. In other words, the menstrual cycle disorders discovered in this research may be caused not just by obesity, but also by it.

Hypothesis testing indicates a substantial correlation between obesity and menstrual cycle disorders. This is proven by the <0.05 p-value, which equals 0.002. From the Odds Ratio value, it is also known that the risk of menstrual cycle disorders increases up to 3.075 times in obese adolescent girls compared to non-obese adolescent girls. This is in line with research undertaken on young Australian women, which indicated that obesity poses a 2.61-fold increased risk of menstrual cycle disorders [13].

In obese women, there is an excessive buildup of fat in the body, resulting in a high percentage of body fat. Adolescent obesity is largely driven by genetics and overeating. Obesity is also linked to inactive lifestyles and excessive time spent on social media, video gaming, and television. Adolescent obesity persists into adulthood, causing clinical problems and lowering life expectancy [14].

Obese women's excessive fat storage drives adipose tissue to produce aberrant hormones, including increased insulin secretion, free testosterone, androstenedione, and decreased SHBG [15]. Obesity causes insulin resistance syndrome, which initially enhances insulin secretion. Hyperinsulinemia improves sex steroid bioavailability by promoting androgen production in the ovarian stromal tissue, decreasing SHBG production in the liver, and increasing aromatase activity in adipocytes [16].

Obesity is associated with the aromatization of androgens into estrogen in the form of androstenedione by the aromatase enzyme, which results in the synthesis of estrogen. This process takes place in the granulosa cells of the ovaries and adipose tissue. The generation of estrogen from androgens will increase in proportion to a high percentage of body fat. Excess estrogen production interrupts the feedback loop to FSH, preventing FSH from reaching peak levels. As a result, follicular development is interrupted and the normal ovulation process will be inhibited [8]. Inefficient insulin metabolism lowers hepatic SHBG synthesis, which eventually raises free testosterone. In obese women, higher testosterone and estrogen in the form of free androstenedione and lower SHBG levels disrupt menstrual function and ovulation. This causes menstrual cycle disorders [15].

Researchers have only limited time to collect data for this research, which poses several limitations. The researcher was unable to personally measure the respondent's weight and height and observe the length of their menstrual cycle. Thus, this topic can only be answered by recollection. However, the school performs a monthly weight and height measurement program for its students. This allows respondents to answer weight and height questions based on their most recent measurements. Most respondents also record their menstruation dates monthly which helps them to answer menstrual cycle questions more properly.

CONCLUSIONS

According to this research, there is a significant relationship between obesity and menstrual cycle disorders in adolescent girls at SMP Al-Izzah International Islamic Boarding School Batu in 2021. Obesity also increases the prevalence of menstrual cycle disorders in adolescent girls by 3.075 times.

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