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Relationship Between Macronutrient Intake and Nutritional Status with The Menstrual Cycle for Class 11 Female Students in MAN Kota Surabaya

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ABSTRACT
The menstrual cycle can be influenced by several factors, one of which is nutritional status. A teenager with over nutritional status or obesity tends to have high testosterone levels which can trigger menstrual irregularities. The aim of this research was to determine the relationship between macronutrient intake and nutritional status of adolescents with the menstrual cycle in grade 11 students at MAN Surabaya City. This research is an analytical research using a cross-sectional study design conducted at MAN Surabaya City with a sample size of 67 people. The sample selection process was carried out using Proportional Random Sampling. Data on macronutrient intake results obtained from the SQ-FFQ interview in the last month and menstrual cycle regularity using a menstrual cycle history questionnaire for the last 3 months. The menstrual cycle and macronutrient intake are not related, according to the findings of statistical tests using the Spearman Rank Correlation test. There is a relationship between the menstrual cycle and the nutritional status of adolescents. Schools and community health centers are expected to work together to educate students about adequate macronutrient intake and meet the nutritional needs of adolescents.

Keywords: Macro Nutrient Intake, Nutritional Statues, Menstrual Cycle

INTRODUCTION

Adolescent is someone between the ages of 10 and 19 years. On the other hand, teenagers can also be described as young children who are between 15 and 24 years old and are going through puberty. One example of puberty that occurs in teenage girls is the start of menstruation[1,2]. Menstruation is defined as bleeding that regularly occurs during the menstrual cycle, flows from the uterus, and emerges through the vagina[3]. The menstrual cycle typically lasts between 21 and 35 days[3,4]. Adolescents from developed and developing countries that experienced economic growth between 2009 and 2017, the average age of menarche is estimated at 13 years[8].

Menstrual cycle irregularities in teenagers can occur due to unhealthy eating habits, and when a person's stomach condition is not good, they are likely to adopt unhealthy eating patterns, namely reducing food intake by eating at irregular times. This leads to the development of primary nutritional problems, the most common of which is menstrual cycle dysphoria in adolescent girls[5,8–10,17].

Menstruation can not only be influenced by macronutrient intake, but can also be influenced by the nutritional status of adolescents. The prevalence of adolescents aged 10-19 years who have menstruated in Surabaya City is 76.23%, while the total prevalence of adolescents aged 10-19 years in East Java Province is 73.58%. prevalence of nutritional status according to BMI/U in adolescents aged 6-18 years in the city of Surabaya who have very thin nutritional status of 1.39%, thin nutritional status of 6.63%, normal nutritional status of 74.22%, excess nutritional status body weight was 14.46% and obesity was 3.30%[12].

The hormonal system, which affects the metabolism of sexual hormones in the female reproductive system, including progesterone, estrogen, luteinizing hormone, and follicle stimulating hormone (FSH), a follicle growth hormone that causes irregularities, is linked to nutritional status. menstrual cycle in women[1,17].

RESEARCH METHOD

The research methodology is based on analytical observational cross-sectional methods. The study population comprised 67 randomly selected female grade 11 students from MAN kota Surabaya. Researchers require: 1). Class 11 student at MAN Surabaya City class XI, 2). Agree to be a respondent and fill out the questionnaire, 3). The student is in good health. Data for this research was collected using the SQ-FFQ approach using questionnaires and food consumption surveys conducted within one month. The data analysis procedure uses univariate and bivariate data analysis.

The nutritional status and macronutrient consumption of respondents were included in the univariate analysis of this study. also the menstrual cycle responds. The SQ-FFQ method for processing macronutrient intake analysis is carried out using the Nutrisurey program. Software used for univariate analysis to calculate average macronutrient intake using the SPSS program. This study uses the Spearman rank correlation test for bivariate analysis.

RESULT AND DISCUSSION

Table 1. Frequency distribution of respondent age and age of menarche among Class 11 MAN Kota Surabaya

Variable	Frequency (n)	Precntage (%)
Age		
<17 years old	18	26.8
17-18 years old	44	65.7
>18 years old	5	7.5
Menarche Age		
<12 years old	19	28.4
12-13 years old	39	58.2
>13 years old	9	13.4
Total	**67**	**100**

Source: Primary Data, 2024

According to the data above, the respondents' age range is as follows: <17 years, which results in 18 female students (26.8%); 17–18 years, which results in 44 female students (65.7%); >18 years, which results in 5 female students (7.5%); and the respondents' age at first menstruation, which is <12 years, which results in 19 female students (28.4%); 12–13 years, which indicates 39 female students (58.2%); and >13 years, which results in 10 female students (13.4%).

Table 2. Frequency distribution of consumption levels of macronutrient intake for Class 11 Female Students at MAN Kota Surabaya

Energy			Protein		
Variable	**Frequency (n)**	**Precntage (%)**	**Variable**	**Frequency (n)**	**Precntage (%)**
Over	0	0	Over	2	3
Normal	15	22.4	Normal	14	20.9
Not enough	46	68.6	Not enough	45	67.1
Very not enough	6	9	Very not enough	6	9
Amount	**67**	**100**	**Amount**	**67**	**100**
Protein			**Carbohydrate**		
Over	12	17.9	Over	0	0
Normal	14	20.9	Normal	10	14.9
Not enough	31	46.3	Not enough	54	80.6
Very not enough	10	14.9	Very not enough	3	4.5

Amount	67	100	Amount	67	100

Source: Primary Data, 2024

From the data above, the level of energy intake among respondents is that 15 female students (22.4%) are in the normal category, 46 female students (68.6%) are in the insufficient category and 6 female students (9%) are in the very poor category.

The level of protein intake among respondents, namely 2 female students (3%) were in the more category, 14 female students (20.9%) were in the normal category, 46 female students (67.1%) were in the less category and 6 female students (9%) were in the less category. in the very poor category.

The level of fat intake among respondents was 12 female students (17.9%) in the more category, 14 female students (20.9%) in the normal category, 31 female students (46.3%) in the less category and 10 female students (14, 3%) 9%) falls into the very poor category.

The level of carbohydrate intake among respondents, namely 10 female students (14.9%) were in the normal category, 54 female students (80.6%) were in the insufficient category and 3 female students (4.5%) were in the very poor category.

Table 3. Frequency distribution of nutritional status of respondents in Class 11 students at MAN Kota Surabaya

Variable	Frequency (n)	Precntage (%)
Nutritional Status		
Malnutrition	5	7.8
Normal	41	60.3
Overweight	16	24.1
Obbesity	5	7.8
Amount	**67**	**100**

Source: Primary Data, 2024

From the data above, 5 students (7.8%) fall into the undernourished category, 41 students have normal nutritional status (60.3%), 16 students have overnutrition (24.1%) and 5 students are obese (5). 7.8%).

Table 4. Frequency distribution of respondents' menstrual cycles and age of menarche among Class 11 female students at MAN Kota Surabaya

Variable	Frequency (n)	Precntage (%)
Menstrual cycle		
Regular	30	44.8
Irregular	37	55.2
Amount	**67**	**100**

Source: Primary Data, 2024

From the data above, the menstrual cycle of the respondents. There were 30 students who had regular menstrual cycles (44.8%), and 37 female students who had irregular menstrual cycles (55.2%).

Table 5. Cross Tabulation of Energy Intake with Menstrual Cycle in Class 11 Female Students at MAN Kota Surabaya

Adequate Energy Intake	Menstrual Cycle				Amount	%	P
	Regular		Irregular				
	n	%	n	%			
Over	0	0	0	0	0	100	
Normal	6	8.9	9	13.4	15	100	
Not enough	29	43.2	17	25.5	46	100	0.587
Very not enough	2	2.9	4	5.9	6	100	
Amount	**37**	**55**	**30**	**45**	**67**	**100**	

Source: Primary Data, 2024

The majority of respondents who experienced menstrual cycle irregularities

fell into the category of inadequate consumption, namely 17 female students (25.5%). According to the research results, there is no significant correlation between the level of energy adequacy and the menstrual cycle, with a p value of 0.587>0.05.

Table 6. Cross Tabulation of Protein Intake and Menstrual Cycle in Class 11 Female Students at MAN Kota Surabaya

Adequate Protein Intake	MenstruaL Cycle				Amount	%	P
	Regular		Irregular				
	n	%	n	%			
Over	0	0	2	3	2	100	
Normal	8	11.9	6	8.95	14	100	
Not enough	27	40.3	18	26.8	45	100	1
Very not enough	2	3	4	6	6	100	
Amount	**30**	**55.25**	**38**	**44.75**	**67**	**100**	

Source: Primary Data, 2024

The majority of respondents who experienced menstrual cycle irregularities fell into the category of inadequate consumption, namely 18 female students (26.8%). The test results show that the p value is 1>0.05, which means there is no significant relationship between the level of adequate protein consumption and the menstrual cycle.

Table 7. Cross Tabulation of Fat Intake and Menstrual Cycle in Class 11 Female Students at MAN Kota Surabaya

Adequate Fat Intake	MenstruaL Cycle				Amount	%	P
	Regular		Irregular				
	n	%	n	%			
Over	5	7.46	7	10.4	13	100	
Normal	5	7.46	9	13.4	14	100	
Not enough	23	34.3	8	11.9	31	100	0.241
Very not enough	4	6	6	9	10	100	
Amount	**38**	**55.3**	**30**	**44.7**	**67**	**100**	

Source: Primary Data, 2024

The majority of respondents who experienced menstrual cycle irregularities fell into the normal consumption adequacy category, namely 9 female students (13.4%). There is no significant relationship between the level of adequate fat consumption and the menstrual cycle, according to the research results, with a p value of 0.241-0.05.

Table 8. Cross Tabulation of Carbohydrate Intake with the Menstrual Cycle in Class 11 Female Students at MAN Kota Surabaya

Adequate Carbohydrate Intake	MenstruaL Cycle				Amount	%	P
	Regular		Irregular				
	n	%	n	%			
Over	0	0	0	0	0	100	0.971
Normal	5	7.5	5	7.5	10	100	

Not enough	31	46.2	23	34.3	54	100
Very not enough	1	1.5	2	3	3	100
Amount	**38**	**55.2**	**30**	**44.8**	**67**	**100**

Source: Primary Data, 2024

The majority of respondents who experienced menstrual cycle irregularities fell into the category of inadequate consumption, namely 23 female students (34.3%). There is no significant relationship between adequate levels of carbohydrate consumption and the menstrual cycle, according to the research results, with a p value of 0.971 > 0.05.

Table 9. Cross Tabulation of Carbohydrate Intake with the Menstrual Cycle in Class 11 Female Students at MAN Kota Surabaya

Nutritional Status	MenstruaL Cycle				Amount	%	P
	Regular		irregular				
	n	%	n	%			
Malnutrition	2	3	3	4.5	5	100	
Normal	29	43.3	12	17.9	41	100	
Overweight	3	4.5	13	19.4	16	100	0.042
Obbesity	3	4.5	2	3	5	100	
Amount	**30**	**55.3**	**37**	**44.7**	**67**	**100**	

Source: Primary Data, 2024

The majority of respondents who experienced irregular menstrual cycles had higher nutritional status, 13 female students (19.4%). The results of the study showed that there was a relationship between nutritional status and the menstrual cycle of class 11 female students at MAN kota Surabaya, with a p value of 0.042 <0.05.

Cracteristice Responden of Class 11 Female Students at MAN Kota Surabaya

Based on the research results above, 67 female students were selected as respondents, the majority of respondents were 44 female students (65.7%). The respondent's age is still in the teenager category because a teenager is someone aged between 10-19 years. Meanwhile, according to terminology, teenagers can be defined as young people aged 15-24 years[1].

Macro Nutrient Intake of Class 11 Female Students at MAN Kota Surabaya

SQ-FFQ questionnaire interviews during the last month, the majority of MAN kota Surabaya female students still do not vary their meals when eating and only consume their favorite foods and with little frequency. The results showed that the average level of energy consumption among respondents was in the less category, namely 46 female students (68.7%), the average level of protein consumption among respondents was in the less category, namely 45 female students (67.2%), the average Fat consumption among respondents was in the less category, namely 31 female students (46.3%) and the average carbohydrate consumption among respondents was in the less category, namely 54 female students (80.6%).

Nutritional Status of Class 11 Female Students at MAN Kota Surabaya

Nutritional status is a measure of success in efforts to fulfill nutritional needs and the use of nutrients to achieve ideal body weight and height. Protein is used to build, regulate and supply energy to other molecules[3,14–16]. The indicators for determining the nutritional status of adolescents are BMI or body mass index and upper arm circumference and it is said that young women have chronic energy deficiency (CED) if the upper arm circumference is <23.5 cm[15,16].

The majority of class 11 female students at MAN Surabaya City fall into the normal nutritional status category because students do physical activities, namely sports and school extracurriculars, for example badminton, dancing, etc.

Menstrual cycle of grade 11 students at MAN Kota Surabaya

Menstruation is bleeding that occurs in the uterus, flows from the uterus, and comes out through the vagina regularly according to the menstrual cycle. The length of a normal menstrual cycle is 28 days, but this is not the same for each individual[4,18]. The menstrual cycle can be influenced by a person's nutritional level. Body mass index (BMI) can be used to determine a person's nutritional level. A high BMI can cause menstrual irregularities and menstrual cycle disorders[15]. Young women are expected to understand menstrual patterns and factors that can cause irregularities in the menstrual cycle[19].

The relationship between macronutrient intake and the menstrual cycle of Class 11 female students at MAN Kota Surabaya

In this study, it was found that the majority of respondents had a pattern of eating twice a day. This can happen because of the respondent's perception or body image[20]. There is a relationship between carbohydrate and calorie intake in the luteal phase, protein intake and the length of the follicular phase, as well as fat intake and reproductive hormones. In the luteal phase there is an increase in food intake, if carbohydrate intake then the luteal phase will be normal. However, if teenagers consume fast food more often, the macro and micro nutrient content will be unbalanced. Excessive accumulation of macronutrients will eventually be converted into fat which is stored in the body. If fat stores are high, the menstrual cycle will be disrupted because there is an increase in estrogen levels in the body[12,20,21].

In class 11 students at MAN kota Surabaya, there was no significant correlation between macronutrient intake and the menstrual cycle. The p value for the level of energy consumption is 0.587 greater than 0.05, the p value for the level of protein consumption is 1>0.05, the p value for the level of fat consumption is 0.241> 0.05, and the p value for the level of carbohydrate consumption is 0.971 > 0.05. This research is in line with research by Septian et al., (2017) Other factors that can cause menstrual disorders are stress and physical activity. Studies on vegetarian women found that there was no significant correlation between macronutrient intake and menstrual cycle, with a p value > 0.05[20].

The Relationship Between Nutritional Status and Menstrual Cycle of Class 11 Female Students at MAN Kota Surabaya

The menstrual cycle can be influenced by the nutritional status of each individual, this happens because women with thin nutritional status, fat tissue which is a source of low estrogen will also produce low estrogen and this can cause disruption to the menstrual cycle. If women have more nutritional status, the fat tissue which is a source of estrogen will increase or be high. This has outlined the factors that can cause menstrual cycle disorders[6,11].

In research, grade 11 students at MAN kota Surabaya showed a relationship between nutritional status and the menstrual cycle, according to the results of the analysis, with a p value of 0.042 <0.05. According to the body's use of nutrients and the amount of food consumed, a person's nutritional status is referred to as nutritional status. Undernutrition status, normal nutritional status, and overnutrition status indicate a balance between energy entered and released by the body[22].

The research carried out was in line with research by Ambariani et al (2020) Midwifery students at Gunadarma University Depok found a relationship between their nutritional status and their menstrual cycle, with a p value of 0.012 less than 0.05[22].

CONCLUSION

Grade 11 female students at MAN Surabaya City had the highest average level of energy consumption among respondents in the less category, namely 47 female students (69.1%), the average level of protein consumption among the highest respondents was in the less category, namely 45 female students (67.2%), the average fat consumption of the highest number of respondents was in the less category, namely 31 female students (46.3%) and the average carbohydrate consumption of the highest respondents was in the less category, namely 54 female students (80.6%).

Grade 11 students at MAN Surabaya City on average have normal nutritional status as many as 41 students (61.2%). On average, 37 students (55.2%) of class 11 students at MAN Surabaya City have an irregular menstrual cycle.

In class 11 students at MAN Surabaya City, there was no significant correlation between macronutrient intake and the menstrual cycle. The p value for the level of energy consumption is 0.587>0.05, the p value for the level of protein consumption is 1>0.05, the p value for the level of fat consumption is 0.241>0.05, and the p value for the level of carbohydrate consumption is 0.971>0. .05 In grade 11 female students at MAN Surabaya City, there was a significant correlation between nutritional status and menstrual cycle, with a p value of 0.042, less than 0.05.

It is recommended that MAN Surabaya City work together with the Community Health Center to hold educational or counseling activities for grade 11 pupils and students about proper eating patterns. It is hoped that young women will pay more attention to their nutritional status so that they do not suffer from health problems. It is hoped that additional research will be conducted on variables related to the menstrual cycle such as stress levels, physical activity and heredity.

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