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RESEARCH STUDY Open Access

Hubungan Pola Makan dan Aktivitas Fisik dengan Status Gizi pada Remaja di SMA Muhammadiyah 7 Sutorejo Surabaya

The Relation Between Diet and Physical Activity with Nutritional Status in Adolescents at Muhammadiyah 7 SMA Sutorejo Surabaya

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ABSTRAK

Latar Belakang: Masalah gizi pada remaja masih terjadi di Indonesia, khususnya di Jawa Timur. Menurut Riskesdas 2018, status gizi dengan indeks IMT/U pada remaja usia 16-18 tahun di provinsi ini masih tinggi, dengan prevalensi status gizi kurus 6,8%, gemuk 11,3% dan obesitas 5,1%. Proses pertumbuhan dan perkembangan pada masa remaja yang terjadi secara cepat menyebabkan peningkatan kebutuhan energi dan zat gizi. Jika hal ini tidak terpenuhi maka akan timbul masalah gizi.
Tujuan: Tujuan penelitian ini untuk menganalisis hubungan pola makan, dan aktivitas fisik dengan gizi lebih pada remaja di SMA Muhammadiyah 7 Sutorejo, Surabaya.
Metode: Jenis penelitian ini adalah observasional dengan desain *cross-sectional*. Sampel pada penelitian ini berjumlah 36 orang diambil dengan teknik *simple random sampling*. Pengumpulan data dilakukan melalui wawancara dengan menggunakan *food frequency questionnaire* (FFQ), *food recall* 2x24 jam, kuesioner *recall* aktivitas fisik 2x24 jam dan pengukuran antropometri untuk mengetahui Berat Badan dan Tinggi Badan. Analisis data menggunakan uji *chi-square* melalui program IBM SPSS Statistics v23.
Hasil: Hasil penelitian menunjukkan bahwa sebagian besar responden memiliki status gizi normal (77%), namun prevalensi status gizi gemuk masih tergolong tinggi (14,8%). Terdapat hubungan antara kecukupan energi (p=0,03), karbohidrat (p=0,000), protein (p=0,04) dan lemak (p=0,04), serta aktivitas fisik (p=0,041) dengan status gizi siswi.
Kesimpulan: penelitian ini adalah terdapat hubunan antara kecukupan zat gizi dan aktivitas fisik dengan status gizi siswi. Diharapkan responden dapat selalu menjaga berat badan idealnya dan salahsatunya dengan menambah aktivitas fisik.

Kata kunci: masalah gizi, pola makan, aktivitas fisik, status gizi, remaja

ABSTRACT

Background: *Nutritional problems in adolescents still occur in Indonesia, especially in East Java. According to Riskesdas 2018, nutritional status with an index BMI to age in adolescents aged 16-18 years in this province is still high, with a prevalence of 6.8% underweight, 11.3% overweight and 5.1% obesity. The process of growth and development in adolescence that occurs rapidly causes an increase in the need for energy and nutrients. If this's not met then there will be nutritional problems.*
Objectives: *to analyze the relationship between diet and physical activity with over nutrition in adolescents at SMA Muhammadiyah 7 Sutorejo, Surabaya.*
Methods: *This research is observational with a cross-sectional design. The sample in this study amounted to 36 people taken by simple random sampling technique. Data was collected through interviews using a food frequency questionnaire (FFQ), food recall 2x24 hours, physical activity recall questionnaire 2x24 hours and anthropometric*

measurements to determine weight and height. Data analysis used chi-square test through IBM SPSS Statistics v23 program
Results: *that most of the respondents had normal nutritional status (77%), but the prevalence of obese nutritional status was still high (14.8%). There is a relationship between energy adequacy (p=0.03), carbohydrates (p=0.000), protein (p=0.04) and fat (p=0.04), and physical activity (p=0.041) with the nutritional status of female students.*
Conclusions: *there is a relationship between nutritional adequacy and physical activity with the nutritional status of female students. It is expected that respondents can always maintain their ideal body weight and one of them is by increasing physical activity.*

Keywords: *nutritional problems, diet, physical activity, nutritional status, adolescents*

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INTRODUCTION

Adolescence is a developmental transition from childhood to adulthood, which involves biological, cognitive and socioemotional changes, which starts from the age range of 10 to 13 years and ends at the age of about 18 to 22 years (Santrock, 2013). Biological changes that occur during adolescence include an increase in height, weight gain, changes in body composition and accumulation of bone mass (Brown, 2016). The process of growth and development in adolescence occurs rapidly, causing an increase in the need for energy and nutrients. Therefore, if this is not met, there will be nutritional problems. One of the causes of changes in body weight is exposure to mass media and the internet (Brown and Tiggemann, 2016; Fardouly and Vartanian, 2016; Steinberg, 2014).

Nutritional problems, especially overnutrition and undernutrition in adolescents, still occur in Indonesia, especially East Java (Kemenkes RI, 2018). Nationally, there has been a decrease in the prevalence of undernutrition in adolescents aged 16-18 years, but the prevalence of overnutrition in the same population has increased. Riskesdas 2013 recorded 1.9% very thin and 7.5% thin; while Riskesdas 2018 recorded 1.4% very thin and 6.7% thin. Riskesdas 2013 recorded 5.7% obese and 1.6% obese; while Riskesdas 2018 recorded 9.5%. When compared with the national average, the prevalence of underweight and obese is still relatively high among adolescents in East Java. According to Riskesdas 2018, nutritional status as measured by the BMI/U index in adolescents aged 16-18 years in East Java is still high, with 6.8% thin nutritional status, 11.

Good nutritional status will contribute to health, while nutritional problems can cause several negative impacts. The nutritional status of obesity in adolescents is a serious problem because it can continue into adulthood and is a risk factor for degenerative diseases, such as cardiovascular disease, diabetes mellitus (DM), arthritis, gallbladder disease, cancer, respiratory function disorders, and various skin disorders. Poor nutritional status will increase the risk of disease, especially infectious diseases(Almatsier, 2010).

Diet in adolescents can be influenced by various factors. Research conducted bySon (2017)on students of SMAN 5 Surabaya showed a relationship between diet and overnutrition. Diet in adolescents can be influenced by various factors (Putra, 2017). StudySusanti (2010), also supports a significant relationship between the amount of pocket money, the habit of consuming fast food with the incidence of overweight and obesity in students of SMA Negeri 2 Jember. A person's decision to consume a food is usually influenced by the preference factor and the amount of pocket money. The bigger the pocket money the child has, the greater the opportunity to consume a variety of favorite foods.

Research Rokhmah, et al. (2016) at a Christian school in Surabaya showed that nutrition was more significantly related to the level of energy adequacy and macronutrients. The majority of adolescents who are over-nourished have a higher level of energy and macronutrient adequacy than the daily adequacy.

This study examines the relationship between diet and physical activity with nutritional status in adolescents at SMA Muhammadiyah 7 Surabaya.

METHODS

This research is an analytical observational study with a cross sectional study approach. This study uses a retrospective approach, namely data collection on the dependent variable (effect) and identification which is then

followed by measurement of the dependent variable (cause). The population in this study was class XI and XII students at SMA Muhammadiyah 7 Surabaya, Mulyorejo District in the 2020/2021 academic year totaling 127 students. The samples included in this study were part of the selected population, namely students of class XI and XII at SMA Muhammadiyah 7 Surabaya, Mulyorejo District in the 2020/2021 academic year.

The minimum sample size is calculated by the sample size formula in the same standard normal distribution with the level of significance (Z score = 1.96) the probability of error (d = 10%). Based on the results of calculations with the formula, the required sample is 36 people. Sampling of 36 people was done by simple random sampling method. This method is carried out by lottery from a population of 127 students so that each toddler gets the same opportunity to be the research sample. This technique is done in order to generalize the problem.

The dependent variable in this study is nutritional status, while the independent variables are diet, nutritional adequacy and physical activity. The types of data collected are primary data and secondary data as supporting data. Primary data were obtained through interviews using questionnaires to students. More nutritional status was obtained by measuring height using a microtoise with an accuracy of 0.1 cm and body weight using a digital scale with an accuracy of 0.01 kg.

This research has received an ethical certificate that has been approved by the ethics committee of the Faculty of Dentistry, Airlangga University with the number: 015/HRECC.FODM/I/2021. This research conducted inclass XI and XII at SMA Muhammadiyah 7 Surabaya, Mulyorejo District in the 2020/2021 academic year in February 2021. Data analysis was carried out to see the relationship between variables and the value of the correlation coefficient (r) using the Spearman correlation test with a 95% confidence level ($\alpha = 0.05\%$).

RESULTS AND DISCUSSION

Characteristics of Respondents

Table 1 shows that the majority of adolescents are aged 17-18 years (4.2%). In addition, most of the teenagers' pocket money is in the middle class, ranging from Rp. 10,000-15,000 (52.8%). Regarding pocket money for teenagers. Respondents with a minimum (Rp. 10,000) and maximum (Rp. 20,000) per day can reach food in the form of side dishes and so on which are available in the school canteen and outside the school, although in different types and quantities.

The large amount of pocket money plays a role in respondents' access to food and beverages. According to Rosyidah & Andrias (2015) pocket money affects access to food. Respondents with larger pocket money have easier access to food. In addition to influencing access to food, the amount of pocket money also plays a role in food selection.

Research by Fadhilah, et al (2018) shows that the amount of pocket money affects food choices. In this study, respondents have a tendency to use pocket money to buy sweet foods and drinks.

Table 1. Characteristics of Respondents

Characteristics of Respondents	n	(%)
Respondent Age		
16-17 Years	14	38.9
17-18 Years	17	47.2
18-19 Years	5	13.9
Pocket money		
Low (<Rp.10,000.00)	10	27.8
Medium (Rp. 10,000.00-15,000.00)	19	52.8
High (>Rp. 20,000.00)	7	19.4

Dietary habit

According to table 2, respondents have a fairly diverse diet. In staple food, the type of food consumed by respondents the most is rice (88.8%) in daily frequency; types of side dishes, namely chicken with a daily frequency (88.8%) and chicken eggs at a weekly frequency (69.4%); types of vegetables, namely soup on a weekly frequency (50%); types of fruit, namely apples for daily frequency (44.4%) and mangoes on weekly frequency (83.3%), and various kinds of pentols on daily frequency (88.8%) and snacks on weekly frequency (36.5%).

The staple food group that is significantly consumed by respondents with a daily meal frequency is rice. Rice is consumed every day by almost all respondents because rice is a staple food in Indonesia. Rice as a staple

food is one of the sources of carbohydrates. One gram of carbohydrates contributes 4 kcal of energy (Almatsier, 2010). Vegetables and fruit should be consumed every day because they are a source of vitamins, minerals and fiber (Withney & Rolfes, 2008). According to Cruz-Requena, et al. (2016) consumption of adequate amounts of fiber can help control body weight, control fat and triglyceride levels, and can cause a feeling of fullness for longer so as to reduce food consumption.

Table 2. Respondent's Diet

Food Type	Quantity and Frequency							
	Daily		Weekly		Monthly		Never	
	n	%	n	%	n	%	n	%
Staple food								
Rice	32	88.8	4	11.1	0	0.0	0	0.0
Bread	15	41.6	2	5.1	13	17.3	6	16.6
Noodles	24	66.6	4	11.1	0	0	8	22.2
Cereals	2	5.1	4	11.1	0	0	30	83.3
Other	0	0.0	0	0.0	0	0.0	0	0.0
Side dishes								
Know	23	63.8	6	16.6	4	11.1	3	8.3
Tempe	26	72.2	10	27.7	0	0.0	0	0.0
Chicken eggs	10	27.7	25	69.4	0	0.0	1	2.7
Chicken	32	88.8	0	0.0	3	8.3	1	2.7
mujaer fish	6	16.6	19	52.7	1	2.7	10	27.7
Other	0	0.0	0	0.0	0	0.0	0	0.0
Vegetables								
Kale	10	27.7	2	5.1	10	27.7	0	0.0
Soup	14	38.8	18	50.0	0	0	8	22.2
Spinach	5	13.8	1	2.7	0	0	30	83.3
Other	0	0.0	0	0.0	0	0.0	0	0.0
Fruits								
Apple	16	44.4	15	41.6	0	0	5	13.8
Mango	10	27.7	30	83.3	0	0	6	16.6
Banana	0	0	0	0	16	16.6	20	55.5
Other	0	0.0	0	0.0	0	0.0	0	0.0
Miscellaneous								
Meatball	32	88.8	4	11.1	0	0	0	0
Fried food	26	72.2	4	11.1	0	0	6	16.6
Shrimp crisp	26	72.2	10	27.7	0	0	0	0
Snack	13	36.5	13	36.5	5	13.8	5	13.8
Sweet Drink	32	88.8	1	2.7	3	8.3	0	0
Other	0	0.0	0	0.0	0	0.0	0	0.0

Adequacy of Nutrients

In table 3, it can be concluded that the nutritional adequacy of many respondents is lacking in each type of nutrient.

Adequacy of nutrients is considered sufficient if it has met 77% of the nutritional needs (Gibson, 2005). The results showed that the level of insufficient energy and nutrients of the respondents was very high. This insufficiency rate is much higher than the level of nutritional adequacy in urban areas of East Java province according to the 2014 Total Diet Study, which has an average energy adequacy of 73.9±29.3% and an average protein adequacy of 90.5 ± 45.5% in adolescent girls aged 13-18 years.

Table 3. Distribution of Adequate Nutrients

Nutrients	Enough		Not enough	
	n	%	n	%
Energy (kcal)	14	38.9	22	61.1

Carbohydrates (grams)	6	16.7	30	83.3
Protein (grams)	12	33.4	24	66.6
Fat (grams)	17	47.2	19	52.8

The low energy and protein intake of the respondents may occur because most of the respondents skip breakfast and several other hours of eating. The habit of skipping meals is very common in teenagers. This habit is correlated with a low amount of energy intake and various essential nutrients, which can inhibit sexual growth and development in adolescents (Brown, 2016).

Physical Activity

In table 4, it can be concluded that the level of physical activity of most respondents is in the heavy category (38.8%) but only 1 difference in frequency with the number of respondents who have light physical activity (36.2%). This shows an even proportion in each level of physical activity (mild-moderate-severe) in female respondents at SMA Muhammadiyah 7 Sutorejo Surabaya, with a slight difference in the light and heavy levels, making most of the students physically active.

Table 4. Distribution of Physical Activity

Physical Activity Level	n	(%)
Light	13	36.2
Currently	9	25
Heavy	14	38.8

Nutritional status

The results showed that most of the respondents had normal nutritional status, but they still had problems with the nutritional status of obesity. Respondents with normal nutritional status are the largest, the number is similar to the prevalence of normal nutritional status in adolescents aged 16-19 years in East Java province and is close to the national average based onRiskesdas 2018 (Kemenkes RI, 2018).

Table 5. Distribution of Nutritional Status (Weight, Height and Z-score BMI/U)

Nutritional status	Frequency (n)	Percentage (%)
Very thin	1	1.6
Thin	3	4.9
Normal	47	77
Fat	9	14.8
Obesity	1	1.6

There are only a few respondents with obese nutritional status, however, the figure is higher than the prevalence of obese nutritional status in adolescents aged 16-19 years in East Java province and much higher than the national average according to the results of the 2018 Reskesdas.. Thus, it can be concluded that there are still nutritional problems in SMA Muhammadiyah 7 Surabaya students.

Relationship between Nutritional Adequacy and Nutritional Status

Table 6. Relationship between Nutritional Adequacy and Nutritional Status

Nutritional Adequacy Level	Nutritional status										*p-value*	OR1	OR2
	Very thin		Thin		Normal		Fat		Obesity				
	n	%	n	%	n	%	n	%	n	%			
Energy													
Enough	1	2.8	0	0	8	22.2	4	11.1	1	2.8	0.03	6,831	3,900
Not enough	0	0	3	8.3	14	38.8	5	13.8	0	0			
Carbohydrate													
Enough	1	2.8	0	0	2	5.6	2	5.6	1	2.8	0.000	7,215	6,429

Not enough	0	0	3	8.3	20	55.6	7	19.4	0	0			
Protein													
Enough	1	2.8	0	0	5	13.8	5	13.8	1	2.8	0.04	1.007	4.091
Not enough	0	0	3	8.3	17	47.2	4	11.1	0	0			
Fat													
Enough	1	2.8	0	0	10	27.7	5	13.8	1	2.8	0.04	9,827	6,176
Not enough	0	0	3	8.3	12	33.4	4	11.1	0	0			

Information.
OR1: Odd Ratio of Underweight Nutritional Status
OR2: Odd Ratio of Fat Nutritional Status

Based on table 6, the OR value is obtained from the results of multinomial regression analysis. There is an OR1 number, it can be concluded that students who have adequate energy, carbohydrates, protein and fat below optimal or less, have a risk of 6.8 times, 7.2 times, 1.007 times, and 9.8 times higher, respectively. to experience underweight nutritional status. Meanwhile, based on the OR2 number, it can be concluded that students who have optimal adequacy of energy, carbohydrates, protein and fat, have a lower risk of 3.9 times, 6.4 times, 4.9 times, and 6.1 times, respectively. to have an obese nutritional status.

The results showed that most of the students with normal nutritional status and all students with underweight and very thin nutritional status had below optimal nutritional adequacy. The results of the chi-square test showed a significant relationship on energy, carbohydrates, protein and fat with the nutritional status of female students of SMA Muhammadiyah 7 Surabaya. The same result was also found that there was a significant relationship between the adequacy of energy, carbohydrates, protein and fat with the nutritional status of students at SMA Negeri 63 Jakarta (Savitri, 2015). Likewise other studies which state that there is a significant relationship between nutritional adequacy and nutritional status of adolescent girls. It is highly recommended for students to maintain a balanced nutritional diet in order to maintain and achieve normal nutritional status (Nugroho, 2018).

Relationship of Physical Activity with Nutritional Status

Table 6. Relationship of Physical Activity with Nutritional Status

Physical Activity	**Nutritional status**												***p-value***	**OR1, OR2**	**OR3, OR4**
	Very thin		**Thin**		**Normal**		**Fat**		**Obesity**		**Total**				
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Light	0	0	0	0	6	16.7	6	16.7	1	2.8	13	36.2		2,149	5,250
Currently	1	2.8	1	2.8	7	19.4	0	0	0	0	9	25	0.041	0.529	4,957
Heavy	0	0	2	5.6	9	25	3	8.3	0	0	14	38.8			

Description:
OR1: Odd Ratio of Underweight Nutritional Status and Light Physical Activity
OR2: Odd Ratio of Underweight Nutritional Status and Moderate Physical Activity
OR3: Odd Ratio Fat Nutrition Status and Light Physical Activity
OR4: Odd Ratio of Fat Nutrition Status and Moderate Physical Activity

Based on Table 6, respondents who have a light physical activity level have a 2,149 times lower risk of experiencing underweight nutritional status, but have a 5.25 times higher risk of being overweight, compared to respondents who have a moderate level of physical activity. Respondents who have a high level of physical activity have a 0.529 times higher risk of experiencing underweight nutritional status and 4.9 times lower risk of being overweight.

The results of statistical tests showed that there was a significant relationship between physical activity and nutritional status in female students of SMA Muhammadiyah 7 Surabaya. This is in line with research bySerly, et al (2014)and Khasanah, et al (2016) who found similar results between physical activity and nutritional status in adolescent girls. Physical activity is one of the determinants of a person's nutritional status. Low physical activity and high sedentary behavior are risk factors for obesity (Peltzer & Pengpid, 2015). While obesity itself can increase the risk of various types of non-communicable diseases such as type 2 diabetes mellitus and coronary heart

disease(Lavie, et al, 2019),as well as several types of cancer such as breast cancer, lung cancer, colon cancer, and ovarian cancer.

Since the COVID-19 outbreak, self-isolation as an effort to limit physical interaction has been carried out in order to break the chain of spreading the virus. Self-isolation is considered effective in reducing the spread of the virus, but at the same time as public fear during a pandemic(Silva, et al, 2017), associated with decreased mental health status which may increase symptoms of stress and depression during the pandemic (Brooks et al., 2020; Wang et al., 2020). Meanwhile, physical activity was found to be negatively correlated with stress levels (Schuch, et al, 2021).

Those who do light-moderate physical activity for at least 30 minutes/day or vigorous physical activity for at least 15 minutes/day have a lower risk of experiencing stress or depression symptoms, while those who have sedentary behavior are more likely to experience depressive symptoms (Schuch , et al, 2021).

Most of the students with overweight and obese nutritional status have low levels of physical activity, this may be because they do too much sedentary behavior. Sedentary behavior in question is spending more than eight hours just sitting and lying down. Those who engage in more sedentary behavior are more likely to experience depressive symptoms, while those who engage in light-moderate physical activity for at least 30 minutes/day or vigorous physical activity for at least 15 minutes/day are at lower risk for experiencing symptoms of stress or depression (Schuch, et al, 2021).

CONCLUSION

The conclusion of this study is that most of the respondents have normal nutritional status, but the prevalence of obese nutritional status is still relatively high. In addition, there is a significant relationship between nutritional adequacy and physical activity with the nutritional status of students of SMA Muhammadiyah 7 Sutorejo Surabaya. In respondents, dIt is hoped that they can always maintain their ideal body weight and those who have more nutritional status (overweight and obese) are expected to increase their physical activity at least 30 minutes a day in order to achieve normal nutritional status.

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