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Obesity Determinants of Teenagers in Rural Areas

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Abstract

Obesity is excessive or abnormal fat deposits in adipose tissue, which will improve health. In 2015, at the age of 15 years, obesity was found to be 28.97%, and in Semarang District, it was found 54.56%. In 2017 obesity increased by ≥15 years, decreased by 6.04%. Whereas in Semarang Regency it was 6.68%. The percentage of the number that has increased, but the number of the number that has increased from the previous year. The aim of the study was to analyze the determinants of obesity in teenagers in rural areas. This study uses a case control design. The population consists of all high school/MA students in Semarang Regency. The sample consists of 35 obese and 35 non-obese teenagers, with the Purposive Sampling technique. The instruments used were Semi-Quantitative Food Frequency Questionnaire (SK-FFQ) and Physical Activity Questionnaire for Adolescent (PAQ-A). Data analysis using Chi-square test and logistic regression test. The analysis showed that there was a relationship between energy intake (p=0,000), protein intake (p=0.002), fat intake (p=0.008), carbohydrate intake (p=0.002), snack consumption (p=0.031), and physical activity (p=0.02) with obesity in teenagers in rural areas. The most dominant risk factors for obesity are energy intake, physical activity, and protein intake. Physical activity that can increase the risk of obesity in teenagers is decided to improve teenager welfare.

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INTRODUCTION

Obesity is a condition where there is excessive or abnormal fat deposits in adipose tissue, which will interfere with health. Worldwide, more than 2.1 billion people are overweight or obese (Ulilalbab, Anggraeni, & Lestari, 2017).

Based on the RISKESDAS results, at the age of ≥15 years, the proportion of obesity experienced a significant increase, namely from 18.8% in 2007, to 26.6% in 2013, and then 31% for 2018. In 2013 the RISKESDAS results stated that obese teenagers were 2.5% in children aged 13-15 years, and 1.6% in teenagers aged 16-18 years. When viewed from 2007 and 2013, the prevalence of obesity has increased, namely 1.4% to 7.3% (Health Research and Development Agency, 2018).

In Central Java, in 2015 found the percentage of obesity at the age of ≥15 years in Central Java as much as 28.97% of the measurements of obesity carried out. In Semarang Regency, the percentage of obesity is higher than the percentage in Central Java, which reached 54.56%. Then in 2017 the percentage of obesity at the age of> 15 years experienced a decline to 6.04%. For the Semarang Regency area as much as 6.68%. Although in terms of percentage it has decreased, but in terms of the number of cases found it has increased from the previous year.

Obesity can occur due to several factors that affect. Diet and physical activity are direct determinants of obesity. Diet is a type of food, the amount of food consumed, and the frequency of consumption of foods containing energy substances, protein, fat, carbohydrates. According to the Ministry of Health, observations arise as a result of high intake of food/drinks which contain energy nutrients, saturated fats, added sugar and salt. In addition, the lack of consumption of vegetables, fruits, and whole cereals. Apart from food intake factors, there are also physical activity factors that are lacking (Ministry of Health Republic of Indonesia, 2014).

Food intake is a factor that can lead to obesity. Snack is one of the types of food consumed. Street food consumption is the most influential factor in teenager obesity (Suraya, 2018). Snack food can be in the form of western fast food and local snacks. According to Pramono & Sulchan (2014), found that there is a significant relationship between the contribution of western fast food, local snacks to obesity in teenagers (Pramono & Sulchan, 2014). The same thing was also found by Mardhiati & Setiawan. Obese teenagers have the habit of consuming fast food and snacks in school more than teenagers who are not obese (Mardhiati & Setiawan, 2017). In addition, in the United Arab Emirates it was found that fast food has a significant relationship with obesity in women. In addition, the risk of obesity is higher in teenager boys due to eating fast food at home compared to teenager girls (bin Zaal, Musaiger, & Souza, 2009).

Apart from several direct causative factors, environmental and genetic factors also play a role in the occurrence of obesity in a person (Ulilalbab et al., 2017). The neighborhood will determine the availability of available food. In 2016, food expenditure of the population in rural areas (59.71%) was much higher than the population in urban areas (47.16%). This situation indicates that the level of welfare and food security in rural areas is lower than in urban areas. In addition, the urban population expenditure tends to be food and beverages and meat. While for rural residents, food expenditure will be higher in the group of grains, vegetables and fish (Ministry of Health, Republic of Indonesia, 2018).

The home environment has an influence on the incidence of obesity through the availability of food and physical activity. The more poor food intake and physical activity, the higher the risk of obesity. Children in rural areas report that they participate in training/sports five or more times compared to children in urban areas (Liu et al., 2012).

The emergence of obesity in a person will have a worrying impact in terms of health will arise. Diseases arising from obesity include hypertension and diabetes mellitus. Along with the increasing prevalence of obesity, the prevalence of type 2 diabetes has also increased sharply (Adriani & Wijatmadi, 2016). In addition, teenagers who are obese tend to experience low self-esteem, poor self-esteem, experience difficulties while studying and in school which

can then lead to depression (Pujiastuti, Fadlyana, & Garna, 2013).

Some of the effects that may arise due to obesity, it is necessary to take precautionary measures by looking at the factors that influence it. From several studies, factors that influence obesity include diet, consumption of snacks, and physical activity. In addition, variable residence can affect obesity.

The purpose of this study is to analyze the determinants of obesity in teenagers in rural areas.

METHOD

This research is a quantitative study using case control design. The population in this study were all teenagers of state high school/MA students in Semarang Regency selected using the Purposive Sampling technique. The minimum number of samples was 35 obese teenagers (case group) and 35 non-obese teenagers (control group). Inclusion criteria for obese teenager groups were students with BMI measurement results ≥27 kg/m^2. Criteria for non-obese teenager groups are students with a BMI of 18.5–24.9 kg/m^2, coming from the same school and the same sex as the obese teenager group. Exclusion criteria were students who were not willing to be respondents of the study and were not present when collecting data. Data analysis used Chi-square test, and logistic regression test. Data processing using the SPSS v.20 application.

RESULTS AND DISCUSSION

Table1. Bivariate analysis of energy, protein, fat, and carbohydrate intake by group (n=70)

Nutrients	Group	Sufficiency level		*p-value**	OR	IK 95%	
		Normal	Over			Min	Max
Energy	Control	31 (88.6%)	4 (11.4%)	0.000	13.115	3.77	45.629
	Case	13 (37.1%)	22 (62.(%)				
Protein	Control	25 (71.4%)	10 (28.6%)	0.002	5.455	1.96	15.176
	Case	11 (31.4%)	24 (68.6%)				
Fat	Control	25 (71.4%)	10 (28.6%)	0.008	4.231	1.55	11.546
	Case	13 (37.1%)	22 (62.9%)				
Carbohydrate	Control	26 (74.3%)	9 (25.7%)	0.002	5.537	1.976	15.516
	Case	12 (34.3%)	23 (65.7%)				

**Chi-square*

Nutrient intake in teenagers in rural areas has been shown in table 1. Starting from the intake of energy, protein, fat, and carbohydrates shows that in teenagers who are not obese tend to have a normal nutrient intake. Conversely, teenagers who are obese tend to have excessive nutrient intake. The results of the analysis using the Chi-square test between energy intake, protein, fat, and carbohydrates with obesity get p<0.05 so that it can be concluded that there is a relationship between energy intake, protein, fat, and carbohydrate with obesity in teenagers.

Rural areas are rural areas where farmers still grow their food sources. According to the observations of researchers, the rural environment for research there are still many farmers who grow rice. In addition, there are still many vegetables found in people's gardens or yards, so that daily food needs can be picked directly from the garden/yard. Most rural residents consume food sources of vegetable protein such as tempeh, tofu, beans.

The bivariate analysis between energy intake and obesity scores p=0,000. Therefore, it can be concluded that there is a relationship between energy intake and obesity in teenagers in rural areas. The results of this study are in accordance with several previous studies. The results of previous studies found that energy intake was significantly associated with obesity in teenagers (p<0.05) (Kurdanti et al., 2015; Loliana & Nadhiroh, 2015; Nugroho, Hanim, & Dewi, 2018).

The results of bivariate analysis between protein intake and obesity obtained p=0.002. It can be concluded that there is a significant

relationship between protein intake and obesity in teenagers in rural areas. This finding is consistent with research conducted by Restuastuti (2016), namely that there is a relationship between protein intake and obesity in teenagers in Pekanbaru (Restuastuti, Jihadi, & Ernalia, 2016). In addition, in this study it was found that the majority of teenagers who had excess protein intake were teenagers who were obese, which was as much as 68.6%. These findings are consistent with Loliana's study which found that teenagers with excessive protein intake were found mostly in obese teenagers (Loliana & Nadhiroh, 2015).

Fat intake has a significant relationship with obesity in teenagers in rural areas with a p value of 0.002. These findings are identical to the results of several previous studies. Loliana (2015) found that fat intake had a significant relationship with the incidence of obesity in teenagers with a p value <0.05 (Loliana & Nadhiroh, 2015).

In addition, in this study it was found that as many as 62.9% of teenagers who have excess fat intake are teenagers who are obese. Like the findings by Kurdanti (2015), who found that 56.9% of obese teenagers have excess fat intake (Kurdanti et al., 2015). According to some of these findings, it can be concluded that fat intake has a relationship to obesity in teenagers in rural areas, both animal protein, and vegetable protein.

Carbohydrate intake is a macro nutrient that can affect obesity (Indonesian Ministry of Health, 2014). As many as 65.7% of teenagers with excess carbohydrate intake are teenagers who are obese. The findings of this study are consistent with research conducted by Kurdanti (2015), where as many as 66.7% of teenagers with excess carbohydrate intake are found in teenagers with obesity (Kurdanti et al., 2015).

The results found that there was a relationship between carbohydrate intake and obesity in teenagers in rural areas with a p-value of 0.002. This finding is in line with previous research findings, that carbohydrate intake has a significant relationship with obesity in teenagers with a p value <0.05 (Kurdanti et al., 2015; Loliana & Nadhiroh, 2015; Restuastuti et al., 2016).

Based on the results of the analysis that has been done, it can be concluded that a diet consisting of energy, protein, fat, and carbohydrate intake has a significant relationship with obesity in teenagers in rural areas.

Table 2. Bivariate analysis of snacks consumption and physical activity by group (n=70)

Factors	Group	Sufficiency level		*p-value**	OR	IK 95%	
		Low	High			Min	Max
Snacks consumption	Case	23 (65.7%)	12 (34.3%)	0.031	3.244	1.219	8.629
	Control	13 (37.1%)	22 (62.9%)				
Physical activity	Case	19 (54.3%)	16 (45.7%)	0.020	4.07	1.352	12.255
	Control	29 (82.9%)	6 (17.1%)				

**Chi-square*

Teenagers who are not obese tend to have low consumption of snacks. Conversely, obese teenagers have high levels of snacks consumption. However, it has been found that the majority of teenagers who are neither obese nor who are obese have low physical activity (see table 2).

Analysis using the Chi-square test showed that there was a significant relationship between consumption of snacks with obesity in teenagers in rural areas with a value of p=0.031. The results of this study are in accordance with the findings of Pramono (2014) in his research, namely that the contribution of snacks has a relationship with obesity in teenagers (Pramono & Sulchan, 2014). In addition, previous research found that the frequency of *fast food* consumption, total *fast food* energy intake, *fast food* consumption habits were associated with obesity in teenagers (Kurdanti et al., 2015; Oktaviani, Saraswati, & Rahfiludin, 2012; Rafiony, Purba, & Pramantara, 2015).

High consumption of snacks was mostly found in the group of teenagers who were obese. This finding was in accordance with the results of previous studies, that as many as 60% of teenagers

with contribution of snacks energy >300 kcal/day were teenagers who are obese (Pramono & Sulchan, 2014).

Based on the results of bivariate analysis, physical activity has a significant relationship with obesity in teenagers (*p-value*=0.020). The results of these studies were identical to the findings in previous studies, that physical activity has a relationship with obesity in teenagers (Kurdanti et al., 2015; Musralianti, Rattu, & Kaunang, 2016; Pramono & Sulchan, 2014). Not only that, in this study it was found that most teenagers who have low physical activity were teenagers with obesity. In addition, Ruslie & Darmadi (2012) also found that less physical activity has a relationship with more weight in teenagers (Ruslie & Darmadi, 2012).

This study found that the majority of teenagers who have low physical activity were teenagers who were obese, which was as much as 82.9%. This finding was in line with Restuastuti (2016), that as many as 81.8% of teenagers who were lacking in sports were teenagers who were obese (Restuastuti et al., 2016). Danari's findings (2013) found something similar, that as many as 85.3% of obese children had mild physical activity. The remaining 14.7% were non-obese children with mild physical activity (Danari, Mayulu, & Onibala, 2013).

According to the results of the analysis that has been done, it can be concluded that the consumption of snacks and physical activity have a significant relationship with obesity in teenagers in rural areas. In addition, special attention was needed to teenagers related to physical activities undertaken. Most teenagers have low physical activity, so the efforts were needed in order to increase physical activity and reduce *sedentary lifestyle* in teenagers.

Table 3. Multivariate analysis of obesity risk factors in teenagers in rural areas (n=70)

	Coefficient	S.E.	Wald	df	*p-value*	OR	CI (95%)	
							Min	Max
Protein	2.696	0.868	9.657	1	0.002	14.827	2.707	81.214
Energy	1.378	0.709	3.774	1	0.052	3.965	0.988	15.916
Constant	2.493	0.872	8.176	1	0.004	12.101	2.191	66.841
Physical Activity	-3.250	0.917	12.551	1	0.000	0.039		

Table 3 shows the results of the logistic regression test for risk factors for obesity in teenagers. The results of multivariate analysis showed that risk factors for obesity in teenagers in rural areas include energy intake, protein intake and physical activity. In rural areas, the effect of energy intake on obesity in teenagers was equal to 14,827 times. Another influential risk factor was protein intake, which was 3,965 times. Then the last risk factor was physical activity with a risk of 12,101 times. According to the results of this analysis, it can be concluded based on a large order of risk figures, that obesity in teenagers was most influenced by energy intake, physical activity, then protein intake.

Energy intake is the most influential risk factor for obesity in teenagers with OR values=14.827 CI (95%)=2.707–81.214. These results can be concluded that the teenagers with excessive energy intake have a risk of 14,827 times greater to be obese compared to the teenagers who have normal energy intake. This finding was identical with previous research, that total energy intake was the most dominant factor towards obesity in teenagers in Pontianak (Rafiony et al., 2015). The results of this study were in accordance with a survey conducted by the Ministry of Health, that rural populations tend to consume whole grains (Ministry of Health, Republic of Indonesia 2018).

Physical activity is a risk factor that affects obesity in teenagers in rural areas with an OR=12,101 CI (95%)=2,191–66,841. Teenagers who have low physical activity are 12,101 times as likely to be obese. This study was the same as previous studies, that according to path analysis physical activity has a direct influence on the

incidence of obesity (Abudu, Handayani, & Yuniastuti, 2019).

Low physical activity can cause low energy output, which is excess residual energy in the body and then stored in the form of fat, which will increase the risk of obesity (Adriani & Wijatmadi, 2016; Ulilalbab et al., 2017). Pramono (2014) in his research found that physical activity has an effect of 5.128 times on obesity in teenagers. Physical activities that were often carried out by teenagers include playing mobile phones, playing games, sitting in the cafeteria, sleeping while reading comics/novels, from some of the physical activities were sedentary activities (Pramono & Sulchan, 2014). Teenagers who have low physical activity and high sedentary lifestyle are more at risk for being overweight or obese (Almughamisi, George, & Harding, 2018; Aryeetey et al., 2017; Kurdaningsih, Sudargo, & Lusmilasari, 2016).

However, the results of the study showed that most teenagers who experience or do not experience obesity have low physical activity. This finding slightly illustrates the similarity with a survey conducted by the government. According to RISKESDAS which found that as many as 33.5% of Indonesia's population aged >10 years have less physical activity. This figure has experienced a significant increase since 2013, from 26.1% to 33.5% in 2018 (Health Research and Development Agency, 2018). Looking at the data, special attention needs to be paid to aspects of physical activity.

Other risk factors that influence obesity in teenagers are protein intake, OR=3,965 CI (95%)=0.988–15,916. Excess protein intake in teenagers is 3,965 times greater risk of obesity compared to normal protein intake. The results of this study are identical to the research by Loliana found that teenagers with excessive protein intake are found in teenagers with obesity (Loliana & Nadhiroh, 2015). Protein intake in rural areas is mostly obtained from consumption of vegetable protein, such as tempeh, tofu, and beans. Consumption of animal protein food sources is not often done by teenagers in rural areas. Even so, protein food sources have been replaced with vegetable protein sources.

CONCLUSION

Risk factors for obesity in teenagers in rural areas based on the order of the results of large statistical effects include energy intake, physical activity, then protein intake. Therefore, prevention or appropriate measures are needed so that obesity does not occur in teenagers and continues into adulthood. One of the efforts that can be done is to provide information about balanced nutrition. Counseling can involve both the school and parents, so that healthy and nutritionally balanced food supervision can be achieved. In addition, given the low physical activity in teenagers who are still low, special attention needs to be given. The school can certainly create programs to increase physical activity by students. In addition, when at home need supervision from parents so that teenagers are not lazy about doing physical activity.

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