Correlation between Junk Food Consumption with Obesity in Children in West Denpasar, Bali Indonesia

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Abstract. Changes in food consumption patterns in children is that they are currently consuming instant foods and having poor nutritional value. This causes the prevalence of obesity in children to increase every yearThis study aims to determine the relationship between consumption of junk food and childhood obesity. This study was a cross sectional study in children aged 9-12 years in West Denpasar District with 175 respondents selected by simple two-stage cluster random sampling. Respondents were children aged 9-12 years who attended elementary schools in West Denpasar District without a history of obesity in their parents. The obesity criterion in this study is if the Body Mass Index (BMI) according to age is more than Z score 2. Criteria for consumption of junk food is if at least once a week consume low-nutrition foods that contain fat and soft drinks. The collected data was analyzed with SPSS 21 for window including Chi-Square test to look for the relationship of consumption of junk food with obesity and multiple logistic regression analysis to control the influence of variables on parental education, parental income and physical activity of children. Obesity prevalence was 18.3%. The prevalence of obesity in the group that consumes junk food is 12%, while in the group that does not consume junk food is 6.3%. There was a significant relationship between consumption of junk food and the prevalence of obesity (x2 = 4,65; p=0,031) with Odds Ratio 2.56 and 95% Trust Interval 1.15-5.72. After being controlled by the parents' education variables and children's physical activity, this relationship was still significant (p = 0.015) but the adjusted Odds Ratio was only 0.32. There is a moderate positive relationship between consumption of junk food and obesity in children.

Keyword : Correlation, Consumption, Children.

1 Introduction

Globalization has caused changes in people's lifestyles, both in developing and developed countries. The diet has now turned into eating foods that are instant and not healthy [1]

Today, there are many food stalls that provide junk food to meet daily food needs. This causes increasing the prevalence of obesity, including in children. Obesity in children is defined as the Body Mass Index (BMI) according to age > Z score 2 using the anthropometric standard of the World Health Organization (WHO) 2007 for children aged 5-18 years. [2] The prevalence of obesity in children in the world is 6.7% in 2010 [2]. Meanwhile, based on data from the Basic Health Research (Riskesdas) in 2013, the prevalence of obesity in children aged 5-18 years in Indonesia was 8.8% [3]. Dewi (2013) in her study found the prevalence of obesity in children aged 6-10 years in two Public Elementary Schools in Bali was as much as 15% [4]. Obesity that occurs at the age of children can continue into adulthood so it is important to carry out interventions to prevent overweight and obesity in children [5]. The risk of comorbidity in obese children will increase, such as coronary heart disease, hypertension, diabetes mellitus, and others [2].

Obesity occurs because of an imbalance between intake and energy output, resulting in excess energy stored in the form of fat. Energy intake from instant processed foods, soft drinks and low-nutrition foods (junk food) is one of the main risk factors for obesity in children. The type of junk food prioritizes its taste compared to its nutritional content so it has a risk of causing various diseases. Siregar (2015) classified foods including junk food, including preservative foods such as packaged foods and cans, instant noodles; foods with high salt content and containing MSG such as snacks; foods with high fat content such as burger meat, chicken skin on fried chicken; and foods containing soda such as soft drinks [6].This study was conducted to determine the prevalence of obesity in children, the relationship of consumption of junk food, and the influence of several variables on obesity in children aged 9-12 years in West Denpasar District. As the null hypothesis (H0) there is no relationship between consumption of junk food and obesity in children aged 9-12 years in West Denpasar District.

2 Method

2.1 Location of the Study

This research is a cross-sectional study conducted in elementary schools (SD) located in West Denpasar District, Bali, Indonesia in 2017 with a target population of elementary school children aged 9-12 years. The sample is children aged 9-12 years who attended elementary schools located in West Denpasar District in 2017

2.2 Method of Data Collection

This research selected by simple two-stage cluster random sampling, were willing to participate by signing an informed consent, and without a history of obesity in their parents. The sample size is calculated using the formula n = Za2 x P(1-P)/d2, and the minimum number of samples needed is 159 people. It is called obesity if the BMI of children according to age is more than Z score 2 using the WHO 2007 anthropometry standard for children aged 5-18 years. It is called consuming junk food if at least a week children consume low-nutrition foods, especially those containing fat and soft drinks, measured using the FFQ (Food Frequencies Questionnaire) table. The research instrument was in the form of a questionnaire, weight scale and height gauge type ZT120. Data collection was carried out in four elementary schools, covering two public elementary schools and two private elementary schools.

2.3 Data Analysis

The collected data was analyzed with the help of the SPSS 21 for window application, using the Chi-Square test to determine the relationship between consumption of junk food and obesity as a unpaired comparative hypothesis test with a significance level of 5% or $p < 0.05$ and multivariate logistic regression analysis to control the influence of variables on parental income, parental education and physical activity of children.

3 Results And Discussion

The number of samples is 175 people, which is 10% more than the minimum requirement of the sample (as many as 159 people) in anticipation if there is a sample that withdraws. Characteristics of basic subjects can be seen in table 1.

Table 1. Characteristics of subjects

Parameter	Percent / Median / Value Range
Grade:	
4th grade	21,1 %
5th grade	41,7 %
6th grade	37,2 %
Gender:	
Male	47,4 %
Female	52,6 %
Age	10 (9 - 12) tahun
Weight	37 (21 - 75) kg
Height	140 (128 - 165) cm
BMI	18,76 (12,23 - 30,86) kg/cm2

The results of cross tabulation of the relationship between junk food consumption and obesity prevalence can be seen in table 2. A total of 32 respondents were found to be obese. It appears that out of 82 subjects who consumed junk food, 21 of them were obese (25.6%) while of 93 subjects who did not consume junk food, 11 were obese (11.8%). The prevalence of obesity was 18.3%, covering 12% in the group that consumed junk food and 6.3% in the group that did not consume junk food. Chi-Square analysis showed significant results with $p = 0.031$, odds ratio (OR) unadjusted 2.56 and 95% Trust Interval (IK) did not include the number one. The value of $x2 = 4,655$ in Chi-Square with continuity correction shows a moderate positive relationship between variables.

The effect of variables on physical activity, father's education, mother's education and parents' income on the relationship of consumption of junk food and obesity in children in bivariate analysis found that $p < 0.25$ was evaluated through multivariate analysis. In multiple logistic regression analysis to control the influence of confounding variables (physical activity of children, father's education and mother's education) on the relationship between consumption of junk food and obesity, this junk food and obesity consumption relationship was still significant ($p = 0.015$) but its adjusted OR is only 0.32. The stepwise method in multiple logistic regression analysis shows that in step 1 after entering three variables that will be controlled for influence, the consumption variable of junk food still has a significant relationship with the prevalence of obesity.

In the next steps the variables that have less influence on the relationship of consumption of junk food and the prevalence of obesity will be excluded from the analysis, namely the father's education variable in step 2, the maternal education variable in step 3 so that in the last step (step 4) only the variables that are truly related to the prevalence of obesity, namely consumption of junk food as seen in table 3.

Table 2. Relationship between consumption of junk food and obesity

	BMI classification		Total N (%)	X2	P	OR	CI 95%	
	Obese n (%)	Non Obese n(%)					Min	Max
Consumption of Junk Food								
Yes	21 (25,6)	61 (74,4)	82 (100)	4,655	0,031	2,56	1,15	5,72
No	11 (11,8)	82 (88,2)	93 (100)					
Total	32 (18,3)	143 (81,7)	175 (100)					

P= P value, OR=Odds Ratio, CI= Confidence Interval, X2

Table 3. Relationship between junk food consumption and obesity prevalence after being controlled by variables of physical activity of children, father's education and mother's education

Steps	Variabel	B	P	Adjusted OR	CI 95%	
					Min	Max
1	Junk Food Consumption	-1,133	0,015	0,322	0,129	0,805
	Father's Education	0,400	0,577	1,491	0,366	6,077
	Mother's Education	-,637	0,374	0,529	0,130	2,151
	Physical Activity	0,485	0,336	1,624	0,605	4,354
2	Junk Food Consumption	-1,180	0,010	0,307	0,125	0,756
	Mother's Education	-0,333	0,466	0,717	0,293	1,756
	Physical Activity	0,507	0,311	1,661	0,623	4,428
3	Junk Food Consumption	-1,125	0,012	0,325	0,134	0,784
	Physical Activity	0,486	0,329	1,626	0,613	4,308
4	Junk Food Consumption	-1,309	0,018	0,354	0,149	0,838

B= Unsatndar Coefisient Linier Regression, OR= Odds Ratio

In the Omnibus test of model coefficients with df 2, the chi-square value was 6.985 and p 0.030. This shows that from the remaining two variables there is at least one variable that significantly affects the prevalence of obesity. In the Partial test, the variable in the equation which was found to be significant was consumption of junk food (p = 0.015). The Hosmer and Lameshow test obtained the chi-square value of 0.596 with p = 0.996. This means that with 95% confidence it can be believed that the logistic regression model used is sufficient to explain the data. The Nagelkerke R Square test was obtained at 0.082, which means that the contribution of variables of junk food consumption to the prevalence of obesity was only 8.2%. In the classification table, overall percentage correct was 79.3%, which means that the accuracy of predictions in multiple logistic regression analysis is quite high.

The median value of BMI in this study was 18,76 kg/cm2 with an average BMI of 19,33kg/cm2. Susilowati (2008) divided the classification of nutritional status of Indonesians based on BMI to be underweight with severe weight deficiency if BMI <17kg/cm2, mild weight loss if BMI 17-18,5 kg/cm2, normal if BMI >18,7-25 kg/cm2, fat with mild overweight when BMI > 25-27 kg/cm2, and BMI> > 27 kg/cm2 for overweight with severe levels [7]. With an average BMI value of 19,33 kg/cm2, the BMI average results in this study fall into the normal category. This result is far different from the results of Budiyati's (2013) study of the relationship between father and mother body mass index with the incidence of obesity in school-age children at Al-Azhar 14 Islamic Elementary School, Semarang City. Budiyati got an average BMI of children of 26,35 kg/cm2 with an average age of children 8.55 years [8].

This is probably due to 70-81% of parents of respondents in their research Budiyati were included in the category of overweight / obesity, while in this study respondents with a history

of obesity in their parents were excluded. The prevalence of obesity in this study was 18.3%. This result is in line with the research of Rismawan, et al. Rismawan (2016) in his study of 382 grade 6th elementary school children in Denpasar City also showed an obesity prevalence of 18.8% [9]. Whereas Juliantini (2013) in her study of 128 elementary school students of grade 1st and grade 2nd of SDN 8 Dauh Puri Kelod, the prevalence of obesity was 34% [10]. The high prevalence of obesity in Juliantini's research is likely due to the respondents of the study were only in one elementary school and respondents with obese parents were still included as samples. In this study it was also found that children who had both parents were obese were 10.5 times more likely to have obesity than children with both parents who were not obese. Nationally based on data from the Basic Health Research (Riskesdas) in 2013, the prevalence of obesity in children aged 5-18 years in Indonesia was 8.8% [3]. Higher obesity prevalence found in this study compared to the Riskesdas data was likely due to the fact that this study was conducted in elementary schools located in urban areas with higher income levels than rural communities and easier access to places that provide ready-to-eat food.

There was a significant relationship between consumption of junk food and obesity with OR = 2.56. This shows that subjects who consume junk food every day or at least once a week have the potential of 2.56 times higher to be obese compared to subjects who do not consume junk food or only consume junk food 1-2 times a month. The results of this study are in line with the management case study by Padmiari (2002) for elementary school children aged 6-12 years in Denpasar City. Padmiari found that elementary school children who consumed fast food > 75% of calorie intake had 12 times higher risk of obesity than elementary school children who consumed fast food <75% calorie intake (OR: 12.3; 95%: 5.5 -27.7). [11] Similarly Dewi (2013) in her research in one urban elementary school and one rural elementary school, found that elementary school children in urban areas who used to consume fast food twice a week were 2.9 times more likely to be obese.[4] Whereas Fachrunnisa (2016) in her study of 176 elementary school students in grade 5th and grade 6th found that children with a frequency of eating > 3 times a day had a potential 2.33 times higher for obesity [12].

The mechanism of consumption of junk food can cause obesity is not fully understood. Consumption of junk food is estimated to be associated with the occurrence of obesity because junk food usually has a high calorie content with low nutritional value [13]. Consumption of flavored drinks, such as soda, is less filling and can be consumed more so that there is a higher calorie intake [13]. School-age children love junk food which generally contains a lot of energy because 40-50% of junk food comes from fat. According to Isganaitis (2005), the high glycemic index and fatty acid composition in fast food causes hyperinsulinemia and ultimately insulin resistance at both the peripheral and central [14]. Districts with a large population of students at risk for obesity may adopt more stringent nutritional policies that reduce the availability of junk foods in school. [15]. Hyperinsulinemia will result in leptin resistance. This encourages a reduction in energy release and increases continued food consumption as an effort to compensate the brain because of the inadequate amount of leptin. Insulin resistance at the center will interfere with the effect of insulin on dopamine re-absorption and deactivate the stimulation system in the nucleus accumbens, which will result in an increase in sustained food intake. Failure of these two central mechanisms results in failure of the energy intake feedback mechanism in the central nervous system. Based on the above explanation, fast food is considered as one of the causes of obesity.[16] Overweight/ high BMI was significantly associated with evening and night time fast food consumption. This suggests that healthy food must consume at home thus restricting them from consuming junk food. They should also be warned by parents and teachers not to consume junk food on their way home and at home. [17] Sociability was the main reason our sample chose to consume fast food as it might

influence the age characteristics that a majority of who were young people. The dining places are influenced by the social class of people to decide consume junk food.[18]

In multiple logistic regression analysis to control the influence of confounding variables on the consumption relationship of junk food and obesity, it turns out that the consumption of junk food and obesity is still found to be significant (p = 0.015) but adjusted OR is only 0.32. This means that if the influence of confounding variables is taken into consideration, subjects with consumption of junk food every day or at least once a week only have a possibility of 0.32 times higher than obese subjects who do not consume junk food or consume only junk food 1-2 times a month. Adjusted OR values of less than one indicate that the consumption variables of junk food are not dominant in relation to the prevalence of obesity. This is evident from the Nagelkerke R Square test which was obtained only at 8.2%. This means that there are many other variables not examined contribute to the consumption of junk food and obesity.

4 Conclusions

As a conclusion from this study it was found that the prevalence of obesity in elementary school children aged 9-12 years in West Denpasar District was 18.3%. Consumption of junk food is significantly positively associated with moderate obesity. Thus the null hypothesis (H0) in this study was rejected. Children who consume junk food every day or at least once a week have closely a potential three times higher to get obesity. The confounding variables (father's education, maternal education and physical activity) influence the relationship of consumption of junk food with obesity in children. If the effect of this variable is taken into account, the child who consumes junk food every day or at least once a week only has less than one potential to get obesity. To find out more about the causal relationship between consumption of junk food and obesity, research should be conducted with a cohort study in the future.

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