Analysis of the Relationship between Nutritional Influence with the Obesity Phenomenon among Primary School Students in Banda Aceh, Aceh Province, Indonesia

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Abstract

BACKGROUND: The prevalence of obesity in children has reached the limit of the pandemic number. Obesity has become a major public health problem in Indonesia due to increasing prevalence. Aceh Province has a prevalence of obesity in children 6–14 years at 5.9% in 2013 and increased to 9.5% in 2017.

AIM: Analyzing the effect of fiber intake, snack foods, breakfast, and sedentary on the incidence of obesity in elementary schoolchildren in the city of Banda Aceh.

METHODS: This research used case–control design. Determination of the sample was done by probability sampling with cluster sampling technique. Study sample was of 84 children. Data collection was done by interviewing the parents, observation using questionnaires. Data analysis was carried out bivariate and using Chi-square statistical tests.

RESULTS: School food intake from daily snacks (p = 0.001, odds ratio [OR] = 5) and fiber consumption (p = 0.017, OR = 3.3) was related to the incidence of obesity in elementary schoolchildren in Banda Aceh (p < 0.05). Sedentary behavior was associated with the incidence of obesity in primary schoolchildren (p = 0.002, OR = 4.6). Breakfast is not related to the occurrence of obesity in primary schoolchildren in the city of Banda Aceh.

CONCLUSION: There was a significant influence between intake from daily snack foods, fiber consumption, and sedentary on the incidence of obesity in primary schoolchildren in the Banda Aceh City area.

Introduction

Indonesia is currently ranked tenth as the country with the largest obesity rate in the world [1]. Obesity is one of the problems of excess feeding that occurs in more developed and developing countries. Obesity or being overweight can be found from the baby to the elderly [2]. Common causes of obesity are low consumption of vegetables, fruits, and high consumption of sweet and fatty foods. Some studies have found that low consumption of vegetables and fruit can risk obesity [3], [4], [5]. Some studies describe that overweight and obesity are usually associated with cognitive impairment [6], [7]. The habit of consuming ethanol which exceeds energy requirements causes fat buildup, weight gain, and obesity [8]. Residents of the city of Banda Aceh are an example of one community in Aceh Province which has the highest obesity prevalence in adolescents and in primary schoolchildren. The high problem of obesity in primary schoolchildren in the city of Banda Aceh is supported by the results of monitoring nutritional status wherein 2017 the prevalence of obesity reached 9.5% [9]. One of the factors that cause obesity in children is a poor diet.

Furthermore, changes in the pattern of food consumption in the city of Banda Aceh have led to reduced consumption of vegetables and low fiber intake. Obesity at children age is currently one of the nutritional problems that must receive special attention. Since 2015, the prevalence of obese schoolchildren continues to increase. As a result, declining learning achievement is one of the short-term effects of obesity. Snack consumption and lack of fiber intake are at risk of obesity in children. Therefore, the purpose of this study was to analyze the effect of fiber intake, snack foods, breakfast, and sedentary on the incidence of obesity in primary schoolchildren in the city of Banda Aceh, Aceh Province.

Methods

This quantitative study used a case–control study design that was carried out descriptively analytic.

The study was conducted in several primary schools in the Banda Aceh area. The selection of the city of Banda Aceh as the location of the study by considering the prevalence of obesity in children aged 6-14 years was very high. The population in the study was all elementary schoolchildren from grade 1 to grade 6 who were suspected of being obese (Z-score body mass index >2 SD). This study used a retrospective study approach that allows for case–control groups so that the sample size in each group is a case group of 42 students who were obese and a control group of 42 normal students.

Determination of the sample was done by probability sampling with cluster sampling technique. Determination of the sample was carried out in two stages, namely, the first stage of choosing a cluster for each sub-district and the second stage selects samples of elementary schoolchildren in each cluster. Data analyzed began by doing descriptive, and continued with bivariate analysis, namely to measure whether there was a relationship between the dependent and independent variables. To reinforce the results of the analysis, the Chi-square test was used to prove the proposed hypothesis and calculate the odds ratio (OR) with 95% CI.

Results

Univariate analysis

Univariate analysis is used to describe each variable. Based on the results of the research that has been done, processing of univariate data related to the variables under study can be seen as follows.

Sample for the case group who were obese was 42 students and the normal weight control group was 42 people. The sample characteristics in this study in the two intervention groups by sex were dominated by female students in the case group (59.5%) and the control group (52.4%). The age of the respondents in the case group was more at aged 9–10 years (40.5%) and in the control group at 11–12 years (38.1%). Based on class, there were more cases in class 4 (47.6) and more control groups in class 4 (45.3%). The results of statistical tests on the three sample characteristics of the intervention group obtained a value of p > 0.05, so it can be concluded that the characteristics of the sample showed similarities in variation between the two groups (Table 1).

Bivariate analysis

Bivariate analysis was conducted to determine the relationship between the independent variables and the dependent variable. The relationship between the

Table 1: Analysis of characteristics of the study sample according to the case–control group

Characteristic sample	Sample group				p value
	Case		Control		
	n	%	n	%	
Gender					
Male	17	40.5	20	47.6	0.660
Female	25	59.5	22	52.4	
Age					
7–8	8	19.1	10	23.8	0.619
9–10	17	40.5	12	28.6	
11–12	15	35.7	16	38.1	
13–14	2	4.8	4	9.5	
Grade					
4	20	47.6	19	45.3	0.959
5	14	33.3	14	33.3	
6	8	19.1	9	21.4	
Total	42	100.0	42	100.0	

independent variable and the dependent variable is indicated by the value p < α (0.05), the value of OR >1, and the CI value: 95%. Bivariate analysis here looks at the effect of food intake and sedentary on obesity phenomena in schoolchildren in the city of Banda Aceh.

Table 2: Analysis of statistical results of the effect of food intake on the incidence of obesity in elementary school students in Banda Aceh city

Food consuming	Obesity phenomenon				Score p	OR (CI: 95%)
	Obesity		Normal			
	n	%	n	%		
Daily snacks						
High consumption	28	66.7	12	28.6	0.001	5.0 (1.98–12.64)
Moderate consumption	14	33.3	30	71.4		
Fiber						
Low	33	75.0	20	47.6	0.017	3.3 (1.33–8.22)
Adequate	11	25.0	22	52.4		
Breakfast						
Not good	25	59.5	18	42.9	0.190*	1.9 (0.82–4.67)
Good	17	40.5	24	57.1		
Total	42	100.0	42	100.0		

The results of testing the Chi-square test showed that there was a significant effect between daily snack food intake and the incidence of obesity in elementary schoolchildren with a value of p = 0.001 and OR = 5.0. There is also a significant influence between fiber intake and the incidence of obesity in primary schoolchildren with a value of p = 0.017 and OR = 3.3. Breakfast did not show an effect with the incidence of obesity in primary schoolchildren with p = 0.190 and OR = 1.9. Unhealthy or excessive daily snacks have a risk of 5.0 times obesity compared to healthy snacks. Lack of fiber intake has a risk of 3.3 times for obesity in primary schoolchildren in Banda Aceh City (Table 2).

Table 3: Analysis of sedentary influence on obesity phenomenon

Sedentary	Obesity phenomenon				Score p	OR (CI: 95%)
	Obesity		Normal			
	n	%	n	%		
Sedentary						
Not good	31	73.8	16	38.1	0.002	4.6
Good	11	26.2	26	61.9		(1.81, SD = 11.58)
Total	42	100	42	100		

Sedentary is one of the habits of children in the life of someone who does not do much physical activity. Statistical results show a sedentary effect on obesity. Primary schoolchildren who were obesity are 73.8% of children who have difficulties or bad habits. The results of the Chi-square statistical test obtained a value of p = 0.002 with OR = 4.6, while it means significant to the incidence of obesity in elementary schoolchildren with a value (p < 0.05), Table 3.

Discussion

The results showed that there was a significant effect between the intake of daily snack foods on the phenomenon of obesity. Snacks for children in schools that are not good or excessive have a risk of 5.0 being obese. Snacks and eating patterns also contribute to being overweight and obese. Inadequate family eating patterns can cause early obesity [10]. Mentions that there has been a shift in diet, where there is an increase in modern diets consisting of more energy and fat [11]. Increased energy intake and decreased energy expenditure are the main causes of obesity. The nutritional value of fiber consumption shows a significant relationship with the incidence of obesity in schoolchildren. Lack of fiber consumption is at risk of 3.3 times the phenomenon of obesity in primary schoolchildren in the city of Banda Aceh. Fiber consumption and eating fruits have an impact on children's health. Obesity in children is also influenced by the area of residence. Several countries in Asia found that children living in cities experience faster weight gain than children who live in villages [12]. The results showed that sedentary significantly affected the phenomenon of obesity in elementary schoolchildren. A sedentary lifestyle in elementary schoolchildren has a risk of 4.6 times the incidence of obesity in Banda Aceh City. The impact of the use of technology contributes to increasing sedentary lifestyles. Sedentary lifestyles are one of the obese factors [13]. Households with higher socioeconomic conditions make it easier to access fast food, fatty foods, and sweet foods or drinks compared to low socioeconomic households. In addition to being associated with access to food, households with high socioeconomic conditions also allow them to access technology such as watching television, computers, and video games. The ratio of obesity increases linearly in children who have longer time watching TV. Children who watch TV 4–8 h/day have a risk of obesity by 1.37 times higher at 7 years of age, while those who watch TV more than 8 h a day increase their risk of obesity to 1.55 times [14]. Obesity phenomenon is very complex, factors that influence can occur from various multifactorial conditions such as genetic and non-genetic factors [15]. In general, obesity in children occurs due to lack of physical activity, unhealthy eating patterns that cause excess energy intake or a combination of both of which cause an increase in energy. Childhood obesity is also a multifactorial condition that results from genetic and non-genetic factors and complex interactions among them [16].

Conclusion

There was a significant influence between intake from daily snack foods, fiber consumption, and sedentary on the phenomenon of obesity in primary schoolchildren in the Banda Aceh area. Primary schoolchildren snacks that are not good or excessive have a risk of 5.0 being obese. Lack of fiber consumption is at risk of 3.3 times the phenomenon of obesity in primary schoolchildren. The sedentary lifestyle in elementary schoolchildren has a risk of 4.6 times the incidence of obesity. Breakfast is not related to the phenomenon of obesity in elementary schoolchildren in that city.

References

1. Gakidou E, Ng M, Fleming T, Robinson M, Thomson B, Graetz N, *et al*. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the global burden of disease study 2013. Lancet. 2014;384(9945):766-81.
   PMid:24880830

2. He K, Hu FB, Coldits GA, Manson JE, Willett WC, Liu S. Changes in intake of fruits and vegetables in relation to risk of obesity and weight gain among middle-aged women. Int J Obes Relat Metab Disord. 2004;28(12):1569-74. https://doi.org/10.1038/sj.ijo.0802795
   PMid:15467774

3. Badan Penelitian dan Pengembangan Kesehatan. Kementerian Kesehatan RI. Riset Kesehatan Dasar. Prevalensi Obesitas Sentral. Jakarta, ID: Badan Penelitian dan Pengembangan Kesehatan. Kementerian Kesehatan RI; 2013. https://doi.org/10.22435/bpk.v44i1.4947.33-40

4. Guallar-Castillón P, Rodríguez-Artalejo F, Fornés NS, BanegasJR, Etxezarreta PA, Ardanaz E, *et al*. Intake of fried foods is associated with obesity in the cohort of Spanish adults from the European prospective investigation into cancer and nutrition. Am J Clin Nutr. 2007;86(1):198-205. https://doi.org/10.1093/ajcn/86.1.198
   PMid:17616781

5. Huot I, Paradis G, Ledoux M. Factors associated with overweight and obesity in Quebec adults. Int J Obes Relat Metab Disord. 2004;28(6):766-74. https://doi.org/10.1038/sj.ijo.0802633
   PMid:15079158

6. Galván M, Uauy R, Corvalán C, López-Rodríguez G, Kain J. Determinants of cognitive development of low SES children in Chile: A post-transitional country with rising childhood obesity rates. Matern Child Health J. 2013;17(7):1243-51. https://doi.org/10.1007/s10995-012-1121-9
   PMid:22915146

7. Wang C, Chan JS, Ren L, Yan JH. Obesity reduces cognitive and motor functions across the lifespan. Neural Plast. 2016;2016:2473081. https://doi.org/10.1155/2016/2473081
   PMid:26881095

8. Mahan LK. Escott-Stump S. Krause's Food and Nutrition Therapy, International Edition. Canada, CA: Saunders Elsevier; 2008.

9. Badan Penelitian dan Pengembangan Kesehatan. Kementerian Kesehatan RI. Laporan Riset Kesehatan Dasar 2013 Provinsi Aceh. 1st ed. Jakarta: Badan Penelitian dan Pengembangan Kesehatan. Kementerian Kesehatan RI; 2013.

10. Giugliano R, Carneiro EC. Factors associated with obesity in school children. J Pediatr. 2004;80(1):17-22. https://doi.org/10.2223/jped.1128

PMid:14978544

11. Zhang J, Wang H, Wang Y, Xue H, Wang Z, Du W, *et al*. Dietary patterns and their associations with childhood obesity in China. Br J Nutr. 2015;113(12):1978-84. https://doi.org/10.1017/s0007114515001154

PMid:25944159

12. Paciorek CJ, Stevens GA, Finucane MM, Ezzati M; Nutrition Impact Model Study Group (Child Growth). Children's height and weight in rural and urban populations in low-income and middle-income countries: A systematic analysis of population-representative data. Lancet Glob Health. 2013;1(5):300-9. https://doi.org/10.1016/s2214-109x(13)70109-8

PMid: 25104494

13. Aryeetey R, Lartey A, Marquis GS, Nti H, Colecraft E, Brown P. Prevalence and predictors of overweight and obesity among school-aged children in urban Ghana. BMC Obes. 2017;4:38. https://doi.org/10.1186/s40608-017-0174-0

PMid:29214030

14. Reilly JJ, Armstrong J, Dorosty AR, Emmett PM, Ness A, Rogers I, *et al*. Early life risk factors for obesity in childhood: Cohort study. BMJ. 2005;330(7504):1357. https://doi.org/10.1136/bmj.38470.670903.e0

PMid:15908441

15. Han JC, Lawlor DA, Kimm SY. Childhood obesity. Lancet. 2010;375(9727):1737-48. https://doi.org/10.1016/s0140-6736(10)60171-7

PMid:20451244

16. Güngör NK. Overweight and obesity in children and adolescents. J Clin Res Pediatr Endocrinol. 2014;6(3):129-43.

PMid:25241606