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SNACK FOOD CONSUMPTION PATTERN AND SLEEP DURATION WITH THE INCIDENCE OF OBESITY AMONG STUDENTS AT MADRASAH IBTIDAIYAH NEGERI 2, BENGKULU CITY

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ABSTRACT

The prevalence of obesity in elementary school children in Indonesia has increased from 2013 to 2018. Bengkulu Province is one of 15 provinces with an obesity rate in elementary school children above the national rate. Obesity in children is a severe problem because it will continue into adulthood, resulting in a higher risk of metabolic and degenerative diseases. This study aimed to determine the relationship between snack food consumption patterns and sleep duration with the incidence of obesity. This research is a quantitative study with a cross-sectional study design. The data were analyzed using univariate and bivariate. The population's study was Madrasah Ibtidaiyah Negeri 2 Bengkulu City students. A sample of 84 people was selected using the Stratified proportional random sampling technique. The results showed that most of the respondents were male (52.4%), aged <10 years (53.6%), and there were 45 children (53.6%) had insufficient sleep duration. Then, 38 children (45.2%) were obese out of 84 students. This study concludes that there is a relationship between snack food consumption patterns and sleep duration with the incidence of obesity (p-value <0.05). Based on the research, provide input to parents in order to be able to provide balanced nutritious food, and parents can adjust their child's sleep patterns to produce quality sleep.

Keywords: Duration of sleep, Elementary school student, Obesity, Snack food

Introduction

Obesity in children and adolescents is still one of the serious public health problems, as evidenced by the increase in obesity cases yearly. From 1975 to 2016, obesity cases quadrupled from 4% to 18% globally[1] Obesity is when a child's *Body Mass Index* (BMI) is above the 95th percentile in the sex-adjusted child growth and development chart or when the *Z-score* results are more than 2 Standard Deviations according to BMI / U aged 5 to 18 years[2]. Obesity in children is a severe problem because it will last until adulthood, resulting in a higher susceptibility to various health problems and making it a risk factor for metabolic and degenerative diseases. The prevalence of obesity in children aged 5-12 years in Indonesia increased from 8% in 2013 to 9.2% in 2018[3,4].

Obesity in developing countries is an effect of lifestyle and dietary changes. The diet is mainly in big cities, shifting from a traditional to a western diet (fast food)[5]. *Overweight* and obesity in children occur due to poor eating habits, such as consuming too much food that is high in fat, sugar, energy, and less exercise[6,7]. The results of a study in Tasikmalaya stated that children who consumed sweet and salty snacks and sugary drinks were at risk of 3 to 5 times being

overweight [8]. The results of another study added that fast food consumption also has an impact on obesity[9,10].

In addition, another factor that contributes to the incidence of obesity in children is a lifestyle. One of the contributors to lifestyle is sleep habits, measured by the duration of a person's sleep. A study states that a significant relationship exists between sleep duration and the incidence of obesity in children aged 3-8 years, where insufficient sleep duration will increase the risk of obesity[11]. A study published in Pediatrics found that young children who routinely stay up late (after 9 p.m.) tend to gain more body fat between the ages of 2 and 6. These children had a more significant waist size and BMI increase than children with an earlier bedtime[12].

The link between short sleep times and obesity is stronger in children than adults and in young adults than older adults[13]. The presence of assignments from school or homework, extracurricular activities, use of electronic devices, discrepancies between the adolescent biological clock and school schedule, and noisy environment can be factors causing children and adolescents sleeplessness[14].

Bengkulu City is one of the cities with a high prevalence of obesity in children aged 5-12 years, reaching 15.83% in 2018 [4]. This figure exceeds the prevalence of the national figure of 9.2%. Bengkulu City Health Office reported on the health activities of grade 1 elementary school children in Bengkulu City for the 2019/2020 school year. The report showed 212 of the 6591 children netted were obese, especially at Basuki Rahmat Health Center. That place had the most cases of 79 obese children. Madrasah Ibtidaiyah Negeri 2 was an elementary school with the highest cases of childhood obesity, namely 17 children in 2020 and 32 children in 2021. The conclusion is that cases of childhood obesity in Madrasah Ibtidaiyah Negeri 2 Bengkulu City have increased from 2020 to 2021. Based on that situation, this study wants to know about the relationship between the consumption patterns of snack food and sleep duration with the incidence of obesity in students in Madrasah Ibtidaiyah Negeri 2 Bengkulu City.

Methods

Madrasah Ibtidaiyah Negeri 2 Bengkulu City in March 2022 is the location of this research. A quantitative study using *a cross-sectional study* design. The sample of 84 people was selected using the *Stratified proportional random sampling* technique.

The data collected included respondents' characteristics, including age, gender, pocket money, and family income. Family income based on Provincial Minimum Wage (PMW) is 2,238,094 rupiah. Questionnaires and interview methods collect the data. Furthermore, data on children's nutritional status using body mass index according to age (BMI / U) parameter. BMI is measured using digital scales and *Microtoise*. The data will be processed with the help of the WHO Anthro Plus application to find out its *Z-Score*. BMI is Normal category if the Z-score is between -

2SD and +1SD; underweight if BMI is less than -2SD; overweight if BMI is between +1SD and +2SD; and obese if BMI is more than +2SD. Food Frequency Questionnaire (FFQ) Data was collected to measure snack food consumption patterns. *Questionnaire*s about Sleep duration through interviews. Sleep duration is said to be sufficient if it is more or equal to 10 hours, and it is said to be less if it is less than 10 hours.

Data was collected, then analyzed using univariate and bivariate. Bivariate analysis with the *Chi-Square* test to see the relationship between snack food consumption patterns and sleep duration with the incidence of childhood obesity. This research has passed an ethical review from the Faculty of Public Health, Sriwijaya University, with number 074 / UN9. FKM/TU. KKE/2022.

Results

The characteristics of respondents, which include gender, age, pocket money, family income, obesity status of parents, and the proportion of obesity in children, can be seen in table 1 below.

Table 1. Frequency Distribution of Respondent Characteristics

Characteristics of Respondents	n	(%)
Gender		
Boys	44	52,4
Girls	40	47,6
Age		
< 10 years	45	53,6
≥ 10 years	39	46,4
Allowance		
< IDR 5,000	42	50
≥ IDR 5,000	42	50
Family Income		
PMW <	21	25
PMW ≥	63	75
Obesity status of parents		
Risky	46	54,8
No Risk	38	45,2
Childhood obesity		
Yes	38	45,2
Not	46	54,8

Based on the study's results, as many as 44 children of primary school age (52.4%) were male, and 40 children (47.6%) were female. In addition, there were 45 children (53.6%) aged < 10 years and 39 children (46.4%) aged ≥ 10 years. Furthermore, 42 children each (50%) have an allowance of < Rp. 5,000 or ≥ of Rp. 5,000. Then, there were also 63 respondent parents (75%) who had a family income ≥ PMW (Rp. 2,238,094) and the remaining 21 (25%) who had a family income < PMW. Most of the children, namely 46 children (54.8%), had a risky parental obesity status (if both parents of the child or one of them had a BMI > 27 kg / m 2), and as many as 38 children (45.2%) the status of obesity parents were not at risk. A total of 38 children (45.2%) were obese, and 46 children (54.8%) were not obese.

Table 2. Consumption Patterns of Snack Foods, Sleep Duration

Characteristic	n	%
Consumption Patterns of Snack Foods		
Often	45	53,57
Infrequently	39	46,43
Sleep Duration		
Less	45	53,6
Enough	39	46,4

Based on the table above, 45 children (53.57%) had frequent snack food consumption patterns, and 39 children (46.43%) with rare snack food consumption patterns. A total of 45 children (53.6%) experienced sleep deprivation.

Table 3. Bivariate Snack Food Consumption Patterns and Sleep Duration with Obesity

Variable	Obesity				Total		*p-value*	PR 95% CI
	Yes		Not					
	n	%	n	%	n	%		
Consumption patterns of snack foods								
Often	33	73,3	12	26,67	45	100		5,72
Infrequently	5	12,8	34	87,18	39	100	0,0001	(2,47-13,21)
Sleep duration								
Less	30	65,2	16	34,8	46	100	0,0001	7,36
Enough	8	21,0	30	78,9	38	100		(2,86-18,91)

The number of obese children who have a pattern of consuming frequent snack foods and insufficient sleep duration (at risk) is more than half of the total respondents. The statistical analysis showed the relationship between snack food consumption patterns and sleep duration and the incidence of obesity ($p<0.001$). In addition, children with a consumption pattern of snack foods in the category are often at risk of obesity 5.72 times greater than children with a consumption pattern of rare category snack foods. This condition is in line with children who have a sleep duration category less obese by 7.36 times greater than children who have sufficient sleep duration.

Discussion

Snack food is a type of food and drink that can consume without further processing, sold by merchants, and easily obtained by various groups. In this study, the pattern of consumption of the most snack foods of respondents was the consumption of fried foods, namely as many as 41 respondents who consumed fried foods with a frequency of 1 time in one day. Fried foods are snacks that taste savory and crispy. Fried foods contain a high number of calories (calorie-dense) due to their cooking oil content. It can lead to people consuming more calories than needed in a day, eventually leading to obesity.

In addition, the type of snack food that children like or are most interested in is the type of dry snack, as evidenced by almost all of the dry snack foods in FFQ consumed by respondents once a day. Dry snack foods consumed by respondents with a frequency of 1 time a day were light

snacks, chocolate, crackers, wafers, sweets, and cookies. These snack foods have a savory, sweet, salty taste that causes an addictive impact, where it is almost impossible for someone to consume only a little. In addition, these snacks are relatively high in fat, salt, and calories which can increase the risk of weight gain to obesity.

Snacking frequency and weight gain are positively related in US children aged 1 to 5 years, with the most consistent association seen in children < 2 years. additionally, the most commonly consumed snacks (ages 2 to 18 years) are desserts, sweetened drinks, and salty snacks which tend to be high in energy, saturated fat, and added sugar [15]. Another study conducted in Semarang City reported that there is a relationship between snacking habits and more nutritional status, and children who usually snack have a risk of 7 times the occurrence of more nutritional status[16].

Although many studies mention the relationship between snack food and obesity, it differs from research conducted in Tegal City, where there is no relationship between snack consumption habits and *soft drink* consumption with the incidence of obesity[17]. Several other studies have also shown no significant association between snack consumption and weight gain[18]. Although the effects of snacks found no association with improved weight status, the consumption of healthy snacks is most likely to affect satiety and improve appetite control, which can reduce obesity[19].

The results of the observation of respondents' snack food consumption patterns were no different from the results of observations of sleep duration. Sleep duration indicates how long a person sleeps in one sleep period or for 24 hours a day[20]. Sufficient sleep duration in school-aged children is 9 to 12 hours daily[21]. According to the Directorate of Prevention and Control of Non-Communicable Diseases (PCNCD) of the Ministry of Health of the Republic of Indonesia, age-appropriate sleep needs for children aged 6-12 years are 10 hours[22].

This study showed that more than half of the respondents who were obese had insufficient sleep duration or less than 10 hours. The results also showed that there was a 7.36 times risk for respondents who had insufficient sleep duration with obesity events compared to those who had sufficient sleep duration. The study results align with a meta-analysis of observational and prospective cohort studies that show an association between sleep duration and the risk of being overweight and obese in childhood and adolescence. Children aged 13 years and under with short sleep duration (10 hours) had a 76% increased risk of being overweight or obese compared to their counterparts with longer sleep durations[23,24]. In contrast to other studies conducted on children in China that there is no significant association between sleep duration and obesity[25].

Insufficient sleep leads to an energy imbalance via altered hormone regulation, reducing physical activity levels, increasing sedentary time, and a higher caloric intake [26]. The reduction or inhibitor loss of orexigenic activity in the hypothalamus area can explain the relationship between sleep duration and be overweight. A decrease in hypothalamic activity inhibitors that modulate appetite regulation can lead to increased hunger. Increased hunger can result in weight gain as a

short-term effect and obesity as a long-term effect. Other pathways that may be associated with hormonal disruptions include increased release of growth hormone (*Growth Hormone*) and ghrelin during the day and increased release of cortisol at night [27].

WHO revealed that there is a relationship between ambient noise and sleep deprivation. Environmental factors can disrupt some children's sleep, depending on the causes felt by the child such as the amount of light, room temperature, noise level, and other disturbances [28]. Therefore, it is important for parents to create the right sleep time and conditions for their children. So that the nutritional status and mental health of children becomes better.

Conclusion

The study's results concluded that there is a significant relationship between the consumption pattern of snack foods and sleep duration with the incidence of obesity in school children. Input for parents and the school to be able to provide food that contains balanced nutrition, both provided from home and school cafeterias. In addition, parents can regulate children's sleep patterns to produce quality sleep.

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Conflict of Interest

There is no conflict of interest in this research.

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