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Softdrink Habit, Breakfast and Physical Activity Associated with Overweight in SMA Negeri 7 Bengkulu

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ABSTRACT

Overweight and obesity can occur in individuals of all age groups, including adolescents, who are experiencing a phase of rapid growth. This study aims to determine the relationship between soft drink consumption, breakfast habits, and physical activity with the incidence of excess body weight among adolescents at SMA Negeri 7 Bengkulu City in 2024. The research is an analytic observational study employing a cross-sectional design. A total of 54 class XI students were selected through simple random sampling. Data on soft drink consumption and breakfast habits were collected using the FFQ form, while physical activity data was gathered using the GPAQ questionnaire. The incidence of excess body weight was determined by measuring height and weight with a microtoise and a weight scale. Univariate and bivariate data analyses were conducted using the chi-square test with a significance level of $\alpha = 0.05$. The results indicated that the majority of respondents frequently consume soft drinks (75.9%), rarely eat breakfast (80.7%), and engage in sufficient physical activity (71.8%). There is a significant relationship between the habit of consuming soft drinks and the incidence of excess weight in adolescents ($p = 0.007$), between breakfast habits and the incidence of excess weight ($p < 0.001$), and between physical activity and the incidence of excess weight ($p = 0.002$).

1. Introduction

Obesity is a major contributor to the global burden of disease through serious non-communicable diseases and neuropathy. Psychological, pulmonary, orthopedic, cardiovascular, metabolic, reproductive, and oncological diseases can be caused by obesity. Therefore, obesity has the potential to trigger premature death. Obesity contributed to 4 million deaths in 2015, or 7.1% of all causes of death worldwide. Overweight refers to the accumulation of body fat, while obesity indicates an excess of body fat mass (Wicherski *et al.*, 2021).

Overweight and obesity are significant problems for the body as they cause it to move more slowly. The constant accumulation of fat results from the body's inability to process fat into carbohydrates, affecting physical health, such as the appearance of folds on the abdomen, waist, and arms, as well as psychological health, such as embarrassment and lack of confidence. Overweight and obesity can occur in all age groups, including adolescents, who are in a phase of rapid growth requiring more nutrients. This can lead to nutritional, environmental, and lifestyle problems that cause overnutrition (Simbolon *et al.*, 2018).

A sedentary lifestyle is a major cause of obesity and an important risk factor. In adolescents who sit for more than six hours, the prevalence of obesity is high; additionally, this lifestyle is often accompanied by the consumption of high-calorie foods (Machado *et al.*, 2018).

There are several literatures that identify the risk factors for overweight and obesity, such as socioeconomics and demographics, eating patterns and habits, physical activity and lifestyle, parenting, and other risk factors (Banjamahor, 2022).

Soft drinks, a term widely used for non-alcoholic beverages made from water and usually containing natural or artificial sweeteners, are one of the lifestyle factors contributing to obesity in today's teenagers (Pietka & Korab, 2024). Soft drinks are high in simple carbohydrates, such as glucose, fructose, and sucrose, which can affect children's health and increase weight (Kamisna *et al.*, 2023).

Children and adolescents who habitually eat breakfast tend to have better micro and macronutrient intake (Deshmusk, 2010). In recent years, skipping breakfast has been shown to be associated with obesity (Purshlow, 2008). Breakfast is especially important for adolescents, as it can fulfill 20-25% of total daily energy needs if consumed properly. A survey conducted by the National Weight Control Registry (NWCR) found that adolescents who consume breakfast regularly have a lower chance of being overweight and obese compared to those who do not. However, in Indonesia, many children do not usually have breakfast before going to school for several reasons, such as lack of available food, unappealing or monotonous food, or not enough time because they have to leave early (Fahrizal, 2021).

Physical activity is broadly defined as any body movement produced by skeletal muscles that results in energy expenditure (Carpersen, 1985). One of the factors that can cause excess weight is insufficient physical activity. If the body's calorie consumption exceeds the limit and is not balanced with adequate physical activity, the body will experience excess weight (Sembiring *et al.*, 2022).

Since 1975, the number of obese people globally has almost tripled. Most people around the world live in countries where overweight or obese individuals die more frequently than those who are underweight. In 2016, more than 340 million adolescents aged 5 to 19 were obese or overweight (WHO, 2020). So far, limited studies have been conducted that analyze the relationship between soft drink consumption habits, breakfast, and physical activity simultaneously.

2. Methods

This research uses the regression analysis method, a data analysis technique used to examine the influence between two or more variables. The variables observed in this study are soft drink habits, breakfast habits, and physical activity, and their association with the incidence of excess body weight

in adolescents at SMA Negeri 7 Bengkulu City in 2024 (SMA Negeri: Senior high school). The study was conducted in May 2024 at SMA Negeri 7 Bengkulu City. Sampling was done by simple random sampling. The population of this study consisted of all adolescents in class XI, totaling 434 students. The sample size used was 54 respondents. Data collection was carried out through direct interviews with the respondents, using the Food Frequency Questionnaire (FFQ) form to determine soft drink consumption patterns and breakfast habits. Physical activity was assessed using the Global Physical Activity Questionnaire (GPAQ) (WHO, 2021). To determine the incidence of overweight in adolescents, height and weight were measured using a microtoice and weight scales, with BMI-for-age (BMI/U) calculations.

The sample size required in this study used the formula (Lemeshow et al, 1990)

$$n = \frac{N.z^2 1-a/2\,.p.q}{d^2\,(\,N-1\,)+z^2\,1-a/2\,.p.q}$$

$$n = \frac{434.(1{,}96)^2.0{,}2\,(1-02\,)}{(0{,}1)^2\,(\,434-1)+\,1{,}96^2.0{,}2\,(1-0{,}2\,)}$$

$$n = \frac{434.3.85.0{,}2\,.0{,}8}{0{,}01\,.(433)+3{,}85\,.0{,}2\,.0{,}8}$$

$$n = \frac{267}{4{,}94}$$

n = 54 Respondents

n = number of samples P = Estimated proportion (0.2) q = 1-p
d = Absolute precision (10%)
Z 21 -α Statistic Z (Z = 1.96 for α = 0.05) N
= Population size (434)

Based on the formula above, the sample for this study was 54 respondents

3. Results and Dicussion

The results of the research conducted obtained data on the habit of drinking soft drinks, breakfast and physical activity with the incidence of excess body weight in adolescents at SMA Negeri 07 Bengkulu city in 2024. Table 1. shows that most of the respondents aged 17 years were 39 people (72.2%). The gender of the respondents was mostly male as many as 28 people (51.9%).

Table 1. Overview of respondent characteristics, *soft* drink habits, breakfast and physical activity with the incidence of overweight in adolescents at SMA Negeri 07 Bengkulu city in 2024.

Respondent Characteristics		n	%
Age			
	16 years	15	27.8
	17 years	39	72.2
Gender			
	Male	28	51.9
	Female	26	48.1

Table 2. Relationship between *Soft* Drink Drinking Habits and the Incidence of Overweight Adolescents at SMA Negeri 07 Bengkulu City in 2024.

Soft Drink	Overweight Incident				Amount		*p-Value*
	Not overweight		Overweight				
	n	%	n	%	n	%	
Infrequent	16	64.0	9	36.0	25	100	
Frequent	7	24.1	22	75.9	29	100	0.007
Quantity	23	42.6	31	57.4	54	100	

Table 2. shows that of the 29 respondents with excessive body weight who have the habit of drinking soft drinks often 22 people (75.9%) of them have excessive body weight and of the 25 respondents with excessive body weight who drink soft drinks rarely 16 people (64.0%) of them have no excess weight. Statistical test results with chi-square test obtained p-value 0.007.

Table 3. The relationship between breakfast and the incidence of overweight adolescents at SMA Negeri 07 Bengkulu City in2024.

Breakfast	Overweight Incident				Amount		*p-Value*
	Not overweight		Overweight				
	n	%	n	%	n	%	
Infrequent	6	19.3	25	80.7	31	100	
Frequent	17	73.9	6	26.1	23	100	0.000
Quantity	23	42.6	31	57.4	54	100	

Table 3. shows that of the 31 respondents with excessive body weight incidence who had breakfast rarely 25 people (80.7%) ofthem had excessive body weight and of the 23 respondents with excessive body weight incidence who had breakfast often 17 people (73.9%) of them had no excess weight. Statistical test results with chi-square test obtained p-value 0.000.

Table 4. Relationship between physical activity and the incidence of overweight adolescents at SMA Negeri 07 Bengkulu City in 2024.

Physical activity	Overweight Incident				Amount		*p-Value*
	Not overweight		Overweight				
	n	%	n	%	n	%	n
Infrequent	11	28.2	28	71.8	39	100	
Frequent	12	80.0	3	20.0	15	100	0.002
Quantity	23	42.6	31	57.4	54	100	

Table 4. shows that of the 39 respondents with the incidence of excessive body weight with sufficient physical activity 28 people (71.8%) of them have excessive body weight and of the 15 respondents with excessive body weight with heavy physical activity 12 people (80.0%) of them have not excessive body weight. Statistical test results with chi-square test obtained p-value 0.002.

3.1 Relationship between Soft Drinking Habits and the Incidence of Excessive Weight in Adolescents at SMA Negeri 07 Bengkulu City

Based on the results of the study in Table 2, there is a relationship between the habit of drinking soft drinks and the incidence of excess weight in adolescents at SMA Negeri 07 Bengkulu City, with a p-value of $p = 0.007 < 0.05$. This study shows that out of the 54 respondents who frequently drink soft drinks, 22 (75.9%) have excess weight. Among the 25 respondents who rarely drink soft drinks, 16 (64.0%) do not have excess weight.

According to the Institute of Food Science and Technology (2016), sugar is a basic carbohydrate. Glucose, fructose, sucrose, trehalose, isomaltose, and D-tagatose are the most common sweeteners used in carbonated beverages. One 12-ounce can of soda, or 350 mL, contains 150 kcal and 40 to 50 grams of sugar, contributing very high calories that directly affect weight gain (Limarda *et al.*, 2022).

The increase in the soft drink industry, especially sugary drinks, is a significant factor contributing to the current rise in the obesity problem. Several studies indicate that the consumption of sugary drinks increases the risk of obesity and metabolic diseases. Consumers of sugary drinks are also more prone to ischemic stroke, especially women. According to the Indonesian Health Research and Development Agency, the daily consumption of carbonated beverages is 2.4 milliliters (ml)/person, with the highest consumption in the age group of 13-18 years at 4.7 ml/person/day (Fatmala *et al.*, 2022).

In this study, sugary drinks were considered simple carbohydrates. Being overweight can be caused by excessive consumption of carbohydrates and saturated fats, as well as insufficient physical activity. Overweight people tend to eat sweets more often than those with an ideal body weight. Soft drinks can cause weight gain because they provide extra energy, leading to overweight and obesity. Additionally, the mechanism (desire to consume food or drink) may not account for the calories in the drink, resulting in many people still eating a lot of food even after consuming sugary drinks, thereby increasing their calorie intake (Fatmala *et al.*, 2022).

Based on data from the research conducted through interviews, it can be concluded that most respondents often consume soft drinks. Researchers conducted interviews by explaining the contents of the FFQ form to the respondents. The contents of the FFQ form were well understood, allowing the respondents to answer accurately. Respondents often consume soft drinks because these beverages are readily available around them (canteens, mini markets, stalls) at school or outside of school hours.

3.2 Relationship between Breakfast and the Incidence of Excessive Weight in Adolescents at SMA Negeri 07 Bengkulu City

Based on the results of the study in Table 3, there is a relationship between breakfast and the incidence of excess weight in adolescents at SMA Negeri 07 Bengkulu City, with a p-value of $p = 0.000 < 0.05$. This study shows that of the 54 respondents who rarely had breakfast, 25 (80.7%) had excess weight, while of the 23 respondents who often had breakfast, 17 (73.9%) did not have excess weight.

Not eating breakfast every day, having breakfast outside the home, lack of physical activity, low economic level, and low parental education are some of the factors that contribute to obesity. In the HELENA study, adolescents who ate breakfast regularly showed lower obesity markers, such as body mass index (BMI) and skinfold thickness; and in boys (but not girls), lower waist circumference (Hallstrom *et al.*, 2011).

Breakfast time is from 6:00 a.m. to 10:00 a.m. It contributes 25% of schoolchildren's daily nutritional needs in energy. The body breaks down carbohydrates into simple sugars such as fructose, galactose, and glucose during digestion. In Indonesia, many children do not eat breakfast

before going to school for several reasons: lack of available food, unappealing food, monotonous food, or not enough time because they have to leave early. Skipping breakfast can cause blood sugar to drop, leading to hunger pangs. Under these conditions, a person may overeat throughout the day (Fahrizal *et al.*, 2021).

Breakfast is not just about eating in the morning; it provides energy for activities during the day. If you skip breakfast, you may tend to eat snacks and high-calorie foods, which will eventually lead to weight gain. Skipping breakfast results in an empty stomach and constantly dropping blood glucose levels. Consequently, there is a risk of eating 1.5 times more snacks than people who usually eat breakfast. Blood glucose stored as glycogen will increase with intake stored at night. Due to low physical activity at night, glycogen will be stored as fat, leading to overnutrition (Sembiring *et al.*, 2022).

Based on data from research conducted through interviews, it can be concluded that most respondents rarely have breakfast. Researchers conducted interviews by explaining the contents of the FFQ form to the respondents. The contents of the FFQ form were well understood, allowing the respondents to answer accurately. Respondents rarely eat breakfast because they are afraid of being late for school, are not accustomed to breakfast, wake up late, or feel nauseous if they eat breakfast.

3.3 Relationship between Physical Activity and the Incidence of Excessive Weight in Adolescents at SMA Negeri 07 Bengkulu City

Based on the results of the study in Table 4, there is a relationship between physical activity and the incidence of excess weight in adolescents at SMA Negeri 07 Bengkulu City, with a p-value of $p = 0.002 < 0.05$. This study shows that of the 54 respondents with moderate physical activity, 28 (71.8%) have excess body weight, while of the 15 respondents with heavy physical activity, 12 (80.0%) do not have excess body weight.

Physical behavior has many complex dimensions. Overall physical activity can be influenced by different types of activities, such as work activities, household activities, and transportation activities, like walking or cycling when the distance is manageable. Walking, whether at home or work, or engaging in low-intensity physical activity requires little physical exertion and does not change the breathing rate. Today, technological advances have changed how human activities are carried out. People now prefer sedentary lifestyles, which means they do not engage in much physical activity, negatively impacting their health. This is evident in many changes in modern lifestyles, such as using elevators instead of stairs, all-digital household appliances, and motorized vehicles, reducing the physical activity required for traveling (Sari *et al.*, 2020).

Physical activity is an important part of lifestyle interventions to lose weight and keep it off. Although the impact of physical activity on weight loss may seem modest at first, there is a dose-response relationship between physical activity and weight loss. Physical activity is also crucial for promoting long-term weight loss and preventing weight regain (Pakaya *et al.*, 2020).

Based on data from research conducted through interviews, it can be concluded that most respondents engage in sufficient physical activity. Researchers conducted interviews by explaining the contents of the GPAQ questionnaire to the respondents. The contents of the GPAQ questionnaire were well understood, allowing the respondents to answer accurately. Respondents engage in sufficient physical activity despite being generally lazy to exercise. Advanced technology also contributes to reduced physical activity, increasing the risk of excess weight.

4. Conclusions

Based on the results of the study, it can be concluded that almost all respondents frequently consume soft drinks because these beverages are readily available around them (canteens, mini markets, stalls) at school or outside of school hours. Nearly all respondents rarely eat breakfast due to

fears of being late for school, not being accustomed to breakfast, waking up late, or feeling sick if they eat breakfast. Additionally, almost all respondents have insufficient physical activity due to a reluctance to exercise, and more advanced technology also contributes to their laziness to move, leading to reduced physical activity and increased risk of excess weight.

This study found a significant relationship. Researchers used previous studies with similar topics and theories but different research subjects as references. Previous studies concluded that lifestyle greatly influences a person's obesity. The results of this study are consistent with those findings, indicating that respondents frequently consume soft drinks because they are easily accessible, which, along with their lifestyle habits, contributes to excess weight.

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