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DIFFERENCES IN NUTRITIONAL STATUS BASED ON OBESOGENIC BEHAVIOUR AMONG STUDENTS AT SMK BINA PROFESI, BOGOR CITY

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Abstract

Adolescent nutritional status is a critical public health concern, as lifestyle shifts and technological advancements have increased vulnerability to overweight and obesity. Obesogenic behaviours, including fast-food intake, regular consumption of carbonated soft-drink, and prolonged sedentary behaviour, further elevate this risk. This study aimed to analyze differences in nutritional status associated with obesogenic behaviour among students at SMK Bina Profesi, Bogor City. A cross-sectional design was employed, with data collected from 39 respondents selected by purposive sampling. Nutritional status was evaluated using Body Mass Index-for-Age (BMI/A), whereas obesogenic behaviour was assessed through a structured questionnaire. Group differences in nutritional status were analyzed using independent t-test. Results indicated significant differences in nutritional status according to carbonated soft-drink consumption and sedentary behaviour ($p<0.05$). Participants reporting regular soft-drink consumption and higher sedentary time exhibited elevated higher BMI/A z-scores. No significant association was observed for fast-food consumption ($p>0.05$), despite its high prevalence among respondents. Regular nutritional monitoring and targeted health education in schools are recommended to mitigate overweight and obesity risks among adolescents.

Keywords: Adolescent, Carbonated Soft Drink, Nutritional Status, Obesogenic Behaviour, Sedentary Behaviour

Introduction

Adolescence is a crucial life stage because rapid physical, psychological, and social growth occurs during this period. Adolescence is a transition from childhood to adulthood; therefore, nutritional requirements increase and nutritional status needs optimal attention [1]. Nutritional status is the condition of the body resulting from the balance between nutrient intake and nutrient requirements, which is influenced by food consumption, physical activity, and health status [2]. Overweight and obesity among adolescents in Indonesia remain relatively high. From 2010 to 2013, the prevalence of obesity among adolescents aged 16-18 years increased from 1.4% to 7.3% in 2013 [3], [4]. Based on the 2022 Indonesian Nutritional Status Survey, the prevalence of overweight and obesity among adolescents aged 13-15 years was 16%, while among adolescents aged 16-18 years it was 13.5% [5].

Technological development and lifestyle changes have made adolescents more exposed to unhealthy dietary patterns, such as consumption of foods high in sugar, fat, and sodium. Adolescents also tend to consume fast food and sweetened beverages because they are practical, easy to obtain, and influenced by the social environment [6]. Increased gadget use among adolescents reduces physical activity and increases sedentary behaviour, such as prolonged sitting, playing games, watching television, and using social media [7], [8].

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Excessive energy intake that is not balanced by physical activity can cause an energy surplus, which is stored as body fat. If this occurs continuously, it can lead to overweight and obesity among adolescents [9]. Adolescent obesity can increase the risk of various non-communicable diseases, such as type 2 diabetes mellitus, hypertension, cardiovascular disease, and psychosocial disorders [10]. Obesogenic behaviour refers to behaviours that can increase the risk of overweight and obesity due to high energy intake and low energy expenditure, such as fast-food consumption, carbonated soft-drink consumption, sedentary lifestyle, and low physical activity [11].

Lifestyle changes have made adolescents more exposed to fast-food consumption. Fast-food consumption is known to be associated with poor diet, weight gain, and increased risk of overweight and obesity among adolescents aged 10-17 years [12]. Fast food generally contains high calories, fat, sugar, and sodium, which may increase the risk of overweight and obesity among adolescents when consumed excessively [13]. Carbonated soft-drink consumption among adolescents may increase the risk of overweight and obesity because its high added sugar content increases total daily energy intake. A recent study showed that daily soft-drink consumption was associated with the prevalence of overweight and obesity among adolescents in 107 countries [14]. Adolescents with low physical activity have a higher risk of overweight and obesity than physically active adolescents. Studies in adolescents have shown that sedentary lifestyle and low physical activity are significantly associated with obesity [15], [16].

Based on the 2023 Indonesian Health Survey (SKI), the prevalence of overweight among adolescents aged 16-18 years in West Java was 8.6% and obesity was 5.1%, resulting in a total overweight and obesity prevalence of 13.7% [17]. Previous studies have mostly examined obesogenic behaviour variables separately, such as fast-food consumption, carbonated soft-drink consumption, and sedentary lifestyle. Studies analysing differences in nutritional status based on obesogenic behaviour simultaneously among high school adolescents remain limited. Therefore, this study aimed to analyse differences in nutritional status based on obesogenic behaviour among students at SMK Bina Profesi, Bogor City.

Methods

This study used an analytical observational approach with a cross-sectional design. The cross-sectional design was selected to identify differences in nutritional status based on obesogenic behaviour among adolescents. The independent variables in this study were obesogenic behaviours (fast-food consumption, carbonated soft-drink consumption, and sedentary behaviour), while the dependent variable was nutritional status (BMI/A). The study was conducted at SMK Bina Profesi, Bogor City, in December 2024. The population in this study comprised all grade XII students at SMK Bina Profesi. The sampling technique was purposive sampling, with inclusion criteria of students aged 17-18 years who completed the questionnaire. A total of 39 respondents were obtained. Data on obesogenic behaviour were collected using a questionnaire completed by respondents after receiving an explanation from the research team. Nutritional status data were obtained through direct measurement of respondents' height and weight. Height was measured using a microtoise, while body weight was measured using a digital scale; BMI/A was then determined using WHO AnthroPlus software. Obesogenic behaviour data were processed into two categories for each behaviour: fast-food consumption was categorised as consuming (if respondents consumed fast food at least once in the past 7 days) and not consuming (if respondents did not consume fast food in the past 7 days); carbonated soft-drink consumption was categorised as consuming (if respondents consumed soda at least once per day during the past 30 days) and not consuming (if respondents did not consume soda during the past 30 days); sedentary behaviour was categorised as non-sedentary (if sedentary activities were <3 hours/day) and sedentary (if sedentary activities were ≥3 hours/day) [18]. Nutritional status was categorised into three groups in the univariate analysis: underweight (<-2 SD to <-3 SD), normal (-2 SD

to +1 SD), and overweight (>+1 SD to >+2 SD) [19], and was analysed as numerical data in the bivariate analysis. Data analysis consisted of univariate analysis and the independent t-test to determine differences in nutritional status based on obesogenic behaviour because nutritional status data were normally distributed ($p>0.05$).

Results

Respondent characteristics in this study included age, sex, and pocket money. Based on Table 1, most respondents were 17 years old, totaling 27 students (69.2%), while 12 respondents (30.8%) were 18 years old. Based on sex, the majority of respondents were male, totaling 21 students (53.8%), while 18 respondents (46.2%) were female. Based on pocket-money category, most respondents had a moderate level of pocket money, totaling 24 students (61.5%), followed by the high category with 12 students (30.8%) and the low category with 3 students (7.7%). These data indicate that most respondents were 17-year-old male adolescents with moderate pocket money.

Table 1. Distribution of Subject Characteristics

Category	n	%
Age		
17 years	27	69.2
18 years	12	30.8
Sex		
Female	18	46.2
Male	21	53.8
Pocket Money		
Low (< IDR 15,000)	3	7.7
Moderate (≤ IDR 20,000)	24	61.5
High (> IDR 20,000)	12	30.8

Based on Table 2, most respondents had normal nutritional status, totaling 31 students (79.5%), while 6 respondents (15.4%) had overweight nutritional status and 2 respondents (5.1%) were underweight. For obesogenic behaviour, the majority of respondents consumed fast food at least once in the past 7 days, totaling 36 students (92.3%), while only 3 respondents (7.7%) did not consume fast food during the past 7 days. Based on carbonated soft-drink consumption, most respondents consumed soda at least once per day during the past 30 days, totaling 26 students (66.7%), while 13 respondents did not consume soda. For sedentary behaviour, the majority of respondents performed sedentary activities for ≥3 hours/day, totaling 26 students (66.7%), while 13 respondents (33.3%) performed sedentary activities for <3 hours/day. These results indicate that most respondents had normal nutritional status but were dominated by obesogenic lifestyle behaviours, namely relatively high fast-food consumption, carbonated soft-drink consumption, and sedentary activity.

Table 2. Distribution of Nutritional Status and Obesogenic Behaviour

Category	n	%
Nutritional Status		
Underweight	2	5.1
Normal	31	79.5
Overweight	6	15.4
Obesogenic Behaviour		
Fast-Food Consumption		
Did not consume in the past 7 days	3	7.7
Consumed fast food ≥1 time in the past 7 days	36	92.3
Carbonated Soft-Drink Consumption		
Did not consume soda in the past 30 days	13	33.3
Consumed soda ≥1 time/day in the past 30 days	26	66.7
Sedentary Behaviour		
Sedentary activities <3 hours/day	13	33.3
Sedentary activities ≥3 hours/day	26	66.7

Based on Table 3, the analysis showed that fast-food consumption was not significantly associated with the mean BMI/A z-score of respondents (p=0.224). Respondents who did not consume fast food in the past 7 days had a mean BMI/A z-score of 0.86 ± 0.32, while respondents who consumed fast food at least once in the past 7 days had a mean BMI/A z-score of -0.25 ± 1.53. For carbonated soft-drink consumption, there was a significant association with the mean BMI/A z-score of respondents (p=0.023) (Table 3). Respondents who did not consume soda during the past 30 days had a mean BMI/A z-score of -0.92 ± 1.26, while respondents who consumed soda at least once per day during the past 30 days had a mean BMI/A z-score of 0.22 ± 1.48. Sedentary behaviour also showed a significant association with the mean BMI/A z-score of respondents (p=0.037) (Table 3). Respondents who performed sedentary activities for <3 hours/day had a mean BMI/A z-score of -0.54 ± 1.72, while respondents who performed sedentary activities for ≥3 hours/day had a mean BMI/A z-score of 0.38 ± 0.90. These results indicate that respondents' nutritional status differed based on carbonated soft-drink consumption and sedentary behaviour, whereas fast-food consumption did not show a difference in nutritional status.

Table 3. Differences in Nutritional Status Based on Obesogenic Behaviour

Variable	Mean BMI/A z-score ± SD	p-value
Fast-Food Consumption		
Did not consume in the past 7 days	0.86 ± 0.32	0.224
Consumed fast food ≥1 time in the past 7 days	-0.25 ± 1.53	0.224
Carbonated Soft-Drink Consumption		
Did not consume soda in the past 30 days	-0.92 ± 1.26	0.023
Consumed soda ≥1 time/day in the past 30 days	0.22 ± 1.48	0.023
Sedentary Behaviour		
Sedentary activities <3 hours/day	-0.54 ± 1.72	0.037
Sedentary activities ≥3 hours/day	0.38 ± 0.90	0.037

Discussion

Differences in Nutritional Status Based on Fast-Food Consumption

The results showed that there was no difference in nutritional status based on fast-food consumption among high school students ($p>0.05$) (Table 3). This finding is consistent with a study at SMA Negeri 1 Tampaksiring, Gianyar Regency, which showed no significant association between fast-food consumption patterns and adolescent nutritional status ($p=0.745$) [20]. Another study among students at SMA Negeri 1 Pajangan also found that fast-food consumption was not significantly associated with adolescent nutritional status ($p=0.468$) [21]. The absence of differences in nutritional status may be due to the larger proportion of respondents being in the consuming category (92.3%). The questionnaire administered to respondents only covered fast-food consumption in the previous seven days and did not ask about the quantity consumed; therefore, it may not adequately represent fast-food consumption.

The most frequently consumed types of fast food found in this study were bakso and fried snacks. These foods were highly consumed among adolescents because they are widely available, inexpensive, easy to find around schools and residential areas, and often part of social activities, such as buying snacks with friends during school breaks or after school. They are also popular local fast foods among adolescents because they are considered practical and filling. Excessive consumption of these foods may increase the risk of nutritional problems, such as excessive intake of trans fats, salt, and food additives, which may reduce the nutritional quality of adolescents' diets. This is supported by a study by Nathania and Jaksa (2024), which showed that consumption of fast food high in salt and saturated fat was significantly associated with an increased risk of hypertension among adolescents. Dietary patterns high in sugar, salt, and fat among adolescents may also lead to metabolic disorders. These consumption patterns are not only shaped by individual preferences but also by strong social pressure [22].

Differences in Nutritional Status Based on Carbonated Soft-Drink Consumption

Based on Table 3, the results showed a difference in nutritional status between respondents who consumed carbonated soft drinks and those who did not ($p=0.023$). The mean nutritional status was higher among respondents who consumed carbonated soft drinks. This finding is consistent with the study by Putri and Muqni (2024), which showed that sugar-sweetened beverage consumption was associated with an increased risk of overweight among adolescents [5]. A study by Hu et al. (2023) also reported consistent findings, showing that soft-drink consumption during adolescence was associated with the prevalence of overweight and obesity [14].

The types of carbonated soft drinks consumed by respondents included Nipis Madu, Sprite, Coca-Cola, Fanta, Adem Sari Sparkling, Big Cola, and Tebs. Nipis Madu was one of the main choices among adolescents. This may be due to its very affordable price, sweet and refreshing taste, and attractive packaging. These products are commonly sold in school canteens, nearby stalls, and minimarkets, making them easily accessible to adolescents from various socioeconomic backgrounds. Consumption of Nipis Madu and similar beverages increases the risk of nutritional and health problems. The carbonated soft drinks consumed by respondents contained relatively high sugar levels (18-41 grams of sugar). Regular consumption of sweetened carbonated beverages significantly increases the risk of central obesity, insulin resistance, and other metabolic disorders among adolescents [23]. When adolescents experience physical changes such as disproportionate weight gain, they tend to receive negative stigma, such as being perceived as not maintaining their appearance or not caring about their health. This creates vulnerability associated with obesity, particularly in peer environments that strongly emphasize body image and certain aesthetic standards [24].

Differences in Nutritional Status Based on Sedentary Behaviour

The results in Table 3 showed a difference in nutritional status between respondents in the sedentary and non-sedentary behaviour categories (p=0.037). The mean nutritional status was higher among respondents with sedentary behaviour. This finding is consistent with the study by Hidayah et al. (2024), conducted among junior high school students, which showed that sedentary lifestyle was associated with obesity. Sedentary behaviour leads to low energy expenditure because the body performs low-intensity activities for long periods, such as sitting, using gadgets, watching television, and playing games [16]. One of the sedentary activities among respondents was gadget use, resulting in relatively high screen time. A study by Muhammad et al. (2023) found that adolescents with high screen time also had larger waist circumference (central obesity) [25]. This condition can cause energy imbalance, thereby increasing the risk of body-fat accumulation and overweight nutritional status among adolescents [18]. Sedentary behaviour refers to activities with low energy expenditure performed in a sitting or lying position for a prolonged period, such as gadget use, watching television, playing games, and other screen-time activities. This behaviour can cause energy imbalance and increase the risk of overweight and obesity among adolescents [26].

This study used a cross-sectional design; therefore, it cannot describe causal relationships. The development of questionnaires related to obesogenic behaviour in Indonesia is needed in future studies. Additional questions regarding the frequency, duration, and quantity of foods or beverages consumed are also needed. Although differences were found in the carbonated soft-drink and sedentary behaviour variables, the nutritional status of respondents in this study was still within the normal category (-2 SD to +1 SD).

Conclusion

This study demonstrates that adolescent status is significantly associated with carbonated soft-drink consumption and sedentary behaviour. Participants reporting regular soft drink intake adn prolonged sedentary time exhibited higher BMI. Given their high added sugar content, soft-drink consumption warrants targeted public health intervention. Similarly, reducing prolonged sedentary periods is essential for weight management. Adhering to balanced dietaru guidelines, minimising intake of added sugars, sodium, saturated fats, and promoting regular physical activity are critical strategies for maintaining optimal nutritional status. Furthermore, schools should implement routine anthropometric screening and comprehensive nutrition education programmes to proactively safeguard adolescent health.

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