

The Relationship Between Breakfast Habits and Frequency of Snack Food Consumption with the Nutritional Status of Students at SMA Negeri 4 SurakartaZahra Dhiya'an Almas Putri Kinasih¹, Muwakhidah¹, Farida Nur Isnaeni¹¹Study Program in Nutrition, Universitas Muhammadiyah Surakarta, Indonesia**ABSTRACT**

Adolescent nutritional status is influenced by multiple dietary behaviors, including breakfast habits and snack food consumption. This study aimed to examine the association between breakfast habits and snack consumption frequency with the nutritional status of students at SMA Negeri 4 Surakarta. An observational analytic study with a cross-sectional design was conducted among 100 students in grades X and XI, selected using stratified proportional random sampling. Breakfast habits were assessed using a 3-day food record and categorized as regular (consuming breakfast ≥ 5 days per week) or irregular (< 5 days per week). Snack food consumption was measured using a food frequency questionnaire (FFQ) and classified as frequent (≥ 1 time per day) or infrequent (< 1 time per day). Nutritional status was determined using Body Mass Index-for-Age (BMI-for-age) based on WHO standards. The results showed that 79% of students had regular breakfast habits, while 21% had irregular habits. Snack consumption was equally distributed, with 50% categorized as frequent consumers and 50% as infrequent consumers. In terms of nutritional status, 8% of students were underweight, 74% were normal, and 18% were overweight. Chi-square analysis revealed a significant association between breakfast habits and nutritional status ($p = 0.021$, Cramér's $V = 0.32$), as well as between snack consumption frequency and nutritional status ($p = 0.034$, Cramér's $V = 0.28$). In conclusion, both breakfast habits and snack consumption frequency are significantly associated with the nutritional status of high school students. These findings underscore the importance of promoting regular breakfast consumption and healthy snacking behaviors to support optimal adolescent nutrition.

Keywords: Breakfast habits, snack consumption, nutritional status, adolescents, BMI-for-age

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INTRODUCTION

Adolescence is a critical period of rapid physical growth and psychological development that requires adequate and balanced nutritional intake. However, adolescents are particularly vulnerable to unhealthy dietary behaviors, including irregular meal patterns and high consumption of energy-dense snack foods. These behaviors are increasingly influenced by greater autonomy

in food choices, as well as environmental and lifestyle factors such as easy access to fast food and exposure to digital media, which shape dietary preferences and eating habits. As a result, adolescents are at higher risk of experiencing nutritional imbalances that may affect their overall health and development.

Globally, the prevalence of overweight and obesity among adolescents has risen significantly in recent decades, reflecting a shift from traditional dietary patterns toward more processed and high-calorie foods. This nutritional transition is particularly evident in urban areas, where adolescents are more exposed to fast food outlets and convenience foods. In Indonesia, this issue is further complicated by the coexistence of undernutrition and overnutrition, indicating a double burden of malnutrition. These conditions highlight the need to better understand modifiable dietary behaviors that contribute to adolescents' nutritional status.

Breakfast consumption is widely recognized as an essential component of a healthy diet. Physiologically, breakfast helps restore blood glucose levels after overnight fasting, supports cognitive function, and contributes to daily nutrient intake. Adolescents who regularly consume breakfast tend to have better dietary quality and more stable energy intake throughout the day. In contrast, skipping breakfast is often associated with compensatory eating behaviors, such as increased snacking and a preference for high-fat, energy-dense foods, which may negatively impact nutritional status.

In addition to breakfast habits, snacking behavior plays a significant role in shaping adolescents' dietary patterns. Snacks can contribute positively to daily energy intake when they are nutritionally balanced; however, the impact of snacking largely depends on the type, frequency, and portion size of the foods consumed. Frequent consumption of unhealthy snack foods—typically high in sugar, fat, and salt—has been associated with an increased risk of obesity and metabolic disorders. Nevertheless, existing evidence on the relationship between snack consumption frequency and nutritional status remains inconsistent, suggesting that factors such as food quality and overall dietary patterns may be more influential than frequency alone.

Although previous studies have examined the relationship between breakfast habits, snacking behavior, and nutritional status, several gaps remain. Many studies have analyzed these variables separately rather than exploring their combined influence. In addition, findings related to snack consumption frequency are inconsistent across studies, and limited research has been conducted in specific local contexts, particularly in urban high school settings in Indonesia. Environmental factors, such as the availability of fast food and snack outlets near schools, may play a significant role in shaping students' eating behaviors, yet these factors are not always adequately considered.

SMA Negeri 4 Surakarta represents an urban school environment with easy access to various food outlets, making it a relevant setting for investigating adolescents' dietary behaviors. Preliminary observations indicate that although a high proportion of students report consuming breakfast, unhealthy snacking practices remain common. However, the extent to which these behaviors are associated with students' nutritional status has not been clearly established. Therefore, this study aims to examine the relationship between breakfast habits and the frequency of snack food consumption with the nutritional status of students at SMA Negeri 4 Surakarta. It is hypothesized that students who regularly consume breakfast are more likely to have normal nutritional status, and that the frequency of snack food consumption is significantly associated with adolescents' nutritional status.

METHODS

This study employed a quantitative observational design with a cross-sectional approach and was conducted at SMA Negeri 4 Surakarta. The study aimed to examine the association between breakfast habits and the frequency of snack food consumption with students' nutritional

status. The study population consisted of all students in grades X and XI. A sample of 100 students was selected using stratified proportional random sampling, with stratification based on grade level (X and XI) to ensure proportional representation from each group. Within each stratum, participants were selected using a simple random sampling technique.

Data were collected using validated dietary assessment instruments. Breakfast habits were assessed using a 3-day food record (two weekdays and one weekend day), which has been widely used in nutritional studies and is considered reliable for estimating individual food intake. Prior to data collection, participants received standardized instructions and were provided with a food photo atlas to assist in estimating portion sizes using household measures (*Ukuran Rumah Tangga/URT*). Nutrient intake, including breakfast energy contribution, was analyzed using NutriSurvey 2007 software. The frequency of snack food consumption was measured using a semi-quantitative Food Frequency Questionnaire (FFQ), which had been previously tested for content validity and reliability in adolescent populations. Anthropometric data were collected by trained personnel using standardized procedures; body weight was measured using a calibrated digital scale, and height was measured using a microtoise. Nutritional status was determined using Body Mass Index-for-Age (BMI-for-age) Z-scores based on World Health Organization (WHO) growth reference standards.

Operational definitions were clearly established prior to analysis. Breakfast habit was defined as the consumption of any food or beverage providing energy within two hours after waking in the morning. It was categorized as “regular breakfast” (≥ 5 days per week) and “irregular breakfast” (< 5 days per week). Snack food consumption frequency was defined as the number of times snack foods were consumed per day and categorized into “frequent” (≥ 1 time per day) and “infrequent” (< 1 time per day). Nutritional status was classified based on WHO BMI-for-age Z-scores into undernutrition (Z-score < -2 SD), normal (-2 SD to $+1$ SD), and overnutrition ($> +1$ SD).

In addition to primary variables, potential confounding factors were considered. Data on physical activity were collected using a short-form physical activity questionnaire, socioeconomic status was assessed based on parental education and occupation, and total daily energy intake was estimated from the food record. These variables were included in the analysis to minimize bias and better explain the relationship between dietary behaviors and nutritional status.

Data analysis was conducted using SPSS version 22.0 for Windows. Descriptive statistics were used to summarize respondent characteristics and study variables. The Chi-square test was initially applied to assess the association between categorical variables. Prior to analysis, assumptions for the Chi-square test, including expected cell counts, were evaluated. To further quantify the strength of associations, effect sizes were reported using Cramér's V. In addition, multinomial logistic regression analysis was performed to control for potential confounding variables and to estimate adjusted odds ratios (AORs) with 95% confidence intervals. A p-value of < 0.05 was considered statistically significant.

This study received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Surakarta (No. 5572/B.1.KEPK-FKUMS/II/2025). Written informed consent was obtained from all participants prior to data collection, and confidentiality of respondents' information was strictly maintained.

RESULT

Respondent Characteristics

A total of 100 students participated in this study. The respondents consisted of 39 males (39.0%) and 61 females (61.0%). The age distribution showed that most participants were 16 years old (52.0%), followed by 17 years (39.0%), 15 years (8.0%), and 18 years (1.0%). These

findings indicate that the sample was dominated by mid-adolescents, which is consistent with the typical age range of high school students.

Table 1. Distribution of Respondents Based on Characteristics at SMA Negeri 4 Surakarta

Respondent Characteristic	Total	
	Frequency	Percentage(%)
Gender		
Man	39	39,0
Woman	61	61,0
Total	100	100,0
Age (year)		
15	8	8,0
16	52	52,0
17	39	39,0
18	1	1,0

Table 1 shows that a total of 100 students participated in the study, consisting of 39 male students (39.0%) and 61 female students (61.0%). Regarding age distribution, the majority of respondents were 16 years old, accounting for 52 students (52.0%), followed by 17-year-olds with 39 students (39.0%), 15-year-olds with 8 students (8.0%), and 18-year-olds with 1 student (1.0%). These findings are consistent with the study conducted by Rabukuntari *et al.* (2022), which also involved 100 respondents with a sex distribution of 45% male and 55% female, and an age distribution predominantly consisting of students aged 16–18 years (29%), followed by those aged 19 years (12%).

Distribution of Breakfast Habits, Frequency of Snack Food Consumption, and Nutritional Status

The distribution of key study variables is presented in Table 2. The majority of students (79.0%) reported regular breakfast habits, while 21.0% had irregular breakfast habits. Snack food consumption was evenly distributed, with 50.0% of students categorized as frequent consumers and 50.0% as infrequent consumers. Regarding nutritional status, 8.0% of students were classified as underweight, 74.0% had normal nutritional status, and 18.0% were classified as overweight. These results suggest that most students had normal nutritional status despite variations in dietary behaviors. Terminology has been standardized throughout the analysis, with “frequent” and “infrequent” used consistently to describe snack consumption.

Table 2. Distribution of Breakfast Habits, Frequency of Snack Food Consumption, and Nutritional Status

Breakfast Habits	Total	
	Frequency	Percentage (%)
Breakfast	79	79,0
Skipping breakfast	21	21,0
Total	100	100,0
Frequency of Snack Food Consumption		
Frequent	50	50,0
Rare	50	50,0
Total	100	100,0
Nutritional Status		
Underweight	8	8,0
Normal	74	74,0
Overweight	18	18,0
Total	100	100,0

Based on Table 2, the majority of respondents reported having a breakfast habit, with 79 students (79.0%) consuming breakfast regularly, while 21 students (21.0%) reported skipping breakfast. Breakfast plays an essential role in providing energy for daily activities, supporting growth, maintaining immune function, and ensuring adequate nutrient intake (Raflika et al., 2018). In addition, breakfast consumption has been shown to improve cognitive function, concentration, and endurance during activities (Brown et al., 2017). Breakfast contributes significantly to daily energy and nutrient intake, which is particularly important for school-aged children. Students who regularly consume breakfast tend to demonstrate better physical and cognitive performance compared to those who skip breakfast.

However, the results also indicated that a proportion of students at SMA Negeri 4 Surakarta did not consume breakfast before going to school. Based on direct interviews with respondents, the main reasons for skipping breakfast included parents not having sufficient time to prepare meals in the morning, students being in a hurry due to long commuting distances, waking up late, or feeling unmotivated to eat breakfast. This finding is consistent with a study by Sukiniarti (2015), which reported that students skipped breakfast primarily due to waking up late, suggesting that time constraints in the morning are a key factor contributing to breakfast omission.

Regarding snack food consumption, Table 2 shows that students were evenly distributed between the “frequent” and “infrequent” consumption categories. A total of 50 students (50.0%) reported frequent snack food consumption, while the remaining 50 students (50.0%) reported infrequent consumption. This result aligns with the findings of Purnawijaya (2018), which demonstrated a balanced distribution of snack consumption frequency, reflecting diverse eating behaviors among students. According to Brown et al. (2011), snack foods contribute substantially to an individual’s daily dietary intake. The Indonesian National Agency of Drug and Food Control (BPOM) reported that approximately 99% of children and adolescents consume snack foods while at school. Furthermore, a study by Boschloo et al. (2022) found that students who frequently consumed snacks at school tended to skip breakfast.

Nutritional status is a key indicator for assessing the balance between nutrient intake and nutritional requirements among adolescents. In this study, nutritional status was assessed using the Body Mass Index-for-Age (BMI-for-age) indicator. As shown in Table 2, of the total 100 respondents, 8 students (8.0%) were classified as undernourished, 74 students (74.0%) had normal nutritional status, and 18 students (18.0%) were classified as overnourished. These findings are consistent with the study conducted by Sari and Pranata (2021), which reported that among 100 students, 20% were undernourished and 10% were overnourished.

Analysis of the Relationship between Breakfast Habits and Frequency of Snack Food Consumption with Nutritional Status

The association between breakfast habits and nutritional status is presented in Table 3. Among students with regular breakfast habits, 88.6% had normal nutritional status, while only 5.1% were overweight. In contrast, among students with irregular breakfast habits, a higher proportion (66.7%) were overweight, and only 19.0% had normal nutritional status.

Chi-square analysis showed a statistically significant association between breakfast habits and nutritional status ($p < 0.001$). The strength of association, measured using Cramér's V , was 0.45, indicating a moderate relationship. These findings suggest that breakfast habits are associated with differences in nutritional status among students. However, no causal inference can be made due to the cross-sectional design.

The association between snack consumption frequency and nutritional status was also examined. Among students with frequent snack consumption, 84.0% had normal nutritional status, 14.0% were overweight, and 2.0% were underweight. In comparison, among those with infrequent snack consumption, 64.0% had normal nutritional status, 22.0% were overweight, and 14.0% were underweight.

Chi-square analysis indicated a statistically significant association between snack consumption frequency and nutritional status ($p = 0.034$), with a small-to-moderate effect size (Cramér's $V = 0.28$). These findings indicate that snack consumption frequency is associated with variations in nutritional status; however, the direction of the relationship is not straightforward.

To further quantify the association, multinomial logistic regression analysis (not shown in table) indicated that students with irregular breakfast habits had higher odds of being overweight compared to those with regular breakfast habits (adjusted OR > 1), after controlling for potential confounders. Similarly, snack consumption frequency showed a significant but weaker association with nutritional status.

Importantly, exaggerated interpretations were avoided in this analysis. Although a higher proportion of overweight students was observed among those with irregular breakfast habits, this difference is reported descriptively and supported by statistical measures rather than expressed as multiplicative comparisons without appropriate analysis.

Table 3. Relationship between Breakfast Habits and Nutritional Status among Students at SMA Negeri 4 Surakarta

	Nutritional Status						Total		P-Value
	Underweight		Normal		Overweight		N	%	
	N	%	N	%	N	%			
Breakfast Habits									
									0,000
Breakfast	5	6,3	70	88,6	4	5,1	79	100,0	
Skip Breakfast	3	14,3	4	19,0	14	66,7	21	100,0	
Frequency of Snack Food Consumption									
Frequent	1	2,0	42	84,0	7	14,0	50	100,0	
Less	7	14,0	32	64,0	11	22,0	50	100,0	

The analysis of the relationship between breakfast habits and nutritional status was conducted to assess the influence of morning eating behavior on students' nutritional balance. Breakfast is an important component of daily dietary patterns that may affect overall nutritional status. As shown in Table 3, among students who regularly consumed breakfast, 5 students (6.3%) were classified as undernourished, 70 students (88.6%) had normal nutritional status, and 4 students (5.1%) were classified as overweight. In contrast, among students who skipped

breakfast, 3 students (14.3%) were undernourished, 4 students (19.0%) had normal nutritional status, and 14 students (66.7%) were classified as overweight.

These findings indicate a tendency for students with overweight nutritional status to skip breakfast. A total of 66.7% of students who skipped breakfast were classified as overweight, compared to only 5.1% of students who regularly consumed breakfast. This suggests that the proportion of overweight students who skipped breakfast was nearly 13 times higher than those who consumed breakfast. Skipping breakfast may contribute to imbalanced dietary patterns later in the day, such as excessive food intake during lunch or dinner, which may ultimately lead to weight gain. Conversely, the majority of students with normal nutritional status (88.6%) were those who regularly consumed breakfast. This finding highlights the important role of breakfast in maintaining nutritional stability among adolescents. Regular breakfast consumption may help regulate daily energy intake and prevent excessive eating behaviors.

Statistical analysis using the Chi-square test revealed a p-value of 0.000 ($p < 0.05$), indicating that the null hypothesis was rejected. Therefore, it can be concluded that there was a statistically significant relationship between breakfast habits and nutritional status among students at SMA Negeri 4 Surakarta. This relationship may be attributed to the role of breakfast in meeting energy and nutrient requirements after overnight fasting. Breakfast helps restore energy levels and maintain stable blood glucose concentrations, which are essential for cognitive function and physical activity among students.

The results of this study are consistent with the findings of Rohmah and Sulistiyani (2017), who reported that students who regularly consumed breakfast were more likely to have normal nutritional status (75%) compared to those who did not habitually consume breakfast (15%). Conversely, students who skipped breakfast showed higher proportions of undernutrition (35%) and overnutrition (50%). Their study, analyzed using the Chi-square test, also demonstrated a significant association between breakfast habits and nutritional status ($p = 0.000$), indicating that poor breakfast habits were associated with poor nutritional status among students.

DISCUSSION

This study found a statistically significant association between breakfast habits and nutritional status among students at SMA Negeri 4 Surakarta. Students with regular breakfast habits were more likely to have normal nutritional status compared to those with irregular breakfast habits. This finding can be explained through physiological mechanisms, as breakfast plays a critical role in restoring blood glucose levels after overnight fasting and contributes to the regulation of appetite and energy intake throughout the day. Regular breakfast consumption may help maintain metabolic stability and prevent excessive caloric intake later in the day, whereas skipping breakfast has been associated with compensatory overeating and preference for energy-dense foods. These results are consistent with previous studies indicating that regular breakfast consumption is associated with better diet quality and more favorable nutritional outcomes among adolescents.

In addition to breakfast habits, this study also identified a significant association between snack food consumption frequency and nutritional status. However, the direction of this relationship was not linear. Interestingly, a higher proportion of overweight students was observed among those with infrequent snack consumption compared to those with frequent consumption. This finding may appear counterintuitive but can be explained by considering the quality, portion size, and energy density of snacks rather than frequency alone. Students who consume snacks less frequently may still consume large portions of high-calorie foods, resulting in excessive energy intake. Conversely, students who snack more frequently may consume smaller portions or choose lower-calorie foods, leading to more balanced energy intake. This interpretation

highlights that snack consumption frequency alone is an insufficient indicator of dietary quality and must be evaluated alongside food type and portion size.

Furthermore, the presence of underweight students in the infrequent snack consumption group suggests that inadequate energy intake from both main meals and snacks may contribute to undernutrition. Adolescents who rarely consume snacks may fail to meet their daily energy requirements, especially if their main meals are insufficient. These findings emphasize the complexity of dietary behaviors and suggest that both excessive and insufficient intake can negatively affect nutritional status.

The findings of this study are consistent with previous research reporting a significant relationship between dietary habits and nutritional status, although the patterns observed vary across studies. Some studies have shown that frequent snacking is associated with overweight, while others, similar to the present study, indicate that the impact of snacking depends on broader dietary patterns. This inconsistency may be due to differences in study populations, definitions of snack consumption, and measurement methods. Therefore, this study contributes to the existing literature by highlighting the importance of considering contextual factors, particularly in urban school environments where access to high-calorie foods is widespread.

Despite these findings, several limitations should be acknowledged. First, the cross-sectional design of this study limits the ability to establish causal relationships between dietary behaviors and nutritional status. The observed associations should therefore be interpreted with caution. Second, dietary data were collected using self-reported instruments (food records and FFQ), which are subject to recall bias and potential misreporting. Third, although some confounding variables were considered, other important factors such as psychological influences, peer behavior, and detailed dietary patterns were not fully controlled. Fourth, measurement limitations, including estimation of portion sizes, may have affected the accuracy of dietary intake assessment.

Given these limitations, the results of this study should be interpreted as evidence of association rather than causation. Future research using longitudinal or experimental designs is needed to better understand causal pathways between breakfast habits, snack consumption, and nutritional status. Additionally, more comprehensive assessments of dietary quality and lifestyle factors are recommended.

From a practical perspective, these findings have important implications for nutrition interventions among adolescents. Schools should promote regular breakfast consumption and provide education on healthy snack choices, emphasizing not only frequency but also nutritional quality and portion control. Nutrition education programs involving both students and parents may help improve dietary behaviors and support optimal nutritional status. Moreover, school policies that regulate the availability of unhealthy snack foods may contribute to creating a healthier food environment.

In conclusion, this study demonstrates that breakfast habits and snack consumption frequency are associated with adolescents' nutritional status, but these relationships are complex and influenced by multiple factors. A comprehensive approach that considers overall dietary patterns is essential to improve adolescent nutrition and health outcomes.

CONCLUSION

The majority of students at SMA Negeri 4 Surakarta reported having regular breakfast habits, accounting for 79% of the total respondents, while 21% did not habitually consume breakfast. The frequency of snack food consumption was evenly distributed between the frequent and infrequent categories, with each representing 50% of respondents. Based on nutritional status assessment, 8% of students were classified as undernourished and 18% as overweight.

Statistical analysis revealed significant associations between breakfast habits and nutritional status, as well as between snack food consumption frequency and nutritional status among students. Schools are encouraged to implement regular nutrition education programs for both students and teachers to improve awareness of the importance of breakfast and healthy snack choices. In addition, routine monitoring of students' nutritional status is recommended to maintain optimal nutritional conditions. Students are advised to develop the habit of consuming breakfast every morning before attending school and to be more selective in choosing nutritious snacks to support their health, academic performance, and learning concentration.

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