

Description of Sugar Intake and Academic Performance Among Adolescents at SMPN 28 Bandung

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Abstract

Academic achievement is influenced by multiple factors, including daily nutritional intake. Sugar consumption is often associated with cognitive function and concentration; however, empirical findings remain inconsistent. This study aimed to analyze the relationship between sugar intake and academic achievement among adolescents. A quantitative study with a correlational design was conducted at SMPN 28 Bandung involving 164 students selected through simple random sampling. Sugar intake data were collected using a Semi-quantitative Food Frequency Questionnaire (SFFQ) and analyzed using the NutriSurvey program, while academic achievement was obtained from students' report card scores across five semesters. The collected data were analyzed using Pearson's correlation test because both variables were measured on a ratio scale and met the normality assumption. The results showed that the mean academic achievement score was 90.92 ± 2.34 and the mean sugar intake was 103.01 ± 58.32 . Pearson correlation analysis indicated no significant relationship between sugar intake and academic achievement ($r = -0.026$; $p = 0.737$). The correlation strength was very weak and negative in direction. It can be concluded that sugar intake was not significantly associated with academic achievement among the study respondents. Other factors beyond sugar intake are likely to play a greater role in determining academic performance.

Keywords: *Academic Achievement, Adolescents, Sugar Intake.*



A. INTRODUCTION

Adolescence is an important period for physical and cognitive growth, during which adequate and balanced nutritional intake is highly needed. Nutritional problems, such as malnutrition and obesity, are very common among adolescents at this age (SEAMEO RECFON, 2020). Nutrition plays an important role in enhancing children's growth and development. Changes in dietary intake patterns, such as the consumption of unhealthy processed foods, poor food diversity, and decreased physical activity, frequently occur among adolescents. These conditions make adolescents vulnerable to nutritional problems (Rah et al., 2021).

Adolescents generally prefer spicy and savory flavors and often consume bubble tea or sweetened beverages. Several foods and drinks favored by adolescents and categorized as high-risk snacks include foods high in sugar, salt, and fat; grilled foods; processed foods containing preservatives and flavor enhancers; soft drinks or carbonated beverages; and instant noodles (Wahyuni & Indriastuti, 2024). The use of sugar has become a common component of modern foods and beverages that are frequently consumed, leading to excessive intake of sugar-containing foods and drinks among children, adolescents, and adults (Beecher et al., 2021).

Sugar is the primary source of energy for brain activity and is important for cognitive function (Gillespie et al., 2023). Increases in blood sugar levels, especially after breakfast, can improve cognitive performance, thereby enhancing attention, memory, and information processing among adolescents (Peña-Jorquera et al., 2021). The American Heart Association recommends that sugar intake for females should not exceed 25 grams (g) or 6 teaspoons of added sugar per day, while for males it should not exceed 36 g or 9 teaspoons of added sugar per day. Meanwhile, according to WHO (2023), the recommended limit of sugar consumption for adolescents is below 51 g to 60 g per day.

Excessive sugar intake can cause various health problems. Obesity, type 2 diabetes mellitus, and cardiovascular disease may occur if sugar is consumed continuously. This condition is caused by insulin resistance, a state in which glucose in the blood cannot be optimally absorbed (Malik & Hu, 2022). In addition, long-term sugar consumption can also interfere with brain function. Excessive sugar intake can disrupt neuroplasticity, which is the brain's ability to change its structure and function and to adapt, especially in areas related to memory and learning. This disruption may lead to decreased cognitive performance and impaired learning ability (Jacques et al., 2019).

Sugar can trigger the release of dopamine in the brain's reward pathways, which increases impulsive behavior and reduces self-control, as well as causes changes in emotional memory and behavior. Studies on added sugar consumption, particularly from sweetened beverages, have shown a significant association with decreased cognitive function and poor memory due to prolonged sugar intake, leading to dysfunction of brain neurons (Gillespie et al., 2023). It may also cause molecular changes and cognitive impairments, particularly in the hippocampus, which plays a role in memory function (Beecher et al., 2021).

Cognitive ability influences many functions, including executive function. Excessive consumption of beverages containing sweeteners is associated with poor performance in executive functions, which refer to inhibitory control, emotional regulation, working memory, focus, task initiation, planning, and organization (Gui et al., 2021). When a child's cognitive ability is good, academic achievement will be aligned with their cognitive capacity (Nesayan et al., 2019).

Education plays an important role in life. During junior high school education, adolescents not only gain academic knowledge but also develop to reach their maximum potential as whole individuals, including social and emotional aspects (Sudarsono, 2024). Educational ability can be observed through students' academic achievement at school. Academic achievement is an assessment of students' learning outcomes to determine whether learning objectives have been achieved. Academic achievement serves as a benchmark for students' success in mastering the learning materials that have been provided (Lubis, 2021).

The phenomenon of high consumption of sugar-containing foods and beverages among adolescents, along with literature supporting the association between high sugar intake and academic achievement, has encouraged researchers to

further investigate the relationship between sugar intake and academic achievement among adolescents.

B. METHOD

This study obtained ethical approval from the Ethics Committee under approval number 013/KEPK/FITKes-Unjani/XII/2024, dated December 13, 2024. The study was conducted from January to February 2025 at SMPN 28 Bandung, considering that this junior high school implements the Merdeka Curriculum or the 2013 Curriculum and has various learning programs and is actively developing innovative programs that support students in becoming adaptive and innovative individuals, which may positively impact the learning process and outcomes at school.

This study employed a cross-sectional research design. The study population consisted of 277 ninth-grade students of SMPN 28 Bandung in the 2024/2025 academic year. The sampling technique used was simple random sampling, with inclusion criteria being respondents who were registered as ninth-grade students at SMPN 28 Bandung, in good health, and not following a specific diet. The exclusion criterion was respondents diagnosed with diabetes mellitus. The sample size was determined using the Slovin formula, resulting in a total of 164 students. Prior to data collection, the researcher explained the purpose of the study to all respondents and obtained their consent by having them sign an informed consent form.

Data collection was conducted through interviews and questionnaires. Interviews were used to obtain in-depth data directly from respondents, strengthening information regarding their dietary habits, particularly those related to sugar intake. Questionnaires were used to collect data on sugar intake using a Semi-Quantitative Food Frequency Questionnaire (SFFQ), which covered six groups: carbohydrates, packaged sweet foods, sweet snacks, beverages, fruits, and additional groups such as granulated sugar, palm sugar, sweetened condensed milk, and others. This instrument produced data on the amount of sugar consumed by adolescents over the past one-month period. Academic achievement was assessed using academic scores obtained from the average report card grades over five semesters.

The collected data were then processed and analyzed. Sugar intake data were processed using the NutriSurvey program, while data analysis was conducted using SPSS version 26. Univariate analysis was performed to describe the basic characteristics of respondents, which were presented in tabular form. The results of the univariate analysis were presented as mean values, minimum values, maximum values, and standard deviations (SD). To examine the relationship between sugar intake and academic achievement, Pearson correlation statistical analysis was applied because both variables were measured on a ratio scale and were normally distributed.

C. RESULTS AND DISCUSSION

1. Basic Characteristics of Respondents

Based on the results of the study, the characteristics of the respondents are presented as follows (Table 1):

Table 1. Basic Characteristics of Respondents (n = 164)

No	Respondent Characteristics	Minimum	Maximum	Mean	Standard Deviation (\pm)
1.	Age (years)	13	16	14,50	0,60
2.	Body Mass Index	13,7	37	20,8	4,1
3.	Sugar Intake (grams)	15,01	248,47	103,01	58,32
4.	Academic Achievement	85,13	96,09	90,92	2,34

Based on Table 1 above, the respondents were adolescents with a mean age of 14.50 years. The Body Mass Index (BMI) values of the respondents ranged from 13.7 to 37, with a mean of 20.8, which falls into the normal nutritional status category (18.5–24.9) (Ministry of Health of the Republic of Indonesia, 2020). The mean sugar intake among the respondents was 103.01 grams, which is categorized as excessive sugar intake, whereas the WHO recommendation for daily sugar intake is 51–60 grams per day. Meanwhile, the average academic achievement score of the respondents was 90.91, which is classified as good.

2. Relationship Between Sugar Intake and Academic Achievement

Based on the analysis using the Pearson correlation test to examine the relationship between sugar intake and academic achievement, the following results were obtained (Table 2):

Table 2. Relationship Between Sugar Intake and Academic Achievement Among Adolescents at SMPN 28 Bandung (n = 164)

Variable	Mean \pm Sd	r (Pearson)	p-value
Sugar Intake	103,01 \pm 58,32	- 0,026	0,737
Academic Achievement	90,92 \pm 2,34		

The results of the Pearson correlation test indicate a very weak and non-significant correlation, meaning that there is no significant relationship between sugar intake and academic achievement ($r = -0.026$; $p = 0.737$).

Adolescence is a critical developmental period for physical and psychosocial growth, during which eating behaviors begin to form and tend to continue into adulthood. Several studies have shown that dietary habits established during adolescence are likely to persist and influence long-term health. Therefore, adolescence is an important phase for developing and maintaining healthy eating habits to support both current and future health. During this period, adolescents require sufficient nutrition not only for growth but also for puberty and the maturation of reproductive organs. In addition, adolescents tend to have high levels of activity, making it necessary for them to maintain physical health and fitness (Rahma Wati I. Kustiani, A. Hervidea, R., 2024).

Adolescents are advised to consume sugar at no more than 10% of total daily energy intake (WHO, 2023). For adolescents aged 13–15 years, with recommended energy requirements of 2,400 kcal for males and 2,050 kcal for females, daily sugar intake should not exceed 51 grams for females and 60 grams for males. In this study, the average daily sugar intake was 103.01 grams, indicating that sugar consumption exceeded the recommended daily limit by more than 72%. This figure is higher than the findings of a study conducted by Akhriani et al. (2016) among adolescents in Bandung, which reported an average intake of sugar-sweetened beverages of 60.43 grams.

When sugar is consumed in excess, the energy produced is not immediately utilized by the body. Instead, it is stored as fat and accumulates in various organs, particularly in the liver and subcutaneous adipose tissue. Excessive sugar consumption can lead to various health problems and nutritional imbalances, one of which is obesity or overweight. In this study, the average Body Mass Index (BMI) of adolescents was 20.8, which falls within the normal nutritional status category. However, the adoption of healthy eating patterns remains necessary to reduce the risk of future health problems.

Adolescents tend to show a stronger preference for sweet foods and beverages compared to children and adults when experiencing stress (Debeuf et al., 2018). Eating habits involving sweet foods and drinks are factors that influence sugar intake levels. Adolescents often follow fast-food consumption trends, including sweet foods and beverages. In addition, adolescents are likely to have unhealthy lifestyles and low levels of physical activity.

Most adolescents consume sugar as a way to cope with negative emotions such as stress, anxiety, boredom, or fatigue. Eating is considered one of the stress-coping mechanisms, particularly among females. During periods of stress, the brain works harder and requires more energy, with glucose serving as its primary energy source (Wiciyuhelma, 2021). Cravings tend to increase most notably for sweet beverages such as boba drinks, ice cream, milk tea, and similar products.

Females consume sweet foods more frequently than males, often more than twice per day. Although male adolescents tend to engage in physical activity more frequently than females, after exercising they often feel thirsty and choose to consume sweetened beverages. This is because sweet drinks are perceived as effective in relieving thirst and providing a refreshing sensation, especially when served cold (Fawziya et al., 2024).

Adolescents tend to consume sweet foods and beverages that are easily accessible and convenient. This habit is related to preferences for practical products that are easy to obtain and affordable. Ease of access and affordable prices are major factors contributing to high sugar consumption in the community. Social media is widely used by adolescents to access information and food products, including perceived benefits, prices, and methods of obtaining or ordering these products (Puspitarini & Nuraeni, 2019). Adolescents who consume high amounts of sugar-

sweetened beverages are more frequently exposed to social media compared to those who are not (Fawziya et al., 2024).

The habit of consuming foods and beverages high in sugar leads to a high glycemic index and can stimulate brain regions that trigger the release of dopamine, a neurotransmitter involved in the brain's reward system, thereby producing feelings of pleasure. In addition, excessive sugar intake may cause mood changes and trigger repeated cravings for sweetened beverages to achieve satisfaction or satiety (Jacques et al., 2019). Continuous excessive sugar consumption may contribute to a decline in cognitive function, particularly affecting the hippocampus, which plays a role in memory function (Gillespie et al., 2023; Beecher et al., 2021).

Cognitive function has a strong positive correlation with students' academic achievement, where improvements in cognitive ability significantly enhance learning outcomes (Miftaviana Zahira Zavy, 2025). Academic achievement serves as an indicator of the success of the learning process and can be measured through report card grades. In this study, the average academic achievement score of adolescents was 90.92, indicating that students at SMPN 28 Bandung fall into the good category.

In this study, no relationship was found between sugar intake and academic achievement. Although the average sugar intake in this study was high, at 103.02 grams per day, academic achievement among adolescents at SMPN 28 Bandung was still categorized as good, with an average score of 90.92. These findings indicate that there is no statistically significant relationship between sugar intake and academic achievement. The correlation coefficient shows a very weak negative relationship that is not significant. This suggests that, within the study population, variations in sugar intake are not directly associated with differences in academic performance.

Several factors may influence academic achievement, including internal and external factors. Internal factors are those inherent to the individual, such as physical health conditions, interest, and readiness to learn. External factors include school-related aspects such as curriculum, teaching methods, student interactions, school discipline, learning facilities, building conditions, and library resources (Salsabila & Puspitasari, 2020).

The absence of a relationship in this study may be attributed to several factors. Academic achievement is a multifactorial outcome. Academic grades are influenced not only by momentary attention but also by learning motivation, teaching quality, family support, study habits, sleep quality, mental health, and exposure to distractions such as screen time. Therefore, the influence of sugar intake alone may be relatively small compared to these other factors.

Several studies have explained the effects of sugar intake on cognitive function; however, the reported effects are often short-term and situational, such as immediate memory or attention performance following glucose consumption under experimental conditions. In contrast, report card grades reflect medium- to long-term academic performance, meaning that daily fluctuations in glucose levels may not be strong enough to be reflected in final academic scores.

Individual variation in metabolic tolerance may influence the impact of sugar on brain function. Glycemic responses are affected by overall dietary composition, physical activity, nutritional status, and insulin sensitivity. Without measuring the glycemic index of foods or total dietary patterns, the specific relationship between sugar intake and cognitive performance may be difficult to detect. In addition, dietary intake measurement methods based on self-reported consumption are prone to bias, such as under-reporting or portion size estimation errors. This may lead to misclassification of sugar intake and weaken the ability to detect statistical associations. The relatively narrow range of academic scores within the sample may also reduce the sensitivity of correlation analysis.

Although no significant relationship was found in this study, the findings remain relevant, as they indicate that the influence of nutrition on academic achievement cannot be explained by a single component but must be understood holistically. Future studies are recommended to assess specific cognitive functions such as attention and working memory using standardized instruments, and to include confounding variables such as sleep quality, screen time duration, nutritional status, and physical activity in multivariate analytical models.

D. CONCLUSION

Based on the results of the study, sugar intake among adolescents at SMPN 28 Bandung was classified as high and far exceeded the WHO recommendations, while academic achievement was categorized as good. The analysis showed that there was no significant relationship between sugar intake and academic achievement among adolescents at SMPN 28 Bandung. The correlation coefficient indicated a very weak negative relationship that was not statistically significant. Therefore, sugar intake cannot be considered a factor directly associated with variations in academic achievement among the respondents in this study. Further research is needed by considering other factors such as overall diet quality, sleep patterns, physical activity, and the learning environment to obtain a more comprehensive understanding.

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