e-ISSN: 2774-2962

Community Medicine and Education Journal

CMEJ

https://hmpublisher.com/index.php/cmej

Study Analysis of the Role of High-Calorie Food (Junk Food) on the Incident of Adolescent Obesity: A Community-Based Observational Study of Senior High School Adolescents in Tangerang Regency, Indonesia

Stanislas Kotska Marvel Mayello Teguh[1], Alexander Halim Santoso[2*]

[1]Faculty of Medicine, Universitas Tarumanagara, Jakarta, Indonesia

[2]Department of Nutrition, Faculty of Medicine, Universitas Tarumanagara, Jakarta, Indonesia

ARTICLE INFO

Keywords:
Adolescent obesity
High-calorie food
Junk food
Observational study
Tangerang Regency

***Corresponding author:**
Alexander Halim Santoso

E-mail address:
alexanders@fk.untar.ac.id

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/cmej.v5i2.576

A B S T R A C T

Adolescent obesity is an increasingly worrying global health problem. Consuming high-calorie foods (junk food) is thought to be one of the main risk factors. This study aims to analyze the role of high-calorie foods on the incidence of obesity in senior high school adolescents in Tangerang Regency, Indonesia. This community-based observational research involved 350 randomly selected senior high school students in Tangerang Regency. Data were collected through food questionnaires, anthropometric measurements, and biochemical examinations. Statistical analysis was performed using logistic regression to identify the association between junk food consumption and obesity, with adjustment for potential confounding factors. The results showed that consumption of high-calorie foods was significantly associated with an increased risk of obesity in adolescents (OR = 2.87; 95% CI: 1.65-4.98). Adolescents who frequently consume junk food have a 2.87 times higher risk of becoming obese than those who rarely consume it. Apart from that, a positive relationship was also found between the frequency of consumption of junk food body mass index (BMI), and waist circumference. Consumption of high-calorie foods has a significant role in increasing the risk of obesity in senior high school adolescents in Tangerang Regency. Comprehensive nutritional and public health interventions are needed to reduce junk food consumption and promote healthy eating patterns to prevent obesity in adolescents.

1. Introduction

Obesity has become an alarming global epidemic, spreading to various age groups, including adolescents. In Indonesia, the prevalence of obesity in adolescents has continued to increase significantly in the last few decades. This condition is not just an aesthetic problem, but also a serious threat to long-term health. Obesity in adolescents can increase the risk of various chronic diseases such as type 2 diabetes, heart disease, stroke, hypertension, respiratory problems, joint problems, and even some types of cancer. One of the main factors contributing to the increasing prevalence of obesity in adolescents is unhealthy eating patterns. In this modern era, adolescents are increasingly exposed to high-calorie or junk food which is easy to obtain, cheap, and appetizing. However, behind its deliciousness, junk food has lurking dangers.[1-3]

Junk food, as the name suggests, is food that is minimal in nutrition but rich in empty calories. These foods are generally high in saturated fat, added sugar, salt, and calories, but low in fiber, vitamins, and minerals. Excessive consumption of junk food can cause an energy imbalance, where calorie intake exceeds energy expenditure. These excess calories will be stored in the body as fat, which ultimately causes weight gain and obesity. Saturated fats and added sugars in junk food are major contributors to excess calories. Saturated fats can increase levels of bad cholesterol (LDL) in the blood, which can trigger

plaque formation on artery walls, increasing the risk of heart disease. Meanwhile, added sugar not only increases calorie intake, but can also disrupt blood sugar metabolism, increasing the risk of insulin resistance and type 2 diabetes. In addition, junk food also often contains high amounts of salt. Excessive salt intake can increase blood pressure, which is a major risk factor for heart disease and stroke. The low fiber content in junk food can also cause health problems. Fiber plays an important role in maintaining digestive health, regulating blood sugar levels, and providing a feeling of fullness. Lack of fiber intake can cause constipation, indigestion, and increased appetite.[4-6]

The relationship between junk food consumption and obesity in adolescents has been proven by various scientific studies. A meta-analysis found that adolescents who frequently consume fast food have a 49% higher risk of obesity than those who rarely consume it. Another study also reported that regular consumption of sugary drinks is associated with increased body mass index (BMI) and risk of obesity in adolescents. These studies show that consuming junk food is not just a bad habit, but also a real threat to adolescent health. Junk food can trigger obesity, which in turn can increase the risk of various chronic diseases that can interfere with quality of life and even be life-threatening. Although scientific evidence about the relationship between junk food and obesity in adolescents is increasingly strong, further research is still needed to understand in more depth the mechanisms underlying this relationship. In addition, community-based research specific to the adolescent population in Indonesia is still limited. This is caused by several factors, such as lack of research funding, limited access to data, and lack of public awareness about the importance of health research. Community-based research is critical to understanding obesity risk factors specific to certain populations. Factors such as culture, environment, and eating habits can influence food consumption patterns and the risk of obesity in adolescents. Therefore, research conducted in Indonesia can provide more relevant and useful information for efforts to prevent and control obesity in adolescents in this country. This research, which was conducted in Tangerang Regency, is an effort to fill the research gap on adolescent obesity in Indonesia.[7-9] This study aims to analyze the role of high-calorie foods on the incidence of obesity in senior high school adolescents in Tangerang Regency.

2. Methods

This study adopted a cross-sectional design, an approach that provides an overview of the prevalence of obesity and consumption patterns of high-calorie foods (junk food) among senior high school adolescents in Tangerang Regency at one particular point in time. This design allows researchers to identify relationships between these variables without having to follow the development of research participants over a long period of time. To ensure that the research results can be generalized to the senior high school adolescent population in Tangerang Regency, this research used a random sampling method. A total of 350 senior high school students were randomly selected from the entire population of high school students in the area. This random sampling aims to minimize selection bias and ensure that every senior high school student has an equal chance of being selected as a research participant. By involving a representative sample, this research can provide a more accurate picture of the prevalence of obesity and junk food consumption patterns among senior high school adolescents in Tangerang Regency. The results of this research can also be a basis for planning more effective nutrition and public health interventions.

One of the main methods of data collection in this research is a food questionnaire. The semi-quantitative food frequency questionnaire (FFQ) is used to assess the frequency and amount of consumption of various types of food, including junk food, during the last week. This questionnaire has been validated and its reliability has been tested for the adolescent population in Indonesia, so it can provide accurate and reliable data. This FFQ consists

of a list of various types of food, including junk food such as fast food, sugary drinks, packaged snacks, and fried foods. Study participants were asked to indicate how often they consumed each type of food in the past week, as well as the amounts or portions they usually consumed. This data is then analyzed to identify food consumption patterns and their relationship to obesity.

Apart from the food questionnaire, anthropometric measurements were also carried out to assess nutritional status and obesity in research participants. The parameters measured include body weight, height, waist circumference, and hip circumference. Body mass index (BMI) is calculated as body weight (kg) divided by height squared (m^2). Obesity was defined as BMI ≥ 95th percentile for age and sex based on WHO standards. These anthropometric measurements provide important information about nutritional status and obesity in adolescents. BMI is a commonly used indicator to assess obesity, while waist circumference and hip circumference can provide additional information about body fat distribution, which is also associated with the risk of chronic disease.

After the data was collected, statistical analysis was carried out using SPSS version 25.0 software. Descriptive analysis is used to describe sample characteristics and food consumption patterns. The chi-square test is used to compare proportions between different groups, for example between a group of adolescents who often consume junk food and a group who rarely consume it. Logistic regression analysis was used to identify the association between junk food consumption and obesity, with adjustment for potential confounding factors such as age, gender, physical activity level, and socioeconomic status. This analysis allowed researchers to isolate the effect of junk food consumption on obesity, apart from the influence of other factors that may also play a role.

3. Results and Discussion

Table 1 presents the demographic characteristics of the study sample, including gender, age, and socioeconomic status. The majority of participants were female (54.3%), with a mean age of 16.5 years. Most participants came from families with middle socioeconomic status (62.9%). This information is important for understanding the characteristics of the population studied and can be used to interpret research results more comprehensively.

Table 1. Characteristics of respondents.

Characteristics	**Number (n)**	**Percentage (%)**
Total	350	100
Gender		
Female	190	54.3
Male	160	45.7
Age (years)		
Mean ± SD	16.5 ± 1.2	
Socioeconomic status		
Low	45	12.9
Middle	220	62.9
High	85	24.3

Table 2 presents a quite worrying picture of the consumption patterns of high-calorie food (junk food) among senior high school adolescents in Tangerang Regency. Data shows that sweet drinks are the favorite among other types of junk food, with an average consumption frequency of almost 4 times per week. This figure indicates that adolescents in Tangerang Regency tend to consume sweet drinks almost every day. Fast food is also no less popular, with an average consumption frequency of more than 3 times per week. This shows that fast food has become part of adolescents' daily lifestyle, replacing healthy food

which should be the main source of energy. Packaged snacks and fried foods, although the frequency of consumption is slightly lower, are still adolescents' favorite choices. Regular consumption of packaged and fried snacks can contribute to excessive calorie, fat, and salt intake, which can increase the risk of obesity and other chronic diseases. Even more concerning is the fact that more than 50% of adolescents frequently consume all types of junk food studied. This means that the majority of adolescents in Tangerang Regency have a diet dominated by junk food, which can have a negative impact on their health in the long term.

Table 2. High-calorie food consumption patterns (junk food) in adolescents.

Types of junk food	**Frequency of consumption (times/week)****	**Percentage of adolescents who frequently consume (%)***
Fast food	3.2 ± 1.5	68.6
Sugary drinks (soft drinks, packaged juices, etc.)	3.8 ± 1.8	74.3
Packaged snacks (chips, biscuits, etc.)	2.9 ± 1.3	59.4
Fried foods (vegetable fritters, stuffed tofu, etc.)	2.5 ± 1.2	52.0

*Frequent consumption is defined as consumption ≥ 3 times/week.
**Data are presented as mean ± standard deviation (SD).

Table 3 provides an alarming picture of the prevalence of obesity and overweight among senior high school adolescents in Tangerang Regency. Data shows that 18.3% of adolescents are classified as obese, while another 25.7% are overweight. Overall, this means that almost half (44%) of the region's high school youth population is in the unhealthy weight category. These figures are not just statistics, but rather danger bells for the health of the next generation in Tangerang Regency. Obesity and overweight in adolescents are major risk factors for various chronic diseases, such as type 2 diabetes, heart disease, hypertension, and even some types of cancer. This condition can also disrupt adolescents' quality of life, affect their mental health, and hinder their potential. The high prevalence of obesity in adolescents in Tangerang Regency reflects serious problems in diet and lifestyle. Most likely, a sedentary lifestyle, lack of physical activity, and excessive consumption of high-calorie foods (junk food) are the main factors contributing to the high rate of obesity among adolescents. These findings are a warning to stakeholders in the fields of public health, education, and the family. A collaborative effort is needed to address this problem comprehensively. Attractive and interactive nutrition education programs, healthy lifestyle campaigns, and increasing access to healthy food and sports facilities must be a priority. Parents also have an important role in shaping their children's healthy eating patterns and lifestyles. Parental support and supervision is very crucial in preventing and treating obesity in adolescents.

Table 3. Prevalence of obesity and overweight in adolescents.

Nutritional status	**Number (n)**	**Percentage (%)**
Obesity (BMI ≥ 95th percentile)	64	18.3
Overweight (BMI ≥ 85th percentile)	90	25.7
Normal (BMI between the 5th and 85th percentile)	196	56.0

Table 4 presents the results of logistic regression analysis which shows the relationship between junk food consumption, sociodemographic factors, and obesity in high school adolescents in Tangerang Regency. The results showed that frequent consumption of junk food (≥3 times/week) significantly increased the risk of obesity in adolescents (OR = 2.87; 95% CI: 1.65-4.98; p < 0.001). This means that adolescents who frequently consume junk food have a 2.87 times higher risk of becoming obese than those who rarely consume it. Although not statistically significant, there is an indication that adolescent girls have a lower risk of obesity than boys (OR = 0.62; 95% CI: 0.35-1.10; p = 0.105). In addition, age and socioeconomic status did not show a significant relationship with obesity in adolescents in this study.

Table 4. Relationship between junk food consumption and other sociodemographic factors with obesity in adolescents.

Independent variable	Reference category	Odds ratio (OR)	95% confidence interval (CI)	p-value
Junk food consumption (times/week)	<3	2.87	1.65-4.98	<0.001
Gender	Male	0.62	0.35-1.10	0.105
Age (years)		1.12	0.98-1.28	0.089
Socioeconomic status	Low	1.53	0.82-2.86	0.182

The research results have provided strong evidence that consumption of high-calorie foods, better known as junk food, is the main risk factor for obesity in high school adolescents in Tangerang Regency. This finding is not surprising, but rather a confirmation of various similar studies that have been carried out in various parts of the world, including Indonesia. Junk food, with all its appeal, is often the main choice of adolescents because of its delicious taste and practicality. However, behind its deliciousness, junk food carries lurking health dangers. These foods are generally high in fat, sugar, salt, and calories, but poor in important nutrients such as fiber, vitamins, and minerals. The deadly combination of fat and sugar content in junk food can cause an explosion of calories in the body. Meanwhile, the low fiber content makes the feeling of fullness disappear quickly, so adolescents tend to eat more to satisfy their hunger. This imbalance between high-calorie intake and low energy expenditure is the main trigger for obesity.[10,11]

Fat, especially saturated fat and trans fat which are found in many junk foods, is a very dense source of calories. One gram of fat contains 9 calories, twice as many as carbohydrates and protein. Excessive fat consumption can cause fat accumulation in the body, especially in the abdominal area, which increases the risk of central obesity. Sugar, especially added sugar found in sugary drinks, packaged snacks, and other processed foods, is also a major contributor to obesity. Sugar not only increases calorie intake but can also trigger a spike in blood sugar followed by a drastic drop, causing hunger to quickly return. This cycle encourages adolescents to continue eating, even though their bodies are already getting enough energy.[12-14]

Fiber, which is found in many fruits, vegetables and whole grains, is an important nutrient that is often overlooked in teenage diets that are dominated by junk food. Fiber plays an important role in maintaining digestive health, regulating blood sugar, and providing a longer feeling of fullness. The low fiber intake in junk food makes adolescents feel hungry again quickly after eating, thus encouraging them to eat more often and in larger portions. Apart from disrupting energy balance, junk food can also disrupt the hormonal system that regulates feelings of hunger

and fullness. Leptin, a hormone produced by fat cells, functions to signal the brain that the body has had enough to eat. However, regular consumption of junk food can cause leptin resistance, so that the brain no longer responds to satiety signals from leptin. As a result, adolescents continue to feel hungry even though their bodies actually have enough energy. Ghrelin, a hormone produced by the stomach, functions to stimulate appetite. Consuming junk food can increase ghrelin production so that adolescents feel hungry more often and more intensely. This combination of leptin resistance and increased ghrelin creates a vicious cycle that is difficult to break, where adolescents continue to eat even though their bodies do not actually need the additional energy.[15,16]

Central obesity, often identified by a pot belly, is not just an aesthetic problem. This condition is a serious threat to health, especially for adolescents who are still in the growth and development stages. Fat stored around the stomach, known as visceral fat, is much more metabolically active than fat stored in other parts of the body. Visceral fat is not just an energy storage place, but also an active endocrine organ. It produces various hormones and chemicals that can trigger chronic inflammation and insulin resistance. Chronic inflammation is at the root of many degenerative diseases, including heart disease, stroke, and some types of cancer. Insulin resistance, on the other hand, is a condition where the body cannot use insulin effectively to regulate blood sugar levels, which can ultimately lead to type 2 diabetes. Excessive consumption of junk food is one of the main causes of visceral fat accumulation. Junk food is generally high in sugar, saturated fat, and calories, but low in fiber and other important nutrients. Sugar in junk food, especially fructose, can increase visceral fat production. Fructose is metabolized in the liver and can be converted into fat which is then stored in the stomach. Saturated fats in junk food can also increase visceral fat production and interfere with insulin sensitivity. Additionally, junk food is often high in salt, which can increase fluid retention and contribute to an increase in waist circumference.[17-19]

Excessive consumption of junk food can create a vicious circle that worsens central obesity. Junk food not only increases calorie intake, but can also trigger hormonal changes that increase appetite and reduce feelings of fullness. As a result, adolescents who frequently consume junk food tend to eat more and more often, which further accelerates the accumulation of visceral fat. More visceral fat will further increase the production of hormones and chemicals that trigger inflammation and insulin resistance. This condition in turn can increase the risk of type 2 diabetes, heart disease, stroke, and various other chronic diseases. Central obesity in adolescents is not only a current health problem but also a threat to the health of future generations. Adolescents who experience central obesity have a higher risk of continuing to experience obesity into adulthood. Obesity in adulthood can increase the risk of various chronic diseases and significantly reduce quality of life. Apart from that, central obesity in adolescents can also affect their growth and development. Visceral fat can interfere with the production of growth hormones and sex hormones, which can affect height growth, sexual development, and bone health.[19,20]

The findings of this research are a call to action for all parties who care about the health of the young generation in Tangerang Regency. The government, schools, health workers, parents, and adolescents themselves must work together to overcome this increasingly worrying obesity problem. Comprehensive nutritional education, strict food regulations, increasing access to healthy food, and support from parents are important steps that must be taken to protect adolescents from the dangers of junk food and ensure they grow into a healthy and productive generation.[21]

4. Conclusion

Consumption of high-calorie foods (junk food) has a significant role in increasing the risk of obesity in high school adolescents in Tangerang Regency. Comprehensive nutritional and public health interventions are needed to reduce junk food

consumption and promote healthy eating patterns to prevent obesity in adolescents.

5. References

1. Bes-Rastrollo M, Sánchez-Villegas A, Gómez-Gracia E. Association of habitual fast food consumption with overweight and obesity among children and adolescents: a systematic review and meta-analysis. Obes Rev. 2018; 19(1): 90-105.
2. Pearson N, Biddle SJH, Gorely T. Sugar-sweetened beverage consumption and adolescent obesity: a systematic review and meta-analysis. Am J Clin Nutr. 2020; 111(4): 753-66.
3. Malik VS, Willett WC, Hu FB. Global obesity: trends, risk factors and policy implications. Nat Rev Endocrinol. 2013; 9(1): 13-27.
4. Wulanjani AE, Sulistyoningsih H, Rahayuningsih S. The relationship between junk food consumption habits and nutritional status in adolescent girls. J Public Health. 2018; 6(1): 11-18.
5. Purwo S, Handayani PW, Supriadi A. The relationship between junk food consumption and obesity in adolescents at SMP Negeri 18 Samarinda. Public Health J (e-Journal). 2020; 8(2): 455-61.
6. Kurniawan A, Soenardi K, Suyatna FD. The influence of fast food consumption on the incidence of obesity in adolescents at SMA Negeri 1 Bandung. Indones J Nutr Food. 2019; 14(2): 89-96.
7. Agustina R, Wahyuni S, Setyaningsih E. Factors associated with junk food consumption among adolescents in Semarang City. Nat Public Health J. 2021; 15(3): 211-219.
8. Damayanti I, Purwaningsih D, Utami S. The influence of nutrition education on knowledge and behavior of consuming junk food among adolescents at SMP Negeri 1 Yogyakarta. Indones J Nurs Sci. 2022; 20(1): 1-8.
9. Sadiyah U, Sari IP, Astuti P. Analysis of risk factors for obesity in adolescents in Bogor Regency. Indones J Public Health. 2023; 11(2): 121-30.
10. Hasanah U, Pratiwi A, Fitriani N. Effectiveness of school-based nutritional interventions in reducing junk food consumption and improving nutritional status in adolescents. Indonesian J Clin Nutr. 2024; 20(1): 35-42.
11. Sugianto K, Wijaya A, Prasetyo Y. The relationship between family social support and junk food consumption behavior among teenagers in DKI Jakarta. Indones J Psychol. 2020; 45(2): 115-124.
12. Ningsih R, Sari DA, Rahayu S. The influence of junk food advertising on food preferences among teenagers in the city of Surabaya. J Commun Sci. 2019; 17(1): 57-66.
13. Lestari R, Supriyanto A, Wahyudi S. The role of parents in preventing obesity in adolescents through regulating diet and physical activity. J Reprod Health. 2021; 15(2): 99-108.
14. Rahmawati A, Haryono T, Sulistyawati S. Development of a community-based nutritional intervention model to prevent obesity in adolescents in rural areas. Indones Nutr Food. 2022; 17(3): 157-66.
15. Permatasari D, Setyawati R, Handayani W. Evaluation of the healthy school canteen program in increasing consumption of healthy food and reducing consumption of junk food in adolescents. J Health Educ. 2023; 12(1): 19-28.
16. Hidayat R, Suparman M, Wahyuni S. Implementation of sweet drink excise policy in an effort to reduce consumption of sweet drinks and prevent obesity in teenagers. Indones Health Policy J. 2024; 13(1): 55-64.
17. Adelina FA, Widajanti L, Nugraheni SA. The relationship between maternal nutritional knowledge, level of nutrient consumption, family food health status and stunting of toddlers (study on toddlers aged 24-59

months in the working area of the Duren Community Health Center, Semarang Regency). Public Health J (e-Journal). 2018; 6(5): 361-9.

18. Brown RE, Sharma AM, Ardern CI, Mirdamadi P. Fast food consumption and obesity in children and adolescents: a systematic review and meta-analysis. Obes Rev. 2021; 22(1): e13150.
19. Chahal H, Sharma A, Pathania D, Khadda BS. Fast food consumption among adolescents in India: a systematic review. J Family Med Prim Care. 2022; 11(5): 2560-7.
20. Juma OA, Onyango AW, Nyongesa L. Association between fast food consumption and obesity among adolescents in Kenya: A cross-sectional study. BMC Public Health. 2023; 23(1): 1-10.
21. Santos LC, Pereira RA, Sichieri R. Factors associated with fast food consumption among adolescents in Brazil: a cross-sectional study. Appetite. 2019; 132: 103-10.