



## Relationship Between Socioeconomic Status and Diet Quality in Obese Adolescents

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### Abstract

The increasing prevalence of adolescent obesity and poor diet quality remains a significant public health issue, with socioeconomic factors playing an important role in shaping dietary behaviors. This study aimed to analyze the relationship between socioeconomic status and diet quality among obese adolescents in Tomohon City using a cross-sectional design. A total of 316 obese adolescents aged 17–19 years were recruited through purposive sampling, a non-probability sampling technique in which participants were selected based on predetermined inclusion criteria. Diet quality was measured using the Healthy Eating Index 2015 (HEI-2015), while socioeconomic status was assessed through a parental questionnaire covering income, education, occupation, and household expenditure. Data were collected via Google Forms and analyzed using the Chi-square test and simple logistic regression at a significance level of  $p \leq 0.05$ . The results showed that most respondents had medium socioeconomic status (61.4%) and diet quality categorized as “needs improvement” (75.0%), with a significant association between socioeconomic status and diet quality ( $p < 0.001$ ; OR = 13.168; 95% CI: 6.975–24.859). In conclusion, socioeconomic status is significantly associated with diet quality among obese adolescents in Tomohon City. These findings underscore the need for targeted nutrition interventions to improve dietary quality among socioeconomically disadvantaged adolescents.

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## 1. INTRODUCTION

Nutritional problems in adolescents encompass two dimensions: undernutrition and overnutrition. While undernutrition predominantly affects developing countries, urbanization, demographic shifts, and epidemiological changes have emerged as significant contributors to the growing burden of obesity (Amrynia & Prameswari, 2022). A family's socioeconomic status (SES) significantly determines the quality of diet provided to household members. A study conducted in Saudi Arabia demonstrated a significant relationship between parental income and adolescent obesity, with low-income parents reporting obese children at a rate of 34.3% (Kutbi & Mumena, 2025).

Global data from the United Nations Children's Fund (UNICEF) indicates that obesity in children and adolescents aged 5–19 years across 190 countries has reached 9.4%, surpassing the prevalence of undernutrition, driven by a cultural shift from traditional eating habits toward ultra-processed foods (UNICEF, 2025). The prevalence of adolescent obesity continues to rise at an alarming rate. High-income countries such as the United States, the United Arab Emirates, and Chile report obesity prevalence rates among those aged 5–19 years of 21–27% (UNICEF, 2025). In low- and middle-income countries such as India, Bangladesh, Indonesia, Timor-Leste, Ghana, and Egypt, obesity has increased by more than 65% (Koyanagi et al., 2020).

Research in China found that families with low socioeconomic status were associated with a poor diet quality rate of 39.3% (Zhang et al., 2023). In contrast, data from Mongolia showed that high SES families had a higher prevalence of overweight and obesity (66.4%) compared to low SES families (Su et al., 2021). Adolescents exhibit diverse dietary behaviors. While some genuinely adopt healthy eating habits, the majority tend to follow food trends promoted through advertising. In the United Kingdom, 32% of adolescents did not comply with the Eatwell guidelines, while only 9% achieved full compliance across all SES categories (Shaw et al., 2025). These inconsistent findings across settings likely reflect differences in food environments, cultural dietary norms, and stages of economic development: in high-income contexts, greater disposable income among high-SES families may increase access to energy-dense convenience foods, whereas in low- and middle-income contexts, low SES is more consistently linked to reliance on cheaper, nutrient-poor diets. This variation underscores the need for context-specific evidence, particularly from Indonesian populations, to clarify how socioeconomic status shapes diet quality among obese adolescents.

In Indonesia, a developing country with a middle-to-lower-income economy, 39.6% of adolescents aged 14–19 years are obese, distributed among low-income families (23.1%) and middle-income families (33.8%) (Colozza et al., 2025). North Sulawesi Province recorded regional revenue of IDR 650 billion, representing only 16% of the allocated budget of IDR 3.8 trillion, lower than South Sulawesi Province at 19% (Kementerian Keuangan Republik Indonesia, 2025), reflecting comparatively limited regional economic capacity. While this regional fiscal indicator does not directly measure household food security or dietary intake, it points to broader economic constraints that may plausibly affect families' capacity to access quality diets (Erlando et al., 2020), an association that has not yet been directly examined among adolescents in Tomohon City. To date, epidemiological data on adolescent obesity and diet quality specific to Tomohon City remain scarce, representing an important gap that the present study seeks to address.

A quality diet has been proven to improve health outcomes in children and adolescents. Through healthy dietary practices, beneficial gut bacteria can be promoted and digestive health maintained (Laitinen & Mokkala, 2019). A quality diet has also been shown to support sustained respiratory health (Li et al., 2024) and preserve muscle mass in growing adolescents, promoting proportional body composition (Davis et al., 2021).

Obese adolescents already carry an elevated risk of metabolic and inflammatory complications, yet most previous studies on socioeconomic status and diet quality have focused on general adolescent populations, leaving this high-risk subgroup underexamined; understanding the socioeconomic determinants of diet quality specifically among obese adolescents is therefore important for designing targeted, rather than generic, nutrition interventions. This study aimed to determine the relationship between socioeconomic status and diet quality in obese adolescents in Tomohon City.

## 2. METHODS

This study employed a cross-sectional design to examine the relationship between socioeconomic status and diet quality among obese adolescents in Tomohon City. The cross-sectional approach was chosen to assess the exposure (socioeconomic status) and outcome (diet quality) simultaneously within a defined population at a single point in time. The study was conducted among university students in Tomohon City. The study population consisted of adolescents aged 17–19 years who were registered as residents of Tomohon City. Nutritional status was assessed using body mass index (BMI)-for-age, with overweight and obesity classified according to the World Health Organization (WHO) 2007 growth reference for children and adolescents aged 5–19 years (BMI-for-age z-score  $> +1$  SD for overweight and  $> +2$  SD for obesity). The inclusion criteria were students who were classified as overweight or obese based on nutritional status assessment, held a valid Tomohon City identity card, and were willing to participate in the study. The minimum required sample size was calculated using the Lemeshow formula for cross-sectional studies, assuming a 95% confidence level, a 5% margin of error, and an expected proportion of 50%, yielding a minimum requirement of 385 respondents. A total of 316 obese adolescents were recruited as the study sample using purposive sampling, a non-probability sampling technique in which respondents meeting the predetermined inclusion criteria were deliberately selected rather than randomly sampled; this approach was chosen because it allowed efficient identification of adolescents who specifically met the obesity criterion within the accessible study population. The final achieved sample of 316 respondents was below the calculated minimum, which should be considered when interpreting the generalizability of the findings.

Diet quality was assessed using the Healthy Eating Index 2015 (HEI-2015), a standardized dietary index scored on the basis of adherence to key food groups and nutrients recommended by dietary guidelines, which categorizes dietary intake into three levels: poor diet ( $<30$  points), needs improvement (31–47 points), and good diet ( $>48$  points). The standard HEI-2015 scoring criteria were applied without a separate validation for the Indonesian adolescent population, which should be considered when interpreting the results. Socioeconomic status (SES) was measured using a structured questionnaire developed by the research team, administered to the parents or guardians of the respondents. The SES questionnaire included indicators such as household income, parental education level, occupation, and monthly household expenditure. Based on the total score, socioeconomic status was classified into three categories: low, middle, and high SES. As this questionnaire was developed specifically for this study and has not undergone formal validation or reliability testing, this represents a further limitation that should be considered when interpreting the findings.

Data were collected using a structured questionnaire distributed electronically through Google Forms. Prior to data collection, participants were informed about the purpose of the study and were required to provide informed consent. The study ensured anonymity and confidentiality by not collecting identifying personal information.

Data analysis was performed using the Chi-square test to determine the association between socioeconomic status and diet quality among obese adolescents. Simple (unadjusted) binary logistic regression was subsequently performed to estimate the odds ratio (OR) and 95% confidence interval (CI) for this association. The level of statistical significance was set at a p-value of  $\leq 0.05$ . All analyses were conducted using appropriate statistical software.

The study received ethical approval from the Research Ethics Committee of Bethesda Tomohon College of Health Sciences, Indonesia, under ethical clearance number 012/KEPK/STIKES-BTH/IV/2026. The ethical approval ensured that the study complied with established standards for research involving human participants, including respect for participants' autonomy, voluntary participation, informed consent, confidentiality and privacy of data, and the right to withdraw from the study at any time without consequences.

### 3. RESULTS AND DISCUSSION

The findings of this study encompass two main variables: socioeconomic status and diet quality among obese adolescents, along with respondent characteristics including gender and age.

**Table 1.** Subject characteristics by gender and age.

| Characteristic | Category | n   | Percentage (%) |
|----------------|----------|-----|----------------|
| Gender         | Male     | 211 | 66.8           |
|                | Female   | 105 | 33.2           |
| Age            | 17 years | 145 | 45.9           |
|                | 18 years | 171 | 54.1           |
| Total          |          | 316 | 100            |

Based on Table 1, the majority of respondents were male (66.8%), and the most common age group was 18 years (54.1%). These findings suggest that male adolescents in Tomohon City were more frequently represented among the obese participants in this sample than their female counterparts, potential explanations for which, such as differences in dietary patterns, physical activity levels, and metabolic rates between genders, warrant further investigation, as these factors were not directly measured in the present study.

**Table 2.** Univariate results of socioeconomic status and diet quality.

| Variable             | Category         | n   | Percentage (%) |
|----------------------|------------------|-----|----------------|
| Socioeconomic Status | Low              | 122 | 38.6           |
|                      | Medium           | 194 | 61.4           |
|                      | High             | 0   | 0              |
| Diet Quality         | Poor Diet        | 79  | 25.0           |
|                      | Need Improvement | 237 | 75.0           |
|                      | Good Diet        | 0   | 0              |
| Total                |                  | 316 | 100            |

Based on Table 2, the majority of respondents' parents had medium socioeconomic status (61.4%), while 38.6% were categorized as low SES, and none belonged to the high SES category. Regarding diet quality, 75% of respondents were in the need improvement category, 25% had poor diet quality, and none achieved good diet quality. These results indicate that the overall dietary quality of obese adolescents in Tomohon City remains far from optimal.

**Table 3.** Cross-tabulation of diet quality and socioeconomic status among obese adolescents in Tomohon City.

| SES    | Poor Diet  | Need Improvement | Total n (%) | p-value | OR     | 95% CI       |
|--------|------------|------------------|-------------|---------|--------|--------------|
|        | n (%)      | n (%)            |             |         |        |              |
| Low    | 64 (20.3%) | 58 (18.4%)       | 122 (38.6%) | <0.001  | 13.168 | 6.975–24.859 |
| Medium | 15 (4.7%)  | 179 (56.6%)      | 194 (61.4%) |         |        |              |
| Total  | 79 (25.0%) | 237 (75.0%)      | 316 (100%)  |         |        |              |

Table 3 demonstrates a statistically significant association between socioeconomic status and diet quality ( $p < 0.001$ ; OR = 13.168; 95% CI = 6.975–24.859). Based on the OR value of 13.168, respondents with low socioeconomic status had 13 times higher odds of poor diet quality compared to those with medium socioeconomic status. It should be noted that this odds ratio was derived from unadjusted (simple) logistic regression and does not account for potential confounding variables such as parental education, adolescents' physical activity levels, and the surrounding food environment; multivariable analysis in future studies is recommended to clarify the independent contribution of socioeconomic status to diet quality.

This study found that socioeconomic status was significantly associated with diet quality, particularly among obese adolescents. Parental purchasing power and knowledge about healthy eating may shape the availability and accessibility of nutritious food for their children. In Tomohon City, where a significant proportion of indigenous residents are farmers who rely on agricultural produce sales as their primary income source, economic constraints may limit household food purchasing capacity. Furthermore, parents engaged in full-time employment may resort to ultra-processed foods as a time-saving measure. The growing presence of fast-food outlets in Tomohon City may have gradually contributed to shifts in the dietary habits of children and adolescents, as these foods tend to be more affordable, come in larger portions, and are perceived as more appealing in presentation compared to healthy alternatives.

The magnitude of this association appears considerably larger than that reported in China, where low socioeconomic status was linked to a poor diet quality prevalence of 39.3% (Zhang et al., 2023), suggesting that the socioeconomic status-diet quality relationship may be particularly pronounced among obese adolescents, who may already face compounded nutritional vulnerability. Conversely, findings from Mongolia showing a higher obesity prevalence among high-SES families (Su et al., 2021) suggest that the direction of this association can vary with the stage of economic development and food environment, with rising affluence sometimes accompanying a nutrition transition toward energy-dense processed foods rather than improved diet quality. These contrasting patterns indicate that the relationship between socioeconomic status and diet quality is context-dependent, shaped by local food systems, cultural dietary norms, and economic development, rather than following a universal pattern.

According to the Healthy Eating Index, a nutritionally adequate diet for adolescents should be calorie-controlled, diverse, and low in oil, flavor enhancers, and preservatives (Wang et al., 2021). In practice, however, healthy food options are frequently more expensive than fast food (Jia et al., 2021). Given the economic constraints faced by many families in Tomohon City, fast food may become a more accessible dietary choice, driven in part by considerations of cost and convenience (Gearhardt et al., 2020).

The consequences of poor diet quality include increased accumulation of dietary fat in adipose tissue, which progressively exacerbates obesity in children and adolescents (Andrade et al., 2021). Obesity is a chronic inflammatory condition that must be addressed

urgently in the pediatric and adolescent population to protect future generations from metabolic diseases and cancer (Sun et al., 2023). Increased body mass index in the overweight and obese range is consistently associated with elevated blood glucose, blood pressure, hyperlipidemia, increased infection risk, and other metabolic complications (Yuan et al., 2020).

Obesity is a multifactorial disease. Addressing it in children and adolescents requires not only parental involvement but also the active engagement of schools, healthcare providers, academics, and government authorities to develop comprehensive, sustainable interventions (Bagheri et al., 2018).

#### **4. CONCLUSION**

This study demonstrates a significant association between socioeconomic status and diet quality among obese adolescents in Tomohon City. Adolescents from lower socioeconomic backgrounds were more likely to have poor diet quality than those from medium socioeconomic backgrounds. These findings highlight the importance of collaboration among healthcare providers, educational institutions, and local governments in developing evidence-based interventions that strengthen nutritional literacy and improve access to healthy foods, particularly among economically vulnerable families. Such targeted efforts may contribute to improving diet quality and reducing the risk of obesity-related health problems among adolescents. Given the cross-sectional design of this study, longitudinal and intervention studies are recommended to further clarify the relationship between socioeconomic status and diet quality and to guide the development of effective public health strategies.

#### **CONFLICT OF INTEREST**

The authors declare no conflict of interest.

#### **AUTHOR CONTRIBUTIONS**

Conceptualization: Cicilia Karlina Lariwu, Christiane Prisilia Sarayar; Methodology: Cicilia Karlina Lariwu, Christiane Prisilia Sarayar, Jeane Sumarauw; Data Collection: Cicilia Karlina Lariwu, Ever Mario Lontaan, Jolie Febri Ponamon; Formal Analysis: Cicilia Karlina Lariwu, Christiane Prisilia Sarayar; Writing - Original Draft Preparation: Cicilia Karlina Lariwu; Writing - Review & Editing: Christiane Prisilia Sarayar, Jeane Sumarauw, Ever Mario Lontaan, Jolie Febri Ponamon, Linnie Pondaag; Supervision: Linnie Pondaag. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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## DECLARATION OF ARTIFICIAL INTELLIGENCE USE

The authors declare that artificial intelligence (AI) tools were used solely to assist with language editing, grammar improvement, and manuscript readability during the preparation of this manuscript. All scientific content, study design, data collection, data analysis, interpretation of results, and final conclusions were developed, verified, and approved by the authors. The authors take full responsibility for the accuracy, integrity, and originality of the work.

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