

## Original Research

# Adolescent Obesity in Surabaya: Causes and Solutions through a Mixed-Methods Study

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### ABSTRACT

**Background:** Adolescent obesity has emerged as a significant public health issue in Indonesia, particularly in urban areas such as Surabaya. Its multifactorial nature—shaped by individual behaviors, family practices, and socio-environmental influences—underscores the need for integrated prevention strategies.

**Purpose:** This study investigates the key determinants of adolescent obesity in Surabaya and proposes practical, collaborative interventions.

**Method:** A mixed-methods design was employed, combining quantitative survey data from 50 adolescents aged 14–18 years (dietary habits, physical activity, and BMI-for-age based on WHO standards) with qualitative insights from interviews with 15 parents, 10 teachers, and 10 healthcare professionals, as well as focus group discussions. Quantitative data were analyzed using descriptive statistics, while qualitative data underwent thematic coding.

**Results:** Five primary factors were identified: high consumption of fast food and sugary snacks, limited physical activity, low nutrition literacy, unhealthy family dietary routines, and peer and media influences. Suggested interventions included integrating nutrition education into school curricula, creating enjoyable peer-based physical activities, strengthening parental engagement, implementing healthier school canteen policies, and involving healthcare providers in adolescent health promotion.

**Conclusion:** Adolescent obesity in Surabaya is driven by unhealthy diets and sedentary lifestyles, reinforced by family and social environments. Practical recommendations emphasize multi-sectoral collaboration between schools, families, and healthcare systems. Future research should expand with larger, representative samples and evaluate the effectiveness of intervention programs to inform scalable urban health policies.

### ARTICLE HISTORY

Received : 18 May 2025

Revised : 30 August 2025

Accepted : 16 September 2025

Available Online: 26 February 2026

Published : 28 February 2026

### KEYWORDS

Adolescent obesity; systemic lupus erythematosus; urban health; lifestyle diseases; nutrition education

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Cite this as: Aryani N. (2026). A Study on the Phenomenon of Obesity among Adolescents in Surabaya: Causes and Solutions. *Gaster*, 24(1). [https://doi.org/ 10.30787/gaster.v24i1.1951](https://doi.org/10.30787/gaster.v24i1.1951)

## INTRODUCTION

In recent decades, the prevalence of overweight and obesity among adolescents has risen significantly at both global and national levels. According to the World Health Organization (1), the number of overweight children and adolescents aged 5–19 years has increased more than tenfold since 1975, reaching approximately 124 million cases in 2016. In Indonesia, the 2018 Basic Health Research (2) reported that 16% of children and adolescents were overweight, with a continuing upward trend. This epidemiological transition has been closely associated with lifestyle changes, particularly decreased physical activity and the increased consumption of energy-dense, nutrient-poor foods such as fast food, which are common features of urban environments.

Obesity during adolescence is not merely a matter of body weight but represents a significant public health concern (3); (4). Adolescents with overweight and obesity are at higher risk for developing non-communicable diseases such as cardiovascular disorders and type 2 diabetes, while also being vulnerable to psychosocial distress, including diminished self-esteem and elevated stress levels. These health and psychological consequences underscore the urgency of understanding the determinants of adolescent obesity and identifying effective preventive strategies.

Surabaya, as one of Indonesia's largest metropolitan areas, provides an important context for examining this issue. Urban settings like Surabaya facilitate easy access to fast food outlets and sedentary lifestyles, both of which exacerbate obesity risks among adolescents. Prior studies, such as Górnicka et al. (5), highlight insufficient physical activity as a major contributor to adolescent overweight in urban populations. Nevertheless, most existing research has not examined the issue comprehensively, particularly in terms of multi-sectoral collaboration that involves families, schools, and healthcare providers.

Several international studies have proposed strategies for preventing adolescent obesity, including school-based nutrition education (6), policies promoting physical activity in schools (7), and parental involvement in dietary guidance (8). However, much of this evidence originates from high-income countries with social and cultural contexts that differ substantially from Indonesia. To date, research in Indonesia remains fragmented, often addressing obesity from isolated perspectives—such as focusing solely on dietary intake or physical activity—without integrating broader environmental and familial factors. This gap highlights the novelty of the present study, which seeks to employ an integrative framework.

Accordingly, this study adopts a mixed-methods approach with two primary objectives: (1) to identify the underlying determinants of adolescent overweight and obesity in Surabaya, and (2) to develop contextually relevant and practical solutions by engaging adolescents, their families, schools, and health professionals. By addressing the research gap through an integrated approach, this study aims to generate evidence that not only advances academic understanding but also informs practical interventions to reduce adolescent obesity in Indonesian urban contexts.

## METHOD

This study employed a mixed-methods approach to explore overweight and obesity among adolescents in Surabaya, following the framework of Creswell and Plano Clark (9). A convergent design was used, where quantitative and qualitative data were collected and analyzed in parallel before being integrated during interpretation. The quantitative component provided numerical data on the prevalence of overweight and obesity, while the qualitative component offered in-depth insights into the social and

cultural factors that influence adolescent lifestyles. Integration of findings was achieved by comparing and contrasting statistical trends with emerging themes from interviews, which allowed for a more comprehensive understanding of the phenomenon. To ensure methodological rigor, the instruments were validated through expert review, with reliability coefficients reported for the quantitative scales and thematic saturation confirmed in the qualitative interviews. This combined strategy not only strengthened the credibility of the results but also aligned the study with recommended mixed-methods reporting standards such as GRAMMS.

In the *quantitative phase*, purposive sampling was used to select 50 adolescents aged 14–18 years who lived in Surabaya. Only those with parental consent were included, while adolescents with chronic diseases were excluded to avoid health conditions that could bias the results. Body Mass Index (BMI) percentiles from the World Health Organization (WHO) were used as the main standard, with adolescents above the 85th percentile classified as overweight and above the 95th as obese. The survey collected information on diet, physical activity, and smoking, and was pre-tested to ensure that the questions were clear and culturally appropriate.

The decision to include 50 adolescents was based on both practical and methodological considerations. In qualitative-oriented mixed methods, a sample of 30–50 participants is often considered sufficient to identify general patterns without being too large to manage. The number also allowed the study to balance between depth and feasibility. Since this study focused on adolescents with specific characteristics—living in Surabaya and at risk of overweight or obesity—50 participants gave enough variation to represent different experiences while still keeping the sample focused and manageable for detailed analysis. This size was also suitable for descriptive statistics, which aimed to provide a snapshot of the problem rather than national-level generalization.

In the *qualitative phase*, purposive sampling was again used to include 15 parents, 10 teachers, and 10 healthcare workers. These groups were chosen because of their direct involvement in the lives of adolescents and their ability to provide insights into family, school, and health influences. Semi-structured interviews were conducted, allowing participants to share their views freely. In addition, a Focus Group Discussion (FGD) was held to allow joint brainstorming on strategies for prevention and intervention.

Data from the survey were analyzed with descriptive statistics to identify the prevalence of overweight and obesity. Meanwhile, interview and FGD data were analyzed thematically to capture common causes and possible solutions. The combination of numbers and narratives gave a more complete understanding of the issue.

To ensure accuracy, both survey and interview instruments were adapted from existing tools and reviewed by experts in health, education, and psychology. Informed consent was obtained from parents or legal guardians, while assent was also secured from adolescent participants to ensure their voluntary participation. During interviews and FGDs, confidentiality was strictly maintained by anonymizing responses and removing any identifying details. To minimize potential power imbalances, discussions were conducted in youth-friendly language, and facilitators were trained to create a supportive and non-judgmental environment. Finally, the study received approval from the Ethics Committee of Universitas Wijaya Kusuma Surabaya (No. 16/SLE/FK/UWKS/2024), confirming that the research met ethical standards for studies involving human participants.

## RESULTS

### Contributing Factors to Adolescent Obesity in Surabaya

The table below shows the main factors that cause obesity among teenagers in Surabaya. The data come from a survey of 50 adolescents and are supported by interviews and focus group talks with parents, teachers, and health workers. The results show that obesity is not caused by one thing, but by many factors such as habits, family, school, and social influence. These are summarized in Table 1.

**Table 1.** Factors Contributing to Obesity among Adolescents in Surabaya

No.	Contributing Factor	Survey Results	Interview and FGD Results
1	Unhealthy eating habits	40 teens eat fast food >3 times/week.	Fast food is easy and tasty, making it popular among teens.
2	Lack of physical activity	33 teens exercise less than twice a week.	Teens sit too much, often using phones or playing games.
3	Lack of nutrition knowledge	30 teens don't understand healthy eating.	Schools lack sufficient nutrition education.
4	Family factors	27 have overweight family members.	Family diet habits strongly influence teen eating behavior.
5	Social environment influence	23 eat similar to their friends.	Peer influence encourages junk food consumption.

This study found several main reasons why many teenagers in Surabaya are overweight. The results came from a survey of 50 teenagers, along with interviews and group discussions with parents, teachers, and healthcare workers. The analysis (see Table 1) showed that the causes of obesity can be grouped into five key areas: unhealthy eating habits, lack of exercise, low knowledge about nutrition, family influence, and social environment.

*Unhealthy Eating Habits.* The survey found that 43 out of 50 teenagers often eat unhealthy food. Many regularly choose fast food, sugary snacks, and sweet drinks like soda. This is very common in cities such as Surabaya, where these foods are cheap and easy to find. Parents explained that teenagers like fast food because it is tasty and convenient, even though it is not healthy. Most teenagers also do not eat enough fruits and vegetables each day. Health workers added that many of them skip meals, especially breakfast, and then eat too much later in the day. Some even replace breakfast with sweet snacks or drinks. These habits add extra calories and increase the risk of weight gain and obesity.

*Lack of Physical Activity.* The survey showed that 33 out of 50 teenagers did not exercise regularly. Many said they preferred video games or social media instead of physical activity. Teachers explained that most students only exercised during PE classes, which was not enough for good health. Parents added that limited sports facilities and the

hot weather in Surabaya made it harder for teenagers to be active. In group talks, health workers stressed that exercise is very important for weight control and overall health, but many teenagers and their families still do not realize how important it is.

*Lack of Nutritional Knowledge.* The survey found that 37 out of 50 teenagers did not know much about nutrition or healthy eating. Many did not understand daily calorie needs or the dangers of too much sugar and fat. Parents admitted they rarely talked about nutrition, either because they were too busy or because they also lacked knowledge. Teachers explained that nutrition is only taught in a few subjects and often in ways that are not practical. Schools also do not provide enough interesting materials, so teenagers find it hard to learn why good nutrition matters in daily life.

*Family Factors.* Family habits have a strong effect on obesity in teenagers. Interviews showed that many families often eat high-calorie foods, such as fast food, because they are quick and easy. Parents admitted they do not always check what their children eat, and most families do not have regular exercise at home. Health experts explained that when parents do not eat well or stay active, children usually follow the same habits. The survey also found that 27 out of 50 teenagers had family members who were overweight, showing that family eating patterns and lifestyle strongly influence teenagers' health.

*The Influence of Social Environment.* Friends and media strongly shape teenagers' eating habits. The survey showed that 23 out of 50 teenagers often eat the same foods as their friends, usually fast food. Because their friends also like fast food, it is hard for them to choose healthier options. Media adds to this problem, as TV and social media ads make fast food look fun and attractive. Teachers said that many teenagers follow food trends online more than advice from adults. Health experts also noted that friends and media have a big impact on what teenagers eat and how they live every day.

### **Solutions for Addressing Obesity Among Adolescents in Surabaya**

Based on the survey and discussions, several solutions were found to reduce adolescent obesity in Surabaya. These solutions reflect ideas from teenagers, parents, teachers, and health workers. They focus on education, supportive environments, and teamwork between families, schools, and communities. Table 2 shows the most practical strategies to help teenagers live healthier lives.

**Table 2:** Effective Solutions to Address Adolescent Obesity in Surabaya

No	Solution Type	Key Findings (Survey & Discussions)
1	Nutritional Education	43 teens want more knowledge; schools and families should teach healthy eating.
2	Physical Activity	37 enjoy group exercise; fun school sports can motivate activity.
3	Home Monitoring	33 eat better with parental control; parents should plan healthy meals.
4	Collaborative Programs	30 more active with peers; teamwork between schools, families, and clinics is effective.
5	School Policies	27 want no junk food; schools should ban unhealthy snacks and give better nutrition lessons.
6	Health Professional Support	23 feel safer with experts; schools should provide check-ups, talks, and counseling.

Table 2 shows the main solutions for reducing obesity among adolescents in Surabaya. These solutions are based on survey results from 50 teenagers and supported by interviews and focus group discussions with parents, teachers, and health workers. The survey gave direct views from adolescents, while the interviews and FGDs added deeper and more practical suggestions. The findings suggest that effective solutions need a multi-dimensional approach, including better nutrition education, more physical activity, closer monitoring of eating habits at home, stronger school policies, community collaboration, and continued support from healthcare professionals. Below is a description of each solution.

*Nutritional Education.* The survey found that 43 out of 50 teenagers said learning about healthy food helps them eat better. Many admitted they do not really understand what healthy food is or how much nutrition their body needs. Because of this, they often eat too much sugar and fat. Parents and teachers agreed that teenagers need more support to build good eating habits. They suggested that schools give clear information on the benefits of healthy food and how to make better choices, especially with so much fast food around. Some teachers also recommended seminars or workshops on balanced nutrition, while health workers advised including nutrition lessons regularly in the school curriculum.

*Promoting Physical Activity.* The survey found that 37 out of 50 teenagers enjoy exercising more when they do it with friends. This shows that group activities can motivate them to stay active and healthy. However, most teenagers spend too much time on quiet activities like using phones or watching TV, which increases the risk of weight gain. To address this, teachers and parents suggested fun group activities such as morning exercise, sports clubs, and friendly competitions. Teachers also recommended more PE classes and better sports facilities to make exercise enjoyable. Parents added that they should set a good example by doing simple activities with their children, like walking or cycling together on weekends.

*Monitoring Dietary Habits at Home.* The survey showed that 30 out of 50 teenagers do not have their eating habits well supervised at home. As a result, many eat high-calorie snacks without control. Parents admitted they are often too busy with work to check what their children eat. As a solution, parents suggested making a simple weekly meal plan with healthier options. Health workers also recommended short training sessions for parents to learn how to prepare healthy meals and read food labels, so families can make better food choices.

*Collaborative Programs and School Policies Supporting Adolescent Health.* The survey found that 30 out of 50 teenagers feel more motivated to join health programs when their friends also join. Teachers and health workers suggested programs that bring together students, parents, and teachers to build healthy habits. Interviews and group discussions strongly supported this idea, saying teamwork between schools, families, and health centers makes obesity programs more effective. Examples include schools working with clinics for health checks and nutrition advice, or community events like healthy cooking contests and group exercise to involve families in a fun way.

*School policies.* The survey showed that 27 out of 50 teenagers agreed schools should not sell unhealthy food. Many said that junk food in the canteen makes it hard to eat healthy. Teachers also admitted that school food rules are often too weak, so unhealthy snacks are still sold. As a solution, teachers suggested that canteens should only offer healthy meals and students should not bring junk food from home. They also recommended stronger health education in schools to support better eating habits.

*Support from Health Professionals.* The survey found that 23 out of 50 teenagers feel more supported when they can talk to doctors or health workers. Many said they feel shy about discussing weight with parents or teachers. Health workers suggested schools provide regular health talks, check-ups, and counseling to help students feel safer and more understood. Nutritionists recommended mentoring programs to track progress, while psychologists highlighted the need for emotional support and motivation to build healthy habits.

The integration of survey data and qualitative insights highlights how numerical trends are explained and deepened by lived experiences. For example, while 40 adolescents reported eating fast food more than three times per week, interviews with parents and health workers clarified that convenience, low cost, and taste are the main reasons behind these choices. Similarly, the survey finding that 33 adolescents exercise less than twice a week was contextualized by teachers and parents, who noted the lack of sports facilities, hot weather, and preference for digital entertainment as barriers to physical activity. This combination of quantitative evidence and qualitative explanation provides a richer understanding of why unhealthy behaviors persist among adolescents in Surabaya.

A side-by-side interpretation also shows how qualitative data sometimes contrast with survey patterns, revealing gaps that may not be visible in numbers alone. For instance, although only 23 adolescents admitted peer influence on eating habits, interviews indicated that peer pressure and media trends strongly drive unhealthy food consumption, suggesting possible underreporting in the survey. Likewise, while family factors were acknowledged by 27 respondents, qualitative discussions revealed a stronger influence of parents' eating and lifestyle habits than the numbers alone suggested. Such integration underscores that adolescent obesity is not only the sum of individual choices but also a reflection of broader family, school, and community environments. By merging survey results with thematic insights, the study presents a more comprehensive and contextually grounded picture of the problem.

## DISCUSSION

*Contributing Factors to Adolescent Obesity in Surabaya.* This study identifies several determinants of adolescent obesity in Surabaya, including unhealthy dietary practices, low nutritional literacy, physical inactivity, family lifestyle, and socio-environmental influences such as peer norms and media exposure. Rather than treating these factors in isolation, this research emphasizes their interconnection and cumulative effect, highlighting the need for integrative approaches that have not been widely explored in prior Indonesian studies.

*Unhealthy Diets and Limited Nutrition Knowledge.* Survey data indicated frequent consumption of fast food and sugary snacks among adolescents, consistent with earlier findings that excessive fat and sugar intake contributes to obesity in urban settings (10). Furthermore, 37 of 50 participants reported limited awareness of healthy diets, reflecting gaps in school-based nutrition education. This aligns with Buru et al. (6), who demonstrated that structured education programs improve students' eating behaviors. Teachers and healthcare professionals in this study also highlighted the potential of embedding nutrition education into school curricula as a sustainable preventive measure.

*Physical Inactivity and Sedentary Lifestyle.* A majority of adolescents reported spending extended time on screen-based leisure, supporting evidence from Haghjoo et al. (11) and Megawati et al. (12) that sedentary behavior is a critical risk factor. Limited access to affordable sports facilities in schools and neighborhoods further exacerbates this

issue. These findings underscore the importance of strengthening school and community environments through policies that promote structured physical activity (7), including regulations that ensure schools provide adequate spaces and programs for exercise.

*Family Lifestyle.* Family routines strongly influence adolescents' dietary choices. Many parents admitted to relying on fast food due to time constraints, and 27 of 50 adolescents reported having overweight family members. This suggests intergenerational transmission of unhealthy behaviors. Prior research emphasizes that parental involvement is essential in shaping healthy routines (13). Thus, empowering families with practical strategies, such as meal planning and food-label literacy, is central to prevention efforts.

*Peer and Media Influence.* Adolescents often mirror their peers' eating behaviors, a pattern documented by da Silva Pinho et al. (14) and Telzer et al. (15). Teachers also observed that students were more influenced by peers than adults. Similarly, exposure to fast food promotion via platforms like TikTok and Instagram reinforced unhealthy food preferences. Studies by Tsochantaridou et al. (16) and Wang et al. (17) confirm the persuasive role of digital marketing in shaping adolescent dietary choices. In Surabaya, this highlights the urgency of community-based interventions that involve peer groups and counteract negative media influences through health campaigns.

*Framework Connection.* These findings are consistent with the energy balance model, which explains obesity as a result of excess caloric intake relative to energy expenditure (18). By demonstrating how family, school, peers, and media environments interact in shaping adolescent lifestyles, this study extends the behavioral epidemiology perspective (12) and offers novel insight into the multifactorial drivers of adolescent obesity in Indonesia.

*Solutions for Addressing Adolescent Obesity in Surabaya.* The study findings suggest that addressing obesity requires strategies that integrate educational, familial, institutional, and community dimensions. Unlike previous Indonesian studies that treated obesity drivers separately, this study highlights multi-level interventions tailored to the Surabaya context, with explicit implications for local policy such as school canteen regulation and community-based initiatives.

*Nutrition Education as a Core Strategy.* Adolescents in this study acknowledged improvements in their awareness when exposed to healthy diet information, echoing Buru et al. (6). Embedding nutrition into school curricula in practical, age-appropriate ways aligns with the Health Belief Model (19), which emphasizes risk perception as a motivator for change.

*Active and Enjoyable Lifestyles.* Physical activity programs that are socially engaging proved more appealing to adolescents, consistent with Bandura's Social Cognitive Theory (20) and findings by Tafuri et al. (21). Schools and communities should collaborate to design appealing activities, including after-school clubs and weekend events, to replace sedentary habits.

*Family Engagement.* Adolescents supported by parents in their eating and exercise routines showed healthier behaviors. This supports Karavida et al. (8), who found that parental modeling is key to prevention. Practical family-based interventions—such as workshops on meal planning—can reinforce healthier habits at home.

*School Policy Reform.* A recurring theme was the ease of access to unhealthy snacks in school canteens. This points to the urgent need for stricter school food regulations in Surabaya, aligned with World Health Organization (1) recommendations. Research indicates that restricting unhealthy food sales (7); (22) while promoting healthier options is an effective preventive measure.

*Community and Healthcare Partnerships.* Teachers, parents, and healthcare professionals emphasized collaborative programs involving all stakeholders. Such initiatives—joint sports events, nutrition campaigns, and health check-ups—help ensure consistent health messages and encourage sustainable behavioral change. Consistent with Domin et al. (23) and Harefa (24), adolescents reported that counseling and direct support from health workers strengthened their motivation to adopt healthier lifestyles. Thus, obesity prevention efforts should integrate healthcare professionals into school and community settings, providing ongoing support and monitoring (25); (26).

The use of a mixed-methods design added significant value by revealing motivations, attitudes, and contextual barriers that survey data alone could not capture. For instance, while statistics highlighted the prevalence of fast food consumption, qualitative interviews uncovered the underlying reasons—such as convenience, affordability, and peer norms—that sustain these habits. Similarly, survey findings on low physical activity were enriched by narratives from teachers and parents who pointed to limited facilities, academic workload, and urban safety concerns as structural barriers to exercise. This triangulation not only confirmed quantitative patterns but also explained their persistence, offering a more holistic understanding of the complex drivers of adolescent obesity.

Moreover, considering the cultural and socioeconomic diversity of Surabaya deepens the interpretation of findings. Adolescents from higher-income families reported greater access to fast food chains and digital platforms that promote sedentary leisure, while those from lower-income households described reliance on inexpensive fried snacks sold near schools. Cultural values emphasizing togetherness in eating further reinforced family and peer influences on dietary choices. By combining quantitative prevalence data with qualitative accounts of daily life, this study demonstrates that adolescent obesity in Surabaya cannot be understood outside its social and cultural context. Such insights underline the necessity of tailored, context-sensitive interventions that address not only individual behavior but also the broader environments shaping adolescent health.

## CONCLUSION

This study demonstrates that adolescent obesity in Surabaya is shaped by interrelated factors, including poor dietary habits, insufficient physical activity, limited nutrition literacy, family routines, and peer as well as media influences. These findings reinforce the relevance of the energy balance model and behavioral epidemiology, emphasizing that obesity emerges from both individual behaviors and broader social environments.

From a practical perspective, several recommendations can be derived. Schools should integrate structured nutrition education into the curriculum and enforce canteen regulations that limit access to unhealthy foods. Communities and schools can also collaborate to design enjoyable and socially engaging physical activity programs, while families play a crucial role by modeling healthy routines and actively monitoring adolescents' dietary practices. Furthermore, healthcare professionals—including doctors, nutritionists, and psychologists—should be incorporated into preventive initiatives through counseling, monitoring, and youth-friendly health promotion activities.

Despite its contributions, this study has several limitations. The relatively small sample size of 50 adolescents restricts the generalizability of findings to broader populations. Future research should expand upon these findings by employing larger and more representative samples, as well as conducting longitudinal and intervention-based

studies. Such approaches would provide stronger evidence for the effectiveness of integrated strategies and inform the design of scalable obesity prevention programs tailored to Indonesian urban contexts.

By emphasizing a multi-sectoral and collaborative framework, this study highlights not only the complexity of adolescent obesity but also the potential for sustainable interventions that align schools, families, communities, and healthcare systems toward healthier adolescent lifestyles in Surabaya.

## ACKNOWLEDGEMENT

The researcher would like to thank the students of the Faculty of Medicine, Wijaya Kusuma Surabaya University, Surabaya who were willing to participate in this study and also to the Kusuma Surabaya University for providing the facilities and support needed to complete this study.

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