

# Determinants of Obesity in Elementary School Children: A Literature Review

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## ABSTRACT

Obesity among elementary school children is a multifactorial nutritional problem that is increasing both globally and in Indonesia. This condition results from an imbalance between energy intake and energy expenditure, influenced by various factors such as dietary patterns, physical activity, and family and socioeconomic factors. This literature review aims to identify factors associated with the prevalence of obesity among elementary school children. The method used in this study was a literature review. Articles were searched through Google Scholar and PubMed using keywords related to childhood obesity and risk factors. The articles were selected based on inclusion criteria, including publication year (2016-2026), relevance to study variables, and availability of full texts. The analysis involved comparing findings from previous studies regarding dietary patterns, physical activity, family factors, and other determinants associated with obesity among elementary school children. The review findings indicate that unhealthy dietary patterns, such as high consumption of calorie-dense foods, fats, sugars, and fast food, are associated with an increased risk of childhood obesity. Additionally, low levels of physical activity are a significant factor contributing to childhood obesity. Family and socioeconomic factors, including household income, parental education, and knowledge, as well as genetic factors, also contribute to the incidence of childhood obesity. It is concluded that obesity among elementary school children is influenced by unhealthy dietary habits, low levels of physical activity, as well as family and environmental factors. Therefore, preventive efforts are needed through improving dietary habits, increasing physical activity, and strengthening nutrition education involving both families and schools.

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## INTRODUCTION

Obesity is a nutritional problem characterized by the excessive accumulation of body fat resulting from an imbalance between energy intake and energy expenditure. One of the factors contributing to obesity is low levels of physical activity. Obesity can be measured using body fat percentage, which refers to the proportion of body fat mass in an individual (Effendy *et al.*, 2018). Childhood obesity is a serious global public health challenge because it increases the risk of various chronic diseases. Currently, obesity is not only found in adults but is also increasingly prevalent among school-aged children. Efforts to address childhood obesity require the involvement of families, particularly through parenting practices that support healthy lifestyle behaviors (Triana *et al.*, 2020).

According to the World Health Organization (WHO), obesity is a condition characterized by excessive fat accumulation in adipose tissue from an imbalance between energy intake and energy expenditure, which may impair health and increase the risk of various diseases. In children aged 6-12 years,

obesity is defined as a BMI for age Z-score greater than +2 standard deviations (Fadhilah *et al.*, 2021). Globally, the number of overweight children continues to rise. Since 2000, the prevalence of overweight children under the age of five in Africa has increased by approximately 23%. In 2022, nearly half of all overweight or obese children under five were in Asia. In addition, more than 390 million children and adolescents aged 5-19 age group increased from 8% in 1990 to 20% in 2022 (WHO, 2024).

In Indonesia, overweight and obesity among school-aged children remain a serious public health concern due to their relatively high prevalence. According to data from the Ministry of Health of the Republic of Indonesia through the 2023 Indonesia Health Survey (SKI), the prevalence of overweight among children aged 5 – 12 years was 7.8%, while obesity reached 11.9% respectively. These findings indicate that overweight and obesity among school aged children continues to pose a significant public health challenge in Indonesia.

Childhood obesity can lead to a variety of serious health consequences from an early age. This condition increases the risk of gastrointestinal, musculoskeletal, and orthopedic disorders, as well as the likelihood of developing type 2 diabetes. In addition, obesity can affect a child's psychological well-being, leading to emotional problems, depression, which may result in long term health and economic burden (Rahmadani et al., 2022).

Several factors are associated with childhood obesity, including family economic status (Widyantari et al., 2018) and unhealthy dietary patterns, such as high consumption of carbohydrate rich foods, fried foods, high sugar and high calorie foods, and fast food (Yensasnidar et al., 2018). In addition, parent's educational level may influence family dietary patterns through food selection. A lack of knowledge regarding nutritious foods can lead to food choices that prioritize taste over nutritional value, resulting in an imbalance between nutritional needs and intake. Family size is also a contributing factor to childhood obesity (Fadillah & Sefrina, 2022).

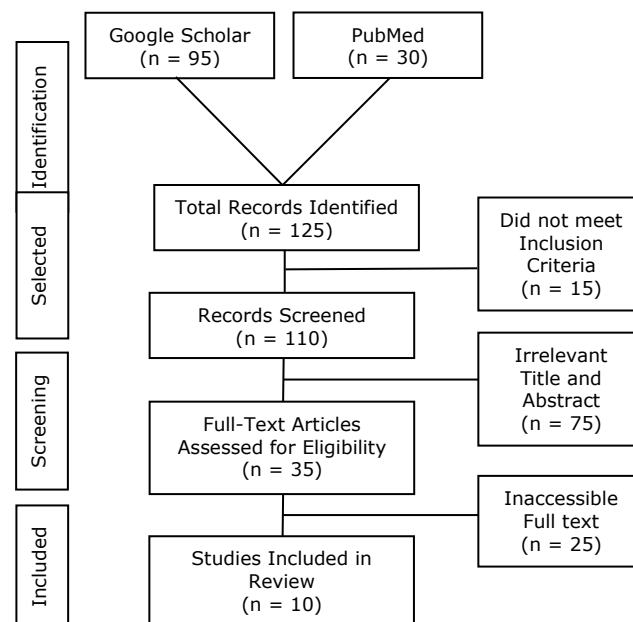
In addition to dietary factors and family characteristics, physical activity is also a contributing factor to childhood obesity. A study conducted by Octaviani et al. (2018) found an association between physical activity and nutritional status among students at SD Negeri 47/IV in Jambi City. The level of physical activity influences the body's energy requirements. When energy intake exceeds energy expenditure and is not balanced by adequate physical activity, the risk of childhood obesity increases, which may hinder optimal growth and development.

Based on this discussion, this literature review aims to identify and analyze factors associated with the prevalence of obesity among elementary school children.

## METHOD

This literature review was conducted by formulating a research question using the PICO (Problem, Intervention, Comparison, Outcome) framework, searching for relevant literature, selecting eligible studies, and synthesizing the findings. Literature searches were conducted using Google Scholar and PubMed with the keywords "obesity in elementary school children," "factors of childhood obesity," "childhood obesity," and "risk factors of obesity in elementary school children" in both Indonesian and English. A total of 125 articles were identified, of which 110 met the initial inclusion criteria. Following title and abstract screening, 35 articles remained for full-text review. After excluding 25 inaccessible articles, 10 articles were included in the final analysis. Inclusion criteria were articles published between 2016 and 2026, discussing factors associated with obesity among elementary school children, and available as full-text scientific journal articles. Data were analyzed using a matrix table to compare study characteristics, including research design, subjects, settings, and variables such as

dietary patterns, energy intake, fast-food consumption, physical activity, parental education, family income, and parental history of obesity. The findings were then synthesized through content analysis to identify the dominant factors associated with obesity prevalence among elementary school children.



**Figure 1.** PRISMA Flow Chart Diagram

## RESULTS AND DISCUSSION

To provide a structured overview of the existing literature, the selected studies were systematically summarized based on their key characteristics, including research title, study location, research design, and study population. This classification aims to highlight the diversity of approaches used in investigating factors associated with obesity among elementary school children. Most of the included studies employed cross-sectional designs, while others used analytical observational approaches conducted in various regions of Indonesia. A summary of the study characteristics is presented in Table 1.

**Table 1.** Characteristics of Studies on Obesity in Elementary School Children (2018–2024)

Author (Year)	Research Title	Location
Rahmadani et al. (2022)	The Relationship Between Physical Activity, Parental History, and Dietary Patterns with the Incidence of Obesity Among Elementary School Children	MIN 2 Kota Bengkulu, Indonesia

Author (Year)	Research Title	Location	Author (Year)	Research Title	Location
Yensasnidar et al. (2018)	Factors Associated with the Incidence of Obesity Among Students at State Elementary School 11 Lubuk Buaya, Padang City, in 2018	State Elementary School 11 Lubuk Buaya, Padang City, Indonesia		A Cross-Sectional Study	Elementary School 71 Kota Tengah, and State Elementary School 83 Kota Tengah, Gorontalo City, Gorontalo Province, Indonesia
Widyantari et al. (2018)	The Relationship Between Physical Activity, Dietary Patterns, and Family Income with the Incidence of Obesity Among Elementary School Children	Abiansemal III Public Health Center, Badung Regency, Bali, Indonesia	Wansyaputri et al. (2020)	The Relationship Between Dietary Patterns and Physical Activity and the Incidence of Obesity Among Elementary School Children at SDN 49/IV Jambi City	State Elementary School 49/IV Kota Jambi
Angkat et al. (2024)	Determinants of Obesity Among Elementary School Children	State Elementary School 101878 Kanan 1 Batu Begimbar, Tanjung Morawa, Indonesia	Maesarah et al. (2019)	Eating Patterns and The Incidence of Obesity in Elementary School Children in Gorontalo District	State Elementary School 01 Limboto and State Elementary School 10 Limboto, Gorontalo Regency, Indonesia
Rahmiwati et al. (2018)	Determinants of Obesity Among Elementary School-Aged Children	Rabbani Islamic Elementary School Indralaya, Ogan Ilir Regency, South Sumatra, Indonesia			
Fadhilah et al. (2021)	The Relationship Between Physical Activity and the Incidence of Obesity Among Students at State Elementary School 113 Banjarsari, Bandung City, in 2019–2020	State Elementary School 113 Banjarsari, Bandung City, Indonesia			
Azzahra et al. (2023)	The Relationship of Food Intake with the Incidence of Obesity on Grade 1 - 3 Students of Sdn Sukasari 4 Tangerang City and its Review According to Islamic View	State Elementary School Sukasari 4, Tangerang City, Indonesia			
Sandalayuk et al. (2024)	Determinants of Obesity Among Elementary School Children:	State Elementary School 70 Kota Tengah, State			

Table 1. presents the characteristics of studies examining obesity among elementary school children published between 2018 and 2024. The included studies were conducted in various regions of Indonesia, including Bengkulu, Padang, Bali, Tanjung Morawa, South Sumatra, Bandung, Tangerang, Gorontalo, and Jambi. Most of the studies were carried out in elementary school settings, while one study was conducted in the working area of a public health center. The reviewed studies generally focused on identifying factors associated with obesity among elementary school children. Several studies examined dietary patterns, physical activity, and food intake as the main variables related to obesity. In addition, some studies also explored the influence of parental history, family income, parental knowledge, socioeconomic conditions, and genetic factors on the prevalence of obesity. Based on the research titles and study locations, the findings indicate that obesity among elementary school children has become a public health concern in various regions of Indonesia. This also shows that the contributing factors to childhood obesity are multidimensional and involve behavioral, familial, and environmental aspects.

**Table 2.** Summary of Research Findings on Obesity in Elementary School Children (2018–2024)

Author (Year)	Method & Sample	Key Findings
Rahmadani et al. (2022)	An analytical study using a cross-sectional approach involving 52 fourth- and fifth-grade students at MIN 2 Bengkulu City selected through total sampling, using the PAQ-C questionnaire, dietary pattern questionnaire, height and weight measurements, and BMI-for-age Z-score tables.	There is an association between physical activity and dietary patterns and the prevalence of obesity elementary school children ( $p=0.000$ ). Most children light physical activity were obese (73.3%), while 72.5% of children with poor dietary patterns were obese.
Yensasnidar et al. (2018)	A descriptive analytical study with a case-control design involving 80 students from SD Negeri 11 Lubuk Buaya in Padang City selected using simple random sampling, using a Food Frequency Questionnaire (FFQ), physical activity questionnaire, and fiber intake assessment.	There is an association between dietary patterns, physical activity, and fiber intake and the prevalence of obesity among elementary school children ( $p<0.05$ ). Risk factors for obesity included poor dietary patterns (47.5%, OR=6.1), light physical activity (48.8%, OR=8.6), and low fiber intake (51.2%, OR=7.4).
Widyantari et al. (2018)	An analytical observational study using a cross-sectional design involving 84 elementary school students selected through purposive sampling, using the Physical Activity Questionnaire for	There is an association between physical activity, dietary patterns, and family income and the prevalence of obesity among elementary school children ( $p<0.05$ ).
	Children (PAQ-C).	Children with low levels of physical activity, unhealthy dietary patterns, and high family income are at greater risk of obesity.
Angkat et al. (2024)	An analytical observational study with a cross-sectional design involving 43 elementary school students selected using purposive sampling, using questionnaires on knowledge, attitudes, and junk food consumption, as well as height and weight measurements.	There is a significant association between knowledge, attitudes, and junk food consumption and the prevalence of obesity among elementary school children. The most dominant factor influencing obesity is children's knowledge about food.
Rahmiwati et al. (2018)	A cross-sectional study involving 28 respondents selected using total sampling, using knowledge and attitude questionnaires.	Most respondents were not obese (85.7%), had low physical activity levels (64.3%), consumed staple foods <3 times a day (75%), frequently ate breakfast (57.1%) and bought snacks (67.9%), and rarely consumed snacks (64.3%) and fast food (78.6%). There was no association between physical activity, consumption of staple foods, breakfast, snack

Author (Year)	Method & Sample	Key Findings	Author (Year)	Method & Sample	Key Findings
		consumption, fast food consumption, and snacking habits with children's nutritional status ( $p>0.005$ ).			parental income, meal frequency, and fast food consumption were not significantly associated with obesity ( $p>0.05$ ).
Fadhilah et al. (2021)	An observational analytical study with a case-control design involving 158 students consisting of 79 obese students and 79 students with normal weight, using questionnaires on physical activity and obesity status.	There was a significant association between physical activity and the incidence of obesity among elementary school students ( $p=0.001$ ; $OR=0.318$ ). Low physical activity is associated with an increased risk of obesity in elementary school children.	Wansyaputri et al. (2020)	A study using purposive sampling involving 49 children, with body weight status measured using the CDC-2000 growth charts and data collected through questionnaires on dietary patterns and physical activity, as well as body weight and height measurements, and analyzed using the Spearman rank test.	Most children had good dietary habits (53.1%) and low levels of physical activity (55.1%). There was significant association between dietary patterns and the prevalence of obesity ( $p=0.013$ ) as well as between physical activity and the prevalence of obesity ( $p=0.020$ ). The better the dietary patterns and the higher the physical activity levels of the children, the better their body weight status.
Azzahra et al. (2023)	An analytical study with a quantitative design and a cross-sectional approach involving 195 students in grades 1–3 at SDN Sukasari 4, using questionnaires, microtoise, and weighing scales.	There is an association between dietary intake and the prevalence of obesity among elementary school children ( $p=0.019$ ). A total of 29 children (30.2%) with excessive dietary intake were obese.	Maesarah et al. (2019)	A descriptive study involving 238 fourth-, fifth-, and sixth-grade elementary school students selected through purposive sampling, with data collected using questionnaires, Food Recall forms, and BMI-for-age measurements based on WHO Anthro Kemenkes 2010.	53.8% of the children frequently consumed junk food ( $\geq 3$ times/week). The average intake of carbohydrates and fats among the children was $\geq 80\%$ of the Recommended Daily Allowance (RDA), while protein intake was $\leq 80\%$ of the RDA. High consumption of junk food,
Sandalayuk et al. (2024)	A cross-sectional study involving 208 elementary school students selected using proportional stratified random sampling, using questionnaires on physical activity, dietary habits, fast food consumption, and family-related factors.	A total of 28.8% of school children were obese. Genetic factors (11.5%) and low physical activity (25.5%) were significantly associated with the prevalence of obesity among school children ( $p=0.017$ ). Gender,			

Author (Year)	Method & Sample	Key Findings
		along with excessive intake of fats and carbohydrates, is a contributing factor to obesity among elementary school children.

### The Relationship Between Dietary Patterns and the Prevalence of Obesity Among Elementary School Children

Diet refers to an individual's behavior in selecting, consuming, and managing the types and amounts of food consumed daily. An unbalanced diet, such as excessive consumption of high calorie, high fat, and high sugar foods, can increase the risk of obesity among elementary school children (Hambali & Karjadidjaja, 2018). Dietary patterns in elementary school children are generally shaped by family habits, the school environment, and exposure to fast food, which is increasingly accessible.

Based on the results of the literature review, dietary patterns are one of the factors most strongly associated with the incidence of obesity among elementary school children. Unhealthy dietary patterns, such as high consumption of high calorie, high fat, and high sugar foods, as well as frequent intake of junk food and fast food, can increase the risk of obesity in children. This indicates that both the quality and quantity of food consumed play a crucial role in maintaining the body's energy balance. A study by Rahmadani et al. (2022) revealed an association between dietary patterns and the prevalence of obesity among elementary school children, with 72.5% of children with poor dietary patterns classified as obese. Similar findings were reported by Yensasnidar et al. (2018), who found that poor dietary patterns were significantly associated with obesity, with an odds ratio (OR) of 6.1.

In addition, a study by Azzahra et al. (2023) found an association between dietary intake and the prevalence of obesity among elementary school children, with 30.2% of children with excessive dietary intake classified as obese. Similarly, Maesarah et al. (2019) reported that frequent consumption of junk food (at least three times per week), along with high intake of carbohydrate and fats, contributes to the prevalence of obesity in children.

A study by Rachmawati et al. (2018) showed that excessive intake of protein and omega-6 fatty acids is a risk factor for obesity among elementary school children in Semarang. These findings indicate that not only the quantity of food but also its nutritional composition influences the incidence of obesity.

In addition, a study by Junaidi & Yovinanda (2018) in Banda Aceh showed that fast food consumption is associated with obesity among elementary school children. Fast food, which is high in calories, fat, and sugar, can increase daily energy intake, leading to an energy imbalance in the body.

Overall, unhealthy dietary patterns in terms of frequency, quality, and nutritional composition play a significant role in increasing the risk of obesity among elementary school children. Therefore, improving dietary habits is one of the key strategies for preventing childhood obesity.

### The Relationship Between Physical Activity and the Prevalence of Obesity Among Elementary School Children

Physical activity refers to any bodily movement produced by skeletal muscles that requires energy expenditure. Low levels of physical activity can lead to an energy imbalance as consumed energy is not utilized optimally and is subsequently stored as fat (Amenani & Januarto, 2022). Among elementary school children, the decline in physical activity is largely influenced by increased gadget use and sedentary behavior.

According to a study by Octaviani et al. (2018), there is an association between physical activity and nutritional status among elementary school children. This is because the level of physical activity affects the body's energy requirements. When energy intake exceeds energy expenditure and is not balanced by adequate physical activity, the risk of obesity increases and may hinder optimal growth and development.

Physical activity is a key factor associated with the prevalence of obesity among elementary school children. Children with low levels of physical activity have reduced energy expenditure and are therefore at greater risk of fat accumulation. This indicates that the balance between energy intake and energy expenditure is a critical determinant of children's nutritional status.

A study by Rahmadani et al. (2022) showed that 73.3% of children with low physical activity were obese. Similarly, Yensasnidar et al. (2018) found that low physical activity was significantly associated with the incidence of obesity, with an odds ratio (OR) of 8.6.

A study by Fadhilah et al. (2021) found a significant association between physical activity and the prevalence of obesity ( $p = 0.001$ ). These findings are supported by Wansyputri et al. (2020) and Sandalayuk et al. (2024), who reported similar results. Adequate physical activity can increase energy expenditure and help prevent the accumulation of body fat.

### Family and Socioeconomic Factors Affecting the Prevalence of Obesity

Family and socioeconomic factors are indirect determinants of children's nutritional status, including family income, parental education, and nutritional knowledge (Widyantari et al. 2018).

These factors play a role in shaping children's eating habits and lifestyle from an early age.

Research by Widyantari et al. (2018) indicates that family income is associated with the prevalence of obesity among elementary school children. Higher income increases access to high-calorie foods and fast food, which contributes to an increased risk of obesity.

A study by Angkat et al. (2024) showed that knowledge is the most significantly factor associated with obesity among elementary school children. In addition, Sandalayuk et al. (2024) stated that genetic factors are also significantly associated with the prevalence of obesity in children. These findings indicate that obesity is influenced not only by behavioral factors but also by biological factors and the family environment.

### Factors Not Associated with Obesity

Obesity is a multifactorial condition; therefore, not all variables show a consistent relationship. Differences in research findings may be attributed to respondent characteristics, research methods, and variation in community lifestyles (Hambali & Karjadidjaja, 2018).

A study by Rahmiwati et al. (2018) found no association between physical activity, consumption of staple foods, breakfast habits, snack consumption, fast food intake, and snacking habits with children's nutritional status ( $>0.05$ ). In addition, Sandalayuk et al. (2024) also reported that certain variables, such as meal frequency and fast-food consumption, were not significantly associated with the prevalence of obesity. These differing results suggest the presence of potential confounding factors, such as genetic, metabolic, and environmental factors, that were not fully controlled in the studies.

### CONCLUSION

Based on the results of the literature review, the prevalence of obesity among elementary school children is influenced by various factors. The factors most consistently associated with obesity are unhealthy eating habits, including the consumption of foods high in calories, fat, and sugar, as well as fast food and junk food, and low levels of physical activity, which can lead to an energy imbalance in the body. Additionally, family and socioeconomic factors, such as parental income, educational level, knowledge, and genetic factors, also play a significant role in shaping children's dietary patterns and lifestyle behaviors.

These findings indicate that efforts to prevent obesity among elementary school children require a comprehensive approach involving families, schools, and healthcare professionals. Strategies such as promoting healthy eating habits, increasing physical activity, and strengthening nutrition education programs are recommended to reduce the prevalence of childhood obesity and support children's long-term health outcomes.

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