Original Article

Parental Support and School Environment as Determinants of Obesity Risk among School-Aged Children: A Cross-Sectional Study

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ABSTRACT

Background: Childhood obesity is an increasing public health concern among school-aged children, particularly in low- and middle-income countries (LMICs). While parental support and the school environment are recognized as important determinants, evidence comparing their relative influence within a socio-ecological framework remains limited. This study aimed to examine the association between parental support, the school environment, and obesity risk among school-aged children in Indonesia.
Methods: A cross-sectional study was conducted on 120 children aged 7–12 years using a purposive sampling method. Data were collected using a validated parental support questionnaire, school environment assessment instrument, and anthropometric measurements to determine the body mass index (BMI) for age. Associations were analyzed using the chi-square tests and multivariable logistic regression. This study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.
Results: Both parental support and school environment were significantly associated with obesity risk. Children with low parental support had higher odds of obesity (OR = 2.50; 95% CI: 1.20–5.10), whereas those exposed to less healthy school environments had even higher odds of obesity (OR = 2.80; 95% CI: 1.35–5.80). Among the examined factors, the school environment demonstrated the strongest independent association with the risk of obesity.
Conclusion: Parental support and the school environment are important determinants of obesity risk among school-aged children; however, school-level factors appear to play a more dominant role in this regard. These findings highlight schools as a critical entry point for childhood obesity prevention within a socio-ecological framework, particularly in LMIC.

Keywords: Body mass Index; Childhood Obesity; Parental Support; Public Health Nursing; School Environment.

Implications for Practice:

- Strengthening family-based health promotion strategies that encourage active parental involvement in children's dietary habits and physical activity may contribute to reducing obesity risk among school-aged children.
- Health policy and school health programs should prioritize the development of supportive school environments through healthy food policies, opportunities for regular physical activity, and integrated school-based obesity prevention initiatives.
- In resource-constrained settings commonly found in low- and middle-income countries, school-centered interventions represent a

Implications for Practice:

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practical and scalable approach for early childhood obesity prevention by leveraging existing educational infrastructures and community partnerships.

Introduction

According to the World Health Organization (WHO), childhood obesity is defined as excess body fat, evaluated through age-appropriate anthropometric measures; specifically, body mass index for age (BMI-for-age) in children aged 5–19 years and weight-for-height in children under 5 years, surpassing two standard deviations above the median of the WHO growth standards (WHO, 2025b). Childhood obesity is an increasing public health issue and has become a global health crisis (Daley & Balasundaram, 2025; Di Cesare et al., 2019). The prevalence of childhood obesity has increased nearly tenfold over the past 40 years (Caprio et al., 2020). Children with obesity are at a higher risk of developing various physical health disorders, such as hypertension, dyslipidemia, insulin resistance, type 2 diabetes mellitus, cardiovascular disease, and musculoskeletal problems (Caprio et al., 2020; Chung et al., 2023). Additionally, childhood obesity often persists into adulthood, increasing the risk of non-communicable diseases and premature death later in life (Jebeile et al., 2022).

This epidemiological shift has led to a rapid increase in childhood obesity in low- and middle-income countries, including Indonesia, where environmental and nutritional transitions have reshaped children's daily behaviors (Popkin et al., 2020). In 2022, over 390 million children and teens between the ages of 5 and 19 years were considered overweight. The prevalence of overweight, including obesity, has increased sharply from 8% in 1990 to 20% in 2022, with a relatively similar pattern of increase in both sexes; 19% in girls and 21% in boys (WHO, 2025b). Low- and middle-income countries (LMICs) are experiencing rapid epidemiological and nutritional transitions characterized by a shift in consumption patterns toward high-energy, fat, and sugar foods as well as a decline in physical activity due to urbanization and modernization. This condition causes obesity to no longer be limited to developed countries, but is increasingly found in children and adolescents in developing countries (Obita & Alkhatib, 2022). Data from Riset Kesehatan Dasar (Riskesdas) in 2013 and 2018 indicated a rising prevalence of obesity among children and adolescents in Indonesia across all age groups. Among children aged 5–12 years, the prevalence of obesity increased from 8.0% to 9.2%; among adolescents aged 13–15 years, from 2.5% to 4.8%; and among individuals aged 16–18 years, from 1.6% to 4.0% (Kemenkes RI, 2018).

Childhood obesity is influenced by multidimensional factors within a socio-ecological framework, including the interaction of genetic, behavioral, psychological, and environmental factors at the individual, family, and school levels (Trindade et al., 2025). Low physical activity, an unstable family structure, and an unsupportive school environment play significant roles in increasing the risk of childhood obesity (Noh & Min, 2020). Parents' conduct and lifestyle directly influence their children's health habits and obesity risks (Maia et al., 2025). Parents provide a familial atmosphere that influences a child's nutritional status. At the same time, accessibility of food at home and parental behavior continuously shape the formation of healthy or less healthy eating habits (Smith et al., 2025). This finding highlights the need for parental involvement in efforts to reduce childhood obesity (Hübner & Bartelmeß, 2024; Maia et al., 2025).

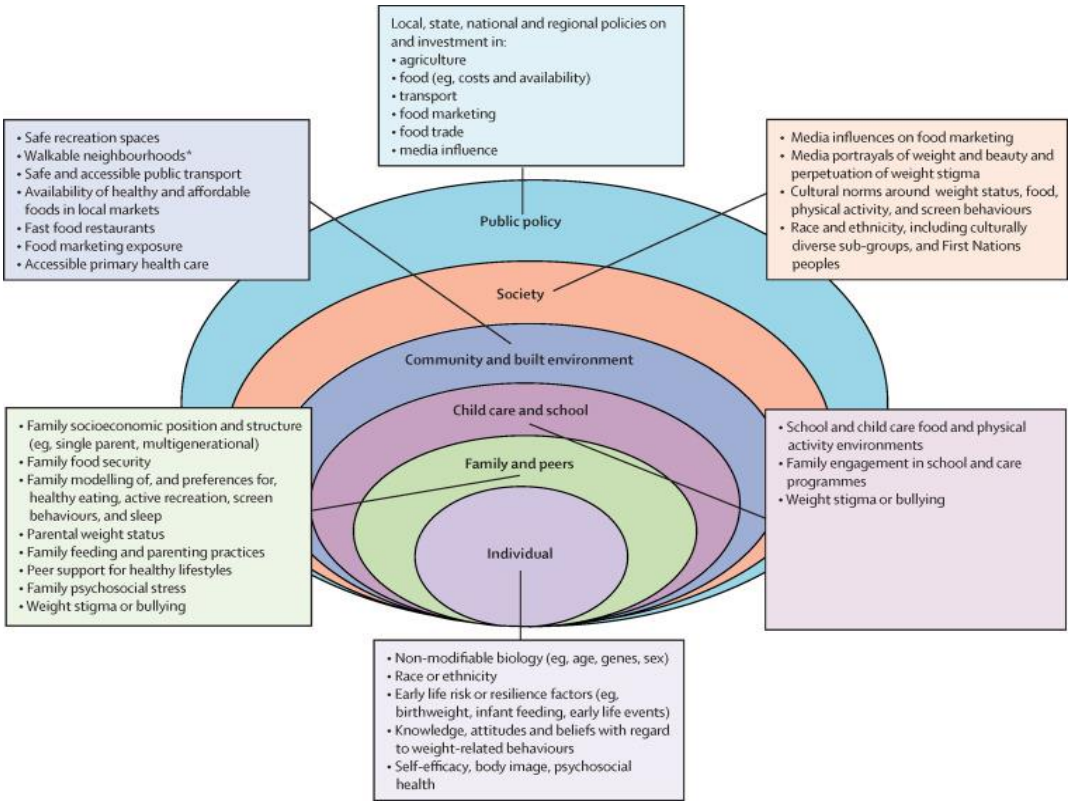

Figure 1. Socioecological Model of Childhood Obesity (Jebeile et al., 2022).

Childhood obesity is influenced by various interconnected factors, particularly sedentary behavior, high sugar consumption, and school environments that allow the sale of less healthy foods, which collectively increase the risk of obesity (Andrade de Medeiros Moreira et al., 2020). Childhood obesity prevention in schools will be more effective when integrated with family engagement, environmental modifications, school regulations, and encouragement of healthy behaviors, including diet, physical exercise, and reduction of sedentary behavior (Lambrinou et al., 2020). Additionally, the risk of obesity in school-aged children is not determined by a single environment, but rather by the interaction between family and school environments. Strong family support, such as positive parenting and healthy lifestyle habits at home, may not be sufficient to protect children from obesity if the school environment is less supportive, particularly regarding the availability of sports facilities and opportunities for physical activity (Noh & Min, 2020).

This study is grounded in the Social Ecological Model (SEM) proposed by Bronfenbrenner, which conceptualizes childhood obesity as a multifactorial condition shaped by interactions across multiple levels of influence, including interpersonal and organizational contexts (Jebeile et al., 2022; Oudat et al., 2025). Within this framework, parental support represents the interpersonal level, reflecting the influence of family relationships on children's dietary behaviors and physical activity (Hu et al., 2021; Jebeile et al., 2022). Meanwhile, the school environment corresponds to the organizational level, encompassing institutional factors such as food availability, physical activity facilities, and school health policies that shape children's daily health behaviors (Liu et al., 2022).

Understanding the interaction between parental support and school environment is

highly relevant to community nursing practice, as this evidence is crucial for informing integrated nurse-led obesity prevention strategies for school-aged children. Although numerous studies have examined the determinants of childhood obesity, the existing evidence often focuses solely on parental or school environmental factors separately, thus limiting a comprehensive understanding of their interactions. Empirical studies that simultaneously examine parental support and the school environment within a socioecological framework are still rare, especially in low- and middle-income countries such as Indonesia. This gap highlights the need for an integrated analysis of the influence of family and school on the risk of childhood obesity. In response to this gap, this study aims to examine the relationship between parental support and a healthy school environment with the risk of obesity in school-aged children using a multivariate approach to provide information for targeted and integrated family and school-based obesity prevention strategies. By providing evidence from an Indonesian school setting, this study contributes to the limited LMIC literature. It offers insights that are relevant to international efforts to prioritize effective obesity prevention strategies within socio-ecological frameworks.

Methods

Study Design

This study employed a cross-sectional design to examine the association between parental support, the school environment, and obesity risk among school-aged children. This design was selected to assess the relationships between variables at a single point in time without inferring causality. The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies (Ghaferi et al., 2021).

The dependent variable in this study was obesity risk, assessed using Body Mass Index (BMI) for age and sex, according to the World Health Organization standards (WHO, 2025a). The independent variables included parental support and the school environment. Parental support was measured using a validated questionnaire that assessed dietary supervision, encouragement of physical activity, and the provision of healthy food at home. The school environment was assessed using a questionnaire covering the availability of healthy food options, physical activity facilities, school policies supporting healthy behaviors, and health education programs.

Participants

The study population consisted of elementary school children aged 7–12 years who were enrolled in grades 1–6 in Indralaya City, South Sumatra Province, Indonesia. The purposive sampling technique was used in this study. The inclusion criteria were as follows: (1) children aged 7–12 years, (2) actively attending full-time elementary school, and (3) having written informed consent from parents or guardians. The exclusion criteria were as follows: (1) children with chronic diseases or physical conditions affecting growth, and (2) incomplete anthropometric or questionnaire data. Of the approximately 1,200 school-aged children invited to participate, 120 met the inclusion criteria, provided written informed consent, and were included in this study. Non-participation was primarily due to scheduling constraints, such as involvement in religious study activities or the assistance of parents. None of the participants withdrew after enrollment or were excluded due to incomplete data. Accordingly, the response rate among

eligible participants was 100%, resulting in a final sample size of 120 children.

A formal a priori power analysis was not conducted because of the exploratory nature of the study and the use of purposive sampling. The sample size was determined based on the feasibility and the availability of eligible participants during the data collection period. Nevertheless, the obtained sample size was adequate for detecting statistically significant associations in the bivariate and multivariate analyses.

Instruments

Instruments: The instruments used in this study consisted of questionnaires and assessment tools to measure parental support and a healthy school environment. All instruments were adapted from previously validated studies, and permission to adapt the instruments was obtained from the original authors before data collection. The dependent variable, the risk of obesity, was measured using Body Mass Index-for-age (BMI-for-age) according to the World Health Organization (WHO) growth standards. The independent variables, parental support and a healthy school environment, were measured using the Parental Support Questionnaire and Primary School Environment Assessment (PSAE) observation instrument.

A parental support questionnaire was administered using a questionnaire adapted from a previous study Rizona et al., (2024). The original instrument was developed in Indonesian and therefore does not require a translation process. The questionnaire consists of 11 items that assess parental support for healthy lifestyle behaviors in school-aged children: (1) providing information related to obesity and healthy lifestyles, (2) regulating and monitoring children's eating behaviors, (3) encouraging physical activity, and (4) monitoring children's weight and growth. Responses were measured using a four-point Likert scale, ranging from never (1) to always (4), resulting in a total score ranging from 0 to 33, with higher scores indicating a higher level of parental support. Based on a predetermined cutoff value of 75% of the maximum score (0.75 × 33 = 24.75, rounded to 25), parental support was categorized as high/good support (>25) and low/poor support (<25). These categories were applied consistently in the Results section. This questionnaire was assisted by parents, meaning that parents or guardians helped the children fill out the questionnaire to ensure accurate reporting. Although the parental support questionnaire demonstrated acceptable internal consistency in the original study (Cronbach's alpha = 0.799), validity testing was not performed in the present study. This limitation should be considered when interpreting findings related to parental support.

The assessment of a healthy school environment was evaluated using an observation instrument adapted from the Primary School Environment Assessment (PSEA) developed by Khoe et al. (2022). Permission to adapt the instrument was obtained from the developer. The original instrument is available in Indonesian and therefore does not require translation. The observation tool consisted of 12 items covering four main components: (1) the food environment within the school, (2) access to food outside the school, (3) school food and nutrition policies, and (4) policies and facilities that support physical activity. Each item was scored dichotomously (yes = 1, no = 0), resulting in a total score ranging from 0 to 12. Based on the 75th percentile of the maximum score, schools with a total score of >9 were classified as having a healthy school environment. In contrast, schools with a score of <9 were classified as having a less healthy school environment, consistent with the categorization

presented in the Results section. The school environment assessment was conducted through direct observation by the researchers, all of whom had a background in nursing or public health and had received prior training on the use of the observation instrument to ensure consistency and accuracy.

Anthropometric Measurements Anthropometric measurements of the children were performed according to the standard procedures of the World Health Organization (WHO). Body weight was measured using calibrated digital scales, and height was measured using a microtoise. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2) (WHO, 2025a). The risk of obesity was determined using BMI-for-age and sex classifications based on WHO growth reference standards for children aged 5–19 years. Children were classified as obese if their BMI-for-age exceeded two standard deviations above the WHO reference median.

Data Collection

Data were collected directly from the school by the research team following the approved research ethics protocol. Before data collection, all researchers received standardized training on research procedures, questionnaire administration, anthropometric measurements, and the use of school environment observation instruments to ensure data consistency. Data collection followed a structured sequence, beginning with observations of the school environment, followed by the administration of parental support questionnaires, and concluding with anthropometric measurements of the children. Data collection was supervised by the principal investigator, and the completed questionnaires were reviewed on-site to check for completeness and accuracy. Missing or unclear responses were clarified immediately during data collection. All collected data were subsequently entered into the database for the final analysis.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Univariate analysis was performed to describe the characteristics of the study participants, including sex, age group, and nutritional status based on BMI-for-age. The results of the univariate analysis were presented as frequencies and percentages to provide an overview of the distribution of each variable. A bivariate analysis was conducted to examine the relationship between parental support, a healthy school environment, and the risk of obesity in school-aged children. The chi-square test was used because all variables were categorical. This analysis aimed to determine whether parental support and school environment were significantly associated with the risk of obesity. Variables that showed a significant association in the bivariate analysis and were theoretically relevant were then included in the multivariate logistic regression analysis.

Logistic regression was chosen as the appropriate method of analysis because the outcome variable, risk of obesity, was dichotomous. The results of the multivariate analysis were reported as odds ratios (OR) with 95% confidence intervals (CI), allowing for the estimation of the magnitude and direction of the association between parental support, a healthy school environment, and the risk of obesity, while accounting for their combined effects. Before performing multivariate analysis, the key assumptions of logistic regression were assessed, including the independence of observations and the absence of multicollinearity between independent variables. All analyses were conducted using a complete case approach, as no

missing data were identified during data collection. Statistical significance was set at $p < 0.05$.

Ethical Considerations

This study was approved by the Ethics Committee of Sekolah Tinggi Ilmu Kesehatan Sumber Waras (No. 021/AGDOSI/10/2025). All participants were provided clear oral and written explanations of the study objectives, procedures, potential risks, and benefits. Participation was voluntary, and written informed consent was obtained from parents or guardians before data collection. To ensure confidentiality, all data were anonymized using coded identifiers, and only the principal investigator had access to the code list. The data were stored securely and used for research. Participants were informed of their right to withdraw from the study at any time without any consequences. All the procedures performed in this study were conducted in accordance with the ethical principles of the Declaration of Helsinki.

Results

Table 1. Characteristic of School-Aged Children and Their Association with Obesity Risk (n= 120)

Variable	Category	Total n (%)	Not Obese n (%)	Obese n (%)	p-value
Gender	Male	62 (51.7)	-	-	-
	Female	58 (48.3)	-	-	
Age (years)	7-9	55 (45.8)	-	-	-
	10-12	65 (54.2)	-	-	
Nutritional Status (BMI/Age)	Normal	73 (60.0)	-	-	-
	Overweight	18 (15.0)	-	-	
	Obesity	30 (25.0)	-	-	
Parental Support	High	72 (60.0)	60 (83.3)	12 (16.7)	0.003
	Low	48 (40.0)	30 (62.5)	18 (37.5)	
School Environment	Healthy	78 (65.0)	65 (83.3)	13 (16.7)	0.001
	Less healthy	42 (35.0)	25 (59.5)	17 (40.5)	

Note: Bivariate associations were examined using the chi-square test; p < 0.05 was considered statistically significant.

In total, 120 school-aged children were included in this study. Table 1 presents the characteristics of the respondents and bivariate associations between parental support, school environment, and obesity risk. The sex distribution was relatively balanced, with 62 boys (51.7%) and 58 girls (48.3%). More than half of the participants were aged 10–12 years (54.2%), and 45.8% were aged 7–9 years. Based on the BMI-for-age classification, 30 children (25.0%) were classified as obese, 18 (15.0%) were overweight, and the majority had normal nutritional status (60.0%). Regarding exposure variables, 72 children (60.0%) received high parental support, whereas 48 (40.0%) received low parental support. In terms of school environment, 78 children (65.0%) attended schools classified as having a healthy environment, while 42 children (35.0%) attended schools with a less healthy environment.

Bivariate analysis showed that both parental support and school environment were significantly associated with obesity risk. Children with low parental support had a higher proportion of obesity than those with high parental support (37.5% vs.

16.7%; p = 0.003). Similarly, children attending less healthy school environments had a higher prevalence of obesity than those attending healthy school environments (40.5% vs. 16.7%; p = 0.001) **(Table 1).**

Table 2. Analysis of Factors Associated with Obesity Risk

Variable	OR	95% CI	p-value
Low Parental Support	2.50	1.20–5.10	0.012
Less Healthy School Environment	2.80	1.35–5.80	0.006

Note: OR = Odds Ratio; CI = Confidence Interval.

Table 2 presents the results of the multivariable logistic regression analysis. Children with low parental support had significantly higher odds of obesity than those with high parental support (OR = 2.50; 95% CI: 1.20–5.10; p = 0.012). Similarly, children attending schools with less healthy environments had higher odds of obesity than those attending schools with healthy environments (OR = 2.80; 95% CI: 1.35–5.80; p = 0.006). School environment demonstrated the highest odds ratio among the variables included in the multivariable model, indicating a stronger independent association with obesity risk.

Discussion

This study highlights childhood obesity as a persistent and evolving public health issue in Indonesia's school environment. The prevalence of obesity observed in this study (25%) is substantially higher than the latest national estimates reported in the 2023 Indonesian Health Survey (SKI), which indicates that approximately 11–12% of children aged 5–12 years are classified as obese (Kemenkes RI, 2023). Although national data indicate an increasing trend of childhood obesity, the significantly higher prevalence identified in this study suggests the presence of local obesogenic conditions that may exacerbate the risk of obesity beyond the national average. In the context of low- and middle-income countries (LMICs) such as Indonesia, rapid nutritional transitions, uneven urban development, and environmental disparities contribute to significant regional variations in childhood obesity. This finding underscores the importance of researching modifiable contextual factors, particularly family and school environments, where children spend most of their daily time.

Parental support represents a key interpersonal-level determinant of childhood obesity in the socio-ecological model. Supportive parenting practices, including supervision of dietary intake, encouragement of physical activity, and role modeling of healthy behaviors, play an important role in shaping children's health-related habits. Previous studies have demonstrated that parenting patterns and quality of the home environment are closely associated with children's nutritional status, physical activity levels, and body mass index (Harrison et al., 2025; Kocaadam-Bozkurt et al., 2023). In the Indonesian context, parental influence is particularly salient during early childhood, as parents largely determine food availability and daily routines at home. However, less supportive parenting styles may contribute to the development of less healthy eating behaviors and sedentary lifestyles, thereby increasing the risk of obesity among school-aged children (Rahayuwati et al., 2025). As children enter school, the protective influence of parental support may become attenuated because of

increased autonomy and greater exposure to external environments beyond the household.

Findings from the multivariable logistic regression indicated that school environment showed the strongest independent association with obesity risk among the factors examined, as reflected by the highest odds ratio in the adjusted model. This finding underscores the school's role as a critical organizational setting within the social-ecological model, where food availability, physical activity opportunities, and institutional norms collectively influence children's daily behaviors. Evidence from Indonesian studies has shown that many primary schools exhibit obesogenic characteristics, including easy access to less healthy foods and beverages and limited availability of healthier alternatives (Khoe et al., 2022; Rangkuti et al., 2024). Consistent with these findings, recent global evidence from a systematic review and network meta-analysis indicated that school-based interventions addressing key obesogenic components such as less healthy food availability and limited physical activity opportunities are effective in improving BMI outcomes among children (Hassan et al., 2024).

School environment emerged as the strongest independent determinant of obesity risk in this study, highlighting its central role at the organizational level of the Social Ecological Model. Beyond individual and family influences, schools represent a structured setting in which children's daily food choices, physical activity opportunities, and health-related norms are continuously shaped. In the Indonesian context, several studies have documented that primary schools often function as obesogenic environments, characterized by the widespread availability of energy-dense snacks, sugar-sweetened beverages, and limited access to healthier food options (Khoe et al., 2022; Rangkuti et al., 2024). These environmental conditions may normalize less healthy dietary behaviors and sedentary routines during school hours. Consistent with this interpretation, evidence from a meta-analysis indicated that obesogenic school environments are associated with a higher body mass index and increased obesity prevalence among children (de Assis et al., 2022). Collectively, these findings suggest that the school setting is not merely a background context, but a powerful behavioral environment that can substantially influence children's obesity risk.

Additionally, the Social Ecological Model plays a significant role in understanding childhood obesity by highlighting the interaction between influences at interpersonal and organizational levels (Jebeile et al., 2022). In this study, the model helps explain why organizational-level factors, particularly school environment, exert a stronger influence on obesity risk than parental support in certain contexts. In low- and middle-income country settings, where children experience prolonged and repeated exposure to school environments, organizational contexts such as schools may outweigh family-level influences in shaping health behaviors. This reinforces the importance of prioritizing higher-level environmental determinants when applying the social-ecological model to childhood obesity prevention in resource-limited settings.

Evidence from intervention studies further supports the central role of school environment in obesity prevention among school-aged children. A Cochrane meta-analysis demonstrated that school-based multicomponent interventions are the most effective approaches for reducing obesity risk, as they simultaneously address dietary behaviors, physical activity, and health

education within children's daily routines (Brown et al., 2019). In low- and middle-income country (LMIC) settings, such as Indonesia, schools represent a particularly strategic platform for intervention because they provide a relatively controlled environment in which health-promoting policies and practices can be implemented consistently, even when family-level resources and parental capacities vary (Popkin et al., 2020). Although parental involvement remains an important reinforcing factor, its effectiveness often depends on alignment with school-based initiatives. Parental supervision of children's eating and physical activity may strengthen healthy behaviors introduced at school, but can be insufficient when school food environments remain obesogenic and weakly regulated, a common challenge in many LMICs (de Assis et al., 2022; Liu et al., 2022). Therefore, preventive strategies that prioritize school-level environmental modifications, complemented by culturally appropriate parental engagement, are likely to be more effective in reducing obesity risk among school-aged children in LMIC contexts, in which the environmental drivers of obesity increasingly outweigh individual- and family-level influences (Olufadewa et al., 2023; Singhal et al., 2021).

These findings are consistent with the World Health Organization's recommendation to adopt a whole-of-school approach to childhood obesity prevention, which emphasizes improvements in the school food environment, increased opportunities for physical activity, and strengthened school health policies (WHO, 2022). In settings where the school environment emerges as a dominant determinant of obesity risk, such as this study, these recommendations provide a relevant policy framework for translating evidence into practice. The alignment between the present findings and the WHO guidance further underscores the importance of school-based preventive interventions in addressing childhood obesity. Taken together, these findings underscore the importance of school and community nursing practices in translating school-based obesity prevention strategies into sustainable actions at the family and community levels.

Implications and limitations

The findings of this study highlight the importance of an integrated conceptual approach to childhood obesity prevention that considers the interaction between the school and family environments. By demonstrating that the school environment is a dominant determinant of obesity risk among school-aged children, this study reinforces the need to prioritize organizational-level contexts within the social-ecological model, particularly in low- and middle-income countries. From a public health nursing perspective, these findings underscore the strategic role of nurses as key agents linking school-based health initiatives with family support, thereby facilitating more coherent and sustainable obesity prevention efforts across settings. This study has several limitations. First, the cross-sectional design limits the ability to infer causal relationships between parental support, school environment, and obesity risk. Second, although a previously developed parental support questionnaire was used, validity testing was not performed, which may have introduced measurement bias and should be considered when interpreting the results. Third, the relatively small sample size and use of purposive sampling may limit the generalizability of the findings. Additionally, other relevant factors such as dietary intake, objectively measured physical activity, and genetic influences were not assessed and should be considered in future research.

Relevance to Practice

The findings of this study have clear relevance to school and community health nursing practice. As the school environment has emerged as the dominant determinant of obesity risk among school-aged children, nurses are well-positioned to lead school-based obesity prevention efforts. In practice, school and public health nurses can conduct structured assessments of the school environment, including food availability, access to safe drinking water, physical activity opportunities, and policies regulating less healthy foods, to identify key obesogenic factors. In addition, nurses play an important role in strengthening parental support through targeted health education and family engagement, helping to align healthy practices between the home and school. The findings also highlight nurses' roles as health advocates, working with school administrators and policymakers to support nutrition standards, physical activity programs, and health education within a whole-of-school approach, particularly in low- and middle-income country settings.

Conclusion

This study shows that both parental support and school environment are associated with obesity risk among school-aged children, with school-level factors playing a more influential role. The findings highlight schools as a key entry point for childhood obesity prevention within a socio-ecological framework, particularly in low-income and middle-income countries. Future research should use longitudinal designs and objective measures to clarify causal pathways and inform context-specific prevention strategies.

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CrediT Authorship Contributions Statement

Nurharlinah: Conceptualization, Validation & Writing - Original Draft

Ari Athiutama: Validation & Writing - Review & Editing

Karyatin: Writing - Original Draft, Review & Editing

Rini Herdiani: Writing - Original Draft, Review & Editing

Conflicts of Interest

There is no conflict of interest.

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Supplementary Materials

Supplementary File S1: Research Instrument contains the full questionnaire used for data collection.

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