Prevalence of Obesity and Over-Weight in School Going Children

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LINK MEDICAL INTERFACE

Sami Ullah[1], Maria Nayyar[2], Syed Kamal Khan[3], Abdul Basit[4], Saba Mazhar[3], Rashid Saeed Abdo Hassen[2], Amal Inayat[5], Esha Nawaz[2], Kainat[3], Tehniyat Rida[3], Mahpara Safdar[1], Muhammad Umair[6]

Correspondence
Saba Mazhar
sabamazhar18@gmail.com
Muhammad Umair
umairkhan.ibms@kmu.edu.pk

Affiliations
1 Department of Nutritional Sciences and Environmental Designs, Allama Iqbal Open University, Islamabad, Pakistan
2 Centre of Biotechnology and Microbiology (COBAM), University of Peshawar, KP, Pakistan
3 Department of Health and Biological Sciences, Abasyn University, Peshawar, KP, Pakistan
4 Department of Allied Health Sciences, Northwest School of Medicine, Peshawar, KP, Pakistan
5 Department of Microbiology, Shaheed Benazir Bhutto Women University, Peshawar, KP, Pakistan
6 Department of Basic Medical Sciences, Khyber Medical University, Peshawar, KP, Pakistan

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ABSTRACT

Background: Childhood obesity is a critical public health issue linked to increased risk of chronic diseases, impacting physical and psychological health. Its prevalence is rising globally, particularly in urbanized and socioeconomically diverse regions.

Objective: To assess the prevalence of obesity and overweight and explore associated demographic, socioeconomic, and physical activity factors among school-going children in Peshawar, Pakistan.

Methods: A longitudinal study was conducted involving 450 children (250 males, 200 females) aged 6-15 years from five schools using a stratified sampling technique. Data were collected through structured questionnaires and physical measurements, including Body Mass Index (BMI) and Waist-to-Hip Ratio (WHR). Statistical analysis was performed using SPSS 25 to determine associations between obesity, gender, age, socioeconomic status, and physical activity levels. Ethical approval and informed consent were obtained following the Declaration of Helsinki guidelines.

Results: The prevalence of obesity was 19.1%, overweight 49.1%, and healthy weight 31.8%. Obesity was higher in boys (19%) than in girls (15%). Urban children (65%) had a higher prevalence compared to rural children (40%). Socioeconomic status significantly influenced obesity rates ($p < 0.05$).

Conclusion: The study identified high obesity rates among school children, influenced by age, gender, urban residence, and socioeconomic status, necessitating targeted interventions

INTRODUCTION

Childhood obesity is a major global health issue that has progressively emerged as one of the most significant public health challenges, contributing to a high prevalence of comorbidities and increased mortality risk (1). This condition, characterized by excessive fat accumulation that may impair health, has been linked to numerous physiological and psychological consequences that extend into adulthood, making it imperative to address early in life (2). Over the past few decades, the prevalence of childhood obesity has escalated dramatically, with approximately 30% of the global youth population currently being classified as overweight or obese, a staggering increase compared to previous generations (3). Data from the World Health Organization (WHO) show that the percentage of overweight children aged 5–19 years has increased more than threefold from 4% in 1975 to over 18% in 2016, demonstrating the urgent need for effective preventive and therapeutic interventions (4). The distribution of obesity varies significantly across regions, socioeconomic statuses, and ethnic groups, highlighting the complexity of factors that contribute to its onset and persistence (5).

A number of social and environmental determinants have been identified as key contributors to childhood obesity. These include high-calorie, low-nutrient food consumption, sedentary behavior, reduced physical activity, and the increasing availability of energy-dense foods (6). Socioeconomic status, in particular, plays a crucial role in shaping dietary behaviors and access to physical activity, with children from higher socioeconomic backgrounds often exhibiting higher obesity rates due to greater access to processed foods and reduced opportunities for physical exercise (7). Conversely, children from lower socioeconomic backgrounds may also experience high obesity rates due to the prevalence of cheaper, less nutritious food options and limited opportunities for healthy lifestyle choices (8). In Pakistan, childhood obesity is a growing concern, with prevalence rates ranging from 15% to 20% among urban populations, particularly in cities like Karachi (9). This trend is reflective of global patterns where urbanization and modernization have resulted in lifestyle changes that promote weight gain among children (10). The adverse health consequences associated with childhood obesity are multifaceted, impacting both physical and mental health. Physically, obese children are at an increased risk of developing conditions such as hypertension, type 2 diabetes, sleep apnea, and musculoskeletal disorders (11). Psychosocially, they often face stigma, low self-esteem, and depression, which can further complicate their condition and quality of life (12). Importantly, obesity established in childhood tends to persist into adulthood, further escalating the risk of chronic noncommunicable diseases (13). Measuring obesity in

children involves various tools, such as body mass index (BMI), waist-to-hip ratio (WHR), and skinfold thickness, each offering different insights into body composition and related health risks (14). While BMI is widely used for its simplicity and standardization, it does not differentiate between muscle and fat, which can be a limitation when evaluating the health status of growing children (15). The waist-to-hip ratio, on the other hand, is a better indicator of central obesity but is susceptible to measurement errors, while skinfold thickness is often impractical in large-scale studies due to variability in results (16).

The literature suggests that childhood obesity rates are higher in economically developed countries; however, low- and middle-income countries are witnessing a faster rate of increase, presenting a double burden of malnutrition (17). The recent upsurge in obesity among school-going children in Pakistan underscores the need to focus on local determinants, such as cultural dietary practices, lack of structured physical education programs, and socioeconomic disparities (18). Furthermore, the impact of urbanization has been particularly pronounced, with urban children showing higher obesity prevalence compared to their rural counterparts due to differences in lifestyle and environment (19). The interplay between socioeconomic factors and obesity is complex, with evidence indicating that both ends of the economic spectrum are vulnerable—children from affluent families often engage in sedentary activities and consume high-energy foods, while those from poorer backgrounds may rely on energy-dense, nutrientpoor diets (20).

Given these challenges, there is a need for targeted interventions that address both the environmental and behavioral aspects of childhood obesity. This study aims to explore the prevalence and associated risk factors of obesity and overweight among school-going children in Peshawar, Pakistan. By focusing on the relationship between socioeconomic status, physical activity, and dietary habits, the study seeks to provide evidence for effective public health strategies tailored to this demographic (21). Addressing childhood obesity requires a multifaceted approach that includes promoting healthy eating, increasing physical activity, and creating supportive environments at school and home to foster long-term behavioral changes (22). The findings from this study will contribute to the existing body of literature by highlighting the specific drivers of childhood obesity in a Pakistani context, thereby informing public health policies and interventions aimed at curbing this growing epidemic (23).

MATERIAL AND METHODS

The study was conducted using a longitudinal design, which allowed the researchers to monitor changes in the prevalence of obesity and overweight among school-going children over an extended period, enabling the identification of trends and their association with variables such as gender, area of residence, age, and socioeconomic status. A stratified sampling method was employed to ensure balanced representation from urban and rural areas, given the potential variation in obesity prevalence across different settings. A total of 450 children were selected as the sample size for this research, distributed evenly among five different schools, namely Allied Schools, Beacon House School, Sarhad Institute, Racines, and The Smart School, each contributing 90 children to the total sample. The participants were categorized based on gender, area of residence, obesity and overweight status, and their levels of physical activity.

Data collection was carried out through a structured questionnaire developed specifically for the study after a thorough review of the literature to ensure it encompassed all relevant variables. The questionnaire included demographic information such as age, gender, area (urban or rural), and detailed questions related to physical activity, dietary habits, and socioeconomic status. Prior to data collection, participants and their parents were briefed on the research objectives, their rights as participants, and the measures in place to ensure confidentiality and anonymity. Written informed consent was obtained from the parents or guardians of the children before their inclusion in the study, in compliance with the ethical principles outlined in the Declaration of Helsinki (World Medical Association, 2013). Children aged 6 to 15 years were included, while those outside this age range, as well as individuals with hypertension, diabetes, or other chronic conditions, were excluded to maintain a homogenous sample. The data was collected over a six-month period, during which trained research assistants visited each school to administer the questionnaires. The research team ensured that all participants were given ample time to complete the questionnaires, and assistance was provided where needed to clarify any queries. To maintain consistency and reduce potential biases, the questionnaires were collected on the same day they were distributed. After collection, the data was entered into Microsoft Excel, and descriptive statistics, including frequencies and percentages, were calculated to describe the sample characteristics. The association between different variables such as gender, age, area, and socioeconomic status was explored using the chi-square test, while differences in obesity and overweight prevalence were analyzed using independent t-tests, as appropriate. All statistical analyses were performed using SPSS version 25, and a p-value of less than 0.05 was considered statistically significant.

The physical assessment of participants included the measurement of height and weight using standardized procedures to ensure accuracy. Body mass index (BMI) was calculated by dividing the weight (in kilograms) by the square of the height (in meters) and was used as the primary indicator to classify children into underweight, normal weight, overweight, and obese categories based on the age- and gender-specific BMI percentiles defined by the World Health Organization (WHO). Additionally, waist circumference and waist-to-hip ratio were measured to assess central obesity, providing a more comprehensive understanding of body fat distribution and its associated risks.

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of the respective

universities involved in the research, and the research was conducted following the guidelines for human research ethics. The IRB approval number was [Insert Number if Available]. All participants were assured that their participation was voluntary and that they could withdraw at any point without any consequences. The anonymity and confidentiality of the participants were maintained throughout the study, and data was stored securely with access restricted to the principal investigator and research team.

The results of this study were interpreted based on the associations between variables such as gender, area, age, socioeconomic status, and physical activity levels. The findings were then compared with previous research to draw meaningful conclusions and provide recommendations for interventions aimed at reducing the prevalence of obesity and overweight among school-going children. The methodology employed in this study ensured a comprehensive approach to understanding the multifactorial nature of obesity and overweight in this population, thereby contributing valuable insights to the existing literature on childhood obesity in low- and middle income countries.

RESULTS

Overall, the study showed that 19.1% (n = 86) of the children were categorized as obese, 49.1% (n = 221) as overweight, and 31.8% (n = 143) were considered healthy based on their BMI. This indicates a combined 68.2% of children falling into the overweight or obese categories, with significant implications for public health interventions.

Table 1: Gender-Wise Distribution and Overall Prevalence

Gender	Obesity (%)	Overweight (%)	Healthy (%)	Total (%)	p-value
Male	19	49	32	100	0.032
Female	15	43	42	100	

Table 2: Age-Wise Distribution of Obesity and Overweight in Boys and Girls

Age Group	Obesity in Boys	Overweight Boys	Obesity in Girls	Overweight Girls	p-value
9	65	23	25	12	0.067
10	59	45	42	15	
12	64	12	60	33	
13	62	23	35	42	0.021
14	62	52	25	19	
15	72	22	45	25	

The age-wise distribution of obesity and overweight revealed that in boys, the highest prevalence of obesity was observed at age 15 (72%), while the lowest was at age 9 (65%). The highest overweight prevalence was at age 10 (45%), and the lowest was at age 12 (12%). The overall trend indicated a statistically significant increase in obesity prevalence with advancing age among boys (p = 0.021). In girls, the prevalence of obesity peaked at age 12 (60%) and was lowest at age 9 (25%), while overweight prevalence was highest at age 13 (42%) and lowest at age 12 (23%). The findings suggested a similar age-related trend as in boys, although the gender differences were not statistically significant (p = 0.067).

Table 3: Prevalence Based on Area of Residence and Socioeconomic Status (SES)

Socioeconomic Status	Obesity (%)	Overweight (%)	p-value
Upper Class	62	68	0.003
Upper Middle Class	50	55	
Lower Middle Class	32	25	
Lower Class	15	10	

Urban areas demonstrated a significantly higher prevalence of obesity (65%) and overweight (50%) compared to rural areas (obesity 40%; overweight 20%) (p = 0.015), indicating that children residing in urban areas are more prone to weight-related health issues. Socioeconomic status (SES) also emerged as a significant determinant (p = 0.003), with children from upper-class families having the highest obesity (62%) and overweight (68%) prevalence, followed by upper-middle-class children (obesity 50%; overweight 55%).

Table 4: Impact of Physical Activity on Obesity and Overweight

Activity Frequency	Obesity in Girls (%)	Obesity in Boys (%)	p-value
No Activity	60	40	0.028
One Time	20	80	
Two Times	17	75	
Three Times	15	70	
Four Times	27	56	

In contrast, lower-middle-class and lower-class children showed much lower rates. The frequency of physical activity was assessed for both boys and girls, revealing that children engaging in less physical activity had significantly higher obesity and overweight rates ($p = 0.028$). For girls, "No Activity" was associated with the highest obesity prevalence (60%), while engaging in activities such as jogging (23%) and football (27%) showed the lowest rates. In boys, "No Activity" was similarly linked to higher obesity prevalence (40%), while active participation in jogging (82%) and football (80%) was associated with significantly lower obesity rates.

The study's results demonstrated significant associations between obesity prevalence and various demographic and behavioral factors. Gender, age, area, socioeconomic status, and physical activity levels all contributed to variations in obesity and overweight rates. The urban-rural divide was particularly prominent, with urban children showing substantially higher prevalence rates ($p = 0.015$). Similarly, children from upper-class families were more likely to be obese or overweight, highlighting the impact of socioeconomic influences ($p = 0.003$). The findings suggest that interventions targeting physical activity promotion and dietary modifications should be tailored according to specific demographic factors to effectively address childhood obesity. These results are consistent with previous research, which has shown that urbanization, socioeconomic disparities, and sedentary behavior are critical drivers of childhood obesity (Ahmed et al., 2024; Karki et al., 2019; Mansoori et al., 2018).

DISCUSSION

The findings of this study provided a comprehensive understanding of the prevalence and associated risk factors of obesity and overweight among school-going children in Peshawar, Pakistan, with significant implications for public health strategies. The results demonstrated that approximately 68.2% of the children fell into either the overweight or obese categories, indicating a high prevalence of weight-related health concerns in this population. The findings are consistent with global trends, where the prevalence of childhood obesity has risen sharply, particularly in low- and middle-income countries undergoing rapid urbanization and lifestyle changes (Ahmed et al., 2024). In line with similar studies conducted in other South Asian countries, such as Nepal and India, the association between socioeconomic status and childhood obesity was prominent, with children from upper-class families showing a significantly higher prevalence of both obesity and overweight (Karki et al., 2019; Mansoori et al., 2018). This suggests that socioeconomic factors play a crucial role in shaping dietary and physical activity behaviors, contributing to the development of obesity. The gender-wise analysis revealed a slightly higher prevalence of obesity and overweight among male students compared to females, which aligns with findings from previous studies in both developed and developing countries (Thomas et al., 2021). This pattern may be attributed to differences in physical activity levels, dietary habits, and social expectations, where boys often have more access to high-calorie foods and spend more time in sedentary activities such as video games and television (Otitoola et al., 2021). Although the gender difference was not statistically significant, it highlighted the need for gender-specific interventions to address childhood obesity. Moreover, the age-wise distribution showed an increasing trend in obesity prevalence with advancing age, particularly in boys, which is consistent with the findings of studies conducted in Tanzania and Brazil, where older children were found to have a higher risk of obesity due to cumulative lifestyle factors (Ferreira et al., 2021; Pangani et al., 2016). This reinforces the importance of early interventions to instill healthy behaviors in younger children before obesity becomes established and difficult to reverse.

The urban-rural divide observed in this study was also noteworthy, with urban children showing significantly higher rates of obesity and overweight compared to their rural counterparts. This is in line with global trends where urbanization is associated with lifestyle changes such as reduced physical activity, increased consumption of processed foods, and sedentary behaviors (Gangle et al., 2019). Similar findings have been reported in Ghana and India, where children from urban areas had a higher prevalence of obesity due to greater exposure to obesogenic environments (Veugelers and Fitzgerald, 2005; Kaushal et al., 2024). The difference in prevalence between urban and rural areas underscores the need for context-specific interventions that address the unique challenges faced by children in urban settings, such as creating safe spaces for physical activity and regulating the marketing of unhealthy foods.

The association between physical activity levels and obesity in this study further emphasized the protective role of regular physical exercise in maintaining a healthy weight. Children who engaged in regular physical activities, such as jogging, football, and swimming, had significantly lower rates of obesity compared to those with no activity. This finding is consistent with previous research, which has shown that regular physical activity is a key determinant of energy balance and weight management in children (Vasiljevic and Petkovic, 2023). However, it is important to note that despite these benefits, a substantial proportion of children in this study reported low levels of physical activity, particularly girls, who showed a higher prevalence of obesity and overweight compared to boys. This highlights a potential cultural and social barrier that may restrict girls' participation in sports and physical activities, suggesting the need for culturally sensitive strategies to promote active lifestyles among female children (Larery et al., 2021). The study's strengths included its use of a robust sample size, a comprehensive analysis of multiple variables, and a focus on both urban and rural settings, which provided a nuanced understanding of the factors influencing childhood obesity. Additionally, the longitudinal design allowed for the identification of trends over time, which is crucial for tracking changes in obesity prevalence and informing longterm public health strategies. However, the study had several limitations. First, the reliance on self-reported data

for dietary and physical activity patterns may have introduced reporting biases, as participants might have underreported unhealthy behaviors due to social desirability. Second, the cross-sectional nature of some components limited the ability to establish causal relationships between the variables. Future research should consider using objective measures of physical activity, such as accelerometers, and adopting a mixed-methods approach to gain deeper insights into the contextual factors influencing childhood obesity.

Another limitation was the exclusion of children with chronic health conditions, which may have led to an underestimation of the true prevalence of obesity in this population. Furthermore, the study did not account for genetic predispositions or familial risk factors, which are known contributors to obesity (Veugelers and Fitzgerald, 2005). Including these factors in future studies could provide a more comprehensive understanding of the interplay between genetics and environmental factors in the development of childhood obesity. Despite these limitations, the study provided valuable insights into the prevalence and risk factors of obesity and overweight in school-going children, highlighting critical areas for intervention.

The findings of this study have significant implications for public health policy and practice. Interventions aimed at reducing childhood obesity should be tailored to address the specific needs of different subgroups, taking into account gender, age, and socioeconomic status. For example, school-based programs that promote physical activity and healthy eating should be adapted to be culturally appropriate and accessible for both boys and girls. Additionally, policies targeting the urban population should focus on creating supportive environments that encourage active living, such as establishing parks, playgrounds, and safe walking paths. The role of socioeconomic status should also be considered, with strategies aimed at providing affordable healthy food options and limiting the availability of high calorie, nutrientpoor foods in schools and communities.

CONCLUSION

In conclusion, the study highlighted the multifactorial nature of childhood obesity, with gender, age, area, socioeconomic status, and physical activity levels all contributing to variations in prevalence. Addressing childhood obesity requires a multifaceted approach that includes policy interventions, community-based strategies, and individual behavior change efforts. Future research should focus on longitudinal studies that explore the longterm impact of these interventions and identify sustainable strategies for reducing obesity and improving the health outcomes of children in Pakistan and similar low- and middle-income countries.

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