ORIGINAL ARTICLE

# Prevalence and Factors Associated with Obesity among High School Children of District Shaheed Benazirabad

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## Abstract

**Background:** Childhood obesity is a growing global health concern, affecting children across nearly all countries. Factors like socioeconomic status, urbanization, and genetic predisposition drive its rise. This alarming trend poses significant long-term health risks and warrants urgent preventive action.

**Objective:** To assess the prevalence of childhood obesity and its associated factors in school children.

**Methods:** A cross-sectional study was carried out at Nawabshah City. 300 participants were selected to participate. The study was conducted from July 2023 to Oct 2023. Data was collected after getting informed assent parents of participants. Performa was filled by the researcher through face-to-face interviews of selected individuals. Weight in kilograms and height in meters were measured at the time of interview and BMI was calculated according to WHO's recommended BMI chart.

**Results:** The frequency of obesity was found to be 34% (n=102). The mean age of the participants who were obese was 17(+/- 1.2 years). This study found that 9% of participants were obese and 25% were overweight. Factors like gender, socioeconomic status, Physical activity, and educational status of both parents were found to be significantly associated with the BMI of participants with a p-value <0.05.

**Conclusion:** The study reveals a notable burden of obesity, as one-third of the participants were obese and overweight highlighting it as a public health concern. Reduced physical activity, along with the consumption of junk food were major contributors. This underscores the need for targeted public health interventions including factors such as physical activity, diet, and sleep.

**Keywords:** *Obesity, body mass index, adolescent, school children, risk factors.*

## INTRODUCTION

Child obesity is an emerging problem throughout the world [1]. Poor growth and sedentary lifestyle among childhood and adolescent, their physical inactivity have increased the burden of obesity and raised adverse effects on children's health. It is now considered a global public health issue [2]. It is a very complex interplay between environmental, genetic, and psychosocial factors that is responsible for the development of obesity. The rising prevalence of childhood obesity is a critical worldwide health-related problem in the 21st century. It is affecting children in nearly all countries globally. Over the past years, the percentage of school-age children who are obese and adolescents has doubled of the children obesity, marking a concerning trend [3]. Childhood obesity is associated with a varying number of factors related to demographic variables, including the social and economic status of the children, the increasing urbanization, and predisposing genetic factors [4]. Furthermore, being a major public health problem, it is nearly attached to the development of many other health-related complications that include oxidative stress among children and metabolic syndrome-related diseases [5].

Obesity vastly increases the risk of Reaven's syndrome, which includes a cluster of health conditions like increased blood pressure, abnormally high cholesterol levels, and an increase in insulin resistance. These conditions contribute to the development of cardiovascular disease later in life. Heart-related diseases are the leading cause of mortality and morbidity worldwide [6]. The relationship between oxidative stress, obesity, and insulin resistance underlines the importance of early identification of obesity and to development of intervention that will help to prevent the onset of life-threatening complications [7]. While obesity has according to tradition been seen as a problem predominantly affecting wealthier people in countries with high incomes, the increasing rates in low-income and middle-income countries (LMICs), especially in areas with high urbanization, reflect an increase worldwide problem [8]. Countries like Pakistan, including many others that are part of developing countries, are experiencing pointing increases in obesity in children, prompting health organizations that are working globally like the World Health Organization (WHO) to call for prompt action. In 2004, the Geneva World Health Assembly identified the urgency of tackling this issue [9],

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and recent information provided by the data underscores the scale of the issue. In 2019, there were around 340 children and adolescents aged 5–19 who were found to be overweight or obese, and there were 39 million children under the age of five in the same category [10].

These statistics indicate an overall shift in the world health landscape, where obesity in children is becoming more dominant in LMICs particularly in urban cities, contradicting earlier perceptions that it was mainly a challenge in HICs [11]. In 2017, a study was carried out in Islamabad, Pakistan, to determine the prevalence of overweight and obesity. The prevalence reported in the study was overweight at 17.4% and obesity at 8.5% respectively [12]. The need for comprehensive public health approaches and actions has never been greater, particularly in urban terrain, where changes in lifestyle and surrounding factors may worsen the problem. Addressing obesity in children is therefore not only a concern of individual health but it is also a combined responsibility to develop environments that encourage healthier lifestyles, improved nutrition, and increasing opportunities for individuals and communities to be physically active. This can be achieved by both preventive measures and early action-oriented programs, with a more precise focus on populations at risk. Studying childhood obesity is crucial due to its rising prevalence, long-term health consequences, and significant economic burden. Understanding its causes, including lifestyle and environmental factors, enables the development of effective prevention and intervention strategies to improve children's physical and mental well-being. This study aimed to assess the prevalence of childhood obesity in children and its associated factors like age, gender, socioeconomic status, and physical activity.

## MATERIAL AND METHODS

A cross-sectional study was conducted at schools in Nawabshah City. It included Government Girls High School Court Road, Cambridge Model High School, The City School Society, and H.M. Khouja Boys High School. Boys and girls aged between 12-19 years were included in this study. The study was conducted from July 2023 to Oct 2023. Ethical approval (No# AS&RB 15: 02) was taken before collecting the data from the participants. Students in classes 6 to 10 in the selected public and private schools were eligible for the study. Parents of Children who did not give assent for their child and those who were not present on the day of the survey were excluded.

The sample size will be calculated from the prevalence of Overweight and Obesity in Pakistan. The prevalence of both overweight and Obesity is 26% [12]. The calculated sample size came out to be 296. Sample size parameters are defined below:

Sample size calculation formula = $Z^2$ P (1-P)/d2
Z=1.96, for a confidence interval (α) of 95%
P is the prevalence or proportion of 26% [12]
d is the margin of error which is 5%

Data was collected using convenience sampling. Data was collected using a self-structured questionnaire based on previously conducted studies on obesity in children. Height and weight scales were used for the measurement of BMI according to WHO guidelines [7]. Data was collected using convenience sampling. All participants were asked to participate voluntarily. Before participation, written consent was obtained from the parents of the participants. The data required for research purposes was to be kept confidential.

Data was analyzed using the SPSS version 27. Categorical variables like occupation, education, and gender were calculated as frequencies and percentages. Continuous variables like height and weight were taken as means and standard deviations. The Chi-Square test was applied to test the prevalence of obesity. Logistic Regression was applied to determine the association of obesity with gender, age, parent's education, and physical activity. P-value <0.05 was considered statistically significant in this study.

## RESULTS

The mean age of obese participants was 17 ± 1.2 years, while the mean age of non-obese participants was 15

**Table 1:** Participants characteristics.

| Variables | Groups n=300 | Frequency | Percentage |
|---|---|---|---|
| Age (in year) | 12-15 | 103 | 34.3 |
| | 16-19 | 197 | 65.6 |
| Gender | Female | 150 | 50 |
| | Male | 150 | 50 |
| Socioeconomic Status | Low | 75 | 25 |
| | Middle | 120 | 40 |
| | High | 105 | 35 |
| BMI | Underweight | 48 | 16 |
| | Normal | 150 | 50 |
| | Overweight | 75 | 25 |
| | Obese | 27 | 9 |
| Father's Education | Illiterate | 8 | 2.6 |
| | Literate | 19 | 6.3 |
| | Primary | 96 | 32 |
| | Secondary | 123 | 41 |
| | Graduate | 54 | 18 |
| Mother's Education | Illiterate | 19 | 6.3 |
| | Literate | 15 | 5 |
| | Primary | 149 | 49.6 |
| | Secondary | 98 | 32.6 |
| | Graduate | 19 | 6.3 |
| Father's Occupation | Doctor | 17 | 5.6 |
| | Teacher | 86 | 28.6 |
| | Landlord | 68 | 22.6 |
| | Labour | 129 | 43 |
| Mother's Occupation | Housewife | 224 | 74.6 |
| | Teacher | 26 | 8.6 |
| | Others | 50 | 16.6 |

**Table 2:** Physical activity and eating patterns.

| Variables | Total Number of participants n=300 | Frequency | Percentage |
|---|---|---|---|
| Interested in Games | Yes | 224 | 74.6 |
| | No | 76 | 25.4 |
| Preferred Area for Playing | Indoor | 123 | 41 |
| | Outdoor | 80 | 26.6 |
| | Both | 97 | 32.3 |
| Involved in Sports in Past 12 Months | Once | 79 | 26.3 |
| | Twice | 141 | 47 |
| | Never | 80 | 26.6 |
| Intake of Junk Food | Yes | 285 | 95 |
| | No | 15 | 5 |
| Skipping Breakfast | Yes | 73 | 24.3 |
| | No | 277 | 75.7 |

± 1.8 years. Participants were categorized into early adolescence (12-15 years) with a frequency of 34.3% (n = 103) and late adolescence (16-19 years) with a frequency of 65.5% (n = 197). Income distribution was 25% (n = 75) low class, 40% (n = 120) middle class, and 35% (n = 105) high class. The father's education level was 2.7% illiterate (n = 8) and 6.3% literate (n = 13) (**Table 1**). The frequency of physical activity and eating patterns showed that 74.6% (n = 224) of participants were interested in playing sports, while 26.6% (n = 80) had not participated in any sports in the past 12 months (**Table 2**).

**Table 3:** Prevalence of obesity with participants' characteristics.

| Study Variables | | Non-Obese n(%) | Obese n(%) | p-value |
|---|---|---|---|---|
| Mean Age | | 15 +/- 1.8 | 17 +/- 1.2 | 0.036 |
| Age | 12-15 | 20 (6.6) | 82(27.3) | 0.002 |
| | 16-19 | 61(20.3) | 136(45.3) | |
| Junk Food | Yes | 81(27) | 204 (68) | 0.221 |
| | No | 1(0.3) | 14(4.6) | |
| Gender | Female | 110 (36.6) | 40(13.3) | 0.037 |
| | Male | 88 (29.3) | 62(20.6) | |
| Length of Sleep | > 6 Hours | 1(0) | 1(0.3) | 0.001 |
| | 07-09 Hours | 42(14) | 81(27) | |
| | 10-12 Hours | 55 (18.3) | 136(45.3) | |
| Eating Butter & Cheese | Yes | 44 (14.6) | 130(43.3) | 0.533 |
| | No | 38 (12.6) | 88(29.3) | |
| Income Level | Low | 15(5) | 60(20) | 0.013 |
| | Middle | 62(20.6) | 58(19.3) | |
| | High | 36(12) | 69(23) | |
| Skipping Breakfast | Yes | 17(5.6) | 56(18.6) | 0.038 |
| | No | 65(21.6) | 162(54) | |

Obesity was observed in 34% of participants (n=102). Age (p=0.002), gender (p=0.037), sleep duration (p=0.001), income level (p=0.013), and breakfast skipping (p=0.038) were significantly associated with obesity status. However, no significant correlation was found between obesity and the consumption of junk food, butter, or cheese (**Table 3**).

**Table 4:** Association of obesity with participants' characteristics.

| Covariates | OR | 95% Confidence Interval | p-value | AOR | 95% Confidece Interval | p-value |
|---|---|---|---|---|---|---|
| **Gender** | | | | | | |
| Male | Reference category | | | | | |
| Female | 0.051 | (0.026-0.103) | **<0.001 | 0.063 | (0.026-0.151) | **<0.001 |
| **Socio-Economic Status** | | | | | | |
| High | Reference category | | | | | |
| Middle | 0.048 | (0.024-0.096) | **<0.001 | 19.400 | (8.11-46.405) | **<0.001 |
| Low | 0.027 | (0.011-0.070) | <0.001 | 42.879 | (10.1-181.7) | **<0.001 |
| **Father's Education** | | | | | | |
| Graduate | Reference category | | | | | |
| Iliterate | 0.106 | (0.021-0.922) | *0.042 | 11.94 | (0.372-38.26) | 0.161 |
| Literate | 0.198 | (0.058-0.675) | *0.010 | 4.322 | (0.398-16.67) | *0.045 |
| Primary | 0.208 | (0.101-0.429) | **<0.001 | 1.828 | (0.493-6.77) | *0.049 |
| Secondary | 0.428 | (0.223-0.822) | *0.011 | 0.949 | (0.324-2.77) | 0.056 |
| **Mother's Education** | | | | | | |
| Graduate | Reference category | | | | | |
| Iliterate | 0.123 | (0.028-0.534) | **0.005 | 0.071 | (0.005-1.022) | *0.049 |
| Literate | 0.178 | (0.039-0.806) | *0.025 | 0.403 | (0.036-4.466) | 0.059 |
| Primary | 0.088 | (0.028-0.282) | **<0.001 | 1.779 | (0.367-8.625) | 0.089 |
| Secondary | 0.169 | (0.052-0.547) | **<0.003 | 2.271 | (0.496-6.404) | 0.078 |
| **Physical Activity** | | | | | | |
| No | Reference category | | | | | |
| Yes | 2.321 | (1.360-3.960) | **0.002 | 0.780 | (0.234-2.34) | **<0.001 |
| **Level of Physical Activity** | | | | | | |
| Never | Reference category | | | | | |
| Once | 1.740 | (0.880-3.442) | 0.112 | 1.036 | (0.329-3.262) | 0.988 |
| Twice | 1.807 | (0.982-3.326) | 0.570 | 0.86 | (0.254-1.855) | **<0.001 |

OR: Odds ratio measures the odds of an event occurring (in this case, obesity) in one group compared to another group (*e.g.*, females *vs.* males).
AOR: Adjusted Odds Ratio accounts for potential confounders, adjusting for other variables in the model.
*Significant at p<0.05, **Significant at p<0.01

Univariate analysis revealed significant associations between obesity and gender (OR: 0.051, 95% CI: 0.026-0.103, p<0.001), income level (OR: 0.048, 95% CI: 0.024-0.096, p<0.001), parental education (OR: 0.123, 95% CI: 0.028-0.534, p=0.005), and physical activity (OR: 2.321, 95% CI: 1.360-3.960, p=0.002). Multivariable analysis showed that gender (aOR: 0.063, 95% CI: 0.026-0.151, p<0.001), mother's education (aOR: 0.071, 95% CI: 0.005-1.022, p=0.049), and engaging in physical activity twice per week (aOR: 0.86, 95% CI: 0.254-1.855, p=0.003) were associated with obesity (**Table 4**).

## DISCUSSION

Obesity is considered one of the most dangerous health issues that is more prevalent in the young population. According to WHO, it is a health-related threat to the children [13]. The purpose of this study is to evaluate the prevalence of obesity among adolescents. The study further aims to find out the associated factors that are related to obesity in adolescents. The prevalence of obesity and overweight was 9% and 25% respectively. In a previous study, it was found that obesity and overweight were 8% and 24% prevalent in adolescents [14]. A conducted study in Nepal showed the prevalence of obesity and overweight as 7% and 28%, which is similar to the findings of our study. In a study conducted by the Chinese, obesity percentages were consistent with the current study. The results of overweight were not similar in the same study. The gender of the participants, their mother's educational status, and use of junk food were found to be associated with obesity and overweight [14, 15]. The most probable reason was the educational status of the parents. Socioeconomic status is closely associated with obesity around the globe.

In this study majority of the participants were from middle-income families. Studies previously conducted reveal that in recent times the loading of non-communicable diseases is increasing in middle and low-socioeconomic regions [15-17]. Previous studies have shown that as deprivation increases, so do rates of overweight and obesity. This is associated with the inequality gap within the nation. Those living in deprivation are more likely to eat unhealthy foods resulting in overweight and obesity [18]. It is believed that when there is deprivation, individuals may face poverty, which can increase crime and lower social solidity. This is further worsened by a lack of green spaces for children to play, increased pollution levels, and a decrease in the quality of the environment [19].

Obesity becomes more severe if it occurs at a young age. There is an increased risk of developing complications which is 11 to 19-fold greater in those who have a BMI more than the 95$^{th}$ percentile in adolescent age [20]. In this study, overweight and obesity were more prevalent in the younger age population, which is consistent with the findings of a study conducted on the American Indian Population [21]. Adolescent obesity and overweight lead to the development of type II diabetes at a very young age, often in the 20s and 30s. Many studies have shown the relative risk of childhood obesity and overweight with the development of cardiovascular disorders and type II diabetes [22, 23].

A decrease in physical activity can lead to overweight and obesity especially when combined with eating junk food. In this study, the majority of participants were using television for entertainment. Television was weakly associated with obesity and overweight in our study, but a trend was observed indicating that obesity and overweight increased in children who spent more time watching television. Many studies previously conducted have shown that an increase in the hours of watching television can increase the prevalence of overweight and obesity [24-26]. The weak association might be due to the other factors associated with increased television use, such as reduced sleep, lack of physical exercise, unhealthy eating habits, or exposure to junk food advertisements [27].

The current era has advanced in technology and has improved agriculture as well as the availability of food that is full of energy [28]. The diet of Asians is very dense in starch and high in carbohydrates as there is an increased intake of starchy foods. The energy from the protein and other micronutrients is very low among the Asian populations [29]. The situation is worsening as there has been an increase in the shift from traditional food methods to ready-to-cook foods, which are often high in fats. In this study, 95% of the participants are eating fatty foods. Other studies have shown that an increase in the consumption of high-density foods can lead to weight gain and obesity [30, 31].

According to this study results increase in BMI has a negative association with the length of sleep. Shorter sleep duration was associated with higher BMI. The study results are similar to those of previous studies showing that a decrease in sleeping hours can increase the likelihood of overweight and obesity [32-34]. A meta-analysis conducted by Ford ND and others showed a negative association of obesity with sleeping hours [35]. The study conducted in Portugal revealed that the odds ratio of obesity in children decreases with the decrease in the sleeping hours in relation to the eight hours of sleep [36]. A meta-analysis, which further included the 15 analytical studies showed the shorter the duration of sleep the higher the incidence of obesity in children. The relationship between shorter sleep and increased total caloric intake, along with decreased physical activity, might explain the rise in obesity [37].

There are several limitations to this study. The first limitation is that this study relies on self-reported data for variables such as diet, physical activity, and weight, which may be inaccurate due to recall bias or social desirability bias in the study population. These biases can lead

to inaccuracies in the data, affecting the validity of the study's conclusions. Future research could mitigate this limitation by incorporating objective measures, such as physical activity trackers or direct observations of dietary intake, to provide more accurate data. Second, the study is cross-sectional and captures data at a single point in time, making it difficult to establish causality between obesity and other factors (*e.g.*, physical activity, diet, or sleep patterns). The relationships observed could be bidirectional or influenced by other unmeasured factors. Longitudinal studies, which track participants over time, would be better suited to establish causal links between these variables and childhood obesity. Finally, the study was conducted in a single location, which may limit the generalizability of the findings to larger populations. Expanding the study to multiple locations with diverse populations would improve the generalizability of the findings and provide a more comprehensive understanding of childhood obesity across different contexts.

## CONCLUSION

The study found that 9% of participants were obese and 25% were overweight. Reduced physical activity, along with the consumption of junk food, can contribute to overweight and obesity. The majority of participants reported using television for entertainment. Additionally, the study revealed a negative association between BMI and sleep duration, with shorter sleep being linked to higher BMI. Following the completion of the study, the data will be used to identify the incidence of childhood obesity in metropolitan areas and get an understanding of the problem's relevance. If this problem is not addressed at its core, it could perpetuate across generations, resulting in long-term health consequences. It is essential to further explore the practical significance of the findings. The study emphasizes the need for public health interventions targeting lifestyle factors such as physical activity, diet, and sleep. Furthermore, the limitations of the study, such as its cross-sectional design, sample size, or the potential influence of unmeasured confounders, should be addressed in future research. Understanding these limitations will help refine interventions and guide more comprehensive strategies to tackle childhood obesity effectively.

## ETHICS APPROVAL

Before the start of the study, the research proposal was presented to the Institutional Review Committee (No. # AS&RB 15: 02) and approvals were taken from IRC. The Helsinki Statement, National/International and institutional ethical standards were followed in every aspect of the study as human subjects were involved.

## CONSENT FOR PUBLICATION

Written consent was obtained from the parents of the participants.

## AVAILABILITY OF DATA

The data can be shared after obtaining consent from all the concerned authors depending on the need for data.

## FUNDING

There is no funding attached to this research work

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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## AUTHORS' CONTRIBUTION

SS and MS developed the main concept, questionnaire, and data analysis. HKT writing the manuscript, its revisions, and correspondence. IM and SK Initial writing and conceptualizing. FM data collection and corrections. D did data collection.

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