

## ORIGINAL ARTICLE

# Community-Level Factors Associated with Body Mass Index Among Pakistani School-Aged Adolescents

MOAZZAM TANVEER<sup>1</sup>, UMAR TANVEER<sup>2</sup>, MUBEEN AFZAL<sup>3</sup>, NASRULLAH RANA<sup>4</sup>, RASHID NAGRA<sup>5</sup>, WAQAR ANJUM<sup>6</sup>, MUSA HASEEB<sup>7</sup>

<sup>1</sup>School of Physical Education and Sport Training, Shanghai University of Sport, Shanghai 200438, China; (M.T.)

<sup>2</sup>Department of Mass Communication, University of Lahore, Lahore, Pakistan; (U.T.);

<sup>3</sup>Department of Radiology, University of health science, Lahore, Pakistan; (M.A.);

<sup>4</sup>School of Physical Education, University of Sindh, Jamshoro, Pakistan; (N.R.);

<sup>5</sup>Physical Education Teacher, Punjab School Education Department, Pakistan (R.N.); (W.A.);

<sup>7</sup>Pakistan Sports Board, Islamabad, Pakistan; (M.H.);

Correspondence to: Umar Tanveer, Email: [umartanveer39@gmail.com](mailto:umartanveer39@gmail.com), Cell: +92 300 7472759

## ABSTRACT

**Aim:** To investigate the most recent estimates of underweight, overweight, and obesity prevalence with association of community-level factors in Pakistani school-aged adolescents aged 12 to 17 years.

**Methods:** A cross-sectional study was conducted using a convenience sampling approach with 1,997 Pakistani from 40 schools in central Punjab province. The CDC US 2000 was used to define underweight < 5th percentile BMI, overweight 85th ≤ BMI to < 95th percentile BMI, and obese 95th percentile ≤ BMI, the Chi-square test was used. The Pearson correlation coefficient (r) was used to determine the correlation. The statistical significance level was set at  $p < 0.05$ .

**Results:** prevalence of underweight U/W, overweight O/W, and obesity O/B was (23.5%, 4.6%, and 6.9%, respectively). There were no chances for students to engage in physical activity in the community, according to 72.9% of parents.

**Conclusion:** Underweight, overweight, and obesity were prevalent among Pakistani school-aged adolescents. The community-based characteristics we discovered here have detrimental influences on school going adolescents' health. The relationship between weight-status, behavioral, and other health variables should also be investigated in future research using longitudinal or interventional approaches.

**Keywords:** Body Mass Index, School-aged adolescents, Community-Level

## INTRODUCTION

Children's obesity is one of the most significant public health concerns of the twenty-first century, affecting every nation. In recent decades, the prevalence of obesity among school-age children and adolescents has increased more than tenfold<sup>1</sup>. Childhood obesity has reached epidemic levels in both high- and low-income countries, and the prevalence of overweight and obese adolescents has doubled or even tripled since 1970<sup>1,2</sup>. The World Health Organization (WHO) reports that, globally, 18% of children and adolescents aged 5 to 19 were overweight or obese in 2016, with significant regional variations in obesity rates<sup>1,3</sup>. Most significantly, childhood obesity and overweight negatively association a child's physical, mental, and emotional health in the short- and long-term<sup>1,2</sup>.

Communities' and neighborhoods' constructed environments have been evolving. These modifications have affected adolescents' sedentary, dietary, and physical activity patterns by increasing traffic, expanding fast-food outlets, and reducing the amount of open space and safe pathways. It is necessary to investigate certain neighborhood and community factors that affect children's health behavior in order to combat childhood obesity<sup>4</sup>. The subjective and descriptive norms, other social influences, and other elements that make up the neighborhood or community make up its social component<sup>5</sup>. In settings that are deemed safe, there is outside play area available for adolescents to use, encouraging healthy physical exercise patterns<sup>6</sup>. The frequency with which a youngster can go outside and engage in additional activity is significantly influenced by the neighborhood's safety<sup>7</sup>.

Globally, obesity is increasing<sup>1,2,8</sup>. Pakistan is a low-income country<sup>1,2,9</sup> with 54 percent of the population between the ages of 0 and 19<sup>1,2,10</sup>. In the global hunger index for 2021, Pakistan is ranked 92nd out of 116 nations on the 2021 global hunger index, which indicates a serious hunger issue<sup>1,2,11</sup>. In Pakistan, malnutrition and excess malnutrition are problems. Pakistan is ranked tenth out of 188 countries in terms of obesity, with 50% of the population being overweight or obese<sup>1,2,12</sup>.

Early mortality associated with obesity is becoming more common among both men and women in Pakistan over time<sup>13</sup>. 5.4 million Pakistani school-aged children will be obese by 2030, according to the World Obesity Federation<sup>14</sup>. According to the WHO Diabetes country profiles, Pakistan has not yet adopted a

policy to address overweight and obesity as well as physical inactivity<sup>1,2,15</sup>. Even though Pakistan has done minimal research on the subject, there is still a gap. Baseline data are needed<sup>1,2,16,17</sup>, in order to evaluate the prevalence of obesity among Pakistani school-aged adolescents. This may provide public health insights about how to avoid being underweight, overweight, or obese in Pakistan. In order to contribute to the creation of evidence-based guidelines for the prevention and management of underweight, overweight, and obesity in this age group, as well as to further research its association with Community-Level variables.

In order to contribute to the development of evidence-based recommendations for the prevention and management of underweight, overweight, and obesity in this age group, the study's purpose was to estimate the prevalence of weight status among Pakistani adolescents aged 12 to 17 and further investigate its association with community-level factors.

## METHODS

**Study design, setting, and participants:** In the summer of 2022, a convenience sampling strategy<sup>1,2,15</sup> was used to perform a cross-sectional survey among school-aged children and adolescents from central Punjab area. Adolescents in (grades 4-5 primary), (grades 6-8 middle), (grades 9-10 secondary), and (grades 11-12 higher secondary) were sampled.

Public schools were selected after gaining approval from the Punjab school education department; they were given a permission letter, while private school administrators had to seek their own approval. If the school's administration refused to take part in the research, an alternative institution was picked at random. departments of Rescue-1122 volunteered to take part in this survey<sup>1,2</sup>.

The Shanghai University of Sport, Institutional Review Board authorized the study protocol [1816111009-2019], and permission to conduct the study was acquired from the participating schools' teachers and principals. All of the children and adolescents in the study, as well as their parents or guardians, were told that participation was completely voluntary<sup>1,2</sup>.

**Measure:** Sampled schools were visited on pre-arranged dates. In the classroom, members of Rescue-1122 took anthropometric weight and height measurements<sup>1,2</sup>.

For students, the survey was conducted in Urdu. We used the back-translation technique to make sure that the meanings were equivalent. By a multilingual researcher in management, the scale was first translated from English into Urdu and then, for verification, back into English. Finally, a management professor compared the Urdu and English versions and made modest adjustments to resolve any differences. First, the students' weight and height were measured. Students then completed the survey questionnaire on paper in a classroom environment. Students self-reported questionnaire paper version were used. Demographic information about adolescents from public and private schools, as well as school levels (primary, middle, secondary, and higher secondary), was used, including gender (boy or girl), age (12 to 17) years, grades (4 to 12), religion (Muslim or Non-Muslim), and residence location (urban or rural)<sup>1,2</sup>. Parents questionnaire was noted in the students' homework diary. Some students did not return the questionnaire on collection day, resulting in an 82% response rate. Students' questionnaire was excluded with the same serial number of parents. Three question was about community with Yes or No options.

Analysis of opportunities for physical activity available in your community environments (The alpha value was 0.93). 2 Analysis of students' lives in a safe community environment (The alpha value was 0.77). 3 Analysis of students' lives in a supportive community environment (The alpha value was 0.81).

Questionnaire for parents was adapted from (GSHS) 2016 Pakistan GSHS Questionnaire. We defined "parent" in this study to include any guardian who was responsible for the child's welfare (i.e., "parent" did not have to be biological parents).

**Weight status:** BMI weight to the nearest 0.1 kg for the purpose of the measured weight and height to the nearest 0.5 cm<sup>1,2,21</sup>. BMI was calculated as body weight (kg) divided by height (m) squared (kg/m<sup>2</sup>). Underweight, normal weight, overweight, and obese classifications were based on BMI percentiles based on age and gender (CDC-US 2000). Underweight (<5th percentile), healthy weight (5th BMI to ≤85th percentile), overweight (85th BMI <95th percentile), and obese (≥95th percentile) BMI for children and adolescents aged 2 to 20 years<sup>1,2,19</sup>. Trained rescue professionals took all of the measurements.

**Statistical Analysis:** IBM SPSSv.26 Statistical Analysis was used to analyze the data. Underweight (<5th percentile), healthy weight (5th BMI to <85th percentile), overweight (85th BMI <95th percentile), and obese (>95th percentile) BMI calculated using the CDC US 2000 BMI chart Children and adolescents between the ages of 2 and 20<sup>1,2,21</sup>. For the present prevalence of body-weight status, a frequency distribution analysis was performed. To compare the prevalence of body-weight status (dependent variable) with Community-Level parameters as (independent variables) using the chi-square test as the trend test<sup>1,2,22</sup>. To measure the relationship between the dependent and independent variables, The Pearson correlation coefficient (r) was used to determine the degree of correlation between independent variables with body-weight dependent variable<sup>1,2</sup>. Linear regression analysis was used to explore the predictive power of, Community-Level

factors as (independent variables) in relation to body-weight (dependent variable)<sup>1,2</sup>. The statistical significance was determined using  $p < 0.05$ .

## RESULTS

Table 1 showed sample sizes and weighted demographic information for all four levels of schools in the research population. primary 195 (9.8%), middle 788 (39.5%), secondary 705 (35.3%), and higher secondary 309 (15.5%). boys 64.2% of the participants, while girls were 35.8%. Students 59.7% of urban areas and 40.3% from rural areas. Muslims were 95.8% of students, while non-Muslims were 4.2%. Students from 77.0% public schools and 23.0% from private schools.

Fig. 1 depicts the current prevalence of body mass index among Pakistani school-aged adolescents. depending on the total number (N = 1,997): (Underweight 23.5%), (Overweight 4.6%), and (Obesity 6.9%).

According to Table 2 weight-status and Lives in a Safe Community ( $r = 0.010$ ), and Lives in a Supportive Community ( $r = 0.011$ ) had a positive relationship with body-weight. Status. Overall, weak correlation between dependent variable and independent variables.

There were no chances for students to engage in physical activity in the community, according to 72.9% of parents, as shown in Table 3. Parents of students who are underweight (23.0%), overweight (5.2%), and obese (7.8%) respond that their neighborhood is unsafe for adolescents to play in. Parents of students who were 25.1% underweight, 5.0% overweight, and 7.5% obese said that the community did not supportive their children.

In this study, the community-Level factors were used as the predictors and the weight status as the dependent variable for regression analysis. The impact of community-Level factors influences on school-aged students' body-weight; the  $R^2$  value of 0.010. Hypotheses 1, 2 and 3 were not appear to had a significant association with weight-status, according to the Table 4.

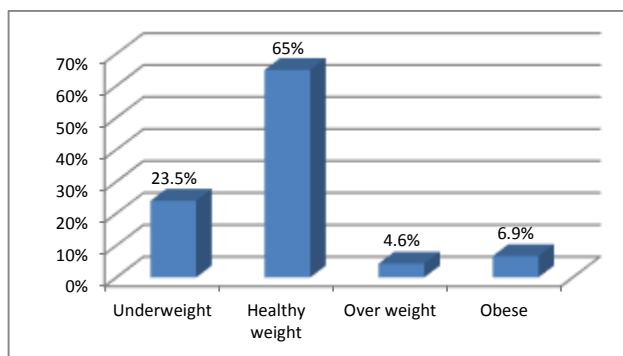


Figure 1 Descriptive Statistics analysis for current Prevalence of body mass index (N=1,997).

Table 1: Descriptive statistics of demographic characteristics (n (%)). (N=1,997).

Variable	Primary School	Middle School	Secondary School	Higher Secondary school	P-value
Sample size 1,997 (n %)	195 (9.8)	788 (39.5)	705 (35.3)	309 (15.5)	
Age (year, mean ± SD)	12.45 ± 0.72	13.57 ± 1.22	15.29 ± 1.15	16.86 ± 0.38	
Gender					
Boy	141 (11.0)	500 (39.0)	457 (35.6)	184 (14.4)	0.032
Girl	54 (7.6)	288 (40.3)	248 (34.7)	125 (17.5)	
Religion					
Muslim	181 (9.5)	750 (39.2)	680 (35.5)	303 (15.8)	0.020
Non-Muslims	14 (16.9)	38 (45.8)	25 (30.1)	6 (7.2)	
Residence					
Urban	157 (13.2)	398 (33.4)	509 (42.7)	128 (10.7)	<0.001
Rural	38 (4.7)	390 (48.4)	196 (24.3)	181 (22.5)	
School kind					
Public	176 (11.4)	599 (38.9)	465 (30.2)	298 (19.4)	<0.001
Private	19 (4.1)	189 (41.2)	240 (52.3)	11 (2.4)	
BMI (kg/m <sup>2</sup> , mean ± SD)	16.06 ± 2.48	18.04 ± 3.31	19.37 ± 3.88	20.30 ± 3.39	

Table 2: The correlation between weight status and community-Level factors.

	Mean	SD	1	2	3	4
Weight status	1.95	0.74	1			
Opportunities for physical activity	1.73	0.44	-0.013	1		
Lives in a Safe Community	1.17	0.37	0.010	-0.721**	1	
Lives in a Supportive Community	1.18	0.38	0.011	-0.714**	0.943**	1

Note; N =1,997; \*p < 0.05, \*\*p < 0.01

Table 3: Chi-square test to compare the prevalence weight status with community-Level factors, (independent variable) (N = 1,997).

Characteristics	Body Mass Index					$\chi^2$	P-value
	Under weight	Healthy weight	Overweight	Obesity	Total		
	n (%)	n (%)	n (%)	n (%)	n (%)		
Analysis of opportunities for physical activity available in community							
Yes	135 (29.9)	337 (62.2)	24 (4.4)	46 (8.5)	542 (27.1)	4.28	0.232
No	334 (23.0)	962 (66.1)	67 (4.6)	92 (6.3)	1456 (72.9)		
Analysis of child Lives in a Safe Community							
Yes	380 (23.0)	1089 (65.9)	73 (4.4)	111 (6.7)	1653 (82.8)	2.97	0.395
No	89 (25.9)	210 (61.0)	18 (5.2)	27 (7.8)	344 (17.2)		
Analysis of child Lives in a Supportive Community							
Yes	379 (23.1)	1075 (65.6)	73 (4.5)	111 (6.8)	1638 (82.0)	1.37	0.711
No	90 (25.1)	224 (62.4)	18 (5.0)	27 (7.5)	359 (18.0)		

Table 4: linear regression analysis of community-Level factors (independent variables) and weight status (dependent variable) was conducted.

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	SE	$\beta$		
Constant	2.069	0.160		12.952	0.000***
Opportunities	-0.050	0.055	-0.027	-0.815	0.415
Safe Community	-0.014	0.136	-0.010	-0.104	0.917
Supportive Community	-0.023	0.132	-0.011	-0.171	0.864

Note, p < 0.001\*\*\*

## DISCUSSION

According to this study estimates, 23.5% among Pakistani school-aged adolescents were underweight, overweight 4.6%, and 6.9% were obese<sup>2</sup>. most recent study showed 21.9% were underweight, overweight 5.8%, and 5.4% were obese. another study from this region showed 24% among Pakistani school-aged adolescents were underweight, normal weight 65%, overweight 4.3%, and 6.7% were obese<sup>2</sup>. Another study from the Hyderabad urban region in 2013 found that 12% of students in grades 6 to 10 were obese, and 8% were overweight<sup>23</sup>. An additional study conducted in Karachi among school children aged 11 to 15 years old found that 19.1% of the children were overweight and 10.8% were obese<sup>17</sup>. A local survey conducted in Lahore founded that 11.9% of students in private schools in grades 6 and 7 were obese, while 21.8% were overweight<sup>24</sup>. In 2018, another local study was conducted on children aged 3 to 18 years in Multan, with the results showed that 10% of the students were overweight and 5% were obese<sup>25</sup>. According to the World Obesity Federation estimated in 2018, that 6.6% of Pakistani children were obese, and 10.7% were overweight<sup>26</sup>.

All demographic characteristics, including minorities, urban and rural locations, public and private schools, and the four levels of education, are examined in detail in this study. Based on this rationale, intervention programs for affected youth and official guidelines for the treatment and prevention of BMI difficulties in Pakistani school adolescents using empirical data can be created. Body Mass Index correlates of community-Level characteristics in Pakistani school adolescents can be used to inform these efforts.

First, it is impossible to draw any causal conclusions about the structural associations that have been discovered due to the cross-sectional data. The second issue is that children were not patriated in this study. Therefore, particular socio-demographic influences of school- or community-related factors among Pakistani school-aged adolescents are yet unknown, necessitating further research.

## CONCLUSIONS

The data revealed that Pakistani school-aged adolescents were underweight, overweight, and obese, which is a severe concern. According to this study, the community-based characteristics we

discovered here have detrimental influences on school going adolescents' health.

Adolescents develop within a context that is shaped by a variety of individuals and factors. providing both girls and boys in Pakistan with high-quality physical education as well as more favorable opportunities and experiences for playing sports and other forms of active recreation. To improve the psychosocial environment, form efficient networks of parents, teachers, and school management committees. Better psychological support will be provided to adolescents as a result, both at school and at home. Establish a policy of "zero tolerance" for bullying.

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**Data Availability Statement:** The corresponding author can provide the data used in this work upon request.

**Competing interests:** The authors have declared they have no competing interests.

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