The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 4, 2025

COMPARISON OF BMI AMONG HIGH AND LOW SOCIOECONOMIC SCHOOL GOING POPULATION

Dr Rabail Idrees[*1], Brig Dr Jawad Jalil[2], Dr Aqsa Shafique[3], Dr Hadia Batool[4], Dr Hina Irshad[5] Dr Laiba Sana[6]

[*1]*CMH LHR Resident Pediatrics*
[2]*CMH LHR HOD Pediatric department. Associate professor. Consultant pediatrician.*
[3]*University of York, UK , Health Sciences PhD Student*
[4]*CMH LHR House Officer*
5Resident Pediatrics LHR
[6]*Capital Hospital Islamabad*

[*1]rabailidrees234@gmail.com,[2]jawadjalil2002@hotmail.com,[3]aqsashafique017@gmail.com, [4]hadiabatool1997@gmail.com

DOI: https://doi.org/10.5281/zenodo.18453828

Keywords
BMI, School Children, socioeconomic, low and high

Article History
Received: 18 February 2025
Accepted: 20 March 2025
Published: 07 April 2025

Copyright @Author
Corresponding Author: *
Dr Rabail Idrees

Abstract

Objective: *The purpose of the research is the comparison of BMI among high and low socioeconomic school going population*

Study Design: *Comparative Cross-Sectional study*

Study Duration: *06 months from August 24-Janurary 25*

Study Place: *Department of Pediatrics, CMH Lahore*

Methods: *It was a comparative cross-sectional study carried in sampled urban and semi-urban government and private schools that represented the low and high socioeconomic status respectively, and the study was conducted with the consent of the institutional ethical committee. Multistage random sampling was used to select students, both male and female. BMI was calculated with the help of the standardized methods of measurement and was interpreted based on the WHO developmental references. The SPSS version 26 was used to analyze the data, and the independent t-tests and Chi-square tests were applied, and $p < 0.05$ was regarded as statistically significant.*

Results: *240 students (120 government and 120 private; 50% boys and girls) were included. There was no difference in mean age ($p > 0.05$). The mean BMI was 18.5 kg/m 2, and BMI among students of private schools was significantly high compared to that among students of government schools (19.8± 3.1 vs 17.2 ±2.8 kg/m ^{2}; $p = 0.001$). Boys and girls of both the private schools were found to have higher BMI at all grades. The progression on BMI was higher as the grade level went up and more so among the students in the private school which showed the body weight was more socioeconomically influenced.*

Conclusion: *A high correlation was found between socioeconomic status and BMI in school children, whereby the children in private schools of the same gender and grade have higher BMI. Specific school-based interventions are necessary to respond to both undernutrition in state schools and the increasing overweight among the private schools and achieve healthy development and population wellbeing.*

INTRODUCTION

The nutritional status of childhood and adolescence is a decisive factor of the current and future health. Body Mass Index is a straightforward and popular measure of anthropometric body indicated by the Body Mass Index (BMI) which is often used in determining nutritional status and classifying a person as underweight, normal weight, overweight or obese. BMI is of significant importance among school going children as a screening tool to determine under and overnutrition since they are becoming the global issues of significant concern by the public health.[1]

One of the strongest social determinants of health is socioeconomic status (SES) that determines the type of dietary habits, exercise habits, healthcare accessibility, and general lifestyles. The children belonging to various socioeconomic strata have varied environmental, cultural, and economic exposure that has an immediate or indirect effect on their development and body structure. Low socioeconomic populations may be caused by low access to nutritious food, food insecurity, frequent infections, and poor living conditions, which contributes to undernutrition and low BMI. On the other hand, the children who belong to the higher socioeconomic groups tend to have more access to energy-dense foods, sedentary leisure and digital media, which predispose them to overweight and obesity.[2]

The world is experiencing a fast change in the nutrition situation among the children. Malnutrition in developing countries is taking a dual burden and thus the undernourishment continues to affect the poor populations of the world, whilst overweight and obesity are on the increase among the rich. This nutritional imbalance is more pronounced in school-going children since schools are the reflection of greater inequalities in the society. The differences of school type like public vs. private school tend to vary in terms of socioeconomic status and can be linked to different nutritional patterns.[3]

Socioeconomic inequalities are very high in South Asian nations, such as Pakistan, and this factor greatly influences child health rates. The rising BMI levels in children who belong to high socioeconomic status have been caused by urbanization, changing diets, physical inactivity and consumption of fast foods. Conversely, children in the lower socioeconomic statuses still experience issues pertaining to poverty, poor diets and poor health education, which can translate as poor BMI and development retardation. These dichotomous results highlight the importance of comparative research to assess the BMI of socioeconomic groups.[4]

School-based tests are a more effective and convenient way of testing the distribution of BMI among children with diverse backgrounds. It can be beneficial to compare BMI in high and low socioeconomic school-going populations to identify high-risk groups, highlight nutritional disparities, and inform specific interventions in the field of the overall health of the population. They must be used in the development of school-based nutrition programs, physical activity programs, and policy interventions that may help to foster healthy development and prevent undernutrition, as well as obesity.[5]

Although the socioeconomic factors affecting childhood BMI have increasingly been noted, there is limited data on the developing countries. The knowledge of the socioeconomic status in relation to the BMI of school children is important in evidence-based planning and resource distribution. Consequently, the given research project will compare the BMI of school-going children belonging to high and low socioeconomic groups, and the goal of the research will be to determine differences in nutritional status and involve in the strategies of child health outcomes improvement.

Methodology:

It was a comparative cross-sectional analysis of school-going children in government and the private school, which are the low and high socioeconomic status (SES), and represented by the two schools. The research was conducted within a specified time frame (to) in selected urban/semi-urban regions to guarantee the availability of access as well as coverage of both school systems. Study was done after taking consent from institutional ethical committee. The study was done by the Department of pediatrics from August 24-Janurary 25, a 06 months study. A sample size of 240 was calculated using WHO sample size

calculator and keeping CI 95% and margin of error being 5%.

The research sample was comprised of male and female students in grades 6-12 (or higher) of one or more chosen grades (e.g., grades 6 to 12). The BMI was compared using the same gender students across the same grade in both government and private schools in order to reduce the confounding effect of age and pubertal variation.

Calculation was done by applying typical epidemiological formulas by considering anticipated variation in BMI among socioeconomic groups, 95 per cent level of confidence, and power of 80. Multistage sampling method was applied. Simple random sampling was used in selecting equal number of government and private schools in the first stage. A set of grades in each school was picked in the second stage. Simple or systematic random sampling was done on the class registers to select the students in the third stage, in proportional representation of both sexes. Boys and girls were drawn as separate samples and analyzed on the gender and grade basis.

Socio-economic Status Classification.

- The socioeconomic status was indirectly assigned depending on the type of school.
- The government schools were grouped as the depiction of low socioeconomic status.
- The private schools were divided as high socioeconomic status.

Parental occupation and educational background where applicable were some of the indicators that were used in supporting this classification.

The body weight and height have been determined by standardized methods:

- The weight was measured by a calibrated digital weighing scale to the nearest 0.1 kg whereby the students were weighed in light clothing without shoes.
- A stadiometer was used to measure the height of the students to the nearest 0.1 cm with the student standing straight, with feet free and keeping their heads in the Frankfurt plane.

The calculation of the Body Mass Index (BMI) was done using the formula:

$$BMI = Weight(kg) \div Height(m)^2$$

The World Health Organization (WHO) standards of growth in children and adolescents (5-19 years old) were used to interpret the BMI-for-age percentiles.

BMI Classification:

According to WHO standards, students were classified as:

1. Underweight
2. Normal weight
3. Overweight
4. Obese

It was classified in regards to each gender and grade.

Inclusion Criteria:

1. Students need to be enrolled to either a government school or a private school which is selected.
2. Students enrolled in the grade/s of choice.
3. The students are expected to be within the age bracket of the selected grade/s.
4. Students of either gender
5. students that attended the day of data collection.
6. Informed consent by parents/ guardians and student assent written.

Exclusion Criteria:

1. Students with known chronic conditions (e.g., endocrine disorders, congenital heart disease, chronic renal disease, etc.)
2. Children on long term drugs that either impair growth or weight (e.g., corticosteroids).
3. Physically disabled students who have a deformity that would not allow them to be accurately measured in height and weight.
4. Sick students during examination.
5. Students who refused to take part or were not given consent by their parents.

The major comparison was conducted in the following way:

- Comparison of the BMI of BMI in government and private school students of gender.

- Comparison of BMI between the same genders (e.g. boys of Grade 6 in government and in private schools) based on grade.

The further analysis involved comparison of various grades of the same gender to establish trends of BMI as grade level advanced. This methodology has been applied so as to make sure that variations in BMI are mainly due to the socioeconomic status than the age or gender difference.

The input of data was done and analyzed through Statistical Package of Social Sciences (SPSS) version 26. The variables that were continuous like BMI were represented as mean +- standard deviation, whereas categorical variables were represented as frequencies and percentages. The independent sample t -test was applied to the comparisons between the mean BMI of the students of the same sex and grade in government and private schools. The chi-square test was used to compare BMI categories. A p-value value that was below 0.05 was taken to be significant.

Results:

The study involved 240 school-going students 120 students in government schools (low socioeconomic status) and 120 students in private schools (high socioeconomic status). The sample comprised 120 boys (50%) and 120 girls (50%), which was an adequate number to compare the performance of boys and girls. The Grades 6, 7, and 8 were selected as students, and the distribution was even among school-type and grades to reduce the effect of the age factor.

The average age of the participants was similar in government and private schools ($p > 0.05$), which implies the homogeneity of the research groups. The anthropometric measures were achieved in all the enrolled students without missing data.

The total mean BMI of the study population was 18.5 kg/m 2. The mean BMI of students in government schools was found to be much lower than that of the students in private schools (19.8 + 3.1 kg/m 2 vs 17.2 + 2.8 kg/m 2; $p = 0.001$). This disparity indicates an increased propensity towards increased body weight by students in higher socioeconomic status.

The spread of the values of the BMI was also wider in the case of students of the private school, which means that the status with regards to nutrition was more varied in this group.

In gender stratification, boys and girls were found to have very high BMI in the private school as opposed to those in the government school.

The average BMI of boys in vocational schools was 20.1 / ± 3.2 kg/m 2 in privatized schools, and 17.5 / ± 2.7 kg/m 2 in government schools ($p = 0.001$). On the same note, the mean BMI (19.4 ±3.0 kg/m 2) and (16.9 ±2.9 kg/m 2) of girls in private and government schools, respectively had a significant difference ($p < 0.001$). The size of difference was a bit bigger in boys than girls, which suggests a greater relation of socioeconomic status and BMI among male students.

To control the confounding variables of age and pubertal development, BMI was cross tabulated within the same grade and gender in the same schools.

Grade 6 boys in private schools had a much higher mean BMI than boys in government schools (18.9 ± 2.4 vs 16.8 ± 2.1 kg/m 2; $p = 0.002$). The same data was found in girls, where the students of private schools had a higher BMI (18.5 ± 2.2 vs 16.4 ± 2.3 kg/m 2; $p = 0.004$).

The difference was more evident in Grade 7. The mean BMI of boys in government school was 17.3 ± 2.6 kg/m 2, whereas it was 20.4 3.0 kg/m 2 in private schools ($p = 0.001$). The average girls BMI was 19.1 +2.7 kg/m 2 in the case of private school and 16.7 +2.8 kg/m 2 in case of government school ($p= 0.001$).

The values of BMI rose even more in Grade 8 in both types of schools but still, the value of BMI of the students in the private school remained much higher. The BMI in boys in the private schools was 21.0 mm/kg/m 2 with a standard deviation of 3.3 against 18.2 mm/kg/m 2 in the government schools ($p = 0.001$). On the same note, the mean BMI of girls in the private schools was 20.0 + 2.9 kg/m 2 against 17.6 + 3.0 kg/m 2 in government schools ($p =0.002$).

In general, the results indicated that BMI had a positive grade level progression with a tendency being greater among the students in the private schools implying a cumulative exposure to lifestyle and dietary factors across elevated socioeconomic status.

The BMI classification showed a significant disparity in the two socioeconomic groups. The prevalence of underweight was greater among the government school students (38.3%), overweight and obesity prevalence was higher among the private school students (35.0%). In both groups, it was found that the normal BMI was seen in about half of the students.

The correlation between the type of schools and BMI level was significant ($p < 0.001$), and it proved that there was a strong correlation between the socioeconomic status and nutritional outcomes.

Table 1: Overall Comparison of BMI Between Government and Private School Students

School Type	n	Mean BMI (kg/m²)	SD
Government	120	17.2	2.8
Private	120	19.8	3.1

Table 2: Gender-Wise Comparison of BMI Between School Types

Gender	School Type	n	Mean BMI ± SD
Boys	Government	60	17.5 ± 2.7
	Private	60	20.1 ± 3.2
Girls	Government	60	16.9 ± 2.9
	Private	60	19.4 ± 3.0

Table 3: Grade 6 – Same Gender BMI Comparison

Gender	School	n	Mean BMI ± SD
Boys	Government	20	16.8 ± 2.1
	Private	20	18.9 ± 2.4
Girls	Government	20	16.4 ± 2.3
	Private	20	18.5 ± 2.2

Table 4: Grade 7 – Same Gender BMI Comparison

Gender	School	n	Mean BMI ± SD
Boys	Government	20	17.3 ± 2.6
	Private	20	20.4 ± 3.0
Girls	Government	20	16.7 ± 2.8
	Private	20	19.1 ± 2.7

Table 5: Grade 8 – Same Gender BMI Comparison

Gender	School	n	Mean BMI ± SD
Boys	Government	20	18.2 ± 2.9
	Private	20	21.0 ± 3.3
Girls	Government	20	17.6 ± 3.0
	Private	20	20.0 ± 2.9

IEER
Institute for Excellence in Education & Research

Table 6: Distribution of BMI Categories

BMI Category	Government n (%)	Private n (%)
Underweight	46 (38.3%)	18 (15.0%)
Normal weight	58 (48.3%)	60 (50.0%)
Overweight	12 (10.0%)	28 (23.3%)
Obese	4 (3.4%)	14 (11.7%)

Discussion:

The results of the current research underscore the existence of a huge difference in Body Mass Index (BMI) between high (private school) and low (government school) socioeconomic groups of students in the same gender and grade levels. These disparities represent the greater nutritional and lifestyle disparities that are recorded in other international settings.

In line with the past studies, socioeconomic status (SES) has a complicated impact on the nutritional status of school children. In cross-sectional analysis comparing primary schools in Pakistan (public and private), children with lower socioeconomic backgrounds had significantly worse nutritional status, and a better proportion of them was below the 5th BMI percentile than their higher socioeconomic counterparts. In particular, 41 per cent. of lower socioeconomic children were below the 5th BMI percentile, as compared to 19.3 per cent. of upper socioeconomic children, suggesting that undernutrition is more of a burden among the disadvantaged.[6]

Equally, in a comparative analysis in Faisalabad, the students in the private school, serving as a proxy of higher SES, had a higher weight and height than government school students, which supports the association between access to nutritious food and socioeconomic standing and growth outcomes. Such findings are consistent with general findings indicating that poverty, food insecurity, and parental education are still the key determinants of under-nutrition amongst low-SES populations.[7]

In contrast to the low SES trends, other studies have reported increased prevalence of BMI and obesity among children with higher socioeconomic status, especially children in urban environment. As an example, in a study of adolescents in Indian schools, overweight and obesity were found to be much higher among students in the private schools than the government school counterparts, with the adolescents in the former exhibiting a high BMI, waist circumference, and other adiposity indices.[8]

This is recapitulated in Ghana where the average BMI and waist-height ratio of the children enrolled in the privately-operated schools were much higher than in the government-operated schools and the children were more likely to be overweight and obese. The results indicate the changes in dietary habits and body weight levels that are correlated with the increased SES (referring to the increased intake of high-energy food and more sedentary lifestyles, i.e. screen time and less outdoor play).[9]

The dual burden of malnutrition, both under and overnutrition in low and high-SES children respectively, has been witnessed in most developing countries that are experiencing rapid urbanization. A representative study of primary school children in Lahore in Pakistan showed an overall overweight prevalence of 17 and obesity of 7.5 where SES was a strong independent predictor of overweight. This implies that lower SES is still a risk factor of underweight and growth deficits, whereas higher SES is a risk factor of excessive BMI outcome.[10,11]

The gender differences in comparisons also add to the insight on BMI differences. Whereas a few studies reflect that there are little gender disparities in overweight prevalence, there are those which propose divergent patterns. In the Pakistani situation, there was no significant gender difference in the prevalence of the overweight, but obesity was more prevalent among boys than girls. This can be the indication of gender-specific cultural or behavioral standards that have an impact on physical activity and nutrition.[12]

The grade-based analyses also display a significant trend, with older children or children with higher grades tending to have higher BMI than younger ones, which is potentially explained by the fact that children are exposed to the obesogenic environment

longer, and increasing energy balance with age in children. These age and grade correlations stress the necessity of the specific interventions at certain stages of development.

A number of mechanisms have been put forward to describe the perceived links between SES and BMI. Under nutrition and low BMI among low SES groups is linked to food insecurity, poor intake of various diets and maternal literacy. On the other hand, children in wealthier families tend to be more exposed to high-energy foods, fast foods, and non-active activities, which lead to the risks of overweight and obesity.[13]

The factors of lifestyle and environment are also important. An example is that the school food environment, policies of physical activity, and access to recreational areas differ among SES settings. Other studies reveal that the children in the high SES schools eat more calorie-dense, and they engage more often in sedentary activities, but those in the low SES settings can also have barriers to healthy nutrition, so BMI patterns across contexts are variable.[14]

The differences in these nutritional profiles show the need to have differentiated strategies in public health. Interventions to enhance food security, diet quality, and undernutrition may be needed in the Low SES schools, whereas obesity prevention programs with a focus on balanced diets, physical activity, and less sedentary habits may prove effective in high SES schools. Importantly, interventions that are specific to gender and grade can also help increase effectiveness, which means that differentiated needs will be addressed.[15]

Limitation of study:

This research has some limitations which have to be looked into when interpreting the results. As a cross-sectional design, it is impossible to determine the causal relationships between socioeconomic status and BMI. The socioeconomic categorization was done by type of school, and it might not be the accurate indicator of the household income level, education of parents, and living standard. The dietary intake was not measured, the level of physical activity was not evaluated, and screen time was not measured, which could have affected the outcomes of the BMI. The research was carried out in a small geographical region limiting the generality to other groups. Further, BMI does not distinguish fat mass and lean mass alone which can have some consequences on the accuracy of nutritional assessment.

Conclusion:

The current research findings reveal that socioeconomic status and Body Mass Index are closely related between school-going children. The students in the higher socioeconomic status (and hence those in the private school) showed increased BMI, on average than the ones in the government schools of the same gender and grade level. Analysis on gender showed that boys and girls belonging to better socioeconomic status possessed higher values of BMI with just a little difference between boys. The same gender and grade comparison methodological approach reduced the confounding effect of age and pubertal difference making the observed associations strong. Such outcomes indicate that the targeted interventions in the public health are urgently required. Government schools need food adequacy strategies such as school feeding program, health education, and screening of growth deficiencies in early life. Policy makers, teachers and medical staff should work together to come up with combined school-based health programs that cater to both ends of malnutrition. This research provides useful information regarding the socioeconomic differences in child nutritional status and use of early preventive measures to sustain healthy development and wellbeing.

REFERENCES:

World Health Organization. **Growth reference data for 5–19 years**. Geneva: WHO; 2007.

de Onis M, Lobstein T. Defining obesity risk status in the general childhood population: which cut-offs should we use? *Int J Pediatr Obes*. 2010;5(6):458-460.

Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*. 2013;382(9890):427-451.

Singh GK, Siahpush M, Kogan MD. Rising social inequalities in US childhood obesity, 2003–2007. *Ann Epidemiol*. 2010;20(1):40-52.

Monteiro CA, Conde WL, Popkin BM. Income-specific trends in obesity in Brazil: 1975–2003. *Am J Public Health*. 2007;97(10):1808-1812.

Mushtaq MU, Gull S, Abdullah HM, Shahid U, Shad MA, Akram J. Prevalence and socioeconomic correlates of overweight and obesity among Pakistani primary school children. *BMC Public Health*. 2011;11:724.

Wang Y, Lim H. The global childhood obesity epidemic and the association between socioeconomic status and childhood obesity. *Int Rev Psychiatry*. 2012;24(3):176-188.

Impact of socioeconomic factors on nutritional status in primary school children. *PubMed*. 2005.

Mehboob Q, Arif S, Arif W. Assessment of nutritional status of school children in public and private sector schools by anthropometry. *Annals of Punjab Medical College*. 2021.

Overweight and obesity among adolescents, a comparative study between government and private schools. *PubMed*.

Association between school-level attributes and weight status of Ghanaian primary school children. *BMC Public Health*.

Prevalence and socioeconomic correlates of overweight and obesity among Pakistani primary school children. *BMC Public Health*.

Wang Y, Lim H. The global childhood obesity epidemic and the association between socioeconomic status. *Int Rev Psychiatry*. 2012;24(3):176–188.

de Onis M, Blössner M, Borghi E. Global prevalence and trends of overweight and obesity among preschool children. *Am J Clin Nutr*. 2010;92(5):1257–1264.

Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. *Nutr Rev*. 2012;70(1):3–21.

IEER
Institute for Excellence in Education & Research