

Research Article

Determinants of Eating Habits and Body Mass Index in Transition; A Comparative Cross-Sectional Study of Public and Private Schools of Lahore

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Abstract

Background: Pakistan is facing a double burden of disease. Nutrition has an impact on nutritionally related non-communicable diseases. Malnutrition in adolescent age continues in adulthood so interventions in this stage can help us fight this emerging problem.

Objective: To determine the nutritional status of school-going adolescents and their eating patterns and then compare them between public and private secondary schools of Lahore.

Methods: This analytical cross-sectional study was done on 372 school-going adolescents from 01.03.2023 to 20.06.2023 (3.5 months). A self-structured questionnaire was filled with interviews by convenience sampling. Weight and height were measured and BMI was plotted on WHO z charts to determine the nutritional status. Data were entered and analyzed by SPSS Version 21. The chi-square test was used to compare BMI and its determinants. Factors found significant were subjected to Binary logistic regression. P-value ≤ 0.05 was taken as significant.

Results: Out of the 372 school-going adolescent participants had a mean age of 14.86 years SD \pm 1.75 (164 males and 208 females). 76(20.43%) were underweight, 201 (54.03%) had normal weight, 66(17.74%) were overweight and 29(7.8%) were obese. Public Schools had higher odds of undernutrition AOR 1.49 and lower odds of overweight and obesity AOR 0.38. Males had a reduced chance of undernutrition AOR 0.59 while the increased odds of overweight/ Obesity AOR 1.81. Age groups 11 to 15 years had reduced odds of undernutrition as compared to 16 to 19 years AOR 0.53 and increased odds of overweight/ obesity as compared to 16 to 19 years AOR 2.00.

Conclusion: There is a significant difference in the nutritional status and eating habits of adolescents between public and private schools. Undernutrition is higher in public schools, among females and age 16 to 19 years. Nutritional interventions should be strengthened in school health services.

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Introduction

Malnutrition refers to deficiencies or excesses in nutrient intake, imbalance of essential nutrients

or impaired nutrient utilization. The types include over-nutrition, under-nutrition, specific deficiencies and micronutrient deficiencies.¹ Eating Habits and nutritional status are related. They are influenced by multiple psychosocial, physical, and cultural factors. Adolescence is a critical time of transition in life. Malnutrition in adolescent age continues in adulthood so interventions in this stage can help us fight this emerging problem.



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Every country in the world is affected by one or more forms of malnutrition. Combating malnutrition in all its forms is one of the greatest global health challenges.² Obesity is a preventable emerging pandemic and is a major contributor to many non-communicable diseases such as stroke, myocardial infarction, diabetes, hypertension, and certain cancers.³ Undernutrition continues to remain a public health problem in adolescents which can result in repeated infections and a decrease in cognitive ability.² Females are more prone to undernutrition and micronutrient deficiency during their growing phase.⁴

Approximately 340 million children and adolescents from age 5-19 years were overweight or obese in 2016. According to WHO, 18% of adolescents are overweight whereas obesity among girls and boys is 6% and 8% respectively.⁵ Cardiovascular diseases (such as heart attacks and stroke, commonly linked to high blood pressure), some malignancies, and diabetes are diet-related NCDs. Poor nutrition and unhealthy diets are global risk factors for many diseases.⁶ In a study conducted in the USA, the prevalence of obesity is found to be greater in low-income groups due to increased intake of energy-dense diet, junk foods, physical inactivity, and less consumption of fruits and vegetables.⁷ Another study demonstrated that undernutrition is more common in lower socioeconomic classes.⁸ Eating habits differ in students who are living at home from those who stay away. A study shows that students at home eat more home-cooked food including vegetables, meat, and fish; whereas those who stay away from home find it more difficult to maintain a healthy diet.⁹

Pakistan National Human Development reports that 64% of the population in Pakistan is below 30 years of age. Youth is the future of Pakistan.¹⁰ School Health program was launched in 2005 with an aim to improve the health of school-going children as poor health affects the performance of students. Screening and timely referral through capacity building of teachers were incorporated into this program.¹¹ Breakfast has a positive effect on the body mass index of adults.¹² A study conducted in Baluchistan revealed that only 45 percent of school-going children fall in the normal body mass index range.¹³

Nutritional programs have targeted more towards maternal and children under 5 years of age. Age groups 11 to 19 years remain excluded from the monitoring frame-

works and nutritional programs. The rationale of this study is to determine the nutritional status of school-going adolescents and their eating patterns and then compare them between public and private secondary schools. Knowledge generated from this study will provide insight into the magnitude of the problem in this specific age group. A comparison between public and private schools in Lahore will give insight into the school health program.¹¹ It will also measure the impact of many nutritional-specific and nutritional-sensitive interventions in this area.

Methods

After approval from institutional review board, this analytical cross-sectional study was done in public and private secondary schools registered with the Board of Intermediate and Secondary Education, Lahore¹³ from 01.03.2023 to 20.06.2023 according to STROBE guidelines for cross-sectional studies. The sample size was calculated to be 372 with a 95% Confidence Interval and a 5% margin of error using an anticipated frequency of overweight and obesity to be 26%.¹⁴ 3 schools from the Public and 3 from the Private sector were included. Convenience sampling was done for data collection. All school-going adolescents from age 11 to 19 years were included in the study. Semi-government schools, trust Schools, history of any chronic disease, and food allergy were excluded from the study.

After obtaining informed written consent from the school and parents or guardians, students were interviewed in the presence of their teachers. Performa was self-designed by a literature search.¹¹⁻¹⁴ For data quality assurance questionnaire was pretested on 25 adolescents. Feedback was incorporated in the final questionnaire. The interviewer filled the questionnaire with biodata, nutritional status, and eating habits. The data collector was trained to take physical measurements (height and weight). For measuring height Stadiometer was used, and adolescents were made to stand straight. Weight was recorded in kg and measured with weighing scales. For improving quality height and weight were taken 2 times and their mean was taken. Body mass index was calculated and compared with a z-score chart given by the World Health Organization to determine nutritional status. All questionnaires were reviewed for completeness and consistency.

Data obtained were entered and analyzed using a statistical package for social sciences (SPSS) version 21. For

quantitative variables (like age, weight and height, Body Mass Index) mean and standard deviations were calculated. For qualitative variables (like gender, type of school and class in school, number of siblings, and amount of servings of milk, fruits, vegetables, meat, caffeine, and soda drinks) frequency and percentages were calculated. Chi-square test was used to compare categories of Body mass index (underweight, normal weight, overweight and obesity) between public and private schools. p-value ≤ 0.05 was considered significant. Factors found significant were entered in binary logistic regression.

Results

In this study, there were a total of 372 school-going adolescent participants with a mean age of 14.86 years with a standard deviation of 1.75 years. There were 186 adolescents were from public schools and 186 were from private schools of Lahore. There were 164 males and 208 females in the study. The mean weight of respondents was 49.47 kg (SD 13 kg), and mean height was 159.08 cm (SD 14.47 cm). 76(20.43%) adolescents were underweight, 201 (54.03%) had normal weight, 66(17.74%) were overweight and 29(7.8%) were obese. The comparison of BMI of study participants in public and private colleges is shown in Figure 1.

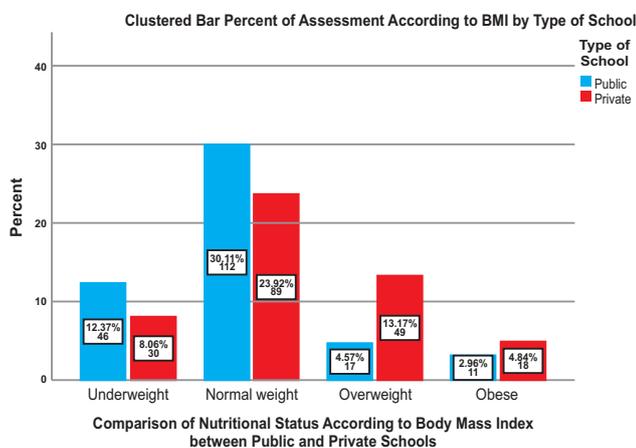


Figure 1: Comparison of Body Mass Index between adolescents of Public and Private Schools

Chi-square test was used to compare BMI with the type of school, age, maternal education, paternal education, and number of siblings as shown in Table 1. Type of school, gender and age groups found significant for underweight and overweight/obesity were subjected to binary logistic regression as shown in Table 2. Public

Schools had higher odds of undernutrition Adjusted odds ratio AOR was 1.49 (95% CI 0.88 to 2.54) and lower odds of overweight and obesity AOR was 0.38 (95% CI 0.22 to 0.64). Males had a reduced chance of undernutrition AOR was 0.59 (95% CI 0.34 to 1.02) while the increased likelihood of overweight/ Obesity

Table 1: Bivariate analysis of BMI (Underweight and Overweight/ Obese) according to Age, Gender, Parental Education and No. of siblings

Factors (n)	Under-weight	P-value	Over-weight or Obese	P-value
Type of School				
Public (186)	46 (24.7%)	0.04	28 (15.0%)	0.000
Private (186)	30 (16.3%)		67 (36.0%)	
Age Groups in years				
11-15 (236)	39 (16.5%)	0.01	71 (30.0%)	0.008
16-19 (136)	37 (27.2%)		24 (17.6%)	
Gender				
Males (164)	26 (15.8%)	0.05	54 (32.9%)	0.008
Females (208)	50 (24.4%)		41 (19.7%)	
Categories of Mothers' Education				
Undergraduate (152)	33 (21.7%)		32 (21.0%)	
Bachelors (152)	28 (18.4%)	0.72	37 (24.3%)	0.055
Masters or above (68)	15 (22.0%)		26 (38.2%)	
Categories of Fathers' Education				
Undergraduate (124)	26 (20.9%)		25 (20.1%)	
Bachelors (187)	38 (20.3%)	0.97	55 (29.4%)	0.460
Masters or above (61)	12 (19.6%)		15 (25.6%)	
Number of Siblings				
0-2 (138)	33 (23.9%)		34 (24.6%)	0.334
3-5 (165)	30 (18.2%)	0.55	49 (29.7%)	
>5 (69)	13 (18.8%)		12 (17.4%)	

Table 2: Binary Logistic Regression for underweight and overweight/Obesity for significant factors in bivariate analysis

Variables	Undernutrition			Overweight/Obesity		
	Adjusted odds ratio AOR	95% Confidence Interval	P-value	Adjusted Odds Ratio AOR	95% Confidence Interval	P value
Type of School						
Public School	1.49	0.88 to 2.54	0.15	0.38	0.22 to 0.64	0.000
Private School	Reference			Reference		
Age categories						
11-15 years	0.53	0.31 to 0.88	0.01	2.00	1.19 to 3.38	0.009
16-19 years	Reference			Reference		
Gender						
Male	0.59	0.34 to 1.02	0.06	1.81	1.08 to 3.03	0.024
Female	Reference			Reference		

AOR was 1.81 (95% CI 1.08 to 3.03). Age groups 11 to 15 years had reduced odds of undernutrition as compared to 16 to 19 years AOR 0.53 (95% CI 0.31 to 0.88). Age groups 11 to 15 years increased odds of overweight/obesity as compared to 16 to 19 years AOR 2.00 (95% CI 1.19 to 3.38).

Eating habits were compared between public and private schools as shown in Table 3. Meat intake, Fizzy drinks intake, Caffeine intake, No. of meals and physical activity differed significantly between public and private schools. Meat intake and Fizzy drinks intake were more frequent in private schools. P-value <0.05 was taken as signifi-

cant. Private schools had a higher proportion of adolescents having 5 meals a day. Recommended Physical activity of more than 60 minutes per day was also significantly higher in adolescents in private schools.

Discussion

This study was done on students in Lahore's public and private schools to assess their nutritional status with BMI and eating habits. The adolescent age group has been overlooked in Pakistan's programs. A life course approach should be used to prioritize adolescent nutrition.

Table 3: Comparison of Eating Habits between Public and Private Schools n=372

Eating Habits	Both Schools	Public School	Private School	p-value
Milk Intake				
0-1 glass/day	223 (60.0%)	123 (66.1%)	100 (53.1%)	0.043
2-3 glasses/day	100 (26.8%)	44 (23.65%)	56 (30.1%)	
>glasses /day	49 (13.2%)	19 (10.25%)	30 (16.8%)	
Fruit Intake				
Daily	207 (55.6%)	104 (55.9%)	103 (55.4%)	0.127
Twice or thrice weekly	109 (29.4%)	48 (25.85%)	61 (32.8%)	
Once Weekly	56 (15.0%)	34 (18.25%)	22 (11.8%)	
Vegetable Intake				
Daily	142 (38.2%)	66 (35.5%)	76 (40.9%)	0.118
Twice or thrice weekly	177 (47.6%)	98 (52.7%)	79 (42.5%)	
Once Weekly	53 (14.2%)	22 (11.8%)	31 (16.6%)	
Meat Intake				
Daily	103 (27.7%)	39 (21.0%)	64 (34.4%)	0.000
Twice or thrice weekly	189 (50.8%)	90 (48.4%)	99 (53.2%)	
Once Weekly	80 (21.5%)	57 (30.6%)	23 (12.4%)	
Fizzy Drinks Intake				
0-3 times per week	198 (53.2%)	98 (52.7%)	100 (53.8%)	0.06
4-5 times per week	94 (25.3%)	48 (25.8%)	46 (24.7%)	
6 or more times per week	80 (21.5%)	40 (21.5%)	40 (21.5%)	
Multivitamin Intake				
Take multivitamins	121 (32.5%)	54 (29.0%)	67 (36.0%)	0.150
Do not take multivitamins	251 (67.5%)	132 (71.0%)	119 (64.0%)	
Number of Meals				
2 times a day	95 (25.5%)	73 (39.2%)	22 (11.8%)	0.000
3 or 4 times a day	152 (40.9%)	74 (39.8%)	78 (41.9%)	
5 times a day	125 (33.6%)	39 (21.0%)	86 (46.3%)	
Breakfast intake				
Skips breakfast frequently	131 (35.2%)	67 (36.0%)	64 (34.4%)	0.745
Do not skip breakfast	241 (64.8%)	119 (64.0%)	122 (65.6%)	
Physical Activity (Moderate or vigorous)				
Less Than 30 Minutes	236 (63.4%)	132 (71%)	104 (55.9%)	0.005
30 to 60 Minutes	92 (24.75%)	40 (21.5%)	52 (28.0%)	
More Than 60 Minutes	44 (11.85%)	14 (7.5%)	30 (16.1%)	

Nutrition-specific and nutrition-sensitive interventions for the adolescent age group should be targeted.

This study found that 20.43% of school-age adolescents were underweight. Similar results have been seen in other studies. A study showed that 27.1% of Gujrat's teenagers were classified as underweight.¹⁵ Similar results were found in a study of school children in Islamabad, Pakistan.¹⁴ While the prevalence of underweight teenagers is lower in developed countries. A study in China found that 6% of adolescent girls were underweight.¹⁶ This could be because emerging countries have higher rates of poverty and lower levels of education than developed countries. In this study, the private sector had more overweight and obese teenagers. ($P=0.00$) Private school pupils may be from a higher socioeconomic class. A survey of Multan school pupils found 10% overweight and 5% obese.¹⁷ This difference could be because of inclusion criteria the study included students of lower ages as well. Developed nations have a higher prevalence of overweight and obese adolescents. Trends reveal that 1 in 3 Canadian kids is overweight or obese.¹⁸ This is attributed to increased consumption of high-calorie foods, fast food, soda, and food security. Adolescent overnutrition is prone to persist into adulthood. Low self-esteem promotes low mood, sadness, anxiety, and other mental health issues.

In this study, undernutrition was related to female gender, public schools, and age 16 to 19 years. Previous studies have also shown that females are more prone to undernutrition, especially in developing countries. Whereas males are preferred in our part of society. Public schools have increased undernutrition as in this area people in the middle and upper class prefer private schools over public schools. In this study, aged 16 to 19 years have more undernutrition. This finding contrasts with the previous studies which show that 11 to 14 years have a higher prevalence of undernutrition.^{14,15} This may reflect difference area differences due to cultural and different eating habits. Moreover, this age group has more access to junk food and unhealthy diets. In this study, 32.5% of adolescents were consuming multivitamins. This reveals that multivitamins and dietary supplements are widely used in Pakistan. In Iran, 34% of children and adolescents use multivitamins.¹⁹ Adolescents have growing bodies and multivitamins can support physical growth in adolescents.

Many non-communicable diseases are caused by inactivity. Inactivity is defined as less than 60 minutes of moderate to strenuous exercise each week. According to WHO, 80% of teenagers were inactive.²⁰ This survey found 88.1 percent of adolescents to have physical activity less than 60 minutes which is higher than the global average. Inactivity is rising due to excessive screen time and indoor activities. Moreover, there is limited access to parks and recreational areas.

In this survey, 35.2 percent of adolescents skipped breakfast. A study of college students revealed that 2/5 of them skipped breakfast.^{21,22} Skipping breakfast can harm one's health. The high frequency may be owing to adolescents waking up late and having less time to prepare and consume breakfast. Students in the private sector had much more meals per day (p -value 0.000).

The consumption of fizzy drinks varies greatly. In this study, 46.77% adolescents were consuming fizzy drinks frequently. Excessive soda consumption is harmful to one's health. They provide empty calories and lack nutritional benefits. Obesity and several adiposity-related malignancies are linked to soda consumption.²³ The study found a substantial difference in BMI between girls from the private and public sectors. This could be because males are prioritized in society. A European study found the opposite. Females were more likely to be overweight.^{25,26} This study may have some limitations. The responses were self-reported, therefore recall bias exists. It is a cross-sectional study so the causal relationship cannot be established. However, the strengths are that it gave an in-depth survey of school-going adolescents. Adolescent health needs to be prioritized as malnutrition causes increased chances of infections and decreased school performance. Nutrition-sensitive and specific interventions should be targeted specifically for the adolescent age group.

Conclusion

The body mass index of public and private school-going adolescents shows a higher frequency of undernutrition in public schools and a higher frequency of overweight and obese adolescents in private schools. Female gender and age 16 to 19 years have increased undernutrition. Public and private school-going adolescents have significant differences in eating habits (meat intake, physical activity, and number of meals per day). School health

programs should incorporate regular health education and healthy eating habits in secondary schools to improve the nutritional status of adolescents.

Ethical Approval: The Institutional Review Board approved the study vide No. 108/RC/KEMU.

Conflict of Interest: The authors declare no conflict of interest.

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Authors' Contribution:

MN: Conception and design, data analysis and manuscript drafting and final approval

KJ: Manuscript appraisal and data analysis

AA: Data Collection and manuscript writing

SR: Data analysis

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