

ORIGINAL ARTICLE

FREQUENCY OF OBESITY AND ASSOCIATION OF DIETARY DIVERSITY AMONG CHILDREN IN RAWALPINDI; A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: The prevalence of childhood obesity has increased dramatically in recent decades leading to morbidity and an increased risk of non-communicable diseases later in life. In Pakistan childhood obesity has become a concerning issue yet limited data exists on its prevalence. Previously, it was thought that only children living in the developed countries were at the risk of being overweight and obese, however the new incoming data suggests otherwise. The vast majority of overweight or obese children live in developing countries, where the rate of increase has been more than 30% higher than that of developed countries.

Material & Methods: A cross-sectional study was conducted at two private schools of Rawalpindi from January 2023 to June 2023. A total of 139 Children between 5 to 12 years of age were recruited in the study through Stratified Random Sampling technique. The study was approved by the Ethical Review Committee (FUSH). Data was collected through a customized questionnaire. Body Mass Index (BMI) z-score was used to screen for overweight and obesity. Data was analyzed using SPSS.

Results: 4 out of 139 children were obese and hence the prevalence of obesity was 2% among the observed children. The children who consumed more than the recommended amounts of daily fruits ($p=0.111$), vegetables ($p=0.018$), dairy products ($p=0.262$), meat products ($p=0.136$), wheat products ($p=0.094$), water intake ($p=0.247$), fried food ($p=0.024$), sweets/sugar ($p=0.009$), and processed food ($p=0.08$) were more likely to be obese. Children with 60 minutes of daily physical activity were less likely to be obese. ($p=0.021$).

Conclusion: Childhood obesity remains relatively underrecognized in Pakistan, with approximately 2% of children aged 5-12 affected. There is a need for promoting healthy dietary habits, encouraging balanced consumption of fruits, vegetables, and water, while discouraging the intake of fried food, sweets/sugar, and processed food. Targeted and culturally appropriate interventions are necessary to foster a healthier lifestyle among children.

Key Words: Overweight, Obesity, Dietary Diversity.

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INTRODUCTION

Obesity in children has dramatically increased in recent times, making it a worldwide epidemic, resulting in childhood psychiatric, psychosocial and psychological disorders, with higher chances of developing NCDs (non-communicable diseases) later on.¹ Psychological disorders like depression occur more often in obese children.²

Obesity has reached global dimensions, with its prevalence in children becoming eight folds since 1975. Contrary to the popular belief of a greater predisposition of children being overweight and obese in the developed countries, the vast recent data suggests that the majority of such children live in the developing countries, with a 30% increase in rate as compared to the developed countries.³ An increase of about 24% has occurred in overweight children under five years of age in low-income countries.⁴

Globally, after extensive exploration into the subject, many interventions have been implemented to prevent the school going children from becoming overweight or obese early on. Unfortunately, that is not the case in Pakistan, where this problem has been gravely neglected, with only 2 conducted surveys having statistically representative samples; the National Health Survey of Pakistan (NHSP)1990-94, and the Karachi Survey 2004-05, reporting the overweight prevalence as 3% and 5.7% respectively in Urban school going children.⁵ As per the National Nutritional Health Survey Pakistan 2018, 9.5% of the children under the age of 5 years are overweight, which is double the amount compared to the 5% in 2011. Childhood obesity is a very challenging, yet under-recognized problem in our country. The total number of adipocytes is established by the time of adolescence and is higher in people who were obese as children, providing another reason for concern about childhood obesity. This makes it essential to apply appropriate targeted interventions as per the situation in the communities concerned at the earliest possible time.^{6,7} A holistic approach, involving participation from not only the patient, but the family, school, community, and even changed government policies, is required to effectively manage obesity. Mainstay for treatment remains lifestyle changes, with a healthy diet and sufficient physical activity. In severe cases, however, medications and bariatric surgery can play critical roles.⁸

MATERIAL AND METHODS

A cross-sectional study was conducted at two private schools in Rawalpindi from January 2023 to June 2023. A total of 139 Children aged 5 to 12 years were recruited in the study through Stratified Random Sampling technique. The study was approved by the Ethical Review Committee (FUSH). The inclusion criteria of the study were children between the age of 5-12 years. Participants who were absent or had some chronic diseases were excluded from the study.

Data was collected using a customized questionnaire consisting of 14 questions, divided into two categories: diet-related behavioral data and lifestyle-related data. The questionnaire was first translated into Urdu and then retranslated into English to ensure high-quality standards. A pilot study was conducted with a group of 30 individuals to refine the instrument. To ensure better understanding and comprehension, the questionnaire was administered in Urdu by a group of researchers, who also recorded the responses to minimize data loss and reduce the likelihood of errors during the data collection process. Body Mass Index (BMI) z-score was used to screen for overweight and obesity. Statistical analysis was performed using SPSS, with p-values derived to determine the significance of associations.

RESULTS

Children with diets rich in fruits and vegetables showed higher obesity prevalence, suggesting a complex relationship between diet and weight (table-I). Findings indicated that children engaging in at least 60 minutes of daily physical activities had lower obesity rates, highlighting the significance of regular exercise to combat childhood obesity.

Factors such as low physical activity, limited vegetable intake, high fried food consumption, and excessive sweets/sugar intake showed significant associations with obesity, indicating their role as potential contributors to obesity. Other factors like screen time, water intake, and processed food consumption showed no statistically significant relationships (table-II).

Table:1 Prevalence Of Obesity And Its Association With Dietary Diversity

	Underweight	Normal	Overweight	Association
Daily fruit (apple, banana, mango etc..) intake				
Less than the recommended amount	34(24.4%)	5(3.59%)	0(0.00%)	0.111
Equal to the recommended amount	41(29.4%)	8(5.75%)	2(1.43%)	
More than the recommended amount	38(27.3%)	9(6.47%)	2(1.43%)	
Daily vegetable intake:				
Less than the normal amount	39(28.0%)	9(6.47%)	1(0.71%)	0.018
Equal to the normal amount	49(35.2%)	9(6.47%)	1(0.71%)	
More than the normal amount	25(17.9%)	4(2.87%)	2(1.43%)	
Daily intake of dairy products (milk, eggs, yogurt)				
Less than the recommended amount	28(20.1%)	3(2.15%)	0(0.00%)	0.262
Equal to the recommended amount	55(39.5%)	6(4.31%)	1(0.71%)	
More than the recommended amount	30(21.5%)	13(9.35%)	3(2.15%)	
Daily intake of meat products (chicken, red meat, fish)				
Less than the recommended amount	46(33.0%)	5(3.59%)	1(0.71%)	0.136
Equal to the recommended amount	34(23.4%)	6(4.31%)	2(1.43%)	
More than the recommended amount	33(23.7%)	1(0.71%)	1(0.71%)	
Daily intake of wheat products (bread, pasta and rice)				
Less than the recommended amount	11(7.91%)	2(1.43%)	0(0.00%)	0.094
Equal to the recommended amount	59(42.4%)	11(7.91%)	1(0.71%)	
More than the recommended amount	43(30.9%)	9(6.47%)	3(2.15%)	
Daily fried food (samosa, French fries, pakora, nuggets etc..) intake				
Less than the recommended amount	30(21.5%)	4(2.87%)	2(1.43%)	0.024
Equal to the recommended amount	1(22.3%)	4(2.87%)	1(0.71%)	
More than the recommended amount	52(37.4%)	1(0.71%)	1(0.71%)	
Daily water intake				
Less than the recommended amount	57(41.0%)	4(2.87%)	1(0.71%)	0.247
Equal to the recommended amount	29(20.8%)	7(5.03%)	1(0.71%)	
More than the recommended amount	27(19.4%)	11(7.91%)	2(1.43%)	
Daily sweets/sugar (toffee, chocolate, sweet dish, flavored milk etc..) intake:				
Less than the recommended amount	44(31.6%)	9(6.47%)	1(0.71%)	0.009
Equal to the recommended amount	31(22.3%)	5(3.59%)	2(1.43%)	
More than the recommended amount	38(27.3%)	8(5.75%)	1(0.71%)	
Processed foods (lays, biscuits, cold drinks) as a significant portion of daily food intake:				
Less than the recommended amount	52(37.4%)	14(10.0%)	2(1.43%)	0.08
Equal to the recommended amount	44(31.6%)	4(2.87%)	2(1.43%)	
More than the recommended amount	17(12.2%)	4(2.87%)	0(0.00%)	

Table 2: Prevalence of Obesity and its Association with Lifestyle Related Data

	Underweight	Normal	Obese	Association
Is your screen time (TV and Phone) less than 3 hours?				
Yes	72 (64%)	16 (73%)	2 (50%)	0.18
No	41 (36%)	6 (27%)	2 (50%)	
Do you use your phone and TV while eating food?				
Yes	50 (44%)	10 (45%)	2 (50%)	0.14
No	63 (56%)	12 (55%)	2 (50%)	
Is your daily physical activity equal to or more than 60 minutes?				
Yes	90 (80%)	17 (77%)	1 (33%)	0.021
No	23 (20%)	5 (23%)	3 (67%)	
Do you sleep for 9-10 hours daily?				
Yes	72 (64%)	20 (91%)	3 (67%)	0.179
No	41 (36%)	2 (9%)	1 (33%)	
Do you opt for walking or cycling over the use of motor vehicles for short distance				
	63 (56%)	13 (59%)	2 (50%)	0.021
	50 (44%)	9 (41%)	2 (50%)	

DISCUSSION

Out of a total of 139 students, 4 were obese, which comes in as 2%. Children consuming more than the recommended amounts of daily fruits ($p=0.111$), vegetables ($p=0.018$), dairy products ($p=0.262$), meat products ($p=0.136$), wheat products ($p=0.094$), water intake ($p=0.247$), fried foods ($p=0.024$), sweets/sugars ($p=0.009$), and processed food ($p=0.08$) were more likely to be obese, while the children with 60 minutes of daily physical activity were less likely ($p=0.021$). The results showed that the significant factors were the vegetable intake, fried food intake, sugar intake, and the daily physical activity, which have their P values less than 0.05.

Study for obesity prevalence, carried out in Lahore, Pakistan, revealed 17% of the children to be overweight, and 7.5% to be obese. Out of these, 2% were severely obese. The IOTF cutoffs brought in the overweight at 33%, and the obesity at 24%. Overweight was more prevalent in the boys (17%) as compared to girls (16.5%), but this association was statistically insignificant. Obesity, on the other hand, was significantly higher in boys (9%) than in the girls (6%), ($P=0.028$).⁹

Latest statistics from China suggest that among the children under 15 years of age, the proportion of obesity has increased from 15% in 1982 to 27% today.¹⁰ Children in the urban China were found to be more obese, not only because the children in rural China were more physically active, but also because the children in urban China consumed considerable amounts of more fat I.e. 23-30% vs 16-20%.¹¹ According to NFHS report, in India, the prevalence in overweight children have increased from 2.1%(2015-2016) to 3.4%(2019-2021).¹² In Bangladesh, however, the prevalence percentages vary depending on the source. A systematic review and meta-analysis revealed that the prevalence varied from 1.0% to 23.0% among children and 1.7% to 25.6% among adolescents.¹³ In 2014, a school-based countywide survey study demonstrated that among children (6-15 years of age), 9.6% were overweight and 3.5%

were obese.¹⁴ In our study, 4 out of the 139 children were obese, which makes it almost 2% of the population observed. Fried food was associated with obesity. In India, Jamnagar, 22.04% and 5.20% of the urban population were found to be overweight and obese respectively.¹⁵

In the research conducted in Bangladesh, 518 adolescents enrolled in college were selected as participants, and their average age was found to be 17.03 years with a standard deviation of 1.36. Among the total participants, 354 individuals (about 68.3%) fell into the category of those consumed fast food at least once a week. Among the fast-food consumers, a significant proportion (approximately 64.1%) were identified as frequent consumers.¹⁶ In Spain, the findings of a study clearly suggested a relationship between fried food consumption and an increased prevalence of both general and central obesity. The odds ratio for the men for general obesity was 1.26. Similarly, the odds ratio for the women for general obesity was 1.25. Regarding central obesity, the odds ratio in men was 1.17 while in women, it was 1.28. These results suggest a significant correlation between increased consumption of energy from fried food and a higher risk of both general and central obesity in both men and women.¹⁷

In Pakistan, among 113 overweight participants, 46% consumed more than the recommended amount of fried food daily, while 26% consumed less, and 27% consumed an equal amount. Among 22 participants with normal weight, 63% consumed more than the recommended amount of fried food daily, while 18% consumed less and 18% consumed equal amount. Among 4 overweight participants, only one consumed more than the recommended amount of fried food, while the rest consumed less. In all these researches, all the subjects with high BMI consumed fried food. The comparison suggests a correlation between fried food intake and BMI status. The higher the fried food intake, the more overweight the person will be.

Association between vegetables and obesity

suggests that in urban Indian population, there is a greater consumption of fats, fruits and vegetables, ready-to-eat foods and sugar as compared to the rural population, where carbohydrates in the form of pellets and cereals are consumed more. Since the meat consumption in India, even in the non-vegetarians, is low as compared to the rest of the world, the main sources of proteins are cereal grains, followed by pulses and legumes. Broadly, calorie-dense food consumption is favored over food diversity, leading to micronutrient deficiencies, along with development of T2D and other related metabolic disorders.¹⁸

A 6 months long, randomized, single blind trial was carried out, in which the effects of fruits and vegetables along with low energy diet were used in supplementation to a prudent diet, for the management of 202 group A and 204 group B patients of myocardial infarction. Upon the 6 months follow up, the group A patients were found to have significantly lower mean body weight, glucose intolerance and waist-to-hip ratio, as opposed to the group B. Body weight defined by 5.3 kg in group A versus 2.2kg in group B. A significant decrease in systolic and diastolic blood pressures, serum triglycerides, along with an increase in serum high density lipoproteins was also observed in group A patients. The reason for these changes was that the group A patients had increased their daily fruit and vegetable consumption by 393 g/day, along with a 1160kJ/day decrease in energy intake. The more the subjects improved their diets, the better the results they saw in terms of lesser central obesity, lesser glucose intolerance and other associated disturbances.¹⁹ In China, there was an inverse relation between the later obesity and children lying in the highest and second highest quartile of traditional Chinese dietary pattern, as compared to those lying in the lowest quartile over 5 years. Likewise, there was a positive association between later obesity and children lying in the highest quartile of modern dietary pattern, in comparison to those children that were lying in the lowest quartile over 5 years. Chinese

adolescents and children have dietary patterns that are associated with obesity later on. These results prove once again how important dietary patterns of children really are, and how essential it is to incorporate culture-specific dietary interventions to target to reduce obesity rates in children and in adolescents.²⁰ A community-based survey to obtain information regarding behavioral risk factors for CNDs among 534 adults was conducted in Karachi, Pakistan. The results showed 22.5% of the adults to be suffering from anxiety/depression, 47.8% to not be having adequate fruits and vegetables intake, 60.1% to be physically inactive, and 49.8% to be overweight/obese. Inadequate fruits and vegetables intake was found to be greater in men, while clusters of the above risk factors were found to be much greater in women ($p < 0.001$). Study concluded the risk factors including the student's age, mother's education, intake of junk food, physical activity, and playing games are associated with obesity among female students at government school in urban areas of the country.²¹ In England, about one fourths of the children upon entry in schools are overweight/obese. The impact of a program designed to help give parents of infants and pre-school children the necessary skills and knowledge required for a healthier family lifestyle, was investigated. Considerable changes were seen, and most of them were retained at follow up. Greater self-efficacy and a better ability to encourage good behavior was reported by the parents ($p < 0.001$). Both the children and the adults reported an increased intake of fruits and vegetables, along with a decreased consumption of sweets, cakes and carbonated drinks (all $p < 0.01$). Positive changes were noted in the eating habits e.g. frequent family mealtimes, watching television while eating, or eating in response to some negative emotions ($p < 0.01$), and in adults, a reduced screen time ($p < 0.001$). It was thus concluded from the above results that the HENRY intervention proved to be of benefits to parents of both infants and school going children. Further findings also suggested that the

resultant positive behavioral changes could be maintained beyond the completion of the above study, thus acting as a way of protection against future obesity.²²

Association between sugar intake and obesity suggests that the research conducted in India indicates that the sugar consumption in India has risen, stemming from traditional sources as well as sugar-sweetened beverages (SSBs). This escalating trend in sugar intake becomes more metabolically relevant, considering the heightened predisposition in the people of India to develop conditions like hyperglycemia, insulin resistance, ectopic fat deposition, abdominal adiposity, atherosclerosis, which can be aggravated by reduced physical activity.²³

In China, a study was conducted to look for relation between intake of sugar-sweetened beverages (SSBs) and the development of obesity and hypertension in their children and adolescents. An analysis of the data from the 2014 National Interventional Program was done, considering the weight, height, waist circumference and blood pressure. The participants were asked to give information regarding their SSBs consumption, their dietary intake, their screen time, and physical activity. The findings showed that 66.6% of the total 53,151 participants consumed SSBs, with the boys, older children and adolescents with a greater screen time/high physical activity but low level of parental education, having higher consumption. The participants who had a greater consumption of SSBs had a greater risk of developing abdominal obesity.²⁴ One of the studies in Spain showed that 10.9% of the children were observed to be obese. A mean energy expenditure of 8.37 MJ/day was indicated in a daily activity questionnaire. The research analyzed various forms of carbohydrate intake, including total carbs, total, added and free sugars, and starches. It was found that a higher daily intake of the above greatly increased the chance of developing overweight/obesity.²⁵ Our research showed that the sugar intake is one of the contributing factor that contributes to obesity with a p-value of 0.009 that is less than 0.05, making it statistically significant.

Association between exercise and obesity suggests that a research done in Pakistan, it was observed that the children with a sedentary lifestyle, with less than an hour a day of physical activity(49%), were much more likely to be overweight/obese, in comparison to their peers with physical activity greater than twice weekly (53%) (all $p < 0.01$). This proved physical activity to have an independent inverse association with BMI.²⁶ In research done in Brazil, it was observed that exercise was used as a non-pharmacological agent to combat obesity, and that it reversed the adverse effects of obesity by modulation in the Microbiome Gut Axis.²⁷ From across Europe, a group of experts gathered evidence from a series of seven systematic literature reviews to fill the knowledge gap around obesity. It addressed the management of overweight and obesity with the help of exercise training. They gave attention to specific outcomes that had not been much reviewed before in such a population of people who were overweight/obese. Individuals who engaged in physical activity >250 min/week had reduced body fat and were better able to maintain body weight than the individuals who did not include physical activity as a part of their lifestyle.²⁸ From our results, P value for exercise came out to be 0.02, indicating that it is indeed a significant factor in reducing obesity. Similar results have been found in research done at national and international levels, where regular physical exercise has been shown to reduce and prevent obesity. The rest of the factors related to diet and lifestyle were insignificant, with their P values more than 0.05.

CONCLUSION

Childhood obesity remains relatively underrecognized in Pakistan, with approximately 2% of children aged 5-12 affected. There is a need for promoting healthy dietary habits, encouraging balanced consumption of fruits, vegetables, and water, while discouraging the intake of fried food, sweets/sugar, and processed food. Targeted and culturally appropriate interventions are

necessary to foster a healthier lifestyle among children.

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