

## Original Research Article

# Relationship between childhood obesity and dietary behavior in selected school-going children from Dhaka city, Bangladesh

Mohammad Rahanur Alam<sup>1\*</sup>, Mohammad Asadul Habib<sup>1</sup>, A. K. Obidul Huq<sup>2</sup>, Sumaiya Mamun<sup>3</sup>, Sompa Reza<sup>3</sup>, Abduz Zaher<sup>3</sup>

<sup>1</sup>Department of Food Technology and Nutrition Science, Noakhali Science and Technology University, Bangladesh

<sup>2</sup>Department of Food Technology and Nutritional Science, Mawlana Bhashani Science and Technology University, Bangladesh

<sup>3</sup>Institute of Nutrition and Food Science, University of Dhaka, Bangladesh

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### \*Correspondence:

Mr. Mohammad Rahanur Alam,  
E-mail: [rahanuralam@gmail.com](mailto:rahanuralam@gmail.com)

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## ABSTRACT

**Background:** The prevalence of non-communicable diseases is rising in Dhaka City, Bangladesh. Obesity is one of the significant risk factors for many non-communicable diseases. This research aimed to investigate the current prevalence of overweight and obesity among children in selected schools in Dhaka City through anthropometric evaluation, as well as to assess the correlation of various environmental determinants such as physical activity, dietary behavior, lifestyle habits, are associated with increased risk of obesity in children.

**Methods:** This school-based cross-sectional study was conducted among 106 participants (50 male and 56 female participants) aged 6-14 years selected by convenience sampling from four randomly selected primary schools of different regions of Dhaka city. A pre-tested questionnaire was used to collect data.

**Results:** The prevalence of overweight and obesity among school-going children 24.5%, 68% respectively. Factors associated with being obese included type of game ( $\chi^2=34.036$ ;  $p=0.001$ ), total playtime ( $\chi^2=17.788$ ;  $p=0.000$ ), TV and computer watch time ( $\chi^2=27.321$ ;  $p=0.007$ ), spend money to buy fast food ( $\chi^2=26.451$ ;  $p=0.002$ ), eating days fast food in a week ( $\chi^2=24.825$ ;  $p=0.003$ ), type of tiffin ( $\chi^2=19.757$ ;  $p=0.072$ ).

**Conclusions:** Less playtime, longer watching TV and computer, and eating more fast food are major risk factors for overweight and obesity among school-going children in Dhaka city. Interventions are needed to increase awareness of child overweight weight and obesity risk factors to decrease the prevalence of overweight and obesity.

**Keywords:** Bangladesh, Childhood obesity, Fast food, Malnutrition, Nutritional status

## INTRODUCTION

Today, obesity in children and adolescents is widely regarded as a global crisis, not only for its harmful physiological effects but also for its negative impact on quality and life-related risk factors.<sup>1</sup> The global prevalence of childhood obesity is rising from 4.2% to 6.7% in 1990-2010, and this trend is expected to reach 9.1% by 2020.<sup>2</sup> In 2011-2014, for children and

adolescents aged 2-19 years, the study found that the prevalence of obesity remained fairly stable at about 17 percent, affecting approximately 12.7 million children and adolescents. The study also found that the prevalence of obesity among 2 to 5 year-olds was 8.9 percent compared to 17.5 percent for 6 to 11-year-olds and 20.5 percent for 12-to 19-year-olds. Child obesity is also a major concern in developing countries.<sup>3,4</sup> Childhood obesity is one of the biggest public health problems in the

world. In the developed world, most research is currently focused on child obesity. The prevalence of obesity among children and adolescents within developing countries was found to be 22.1% in Brazil, 41.8% in Mexico, 19.3% in Argentina, and 22% in India.<sup>5</sup> In a countrywide epidemiological study, it was found that the prevalence of childhood overweight and obesity was 9.5% and 3.5%, respectively, in Bangladesh.<sup>6</sup> Children and adolescents are gradually obese due to improved technology combined with changing lifestyles of families with increased purchasing power, luxurious living, rising hours of inactivity due to television, video games, and computers, which seem to substitute outdoor games and other social activities.<sup>7</sup> According to a recent report, out of an estimated 43 million obese children worldwide in 2010, about 81% were from developing countries, half of whom (18 million) were reported to be living in Asia despite the enormous under-nutrition burden. By 2020 the global prevalence of childhood obesity is estimated at about 60 million.<sup>2</sup> The epidemic of obesity and overweight is increasing with urbanization, lifestyle shifts, and social-economic transition. Social transition is known to be one of the causes of obesity and overweight that gives city residents greater access to fast food and the emergence of people with high economic incomes who can afford fast food, i.e., foods with a high glycemic index.<sup>8,9</sup> Rapid urbanization in low-income countries, such as Bangladesh, can lead to a nutritional transition. The transition involves the intake of more animal fat, more refined food, and drinks, as well as more salt and sugary snacks.<sup>10</sup> Obesity is now the most common infantile and adolescent disease in the developed world. The increasing prevalence of overweight and obesity among children (0-12 years) and adolescents (13-19 years) has also emerged as a major public health problem in Bangladesh and it was observed that the prevalence of overweight and obesity in children and adolescents ranged from 1.0% to 20.6% and from 0.35% to 25.6% respectively.<sup>11</sup> The overweight and obesity prevalence rates collectively were 7.0 percent and 6.0 percent, respectively. It is, however, increasing in trend. An estimated 43 million preschool-aged children worldwide are overweight and obese.<sup>12</sup> Research from Dhaka City on selected private and English medium schools showed that the prevalence of overweight and obesity was 77 percent and 58 percent respectively students. Among various risk factors, food intake outside the home and physical education at school, etc., along with parental history of obesity showed significant risk association with overweight and obesity.<sup>13</sup> In Bangladesh, nearly 40% of children under 5 years of age suffer from a lack of adequate sustenance.<sup>14</sup> According to the Asian-Pacific cutoff points underweight (<18.5 kg/m<sup>2</sup>), normal weight (18.5-22.9 kg/m<sup>2</sup>), overweight (23-24.9 kg/m<sup>2</sup>), and obese (≥25 kg/m<sup>2</sup>).<sup>15</sup> The goal of this study was therefore to investigate the current prevalence of overweight and obesity among children in selected schools in Dhaka City through anthropometric evaluation, as well as to assess the correlation of various environmental determinants such as physical activity, dietary behavior, lifestyle

habits, etc. associated with increased risk of obesity in children.

## METHODS

This school-based cross-sectional study was conducted in randomly selected four primary schools from different regions of Dhaka city. The study was conducted from February 2020 to May 2020.

### *Inclusion and exclusion criteria*

School going children aged 6-14 years, who agreed to participate, were selected for this study. Children aged over 14 years or below six years or did not agree to participate were excluded from the study.

### *Sample size determination and sampling*

The sample size was estimated with the formulation below.<sup>16</sup>

$$\text{Sample size} = (Z_{(1-\alpha/2)}^2 p (1-p))/d^2$$

Here,  $Z_{(1-\alpha/2)}$  = normal standard deviation (Type 1 error of 5% ( $p < 0.05$ ) is 1.96,

$p$  = expected proportion of the population based on previous analysis of 1,768 children (980 boys; 788 girls) from eight schools selected for purpose in various areas of Dhaka City, which is 0.05 (5.0 percent).<sup>17</sup>

$d$  = absolute error, or precision set to 0.05.

This proposed study had at least 77 subjects according to formula. Therefore, this study included 106 research subjects. The sample population was selected from different schools in Dhaka city using a convenience sampling method.

### *Data collection instruments*

Anthropometric data, such as the height, weight, and MUAC of the subjects examined, were measured with precision using the standard techniques recommended by the WHO. The following indices: BMI-for-age Z score and Height-for-age Z score have been calculated in line with the WHO development guide for school-aged children and adolescents.<sup>18</sup> Demographic and behavioral data were collected through a questionnaire.

### *Data analysis procedure*

Data analysis was performed using the statistical program IBM SPSS Statistics 20.0. Using WHO Anthro Plus 1.0.4 software, anthropometric indices such as BMI-for-age Z score, Height-for-age Z score, is determined from anthropometric measurements and compared to WHO growth standards.<sup>19</sup> Chi-square tests were carried out for

categorical variables such as anthropometric indices such as nutritional status, data on physical activity, etc.

**RESULTS**

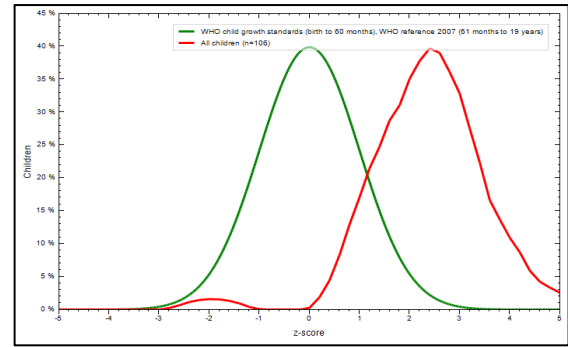
In our study, there were 50 male children and 56 female children. The highest sample of the study was from Muslims. Most of the children were between 8-9-year-olds. The demographic features of the study population are shown below in Table 1.

**Table 1: Demographic information of the participants.**

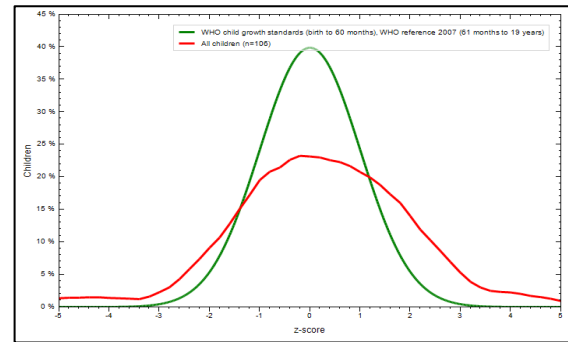
Demographic information	Frequency
<b>Gender</b>	
Male	50
Female	56
<b>Religion</b>	
Islam	101
Hinduism	5
<b>Age (years)</b>	
6-7	20
8-9	71
10-12	13
12-14	2

The age distribution of BMI is negatively skewed, and most data is between +2SD and +3SD relative to the reference data from the WHO. The overweight prevalence is 24.5 %, and obesity is 68 % (Figure 1).

On the other hand, if we compare the height for age Z score with the WHO reference data, the distribution is normally distributed. Most values are from reference mean from -1SD and +2SD (Figure 2). According to reference data from the WHO, 3.8 % of children were below the reference 3SD, and 6.6 % of children are below the reference median 2SD.



**Figure 1: BMI for age Z score distribution of the study population compared with reference data from the WHO.**



**Figure 2: Height for age Z distribution of the study population compared with reference data from the WHO.**

Table 2 shows the result of the frequency and correlation between different risk factors and overweight. It has been evident from the result that type of game, total playtime, TV, and computer watch time, spend money to buy fast food, eating days fast food in a week, type of tiffin shows a significant correlation with being overweight and obese.

**Table 2: Association of various lifestyle factors with nutritional status.**

Variables	Statements	BMI range				X <sup>2</sup> , P value
		Underweight (%)	Normal (%)	Overweight (%)	Obese (%)	
Type of favorite sports	Football	0 (0)	5 (8.9)	1 (5.3)	4 (16)	34.036, 0.001*
	Cricket	0 (0)	3 (5.4)	0 (0)	11 (44)	
	Badminton	0 (0)	6 (10.7)	2 (10.5)	2 (8)	
	Others	2 (33.3)	17 (30.4)	5 (26.3)	3 (12)	
	Don't play	4 (66.7)	25 (44.6)	11 (57.9)	5 (20)	
Total play time	1 hours	0 (0)	22 (71)	8 (100)	20 (100)	17.788, 0.000*
	2 hour	2 (100)	9 (29)	0 (0)	0 (0)	
TV and computer watch time	1 hours	3 (50)	21 (37.5)	7 (36.8)	2 (8)	27.321, 0.007*
	2 hours	0 (0)	13 (23.2)	7 (36.8)	18 (72)	
	3 hours	0 (0)	8 (14.3)	2 (10.5)	2 (8)	
	4 hours	3 (50)	11 (19.6)	3 (15.8)	2 (8)	
	>4 hours	0 (0)	3 (5.4)	0 (0)	1 (4)	
Daily money spending	50-100 /=	5 (83.3)	33 (58.9)	8 (42.1)	5 (20)	26.451,

Variables	Statements	BMI range				X <sup>2</sup> , P value
		Underweight (%)	Normal (%)	Overweight (%)	Obese (%)	
to buy fast food	101-150 /=	1 (16.7)	13 (23.2)	6 (31.6)	5 (20)	0.002*
	151-200 /=	0 (0)	9 (16.)	3 (15.8)	7 (28)	
	201-250 /=	0 (0)	1 (1.8)	2 (10.5)	8 (32)	
Weekly fast food consumption frequency	Every day	0 (0)	11 (19.6)	4 (21.1)	8 (32)	24.825, 0.003*
	2-3 days	4 (66.7)	24 (42.9)	12 (63.2)	3 (12)	
	4-5 days	0 (0)	15 (26.8)	2 (10.5)	13 (52)	
	6 days	2 (33.3)	6 (10.7)	1 (5.3)	1 (4)	
Type of tiffin	Roti vaji	0 (0)	7 (12.5)	2 (10.5)	4 (16)	19.757, 0.072
	Ready-made food	0 (0)	6 (10.7)	0 (0)	3 (12)	
	Home-made fast food	1 (16.7)	27 (48.2)	4 (21.1)	5 (20)	
	Fast food shop	5 (83.3)	15 (26.8)	13 (68.4)	13 (52)	
	Others	0 (0)	1 (1.8)	0 (0)	0 (0)	

\*(p<0.05)

## DISCUSSION

Our study shows the co-occurrence of both undernutrition and overnutrition in the same population, even in the same child. Nearly 10.4% of children are less than 2SD below the reference mean. Length/high-for-age represents cumulative linear growth. Low height for age refers to nutritional deficiency past or chronic, and/or extreme or persistent illness. Low length/height-to-age compared to a child of the same sex and age in the reference population can be described as 'shortness'. Shortness can be considered as being pathological at extremely low length/height-to-age, known as 'stunting'. Length/height-for-age is commonly used as a population measure rather than as an individual growth monitoring.<sup>20</sup> In contrast, the Body Mass Index (BMI) is a relative measure of height and weight. BMI represents body fat and protein storage.<sup>21</sup> BMI for age Z is a comparison of BMI with WHO reference data. 24.5% of students are 2SD above the reference data, of which 68% are 3SD above the reference median, which are categorized as overweight and obese, respectively.

The prevalence of overweight and obesity among school-going children in Dhaka City is significantly higher, as most of them come from well-to-do families. It is truly alarming for a developing country like Bangladesh that has no clear policy to prevent childhood obesity in Bangladesh. For example, playing outside a very potential source of physical activity, keep track of children in good health, while we have evidence that playing games like computer games (video games or indoor games) often has a horrible effect on their health. Low physical activity levels are associated with a high risk of childhood obesity.<sup>22</sup> Some studies have found that physical activity protects against childhood obesity, While others have not found a relationship like that.<sup>23</sup> Our results showed that children who do not play and watch TV and computer for at least 2 hours are more overweight, obese, respectively.

Our research also points out that those who only play cricket and spend one hour playing any kind of game during the whole day are more likely to obese. Playing many sports games on a regular basis, such as football, badminton, and many other childish games of proper physical activity, keep children safe from becoming obese or overweight. Increasing consumption of fast food could have particular relevance to childhood obesity epidemics in developed and developing countries. The findings of several studies suggest an association between fast-food consumption and total energy intake or bodyweight in adolescents and adults.<sup>24-26</sup> The consumption of fast food on obese or overweight groups and healthy weight group children are respectively high. Although several studies have suggested that energy-dense foods, high-fat and high-sugar snacks, inexpensive, and easily accessible fast foods have contributed enormously to the epidemic of obesity.<sup>27</sup> Children's weights also differ with fast-food consumption. In both sexes, the level of intake of vegetables and dairy products reduced the risk of becoming obese or overweight.

Taking proper foods such as vegetables, meat, fish, eggs, milk, which contain proper nutrients and vitamins, helps children to maintain a healthy and healthy life. A strong association with BMI was found to be the desire to take rest after lunch. The association between maternal and childhood obesity education has also been significant in Dhaka City, and the level of childhood obesity among school children in affluent communities is very high.<sup>28</sup> The study shows that children who spend 201-250 taka, eat fast food 4-5 days a week, and eat tiffin as fast food from the fast food shop are more obese. Sample size was not quite sufficient for significant results in our research.

## CONCLUSION

This study demonstrated the high prevalence of overweight and obesity among school-going children in

Dhaka city. Type of play, playtime, watching television and computer for long periods, and consuming more fast food habits are major risk factors for overweight and obesity among school-going children in Dhaka city. Policies and initiatives are needed not only from the Ministry of Health and Population but also from the Ministry of Education and the Ministry of Youth and Sport to tackle this rapidly growing issue in a timely and appropriate way. Therefore, through behavioral strategies, we need to establish policies that encourage children to change their negative health habits.

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## REFERENCES

- World Health Organization. Obesity: preventing and managing the global epidemic. 2000.
- Onis D, Blössner M, Borghi ME. Global prevalence and trends of overweight and obesity among preschool children. *Am J Clin Nutr*. 2010;92:1257-64.
- Ogden CL, Carroll MD, Fryar CD, Flegal KM. Prevalence of obesity among adults and youth: United States. *NCHS Data Brief*. 2017;288:1-8.
- Singh M, Sharma M. Risk factors for obesity in children. *Indian Paediatr*. 2005;42:183-5.
- Gupta N, Shah P, Nayyar S, Misra A. Childhood obesity and the metabolic syndrome in developing countries. *Indian J Pediatr*. 2013;80:28-37.
- Bulbul T, Hoque M. Prevalence of childhood obesity and overweight in Bangladesh: findings from a countrywide epidemiological study. *BMC Pediatr*. 2014;14:86.
- Rasoul A. Obesity in children and adolescents in Gulf countries: facts and solutions. *Advances Diabetologia*. 2012;28:64-9.
- Mosha T, Fungo S. Prevalence of overweight and obesity among children aged 6-12 years in Dodoma and Kinondoni municipalities, Tanzania. *Tanzania J Health Res*. 2010;12:6-16.
- Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *Int J Pediatr Obesity*. 2006;1:11-25.
- Popkin BM. The nutrition transition and obesity in the developing world. *J Nutrition*. 2001;131:871-3.
- Biswas T, Islam A, Islam MS, Pervin S, Rawal LB. Overweight and obesity among children and adolescents in Bangladesh: a systematic review and meta-analysis. *Public Health*. 2017;142:94-101.
- Hoque ME. Prevalence of overweight and obesity among children and adolescents of the Indian subcontinent: a meta-analysis. *Nutrition Rev*. 2014;72:541-50.
- Alam MR. Prevalence and association of different lifestyle factors with overweight and obesity among the children of selected private english medium schools from Dhaka City. *World*. 2019;7:42-7.
- Ahmed T, Ahmed AS. Reducing the burden of malnutrition in Bangladesh. *BMJ*. 2009;39:4490.
- Pan WH, Yeh WT. How to define obesity? Evidence-based multiple action points for public awareness, screening, and treatment: an extension of Asian-Pacific recommendations. *Asia Pacific J Clin Nutr*. 2008;17:370.
- Charan J, Biswas T. How to calculate sample size for different study designs in medical research? *Indian J Psychol Med*. 2013;35:121.
- Sultana N, Afroz S, Tomalika N, Momtaz H, Kabir MH. Prevalence of childhood obesity and undernutrition among urban school children in Bangladesh. *J Biosocial Sci*. 2019;51:244-53.
- Onis MD. Development of a WHO growth reference for school-aged children and adolescents. *Bulletin of the World health Organization*. 2007;85:660-7.
- Sullivan KM, Gorstein J. ANTHRO: Software for calculating pediatric anthropometry. Available at [https:// apps. who. int/ iris/ handle/10665/59089](https://apps.who.int/iris/handle/10665/59089). Accessed on 12 January 2020.
- O'donnell O, Doorslaer VE, Wagstaff A, Lindelow M. Analyzing health equity using household survey data: a guide to techniques and their implementation. Available at [https:// openknowledge. worldbank.org/handle/10986/6896](https://openknowledge.worldbank.org/handle/10986/6896). Accessed on 20 January 2020.
- Cogill B. Anthropometric indicators measurement guide: food and nutrition technical assistance project. a guide for educational development. Available at [www. fantaproject. Org](http://www.fantaproject.org). Accessed on 20 January 2020.
- Pavón JD, Kelly J, Reilly JJ. Associations between objectively measured habitual physical activity and adiposity in children and adolescents systematic review. *Int J Pediatr Obesity*. 2010;5:3-18.
- Lobstein T, Baur L, Uauy R. Obesity in children and young people: a crisis in public health. *Obesity Rev*. 2004;4:85.
- Campbell KJ, Waters E, O'Meara S, Kelly S, Summerbell CD. Interventions for preventing obesity in children. *Cochrane Database Syst Rev*. 2001;7(12):CD001871.
- French SA, Story M, Sztainer ND, Fulkerson JA, Hannan P. Fast food restaurant use among adolescents: associations with nutrient intake, food choices and behavioral and psychosocial variables. *Int J Obesity*. 2001;25:1823-33.
- French SA, Harnack L, Jeffery RW. Fast food restaurant use among women in the Pound of Prevention study: dietary, behavioral and

- demographic correlates. *Int J Obesity*. 2000;24:1353-9.
27. Bowman SA, Vinyard BT. Fast food consumption of US adults: impact on energy and nutrient intakes and overweight status. *J Am College Nutrition*. 2004;23:163-8.
28. Ahmed S, Islam M, Razzaque A, Ahmed T. 11th Annual Scientific Conference (ASCON).

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