Prevalence and Association of Different Lifestyle Factors with Overweight and Obesity among the Children of Selected Private English Medium Schools from Dhaka City

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Abstract **Background:** The prevalence of undernutrition among children has always been higher for Bangladesh. Although over the last decade, the intensity of undernutrition is decreasing, the problem of over-nutrition and obesity is increasing among the children. **Aim:** This goal of this study is to determine the prevalence of obesity and overweight among children of selected private English medium schools from Dhaka city through anthropometric assessment as well as to assess the association of various lifestyle factors with the incidence of overweight and obesity. **Methods:** This school based cross sectional study was conducted in selected four different private English medium schools of Dhaka city among one hundred participants (Fifty male and fifty female participants) aged 6-14 years selected by convenience sampling following recommended ethical guidelines. Anthropometric assessment was done by following WHO guideline along with demographic and behavior related data were collected by a carefully formulated and pretested questionnaire. **Results:** According the WHO growth reference, the prevalence of the overweight and obesity is 77% and 58% respectively. Among various risk factors, consumption of food outside home and having physical education in school etc., along with parental history of obesity showed significant risk association with overweight and obesity. **Conclusion:** The prevalence of overweight and obesity is substantially high, which is alarming for a developing country like Bangladesh. Behavioral approaches should be followed to address the factors of overweight and obesity among children.

Keywords: *pediatric obesity, prevalence, Bangladesh, life style*

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1. Introduction

Bangladesh has been well known for the severity of malnutrition more specifically undernutrition, but Bangladesh is now suffering from the double burden of malnutrition. The term "Double burden" refers to the coexistence of both under-nutrition and overnutrition in the same population, even sometimes in the same households. The low-and middle-income countries are facing this exceptional phenomenon with rising incidence of non-communicable disease such as obesity, diabetes mellitus, coronary heart diseases, etc., with the simultaneous presence of infectious diseases [1]. There is a worldwide upward trend of obesity among population of all age particularly in school-aged children and the prevalence of obesity in Bangladesh is also on the rise as per the pooled analysis of NCD risk factor collaboration [2]. According to a report from Institute of Health Metrics and Evaluation, USA, the prevalence of overweight increased from 7% in 1980 to 17% in 2013 among adults in Bangladesh [3].

In thrifty gene hypothesis by Dr. Neel, assumed that human kind is subjected to a continuous cycle of famine and feast during evolution. People having higher stored energy have a better possibility of surviving during famine therefore selection of genes, which are more efficient at storing fat occurs. These "Thrifty" genes store more fat even if there is an absence of famine. Development and urbanization provide the availability of food which leads

to obesity and other linked metabolic disorders such as diabetes mellitus [4]. Rapid urbanization in lower income countries such as Bangladesh, can result in a nutritional transition. This transformation includes consumption of more animal fat, more processed food and beverages as well as more salt and sugary snacks [5]. LBW babies have a higher risk of developing obesity, coronary heart disease as well as non-insulin dependent diabetes mellitus in later life [6]. These factors also resemble "The Thrifty phenotype hypothesis". It is mainly based on poor foetal growth and impaired child development, which is caused by poor environmental conditions as well as maternal malnutrition [7]. These developmental issues are associated with reduced insulin secretion and insulin resistance [8], which are associated with obesity and type 2 diabetes [9]. According to the National Low Birth Weight Survey of Bangladesh, 2003-04, over 35% of babies had low birth weight in Bangladesh [10]. However, the prevalence of overweight and obesity among the children is increasing day by day. It can be hypothesized the prevalence is higher among the students of English medium schools since most them come from higher socioeconomic class [11]. There has not been any recent study found on this vulnerable group on obesity and its' determinants. This study aims to determine the prevalence of obesity and overweight among children of selected private English medium schools from Dhaka city through anthropometric assessment as well as to assess the association of various environmental determinants such as physical activity, dietary behaviour, etc.

2. Materials and Methods

2.1. Study Design, Area and Subjects

This school based cross sectional study was conducted in randomly selected four different private English medium schools of Dhaka city. School going children aged 6-14 years were selected for this study.

2.2. Sample Size Determination and Sampling

Sample size was calculated using the following formula [12]:

$$Sample\ size = \frac{Z^2_{1-\frac{\alpha}{2}}\,p(1-p)}{d^2}$$

Here, $Z_{1-\frac{\alpha}{2}}$ = Standard normal variate (at 5% type 1 error (P<0.05) is 1.96,
p= Expected proportion in population based on previous study on 1768 children (980 boys; 788 girls) from eight purposively selected schools in different areas of Dhaka city which is 0.05 (5.0%) [13],
d= Absolute error or precision, which is set to 0.05.

According to formula, this proposed study should have at least 77 subjects. Therefore, 100 study subjects were included for this study. The sample population was selected by convenience sampling method from different schools in Dhaka city.

2.3. Data Collection Instruments

Anthropometric data such as height, weight as well as MUAC of the study subjects were measured with precision by standard techniques recommended by WHO. Following indices: BMI-for-age Z score and Height-for-age Z score were calculated in accordance with the WHO growth reference for school-aged children and adolescents [14]. Demographic and behaviour related data were collected by questionnaire.

2.4. Ethical Review

Study was conducted in accordance with the declaration of Helsinki and ethical clearance was taken from the institutional Ethical Committee. Informed consent from the all participants as well as from the institutional heads were taken and confidentiality of all the participants was ensured.

2.5. Data Analysis Procedure

Data analysis was carried out using statistical software IBM SPSS Statistics 23.0. Anthropometric indices such as BMI-for-age Z score, Height-for-age Z score, were computed from the anthropometric measurements and these were compared with WHO growth standards by using WHO AnthroPlus 1.0.4 software [15]. All data from assessments was tested separately for a normal distribution by Shapiro-Wilk test. If the data were normally distributed, then homoscedasticity will be checked by the Fligner-Kileen test. Chi-square test was done for categorical variables such as anthropometric indices such as Nutritional status, physical activity data etc. Otherwise, if the data were not normally distributed, non-parametric Wilcoxon test was carried out. If data were normally distributed but do not have equal variance then the Welch t-test was done for comparison. In order measure the association, odds ratio was calculated using binary logistic regression.

3. Results

3.1. Demographic Information

Following Table 1 shows the demographic characteristics of the study population.

Table 1. Demographic information of the participants

	Frequency
Gender	
Male	50
Female	50
Religion	
Islam	98
Hinduism	2
Age (years)	
6-7	17
8-9	21
10-12	45
12-14	17

3.2. Prevalence of Overweight and Obesity

The distribution of BMI for age is negatively skewed and most of the data is in between +2SD to +3SD compared with the WHO reference data. The prevalence of overweight is 77% and obesity is 58% irrespective of sex (Figure 1). Among female children the prevalence of overweight is 72% and obesity is 52% compared to 82%, 64% for male children respectively (Table 2).

On the other hand, if we compare the height for age z score with WHO reference data, the distribution is positively skewed. Most of the values are in between -1SD to -2SD from reference mean (Figure 2). According to WHO reference data, 11.3% of children were 3SD below the reference and 28.3% of children are 2SD below than the reference median.
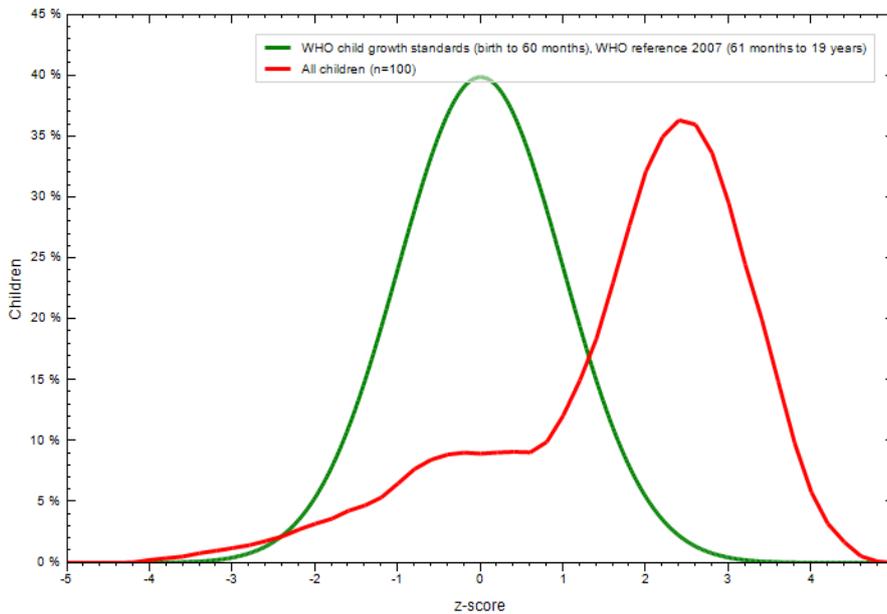

Figure 1. BMI for age z score distribution of the study population compared to WHO reference data

Table 2. Nutritional status according to BMI for age z score

Population	Severe thinness (%)	Thinness (%)	Optimum (%)	Overweight (%)	Obesity (%)
Male	2	1	6	9	32
Female	0	4	10	10	26
Total	2	5	16	19	58

Overweight: >+1sd, Obesity: >+2sd, Thinness: <-2sd>, Severe thinness: <>
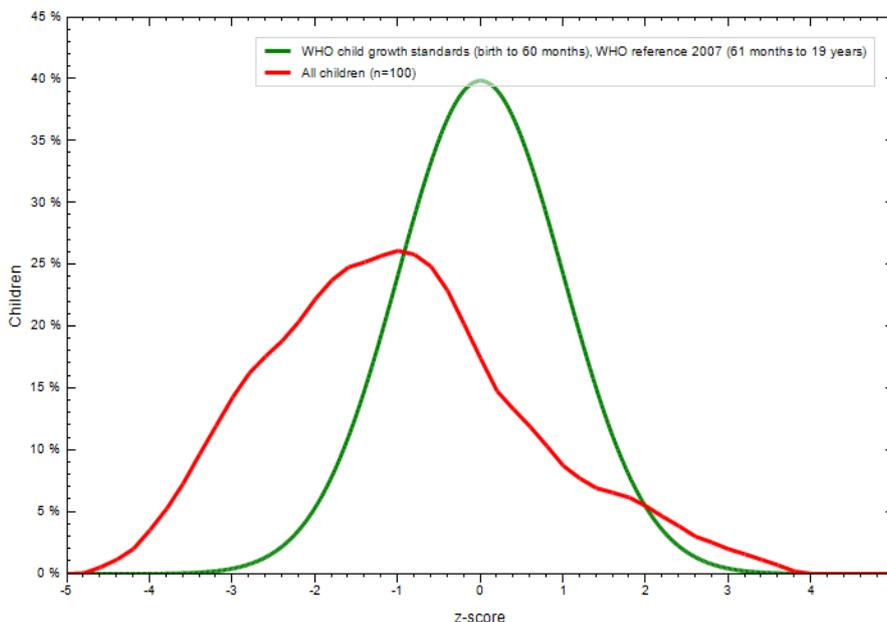

Figure 2. Height for age z score distribution of the study population compared to WHO reference data

3.3. Association of Different Lifestyle Factors with Overweight and Obesity

Following Table 3 shows the result for the frequency and association between different risk factors and overweight.

It has been evident from the result that frequent consumption of street food, sleeping during the day, outside home eating, having physical education class in school and parental history of obesity shows significant risk association with being overweight.

Table 3. Association of various factors with the incidence of overweight and obesity

		Non overweight	Over-weight	Total	Odd Ratio	p-value
Skipping breakfast	Never	13	32	45	1.828 (0.714-4.684)	0.20
	Few times	2	18	20		
	Sometimes	2	17	19		
	Usually	0	2	2		
	Always	6	8	14		
Frequency of street food consumption	Never	3	8	11	1.294 (0.314-5.337)	0.72
	Always	13	36	49		
	Usually	0	20	20		
	Sometimes	7	13	20		
Sleep during the day	Never	6	17	23	1.246 (0.425-3.651)	0.68
	Sometimes	13	17	30		
	Usually	0	17	17		
	Always	4	26	30		
Outside home eating	Never	6	7	13	3.529 (1.050-11.864)	0.04*
	Sometimes	15	50	65		
	Usually	2	19	21		
	Always	0	1	1		
Liking home-made food	Yes	21	66	87	1.750 (0.359-8.536)	0.48
	No	2	11	13		
	Sometimes	15	50	65		
	Usually	2	19	21		
	Always	0	1	1		
Frequency of fast food consumption	Never	5	7	12	2.778 (.789-9.784)	0.11
	Sometimes	16	58	74		
	Usually	0	9	9		
	Always	2	3	5		
Frequency of carbonated beverage	Never	2	7	9	0.952 (0.184-4.936)	0.95
	Sometimes	16	52	68		
	Usually	1	10	11		
	Always	4	8	12		
Television during eating	Never	3	8	11	1.294 (.314-5.337)	0.72
	Sometimes	7	29	36		
	Usually	0	24	24		
	Always	13	16	29		
Uses of mobile phone	Yes	1	7	8	2.2 (.256-18.875)	0.47
	No	22	70	92		
Having computer/laptop in your home	No	15	41	56	1.646 (.625-4.334)	0.31
	Yes	8	36	44		
Playing games on mobile /computer	No	1	12	13	0.246 (.030-2.004)	0.16
	Yes	22	65	87		
Having physical education class in school	Yes	14	63	77	0.346 (.125-.957)	0.03*
	No	9	14	23		
Outdoor sports	Yes	13	58	71	2.348 (.887-6.217)	0.08
	No	10	19	29		
Parental obesity	One of them	5	40	45	1.709 (.669-4.365)	0.26
	Both of them	6	7	13		
	None of them	12	30	42		
Passive smoking by parents	Yes	5	33	38	2.7 (.909-8.021)	0.07
	No	18	44	62		

4. Discussion

Our study shows the cooccurrence of both under nutrition and over nutrition in same population even in same child. Almost 30% of the children are less than 2SD below reference median. Length/Height-for-age reflects cumulative linear growth. Low height for age refers to past or chronic nutritional deficiency and/or chronic or frequent illness. Low length/height-for-age compared to a child of the same sex and age in the reference population can be defined as "shortness". Shortness can be interpreted as pathological at extremely low length/height-for-age, which is defined as "stunting". Length/Height-for-age is generally used as a population indicator rather than for individual growth monitoring [16]. On the other hand, Body mass index (BMI) is a relative measurement of height and weight. BMI reflects body storage of fat and protein [17]. BMI for age Z score is the comparison of BMI with reference data of WHO. 77% of the students are 2SD above than the reference data and among them 58% students are 3SD above the reference median, who are classified as overweight and obese respectively. The prevalence of overweight and obesity is substantially high among the students of English medium schools since most of them comes from well off families. It is really alarming for a developing country like Bangladesh which has no particular policy to prevent childhood obesity in Bangladesh. We have found significant association between several risk factors of obesity. For example, sleeping during the day also act as a factor in the occurrence of obesity. Sleeping during the day reduces the physical activity of the child therefore they do not indulge in required physical exercise [18]. Dietary behaviour is an important factor of obesity. From our study, Obese or overweight children tend to eat outside home and the consumption of fast food and street food is high among the obese and overweight children. Street foods and fast foods are mostly unhygienic [19] as well as contain high amount of salt, sugar and fat, which can contribute to high energy intake [20]. These factors showed highly significant association with the incidence of over nutrition among the study population. Sedentary behaviours such as watching television while eating as well as playing games in mobile phone or computer are determining factors of obesity. Obesity is mainly a polygenic disorder and it can be transmitted to children from their parents. Our study confirms that there is a higher probability of obesity if the child has a family history of obesity as well as children who are exposed to passive smoking tends have higher risk of being overweight. Anthropometric assessments are non-invasive and require less logistics and time than most of the other nutritional assessments [17]. However, anthropometric measurements are prone to measurement errors. Anthropometric measurements below cut-off points cannot indicate the depletion of nutrients since anthropometric indications are the late symptoms of any nutritional deficiency. As a result, subclinical deficiencies can remain undetected. Weight represents both lean mass and fat mass so people having higher lean mass, can be misinterpreted as overweight depending on BMI classification [21].

5. Conclusion

Based on our study, the prevalence of overweight and obesity as well as stunting is alarming. It is high to take steps to resolve this issue of over nutrition in order to fulfil sustainable development goal in time. Therefore, we need to develop policies following behavioural approaches to motivate the children to change their negative health behaviours.

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Statement of Competing Interests

Authors have declared no conflict of interest.

References

[1] Boutayeb A. The double burden of communicable and non-communicable diseases in developing countries. Transactions of the Royal society of Tropical Medicine and Hygiene. 2006; 100(3): 191-9.

[2] Abarca-Gómez L, Abdeen ZA, Hamid ZA, Abu-Rmeileh NM, Acosta-Cazares B, Acuin C, et al. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults. The Lancet. 2017; 390(10113): 2627-42.

[3] Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. The lancet. 2014; 384(9945): 766-81.

[4] Neel JV. Diabetes mellitus: a "thrifty" genotype rendered detrimental by "progress"? American journal of human genetics. 1962; 14(4): 353.

[5] Popkin BM. The nutrition transition and obesity in the developing world. The Journal of nutrition. 2001; 131(3): 871S-3S.

[6] Barker DJ. The developmental origins of chronic adult disease. Acta Paediatrica. 2004; 93: 26-33.

[7] Wells JC. Environmental quality, developmental plasticity and the thrifty phenotype: a review of evolutionary models. Evolutionary Bioinformatics. 2007; 3: 117693430700300027.

[8] Hales CN, Barker DJ. The thrifty phenotype hypothesis: Type 2 diabetes. British medical bulletin. 2001; 60(1): 5-20.

[9] Kahn SE, Hull RL, Utzschneider KM. Mechanisms linking obesity to insulin resistance and type 2 diabetes. Nature. 2006; 444(7121): 840.

[10] Salam A, Haseen F, Yusuf H, Torlesse H, Icddr B. National low birth-weight survey of Bangladesh, 2003-2004. Combating malnutrition and intestinal diseases in children: are we doing enough. 2004.

[11] Al-Quaderi GG, Al Mahmud A. English literature in English medium schools in Bangladesh: The question of post-colonial pedagogy. Asiatic: IIUM Journal of English Language and Literature. 2010;4(2):121-54.

[12] Charan J, Biswas T. How to calculate sample size for different study designs in medical research? Indian J Psychol Med. 2013; 35(2): 121-6.

[13] Sultana N, Afroz S, Tomalika N, Momtaz H, Kabir MH. Prevalence of childhood obesity and undernutrition among urban school children in Bangladesh. Journal of biosocial science. 2019; 51(2): 244-53.

[14] Onis Md, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. Bulletin of the World health Organization. 2007; 85: 660-7.

[15] Sullivan KM, Gorstein J. ANTHRO: Software for calculating pediatric anthropometry. 1999.

[16] O'donnell O, Van Doorslaer E, Wagstaff A, Lindelow M. Analyzing health equity using household survey data: a guide to techniques and their implementation: The World Bank; 2007.

[17] Cogill B. Anthropometric indicators measurement guide. 2003.

[18] Resta O, Foschino-Barbaro M, Legari G, Talamo S, Bonfitto P, Palumbo A, et al. Sleep-related breathing disorders, loud snoring and excessive daytime sleepiness in obese subjects. International journal of obesity. 2001; 25(5): 669.

[19] Noor R. Microbiological quality of commonly consumed street foods in Bangladesh. Nutrition & Food Science. 2016; 46(1): 130-41.

[20] Bowman SA, Gortmaker SL, Ebbeling CB, Pereira MA, Ludwig DS. Effects of fast-food consumption on energy intake and diet quality among children in a national household survey. Pediatrics. 2004; 113(1): 112-8.

[21] Garn SM, Leonard WR, Hawthorne VM. Three limitations of the body mass index. Oxford University Press; 1986.