Socio-demographic Factors Associated with Obesity among Primary School Children: A Cross-sectional Survey from Khulna District of Bangladesh

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Abstract

Obesity among children has become an epidemic worldwide. Although various risk factors have been detected for childhood obesity, studies on younger age groups in Bangladesh are still inadequate. The current study was demonstrated to assess the relationship between socio-demographic factors and obesity among primary school children in Khulna district of Bangladesh. A cross-sectional survey was conducted in August, 2019 among school children of classes one to five. Data were collected from 319 randomly selected mothers of the children. An interview schedule concerning socio-demographic characteristics of the parents and children was used for data collection. Both descriptive and inferential statistics (bivariate) were used for the analysis of the data. Findings show that age, sex, and birth weight of the child, residence, father's Body Mass Index (BMI), mother's BMI, and family size were the factors associated with obesity among the variables concerned in our study. However, the father's occupation and mother's occupation were found to have no significant link/relationship with obesity. We suggest awareness programs and policy interventions concerning gender stereotypes in food distribution mainly to reduce the prevalence of obesity. In addition, the promotion of physical activities may also help to prevent childhood obesity.

Keywords: Obesity, Children, Nutrition, Awareness, Bangladesh

Introduction

Childhood obesity is a rapidly increasing health problem worldwide (Hossain et al., 2020). Many underdeveloped and developing countries with high malnutrition rates have seen this rapid growth in the prevalence of childhood obesity over the past two decades (Hossain et al., 2019). In Bangladesh, childhood obesity is now an emerging public health concern (Biswas et al., 2017; Bhuiyan et al., 2013). The outbreak of obesity is significantly increasing among Bangladeshi children, adolescents, and adults, as well as the rate is greater among girls and in the city areas rather than boys in the rural areas (Banik &

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Rahman, 2018). In addition, overweight and obesity are significantly high and rising among certain groups, especially urban children and adolescents from rich households (Rahman et al., 2014).

The global prevalence of overweight and obesity among children and adolescents has increased dramatically in the last few decades. The worldwide commonness of overweight and obesity among children and adolescents aged 5 to 19 was over 340 million in 2016 (World Health Organization, 2020). In Bangladesh, a nationwide epidemiological study conducted in 2009 revealed that childhood overweight and obesity prevalence was 9.5 percent and 3.5 percent, respectively (Bulbul & Hoque, 2014). A systematic review showed that childhood obesity negatively impacts premature mortality and morbidity in adulthood (Reilly & Kelly, 2011). In addition, childhood obesity can overwhelmingly affect the children's physical health, self-esteem, emotional and social well-being (Sahoo et al., 2015; Lee, 2009; Dietz, 1998).

Overweight and obesity among children have been attributed to various factors like food habits, physical activity, excess television watching, playing video games (Huang et al., 2011; Mozaffari & Nabaei, 2007; Giugliano & Carneiro, 2004; Popkin, 2002; Davison & Birch, 2001); family history of obesity, socio-economic condition and parental education (Mozaffari & Nabaei, 2007; Giugliano & Carneiro, 2004); genetic (Huang et al., 2011; Birch and Anzman, 2010); environment, metabolism, behavior, personal history of obesity, culture and socio-economic status (Huang et al., 2011); emotional overeating, indulgence, parental neglect, medical factors, geographical location, seasonality, and demographic factors (Power et al., 1997; Boyuchard, 1991).

Socio-demographic factors, including age and sex of the children, place of residence, parental education as well as occupation, parental BMI, and family size, have also been found as the risk factors of childhood overweight and obesity (Hajian-Tilaki & Heidari, 2013; Hassan et al., 2016; Juliusson et al., 2010). Worldwide prevalence of overweight and obesity increased with age (Bulbul & Hoque, 2014), especially among the boys (Bibiloni et al., 2013; Hossain et al., 2019). The risk of obesity among the urban children was more than that of rural children as urban children spent less time for physical activity (Black & Macinko, 2008; Elder et al., 2010).

Although various risk factors have been detected for childhood obesity, studies on this topic are inadequate in Bangladesh. Given this context, this study aimed at identifying the socio-demographic factors associated with obesity among primary school children in Khulna district of Bangladesh. The findings of this study will help to develop intervention strategies to minimize the future burden of obesity among the younger population in Bangladesh. In addition, the findings of this study will also assist public health professionals and policymakers in developing future research agendas.

Materials and methods

Study design

The study followed both descriptive and explanatory approaches. A cross-sectional survey was pursued to conduct this research enabling quick investigation and knowledge about the causal relationship between socio-demographic characteristics and childhood obesity. Batiaghata Upazila and Khulna City Corporation under the Khulna district of Bangladesh were purposively selected as the study area. Two primary schools from the Khulna City Corporation and three schools from the Batiaghata Upazila were purposively selected for conducting the survey.

Study population

Mothers of the primary school children living in the study area for at least one year were the participants in this study as they were the children's primary caregivers. Data were collected from the mothers in school because they usually come to the school with their children and pick them up. To know the size of the population, we obtained registers of all students in each of the selected schools. Afterward, we collected the list of the students in order to reach the mothers of the students. A total of 1874 mothers (1349 mothers from the Khulna City Corporation and 525 mothers from the Batiaghata Upazila) were selected as the population in this study.

Sampling

We used the following formula mentioned in Cochran (1963) for estimating our sample size, which is obtained by solving the maximum error of the estimating formula for the population.

$$n_0 = \frac{n}{1 + \frac{n-1}{N}}$$

Where,

n_0 = Initial sample

N = Population size

$$n = \frac{z^2_{/2} p\, q}{2},$$

Where

$z^2_{/2}$ = Standard normal deviate;

p = Proportion of the target population estimated to have a particular characteristic; and

d = Allowable maximum error in estimating a population proportion.

We considered a 95 percent confidence interval for which the value of z is 1.96. We got the initial sample (n_0) as 384 where p= 0.5, q= 0.5, and d= 0.05. As we developed the sampling frame following the characteristics of our target population in the study area=1874. Thus, the final sample size was 319. Therefore,

319 mothers were selected as the respondents from a total study population of 1874 mothers. From the sample frame, we randomly selected 319 mothers following the with-replacement lottery method.

Data collection

We collected the data using a semi-structured interview schedule developed after reviewing the related literature. Before conducting the fieldwork, a pre-test on 25 samples was done in July 2019 and finalized for final data collection. The final data were collected during August 2019. Both oral and written consent of the respondents were taken. We collected information about the height and weight of each child to enable the calculation of the Body Mass Index (BMI) and obesity status. A digital weighing machine was used to measure the weight of each child in kilograms, and a vertical scale was used to measure height in meters.

Variables

Child obesity, the primary outcome variable of the study, was divided into two categories, i.e., obese and non-obese. We calculated the obesity status based on the BMI of the children recommended by the Centre for Disease Control (CDC) growth chart for boys and girls aged 2 to 20 years (Kuczmarski et al., 2002). Obesity was defined as having a 95th percentile or greater BMI based on age and sex-specific BMI percentiles (WHO, 2020). In our study, the outcome variable was dichotomized into 'obese' (95th percentile or greater) and 'non-obese (less than the 95th percentile) in line with a previous study (Ganle et al., 2019). Besides the primary outcome variable, we also considered some other socio-demographic variables such as the age of the children (5-9 years and 10-14 years), sex of the children (boy, girl), residence (rural, urban), fathers' BMI (non-obese [BMI≤29.9] and obese [BMI≥30]), mothers' BMI (non-obese [BMI≤29.9] and obese [BMI≥30]), fathers' occupation (officials, worker, and business), mothers' occupation (housewife and worker), birth weight of the children (underweight [1.5-2.49 kg], normal weight [2.5-3.49 kg] and overweight [≥3.5]), and family size (small [2-4 persons] and large [≥5 persons]). These variables were found significant in previous studies (Khan et al., 2020; Bulbul & Hoque, 2014; Hossain et al., 2019; Hassan et al., 2016; Bingham et al., 2013; Calisir & Karacam, 2011).

Statistical analysis

After collecting data, all the interview schedules were first manually examined to check for inconsistency. Then, Statistical Product and Service Solutions (SPSS) for Windows (version 21) software was used for data analysis following the data cleaning procedure. Both descriptive and inferential statistical analyses were performed in this study. For the descriptive analysis, frequency distributions and percentages were used to present the prevalence of child obesity and socio-demographic information of the children and parents. For inferential analysis, both the Chi-square test and Fisher's exact test (for observations with

less than five cell counts) were carried out to find the association between dependent and independent variables.

Results

Socio-demographic information of the children's parents

Table 1 shows the socio-demographic information of the children's parents. More than half (59.6%) of the mothers belonged to 20 to 34 years old and lived in the urban area (72.1%). The majority of the mothers (36.7%) had a secondary level of education and were housewives (76.2%). Almost all the children's parents (around 97%) were non-obese, and most of the mothers (63.3%) belonged to a small family with 2 to 4 members. Slightly over half of the children's fathers were officials (54%), while the rest were businessmen (25.4%) and workers (20.7%).

Table 1. Socio-demographic information of the children's parents

Variables	Total (%)
Mother's age (in years)	
20-34	190 (59.6)
35-49	125 (39.2)
≥50	4 (1.2)
Place of residence	
Urban	230 (72.1)
Rural	89 (27.9)
Mother's education	
Non-literate (0)	4 (1.2)
Primary (1-5)	14 (4.4)
Secondary (6-10)	117 (36.7)
Higher Secondary (11-12)	79 (24.8)
Tertiary (≥13)	105 (32.9)
Mother's occupation	
Housewife	243 (76.2)
Worker	76 (23.8)
Mother's BMI	
Non-obese	308 (96.6)
Obese	11 (3.4)
Family size	
Small (2-4)	202 (63.3)
Large (≥5)	117 (36.7)
Father's BMI	
Non-obese	312 (97.8)
Obese	7 (2.2)
Father's occupation	
Officials	172 (53.9)
Worker	66 (20.7)
Business	81 (25.4)

Socio-demographic information of the children

We collected data on primary school children in the age group of 5 to 15 years in this study. Table 2 depicts that about three-fifths of the children (58%) were 5 to 9 years, and the rest (42%) were 10 to 14 years old. Among the children, 53.9 percent were female and 46.1 percent were male. An about three-fifths of the children's birth weight was normal. The rest were underweight (24.1%) and overweight (17%), respectively. Furthermore, about 39 percent of the children were obese, and the rest belonged to the non-obese categories.

Table 2. Information about the children

Variables	Total (%)
Age of child (in years)	
5-9	185 (58.0)
10-14	134 (42.0)
Sex	
Female	172 (53.9)
Male	147 (46.1)
Birth weight (in kg)	
Underweight	77 (24.1)
Normal weight	188 (58.9)
Overweight	54 (17.0)
BMI of children	
Obese	124 (38.9)
Non-obese	195 (61.1)

Obesity and its associated factors

Table 3 shows the association between socio-demographic variables (age and sex of the children, residence, father's occupation and Body Mass Index (BMI), mother's occupation and BMI, birth weight, and family size) and child obesity. Results show that the age of the children was significantly associated with childhood obesity, and it reveals that the prevalence of obesity was higher amongst the younger age group. Children's sex was another significant factor of obesity, and its percentage was greater among boys than their counterparts. Furthermore, the residence was significantly associated with childhood obesity, and it reveals that urban children were more prone to be obese than rural children. Parental BMI (mother's and father's BMI) was another critical factor in childhood obesity, as obese parents were more likely to have obese children. Apart from this, the birth weight of the children was also significantly associated with obesity. Furthermore, family size is another significant factor in childhood obesity. However, the father's occupation and mother's occupation were found not to have any significant association with childhood obesity.

Discussion

The present study investigated the factors related to obesity among primary school children in the Khulna district of Bangladesh. We found that 38.9 percent

Table 3. Obesity and its associated factors

Variables	Child obesity		Chi-square /Fisher's exact value	p value
	Non-obese	Obese		
Age of the child (in years)				
5-9	85 (45.9)	100 (54.1)	42.724a	.001
10-14	110 (82.1)	24 (17.9)		
Sex of the child				
Female	115 (66.9)	57 (33.1)	5.161 a	.023
Male	80 (54.4)	67 (45.6)		
Residence				
Urban	132 (57.4)	98 (42.6)	4.846a	.028
Rural	63 (70.8)	26 (29.2)		
Mother's BMI				
Non-obese	192 (62.3)	116 (37.7)	4.119 b	.042
Obese	3 (27.3)	8 (72.7)		
Father's BMI				
Non-obese	194 (62.2)	118 (37.8)	4.747b	.029
Obese	1 (14.3)	6 (85.7)		
Mother's occupation				
Worker	53 (69.7)	23 (30.3)	3.111a	.078
Housewife	142 (58.4)	101 (41.6)		
Father's occupation				
Officials	99 (57.6)	73 (42.4)		
Worker	48 (72.7)	18 (27.3)	4.779a	.092
Business	48 (59.3)	33 (40.7)		
Birth weight of the child				
Underweight	49 (63.6)	28 (36.4)		
Normal weight	121 (64.4)	67 (35.6)	6.030a	.049
Overweight	25 (46.3)	29 (53.7)		
Family size				
Small (2-5)	115 (56.9)	87 (43.1)	4.084a	.043
Large (≥6)	80 (68.4)	37 (31.6)		

a=Pearson chi-square test; b=Fisher's exact test

of the children were obese in this study. This higher percentage of obesity was reported because most of the children who participated in this research were from urban areas. The higher rate of childhood overweight and obesity was also noted in another study (Zabeen et al., 2018), where overweight and obesity prevalence was up to 60 percent among 10 to 18 years in Bangladesh.

Findings of our study indicate that socio-demographic factors including age and sex of the children, residence, father's BMI, mother's BMI, child body weight at birth, and size of the family were significantly associated with child obesity. In

addition, the rate of obesity was higher among the younger children, and it is inconsistent with the findings of previous studies (Bingham et al., 2013; Bulbul & Hoque, 2014), where they found obesity increased with child age. One of the reasons for this fact may be the nature of the early feeding of the children. At present, feeding bottle milk increases among mothers, which may increase the risk of obesity among children at an early age.

Furthermore, the prevalence of obesity is higher among boys than girls in the study area, consistent with other studies (Bibiloni et al., 2013; Hossain et al., 2019; Silva et al., 2018). Societal conditions and gender-based stereotypes might influence this difference in the prevalence of childhood obesity. For example, in our country, sons are encouraged to eat more and optimize physical performance than daughters.

The place of residence is significantly associated with the prevalence of obesity among children in the study area. In our study, urban children were more obese than rural children, consistent with some previous studies (Bulbul & Hoque, 2014; Stojanovic & Belojevic, 2009; Cheng, 2004). The possible reasons for this may be spending more time on-screen watching and consuming fast food among urban children than rural children in the study area.

BMI of father and mother is another significant predictor of childhood obesity, and it is significantly associated with this study. Parents who are fatal in nutritional aspects children have a great chance of becoming obese. There is wide evidence-based support regarding the association of parental obesity and childhood overweight (Dev et al., 2013; Hajian-Tilaki & Heidari, 2013; Hassan et al., 2016). In addition, some studies found that maternal overweight and obesity significantly increased the risk of childhood obesity (Fisher & Birch, 1995; Lake et al., 1997; Lee et al., 2017; Strauss & Knight, 1999). One possible reason for this may be the lifestyle, including food habits and overeating tendency, and more sedentary activities of the parents may motivate their children to do so, which ultimately increases the risk of obesity among children.

The birth weight of the children was an influential factor of childhood obesity in this study, consistent with some other previous studies (Bingham et al., 2013; Dieu et al., 2007). High birth weight is associated with the prevalence of obesity among children. The variations in maternal weight and nutritional status during and before pregnancy and the nature of child feeding might result in the association between high birth weight and the risk of childhood obesity.

The present study also found the family size to be significantly associated with child obesity. A previous study reported that having a family with four or fewer members increased the risk of overweight and obesity (Calisir & Karacam, 2011). Similarly, it is observed in other studies that the prevalence of obesity declined with increasing family size (Barker et al., 1997; Stettler et al., 2000). One of the reasons may be that children find less scope to play with other family members

in smaller families. This might encourage them to spend more time in sedentary activities like watching television, playing games on mobile phones or computers. As a result, the risk of obesity among children increases.

Although our study reports some interesting findings, we admit that it is subject to certain limitations. The study was conducted in some selected areas of Khulna district, limiting its generalizability to the entire population of Bangladesh. Furthermore, the study only considered the socio-demographic factors and could not assess other relevant factors such as food habits and sedentary activities of the children, which may associate with child obesity. In addition, rural children's percentage was comparatively low, limiting the study in presenting rural-urban variations in obesity among school children.

Conclusions

Obesity is becoming one of the significant child health problems in our country, especially in the urban area, leading to different health consequences. Findings of this study depict that the prevalence of obesity was higher among boys rather than girls and younger groups than their counterparts. In addition, residence, birth weight of the child, father's BMI, mother's BMI, and family size are significantly associated with obesity among the children. Therefore, we suggest health education programs and policy interventions for the parents to maintain a healthy lifestyle for better health outcomes for themselves and their children. This should help to decrease the risk of obesity among primary school children. We also recommend awareness programs on family planning and gender-based stereotypes in food distribution and physical activity to prevent childhood obesity in Bangladesh. We encourage further research in this area for further understanding.

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