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Growing up healthy: Body mass index patterns among primary school girls

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Abstract

This research addresses the Body Mass Index (BMI) patterns among primary school girls in the Jashore district of Bangladesh, considering the escalating concerns regarding childhood obesity globally. The present study aimed to investigate the Body Mass Index (BMI) patterns among primary school girls in the Jashore district of Bangladesh. A sample of 300 girls (age ranged from 6 to 12 years) from classes one to five were chosen randomly in the study. Height and weight measurements were taken, and BMI was calculated according to WHO guidelines. Statistical analysis, including tests of normality and post hoc tests, was conducted using SPSS. The findings reveal a progressive increase in BMI with advancing academic classes. Significant differences in BMI were observed among Class 2 & Class 3 ($p = 0.002$); Class 2 & Class 4 ($p < 0.0001$); Class 2 & Class 5 ($p < 0.0001$); Class 1 & Class 4 ($p = 0.027$); Class 1 & Class 5 ($p < 0.0001$); Class 3 & Class 5 ($p = 0.002$) and also between Class 4 & Class 5 ($p = 0.012$). But there was no significant difference among Class 2 & Class 1 ($p = 0.109$); Class 1 & Class 3 ($p = 0.117$) and Class 3 & 4 ($p = 0.523$). The significance level was $\alpha \leq 0.05$. The study provides valuable insights for public health interventions aimed at promoting healthy weight management among primary school girls in the region.

Keywords: *Body Mass Index (BMI), primary school girls, obesity, overweight, health*

Introduction

A person's body mass index (BMI) is calculated as their weight (in kg) devided by their height squared (in m). It is the most widely used sensitive, specific, and accurate screening technique to find people who may be at risk for health issues related to their body mass. It can only be used to evaluate obesity, it cannot be used to diagnose obesity (Mahalakshmi & Abirami, 2019).

The body mass index (BMI) pattern in school children can vary depending on a variety of factors such as age, sex, ethnicity, and lifestyle. Generally speaking, BMI is a measure of body fat based on an individual's height and weight, and it is often used as an indicator of overall health status (Nihiser et al., 2009). According to the World Health Organization (WHO), BMI values for children and adolescents are expressed in relation to age and sex, and are classified based on percentiles. A BMI between the 5th and 85th percentile is considered normal, while a BMI between the 85th and 95th percentile is classified as overweight, and a BMI above the 95th percentile is considered obese (Mei et al., 2002). In some countries, there has been a trend towards increasing rates of overweight and obesity among school-aged children. This trend has been associated with factors such as increased availability of high-calorie foods and decreased levels of physical activity (Berg et al., 2003). In school-aged children, the pattern of BMI can vary depending on a variety of factors such as age, sex, ethnicity, genetics, lifestyle, and environmental factors' (Brener et al., 2007).

However, studies have shown that there has been a general increase in the prevalence of overweight and obesity among school-aged children over the past few decades, both in developed and developing countries (Dietz & Bellizzi, 1999). In the United States, for example, according to the Centers for Disease Control and Prevention (CDC), the prevalence of obesity among children and adolescents aged 2-19 years increased from 10.7% in 1999-2000 to 19.3% in 2017-2018.

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In other countries, similar patterns have been observed. For instance, in India, a study conducted in 2017 found that the prevalence of overweight and obesity among school children was 19.1% and 5.9%, respectively (Freedman et al., 2013). These trends are concerning because overweight and obesity can lead to a range of health problems such as type 2 diabetes, heart disease, and certain types of cancer.

Schools help to promote a healthy country by facilitating early diagnosis, screening, and prevention. Earlier investigations in this sector have clearly identified two significant tendencies of concern. According to cohort research conducted in Louisiana on 2610 children aged 2 to 37 between 1973 and 1996, childhood BMI levels are related to adult BMI levels (Freedman et al., 2005). A cross-cultural research conducted in 25 communities that included 182 preschool children revealed similar findings i.e., 59.8% of the children were underweight. A research conducted in South Africa found similar results, revealing that 66-70% of children aged 10 to 12 were underweight and 5% were overweight, highlighting the need to improve school-children's nutritional habits (Dolla et al., 2005).

However, it is important to note that BMI is not a perfect measure of health and does not take into account factors such as muscle mass, bone density, and overall body composition. Therefore, it is important to consider other indicators of health as well, such as blood pressure, cholesterol levels, and overall physical fitness (Jolliffe & Janssen, 2006). Additionally, it is important to approach discussions of BMI and weight with sensitivity and without stigmatization.

Considering previous findings, the present study was realized in primary schools in Jashore among 300 children of classes one to five. The objective was to investigate the BMI pattern of primary school girls in the Jashore district of Bangladesh. The Jashore district is located in the southwestern part of the country and is home to a diverse population of over 1.5 million people. The study will focus on primary school girls, as they represent a critical age group that is at risk of developing overweight and obesity. The study will use a cross-sectional design, and data will be collected through a survey of primary school girls in the Jashore district. We hypothesized that BMI pattern of Primary school Girls of Jashore District would be progressive.

Methodology

The subjects

A total of 300 primary school girls (Class 1 to Class 5) from four primary schools (1. Sultanpur Begum Shamsun Nahar Govt. Primary School, Sadar, Jashore; 2. Hamidpur Govt Primary School, Sadar, Jashore; 3. Churamankati Govt. Primary School, Sadar, Jashore; 4. Gopalpur Government Primary School, Sadar, Jashore) of Jashore District were selected as subjects for the present study. The primary schools were located on Urban, Sub urban and rural areas. Participants age ranged from 6 to 12 years.

Procedure for collecting data

Data has been collected through a survey that includes measurements of height and weight. Trained data collectors who visited the selected schools to measure the height and weight of the primary school girls have administered the survey. A random sampling technique has been used to select primary schools in the Jashore district. Parents, guardians and teachers of the selected primary school have been informed about the purpose and nature of the study. Children's parents/legal guardians gave their consent for participation. The height and weight of the primary school girls were measured using standard procedures. The height was measured using a stadiometer, and weight was measured using a calibrated digital scale. Ethical considerations have been taken into account during the data collection process, and the privacy and confidentiality of the participants have been ensured.

Procedure for analysis of data

Height and weight were taken to compute the BMI and graded as per WHO guidelines: 1) Underweight: <18.50; 2) Normal range: 18.50-24.99; 3) Overweight: >25.00; 4) Obese >30.00 (WHO, 2004). The BMI data were summarized using descriptive statistics, mean and standard deviation. We used the Kolmogorov-Smirnov and Shapiro-Wilk test to test the normality of the distribution. According to observed values for both Kolmogorv-Smirnov and Shapiro-Wilk, data do not follow the Gaussian distribution. Data failed the homogeneity criterion as well, thus, researchers opted for non-parametric statistical tool to draw inherence on the collected data. More precisely, the differences between different classes were examined using the Mann-Whitney U test and the Kruskal-Wallis test. Statistical significance was set at 0.05 and differences were considered significant if $p \leq 0.05$. The software used to compute the statistical data was SPSS package.

Here, table-1 shows the mean values and standard deviation of class one to five: class 1 values is 15.86 ± 1.48, class 2 value is 15.36± 2.30, class 3 value is 16.76± 2.51, class 4 value is 17.21± 3.00 and class 5 value is 18.88± 4.01.

Table 1. Descriptive Statistics of BMI from class 1 to 5

Class	Mean	SD
Class-I	15.86	1.48
Class-II	15.36	2.30
Class-III	16.76	2.51
Class-IV	17.21	3.00
Class-V	18.88	4.01

Table 3 shows that there were significant differences between class 2 and class 3, class 2 and class 4, class 2 and class 5, class 1 and class 4, class 1 and class 5, class 3 and class 5 as well as class 4 and class 5. No significant differences were observed between Class 2 and class 1, class 1 and class 3, and class 3 and class 4

Table 2. Hypothesis test summary

Null Hypothesis	Test	Sig.	Decision
The distribution of BMI is the same across categories of class	Independent sample Kruskal-Wallis Test	<0.0001	Reject the null hypothesis

The significance level is $\alpha \leq 0.05$

Table 3. Post Hoc Test (Mann Whitney U Test) of pair wise comparison of Class.

	Sig.
Class 2- Class 1	0.109
Class 2- Class 3	0.002
Class 2- Class 4	<0.0001
Class 2-Class 5	<0.0001
Class 1-Class 3	0.117
Class 1-Class 4	0.027
Class 1-Class 5	<0.0001
Class 3-Class 4	0.523
Class 3-Class 5	0.002
Class 4-Class 5	0.012

*The mean difference is significance at the .05 level.

Discusion

The research aimed to identify the average BMI score of primary school girls in the district, analyze their BMI distribution, and test if there are any difference in BMI scores between different classes. The findings of the study showed that the BMI was progressive in nature, increasing with the increase of the academic classes. One study that looked at the BMI pattern of primary school girls in Australia (Lazarus et al., 2000) also found similar results. The study included 1421 children aged 7-12 years and found that the prevalence of overweight and obesity was 9.6% and 6.3%, respectively. The study found that the prevalence of overweight and obesity increased with age, with the highest prevalence observed among girls aged 10-12 years. A study conducted in Saudi by (Kordy & Elgamal, 1995) found that the prevalence of overweight and obesity was higher in boys than girls, and the prevalence also increased with age. The study found that girls who were overweight or obese were more likely to have a family history of obesity and to engage in sedentary activities such as watching television. Another study that looked at the BMI pattern of primary school girls in Spain (Moreno et al., 2000) included 90,997 children aged 7-12 years. Between 1985 and 1995, the population under investigation had significant changes in BMI, although these changes varied according to sex and age. In addition to the paediatric population having higher body mass, the rising skewness of BMI in the highest percentiles of the population, particularly in girls, shows that the obese individuals of the population are becoming even more obese. Another study in China (Zhou et al., 2006), found that the prevalence of overweight and obesity was higher in urban areas than in rural areas. The study also found that the prevalence of overweight and obesity was higher in boys than girls in both urban and rural areas. The findings of this study extend upon existing research regarding BMI growth patterns across different socio-demographic groups. Consistent with previous studies (Hankey & Miyazaki, 2019; He & Karlberg, 2001; Lu et al., 2019; Salmela et al., 2020; Wronka, 2010), our results highlight significant differences in BMI trajectories between various classes.

Our observation of significant disparities in BMI progress between specific class combinations aligns with the findings of Wronka, (2010), who reported similar trends in a longitudinal analysis of BMI among adolescents from diverse socio-economic backgrounds. Finally, the findings of the present study provide novel insights into the specific class combinations associated with divergent BMI trajectories. By identifying these differences, our findings may contribute to the refinement of targeted interventions aimed at addressing obesity and promoting healthy weight management behaviors among schoolchildren. Further studies may be conducted with larger sample size collecting data from the whole country.

Conclusion

All primary school girls are close to normal body mass index and BMI progress aligns with the increase of the academic classes. However, authors recommend nutritional adherence and more physical activity with the aim to improve health. Parents and primary school teachers should pay special attention on the children's physical development as well. Findings of this study provide valuable insights into the BMI pattern of primary school girls in the Jashore district and will help to identify any trends or patterns that may be contributing to the increasing prevalence of overweight and obesity among children in the region. This information can be used to inform public health policies and programs aimed at preventing and managing overweight and obesity in children and adolescents. Ultimately, this study can also contribute to the development of evidence-based interventions that will promote healthy weight management among children and adolescents in the Jashore district and beyond.

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