Original Article

Prevalence of obesity and central obesity among adolescent girls in a district school in Bangladesh

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ABSTRACT

Introduction: The prevalence of childhood obesity has increased over the last two decades. Obesity is a major risk factor for chronic diseases and plays a central role in insulin resistance or metabolic syndrome. **Methods:** The aim of the study was to assess the prevalence of obesity and abdominal obesity by means of body mass index (BMI) and waist-to-height ratio (WHtR) in adolescent girls in a district school in Bangladesh. Based on age and sex specific BMI percentiles, the students were classified as normal weight (5th–<85th percentile), overweight (85th–<95th percentiles), and obese ($\geq$95th percentile). Central obesity was categorized as WHtR $\geq$ 0.5. Adolescent girls (aged 9–17 years) attending the sixth to twelfth grades (n = 501) in a Bengali medium school participated in the study. **Results:** The prevalence of obesity and overweight were 23% and 14% among the girls. The prevalence of central obesity was 26%. Around 14% of girls in the normal weight group were centrally obese. There was a significant relationship between WHtR and BMI status (P = 0.0001). **Conclusion:** Our study provides evidence showing a high prevalence of overall and central obesity in adolescent girls in our population. We emphasize the need for further large scale surveillance programs and preventive strategies in our population to reduce the incidence of obesity.

Key words: Adolescent girls, central obesity, obesity, waist-height ratio

INTRODUCTION

The prevalence of childhood obesity has increased over the last two decades.[1] Obesity is a major risk factor for chronic diseases and plays a central role in insulin resistance or metabolic syndrome. In a recent study done in India, there was evidence of the presence of early cardiovascular risk factors in obese children and adolescents.[2] Body mass index (BMI) is widely used as a measure to evaluate the impact of obesity on cardiovascular and metabolic risk factors, both in children and adults. However, BMI does not always relate to central obesity[3] and it cannot differentiate muscle mass from bone and fat mass[4] waist-to-height ratio (WHtR) has been proposed as an easily measurable anthropometric index for detection of central obesity and to assess associations between cardiometabolic risk factor variables and central intra-abdominal obesity[5-9] The use of WHtR for detecting central obesity and its associated health risks was first proposed in the mid1990s.[10-13] Recently, many authors[14,15-18] have suggested the WHtR as a measure of excess central adiposity. The rationale underlying this index is that, for a given height, there is an acceptable degree of fat stored on the upper body. Since the WHtR takes into account children's height, a single cut-off point can likely be set for the ratio without age and gender difference bias.[18] In addition, it has been shown to be a simple, noninvasive, and practical tool that correlates well with visceral fat and is easier to use.[15-18] In the small number of studies that have examined this index in children, WHtR has been shown to be superior in its ability to predict cardiovascular disease risk factors

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compared with either BMI or percentage of body fat.[17] A WHtR cut-off-point of 0.5 has been proposed as a simple means of indicating whether the amount of central adiposity is excessive and represents a health risk in children.[14,15-19] In Bangladesh, studies have been done mostly in English medium schools focusing on overall obesity but no study has been done to assess central obesity in children and adolescents. In a recent study done among urban children, approximately a fivefold increase in overweight and obesity over the past two decades was reported.[20] In one study done in an adult population, the mean WHtR of 0.48 significantly correlated with sociodemographic variables and was markedly higher in females.[21]

Considering the scarcity of studies on WHtR in children and adolescents in our country the present study was done to assess the prevalence of obesity and central obesity by means of BMI and WHtR in a girls' high school in a central district near the capital city of Bangladesh.

METHODS

Sample
All adolescent girls (aged 9–17 years) attending the sixth to 12 grades ($n = 501$) in a Bengali medium school participated in the study. This study was carried out as part of "Diabetes Awareness and screening program" a surveillance of changing diabetes in children (CDiC) program in Bangladesh Institute of Research and Rehabilitation of Diabetes, Endocrine and Metabolic Disorders, a tertiary hospital in Bangladesh. The survey was conducted with the cooperation of School teachers, CDiC staff, and some volunteers. They underwent 8 h of training before starting the survey. Students and their parents were informed about the study by means of written form. Informed written consent was obtained by means of a signed letter from the school authority. A self-designed structured questionnaire was used for the data collection.

Anthropometric measurements assessment
All the girls were examined by a trained team consisting of diabetes educators, dietician, and volunteers. The team had received 8 h of training and had been standardized in the measurement assessments. The assessment was carried out during school hours as time allocated by the school authority. Body weight was measured by a bathroom scale wearing light clothes to the nearest 100 g. Standing height was measured with stadiometer and measurement was done to the nearest 0.1 cm. Waist circumference (WC) measured to the nearest 0.5 cm in duplicate according to standard conditions by placing a flexible tape midway between the lowest rib and the iliac crest. The tape did not squeeze or compress the skin and was parallel to the floor. The measurement was taken on unclothed, relaxed subjects after gentle expiration. BMI was calculated as the ratio between weight (in kilograms) and the square of height (in meters). WHtR was calculated as the ratio between waist and height both measured in centimeters.

Cut-off values
Based on age and sex specific BMI percentiles,[22] the girls were classified as normal weight (5th–<85th percentiles), overweight (85th–<95 h percentiles), and obese (≥95th percentile). A cut-off of 0.5 was used to differentiate low WHtR from high W/HtR.[14,15,19,23]

Data analysis
Data were processed using the Statistical Package for the Social Sciences (SPSS) (SPSS Inc, Chicago, IL, USA). Descriptive statistics was presented as mean ± standard deviation score for normally distributed data and median with interquartile range (IQR) for skewed data. Chi-Square test was used to evaluate the relationship between WHtR and age group with BMI.

RESULTS

Median age of the students was 13.0 (IQR: 11.0–14.0). Median BMI was 20.3 (17.8–23.4) and median WHtR was 0.44 (0.38–0.50). The prevalence of overweight and obesity were 23% and 14% among the girls. The prevalence of central obesity was 26%. Around 14% of girls in the normal weight group were centrally obese. In overweight girls, 46% and in the obese group, 54% had central obesity [Figure 1]. There was significant relationship between WHtR and BMI status ($P = 0.00001$) [Figure 1]. We have analyzed age groups with BMI status, which showed a significantly higher rate of obesity and overweight in the younger age group ($P = 0.001$) [Table 1]. There was no significant
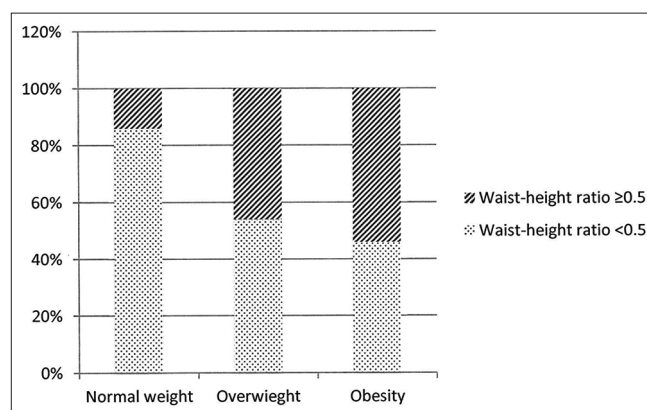

Figure 1: Waist-height ratio among different body mass index group ($P = 0.0001$)

Table 1: BMI according to age group

Age group(years)	Underweight	Normal weight	Overweight	Obesity	Total
9-13	21 (6%)	182(53%)	86(25%)	57(17%)	346
14-19	23(15%)	89(57%)	31(20%)	12(8%)	155
Total	44(9%)	271(54%)	117(23%)	69(14%)	501(100)

Prevalence of overweight and obesity was significantly higher in younger age group (P=.001 on Chi-square test).

relation between the two age groups (26% vs. 24%) with WHtR ($P = 0.673$).

DISCUSSION

The prevalence of obesity was 14% and was higher in younger age than older age group (16% vs. 8%). In our previous study done between 3 and 18 years of age, 15.3% were females which is similar to this finding.[24] The prevalence of overweight was 23% and was higher in younger age group (25% vs. 20%) in our study. In a study done in India among girls aged 13–18 years, the prevalence of overweight was 15.8%.[25] In Tunisian adolescent girls, it was found to be 16%.[26] The prevalence of overweight in our studied subjects was higher than the studies (23%) mentioned above.

In our population, the prevalence of abdominal obesity was 26%.

The prevalence of abdominal obesity was found to be 16.7% in 1500 Egyptian males and females aged 11–19 years according to WHtR.[1] McCarfhy and Ashwell reported WHtR exceeded 0.50 in 11.7% of adolescent girls aged 11–16 years in UK children in 1997.[15] In a Swedish study girls aged 15.6 ± 0.4 years, high-risk WC was detected in 30.1% of subjects.[27] In a large cohort of 985 girls (14–17 years old) in Iran, 18.2% were centrally obese.[28] Children from different populations vary in their rate of proportional growth and in fat patterning.[29,30] Body fat distribution in total mass and composition of skeletal muscles, subcutaneous, intra-abdominal adipose tissue, and bone varies with ethnicity. In Asian populations, particularly those who suffered childhood malnutrition have less skeletal muscle mass and pelvic skeleton dimensions, which may affect waist and hip circumferences.[31] Several epidemiologic studies in Asian population including Chinese, Taiwanese, Indians, and Koreans have higher amounts of body fat at lower BMIs and WC than do Western populations such as USA whites and blacks, perhaps leading to the greater prevalence of cardiovascular disease risk factors at lower BMIs in Asian populations than in Western populations.[32]

In our sample, 54% of obese, 46% of overweight, and 14% of normal weight subjects had central obesity. A high prevalence of central adiposity in our population is of concern as it increases the risk for obesity-associated morbidity and mortality in children and adults.[33]

CONCLUSION

Our study provides evidence showing a high prevalence of overall and central obesity in adolescent girls in our community. We emphasize the need for large scale surveillance programs and preventive strategies in our population to reduce the incidence of obesity.

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