Prevalence of overweight and obesity among school children of Bhaktapur and Kathmandu

Kayastha P1, Vaidya B2, Shakya D3

1Pawana Kayastha, Lecturer, Department of Pediatrics, Kathmandu Medical College Teaching Hospital; 2Binit Vaidya, Chairman and Head of National Center for Rheumatic Diseases; 3Dipesh Shakya, Lecturer, Department of Medicine, Kathmandu Medical College Teaching Hospital, Kathmandu, Nepal.

Abstract

Background: World Health Organization defines childhood obesity as “one of the most serious public health challenges”. Low income countries like Nepal experience a burden of infectious diseases as well as rising incidence of non-communicable diseases frequently associated with obesity. There is paucity of information on childhood obesity in Nepal.

Objectives: This study aims to determine the prevalence of childhood obesity and overweight in school going children and find its association with blood pressure.

Methodology: A school based cross-sectional analytical study was conducted on 509 children aged between 10-16 years, studying in grade 5-10 of private schools in Kathmandu and Bhaktapur. Simple random sampling technique was used for data collection. Anthropometric measurements and blood pressure were taken using standard protocol. Obesity was assessed using Body Mass Index criteria.

Results: The overall prevalence of obesity and overweight in children were found to be 1.6% and 6.1% respectively. This study also showed that prevalence of obesity in children from Kathmandu is comparatively more, which was statistically significant (p<0.001). A highly significant relationship was observed for diastolic blood pressure and Body Mass Index (p<0.001) between the two groups.

Conclusion: This study concludes that obesity though small in percentage, was found in rising trend when compared with previous data. Also, there was strong association with blood pressure, so timely identification and control of obesity is required for prevention of development of other cardiovascular comorbidities.

Key words: Blood pressure; Childhood obesity; Overweight; Prevalence.

INTRODUCTION

According to World Health Organization (WHO) childhood obesity is “one of the most serious public health challenges of the 21st century”. Obesity gives rise to major risk factors for non-communicable diseases (NCD) such as diabetes mellitus, metabolic syndrome, cardiovascular disease and hypertension. Higher socioeconomic status, watching television for long intervals of time, and consuming less fruits are major risk factors for overweight among adolescents in Nepal. With the ongoing transformation of Nepalese society towards rapid urbanization, it can be expected that the burden of the disease may be mounting in Nepal.

Worldwide 42 million school children aged less than five years are overweight and close to 35 million of that population is living in developing countries. The magnitude and seriousness of this problem, has largely been underestimated in Nepal as no national data is available. We must therefore be particular in addressing this problem before it turns epidemic. This study aims to determine the prevalence of childhood obesity and overweight in school going children and find its association with blood pressure.

METHODOLOGY

Case Selection: A school based cross-sectional analytical study was conducted from August to December 2017.
In this study all the school going children aged 10 to 16 years were included. The study population was 509 school children aged 10-16 years studying in grade 5-10 of two different private English medium schools from each district which was randomly selected. Age was verified from school records and rounded off to completed years.

Population proportion simple random sampling technique was used based on their roll numbers so that each student had equal chance of being included. Informed written consent was obtained prior to data collection both from the school authorities and from the parents of the children after explaining the objectives and the method of study. Confidentiality of information was assured and ensured throughout the study. Children with any chronic illness like hypothyroidism, heart disease, kidney disease and those children on any steroid treatment were excluded from the study.

**Measurement methods**

Anthropometric measurements were done utilizing the standard equipment and methodology. Height and weight of each child was recorded. Height was measured by using stadiometer (Hardik Medi-tech, India) to the nearest 0.1 cm with child standing upright barefoot on ground with heels, buttocks touching wall and head in the Frankfurt plane. A calibrated and standardized electronic weighing scale (Dr Trust, USA) to nearest 100 grams was used to measure weight. Weight was measured in three recordings and mean was taken to minimize measurement errors. Body Mass Index (BMI) was calculated using the formula BMI=weight in kg / (height in meters)² and plotted in Center for Disease Control (CDC) BMI percentile chart for age and sex for classification.

A child was classified according to National Center for Health Statistics (NCHS) guidelines as overweight with BMI for age between 85th and 95th percentiles and as obese with BMI for age at or above the 95th percentile. Blood pressure was measured by auscultatory method using a mercury sphygmomanometer and appropriately sized cuff (bladder width of approximately 40% of arm circumference midway between olecranon and acromion; inflatable bladder covering at least two thirds of upper arm length and 80-100% of its circumference). We measured BP after 5-10 minutes of quiet rest with the subjects seated and the right arm positioned at the level of the heart. To avoid the effects of white coat hypertension, blood pressure was measured thrice on each occasion at an interval of 5 minutes between each measurement and a mean of the three measurements was taken as blood pressure value. The first and fifth Korotkoff sounds were recorded as the systolic blood pressure (SBP) and diastolic blood pressure (DBP).

**Data Collection Tools used**

Sphygmomanometer, Stadiometer, Digital weighing machine, CDC BMI percentile chart for age and sex.

**Data analysis**

Prevalence rates of obesity and overweight were calculated and presented as percentage. Pearson’s chi-square test was used to estimate the p-value for the difference in prevalence of obesity in different demographic variable. The Student t-test was done to test statistical significance of the difference in the mean values continuous variables like systolic and diastolic blood pressure in obese and overweight groups. Values were expressed as mean ± standard deviation. P-values <0.05 indicated statistical significance. Statistical Package for the Social Sciences (SPSS) version 20 software was used for this purpose.

Ethical approval was provided by the Institutional Review Committee of Kathmandu Medical College Teaching Hospital, Kathmandu, Nepal.

**RESULTS**

A total of 509 (256 boys and 253 girls) school children were included in this study. Among them eight children were found to be obese, (two males, six females) and 31 children were overweight (14 males, 17 females). The overall prevalence of obesity and overweight in children was found to be 1.6% and 6.1% respectively (Figure 1). Prevalence of obesity as well as overweight in girls were higher (2.4% and 6.7% respectively) as compared to boys (0.8% and 5.5%) (Table 1). Highest prevalence rates of obesity and overweight were seen in the age group 16 years (Table 2).

The presence of obesity and overweight at 16 years of age is higher i.e 4.68% and 9.37% compared to other age group children. No case of obesity was observed at age 10, 11 and 15 years but overweight was observed in all age groups. To compare variables with BMI Category, children above 85th percentile BMI for age and sex were considered obese and overweight, and below 85th percentile BMI for age and sex were considered non obese.

This study also showed that prevalence of obesity and overweight in children from Kathmandu is comparatively
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more than children from Bhaktapur which is statistically significant. However, no statistically significant association of BMI category was seen with age and sex (Table 3).

Figure 1: Overall prevalence of overweight and obesity in children

Table 1: Prevalence of obesity/overweight according to gender

| Gender | Obesity | Overweight |
|--------|---------|------------|
| Girls  | 6 (2.4%)| 17 (6.7%)  |
| Boys   | 2 (0.8%)| 14 (5.5%)  |

Table 2: Prevalence of obesity and overweight in different age groups

| Age in years | Obese | Overweight | Normal | Underweight |
|--------------|-------|------------|--------|-------------|
| 10           | 0 (0%)| 2 (3.27%)  | 35 (57.3%) | 24 (39.3%)  |
| 11           | 0 (0%)| 5 (6.3%)   | 36 (45.5%) | 38 (48.1%)  |
| 12           | 3 (4.3%)| 2 (2.8%)  | 41 (59.4%) | 23 (33.3%)  |
| 13           | 1 (1.29%)| 5 (6.49%) | 45 (58.4%) | 26 (33.76%) |
| 14           | 1 (0.9%)| 8 (7.5%)   | 63 (59.4%) | 34 (32.07%) |
| 15           | 0 (0%) | 3 (5.66%)  | 36 (67.9%) | 14 (26.4%)  |
| 16           | 3 (4.68%)| 6 (9.37%) | 40 (62.5%) | 15 (23.4%)  |

Table 3: Comparison of BMI categories with different demographic variables

| Variables         | Obese/overweight | Non-obese | p-value |
|-------------------|------------------|-----------|---------|
| Age               |                  |           |         |
| 10-13             | 18 (6.3%)        | 268 (93.7%)| 0.126   |
| 14-16             | 21 (9.4%)        | 202 (90.6%)|
| Sex               |                  |           |         |
| Male              | 16 (6.2%)        | 240 (93.8%)| 0.150   |
| Female            | 23 (9.1%)        | 230 (90.9%)|
| Area              |                  |           |         |
| Kathmandu         | 31 (12.7%)       | 214 (87.3%)| <0.001  |
| Bhaktapur         | 8 (03.0%)        | 256 (97.0%)|

Table 4: Comparison of mean systolic and diastolic blood pressure with obese/overweight and non-obese children

| Blood pressure | Obese/overweight | Non-obese | Test of significance |
|----------------|------------------|-----------|----------------------|
|                | Mean | Standard Deviation | Mean | Standard Deviation | t-test | p-value |
| Systolic       | 107.7| 9.25               | 95.02| 42.1               | 1.8529 | 0.869   |
| Diastolic      | 73.18| 10.24              | 61.85| 7.09               | 9.111  | <0.001  |
DISCUSSION

Obesity is becoming a global nutritional concern. In the present study, the proportion of overweight children was higher compared to obese children. The prevalence of obesity is high in developed countries and similar trends are found in recent years among children from developing countries. A study in 2014 by Raut et al among children in different locations of Kathmandu valley showed that 3.1% were overweight, 0.6% were obese, 64.8% were underweight and 31.5% were of normal BMI. Another school-based study from eastern Nepal showed 1.8% prevalence of obesity, 2.9% overweight, 19.9% underweight and normal BMI in 75.3% children. Our observation showed that 1.6% of children were obese, 6.1% were overweight, 34.2% were underweight and 58.2% were normal BMI children, which corroborates with the prior mentioned studies.

According to various studies, the current prevalence of overweight children in India could range from 4% to 22%. Though the prevalence of obesity in Nepalese children is lower than in India, comparison between previous and our study shows a gradually increasing trend in childhood obesity. This may be because certain areas in Nepal are urbanizing at a fast pace, its urban population increasing to 17% of the total population in 2011 from 13.9% in 2001.

Piryani et al showed that 12.2% of adolescent students in Nepal were overweight. A study assessing the knowledge and prevalence of obesity in adolescent children of Kaski district showed that all children with obesity were between 14 to 16 years age group. Our study is comparable with previous studies as the highest prevalence rates of overweight children in India could range from 4% to 22%. Though the prevalence of obesity in Nepalese children is lower than in India, comparison between previous and our study shows a gradually increasing trend in childhood obesity. This may be because certain areas in Nepal are urbanizing at a fast pace, its urban population increasing to 17% of the total population in 2011 from 13.9% in 2001.

In the study by Raut et al 3.5% male children were overweight and 1.2% were obese; whereas only 2.6% females were overweight, and none were obese. But in some studies a higher prevalence was reported in males as well. Our study also showed a higher prevalence in girls, but the difference was not statistically significant. The gender difference in BMI category could be due to sedentary lifestyle of girls and also the pubertal changes.

The difference in prevalence of overweight/obesity in Bhaktapur and Kathmandu were statistically significant with obesity being more common in the school of Kathmandu. The difference may be because of changes in lifestyle, cultural differences, food habits and different rate of urbanization in the two areas. Studies from India, Bangladesh and China also show similar pattern of higher prevalence of overweight or obese children in urban areas and private schools. However, in the present study all the schools belonged to private management. But it is particularly seen in those studies, that obesity is prevalent in areas that have gone through rapid economic growth, urbanization, cultural transition and variation of food systems.

On comparing the mean SBP and DBP values between obese and non-obese groups, a highly significant relationship was observed for DBP with obesity but not with SBP. Some studies however, do show relationship of SBP with obesity in children. SBP and DBP were also found to be higher in children with high BMI (>85th percentile) in a study by Dwivedi et al. A study by Shah et al in eastern Nepal as well as other various studies from Brazil, Spain, Thailand and China showed that childhood obesity was significantly associated with blood pressure. Multiple data including this seems to point out that obesity and overweight may lead to early onset of chronic disease like hypertension leading to multiple cardiovascular comorbidities later in adulthood.

CONCLUSION

The present study shows overweight and obesity in children is in increasing trend whereas underweight still remains a major concern. This suggests the need for a balanced and judicious approach to effectively control this double burden paradox in Nepal. A strong association of overweight with blood pressure was also observed suggesting need of timely identification and control of overweight and obesity for prevention of development of other cardiovascular comorbidities later in life.
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