

Nutritional status of preschool children- a school based study

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Abstract

Objective: (1) To estimate the prevalence of Overweight, Obesity and Underweight amongst preschool children in urban nursery schools from Pune (2) To compare the two growth references that can be used to assess the BMI status of preschool children and (3) To compare BMI for age / gender with Weight for age / gender to define Overweight and Obesity. **Methods:** It is an observational study with 334 preschool children of 4 years of age from urban nursery schools of Pune. They were examined during annual health check-up. Anthropometric measurements such as Body weight (Wt.), height (Ht.) were taken and Body Mass Index (BMI) was calculated. Child Growth standards released by the World Health Organization and CDC charts were used to define obesity, overweight and underweight. Cutoff values for nutritional status using 'weight for age' as criteria was defined as > 85th percentile being Overweight, > 97th percentile being obesity and < 3th percentile as underweight. Using BMI criteria Overweight was defined as > 85th percentile, obesity > 95th percentile and underweight as < 5th percentile. **Results:** The prevalence of overweight, obesity, and underweight was 2.1%, 1.2% and 29.77 % respectively using BMI for age /gender as criteria and WHO growth reference charts. Amongst two growth references used to assess BMI; Underweight was overestimated by CDC growth charts. **Conclusion:** The Prevalence of overweight and obesity among preschool children of Pune were lower than that of preschool children of developed countries and other parts of India. Under nutrition is still a problem for preschool children. BMI for the age and gender is a better indicator to pick up nutritional status of preschool children than weight for age.

Key words: Preschool children, Growth reference, Measurement, Body Mass Index

Introduction

Preschool years (3 to 6 years) of childhood are important as far as growth is concerned. This period of rapid growth is affected by nutrition and infectious diseases prevalent during this period. Much attention is not given by parents towards nutritional needs. Appetite pattern is also variable. Therefore, nutritional disorders occur frequently during this period.

A rapid epidemiological, demographic and nutritional transition has occurred in the developing countries including India [1,2,3] which has led to dual burden of underweight and overweight-obesity among preschool children. NFHS data has identified that significant proportion of overweight coexists with high rates of

under nutrition, pointing out that the nutritional transition is underway in India [4].

A few studies have been conducted on nutritional status especially to estimate the prevalence of overweight and obesity among preschool children in India.

Therefore, in this study an attempt has been made to estimate the prevalence of overweight, obesity and under nutrition amongst preschool children from middle income group families studying in urban nursery school from Pune.

Materials and Methods

A cross-sectional study was conducted in the year 2014, using purposive samples which consisted of preschool children from Pune city. Data was collected using a pre

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structured pro forma after obtaining a written informed consent from the head of the institutions. Weight was measured to nearest of 100 gm using digital scale. Height was measured to nearest 1mm using a non-stretchable tape.

Overweight and obesity were defined according to WHO [5] and CDC growth standards [6]. Children between 85th to 95th percentile of BMI for age and sex were defined as overweight, those who were > 95th percentile of BMI for age and gender were defined as obese and those below 5th percentile of BMI for age and sex were defined as underweight / thin as per growth standards used.

Results

Study population consisted of 334 children of age 4 from four nursery schools from Pune city. There were 203 boys (60.78%) and 131 (39.2%) girls.

Nutritional status of boys and girls was studied separately and is depicted in Table 1.

Table-1: Mean and standard deviation for Height (height / age), Weight (weight / age) and Body Mass Index (BMI/ age) according to gender

| Nutritional status | Boys | | Girls | |
|----------------------------|--------------|-----------------|--------------|-----------------|
| | Range | Mean \pm sd | Range | Mean \pm sd |
| Height (cm) | 92 - 125 | 105 \pm 6.15 | 87 - 117 | 103.2 \pm 4.9 |
| Weight (kg) | 11 - 27.3 | 15.21 \pm 2.3 | 9.7 - 26.0 | 15.0 \pm 2.2 |
| BMI (kg / m ²) | 8.84 - 19.88 | 13.89 \pm 1.5 | 9.88 - 18.99 | 13.6 \pm 1.44 |

Accordingly, though the range of height and weight of boys was higher than that of girls, there was no statistical difference in average height, weight and BMI of boys and girls. Comparison of nutritional status as defined by WHO growth reference for BMI for age and Weight for age is shown in Table 2.

Table-2: Nutritional status using WHO criteria for BMI and weight for age.

| Nutritional status | BMI for age No. | Percent | Weight for age No. | Percent | Z(p) |
|--------------------|-----------------|---------|--------------------|---------|--------------|
| Underweight | 101 | 30.24 | 8 | 2.4 | 10.5(0.0001) |
| Overweight | 4 | 1.20 | 2 | 0.6 | 0.82(0.206) |
| Obese | 7 | 2.10 | 2 | 0.6 | 1.68(0.046) |

It can be seen that the percentage of children identified in all the three categories was significantly more i.e. 30.24%, 4% and 7% respectively for Underweight, Overweight and Obesity when BMI for age was used as a criterion to define the categories as compared to those identified when weight for age was used as the criterion for defining the same (2.4%, 2% and 2% respectively). The difference was statistically significant for underweight children.

Comparison of different growth standards for nutritional status for boys and girls using BMI for age 4 years is given in Table 3.

It can be seen that 48.50% children were underweight and boys were affected more as compared to girls using CDC standard as against 30.24% children were underweight using WHO growth standard. There was no difference in identification of overweight and obese children using both the growth references.

Table-3: Comparison of nutritional status by using BMI for age as criteria and two different Growth references charts.

| Reference | WHO | | | | | | CDC | | | | | |
|-----------------------|-----------------|-------|------------------|-------|----------------|-------|-----------------|-------|------------------|-------|-----------------|-------|
| | Boys n = 203 | | Girls n = 131 | | Total n=334 | | Boys n = 203 | | Girls n = 131 | | Total n =334 | |
| Nutritional status | No | % | No | % | No | % | No | % | No | % | No | % |
| Underweight/ Thin | 62 | 30.54 | 39 | 29.77 | 101 | 30.24 | 112 | 55.17 | 50 | 38.17 | 162 | 48.50 |
| Overweight & Obese | 7 | 3.45 | 4 | 3.05 | 11 | 3.30 | 7 | 3.45 | 4 | 3.05 | 11 | 3.30 |

A large variation was seen in number of children classified as underweight, overweight or obese with two different growth references. It is thus essential to have a growth reference which can be universally accepted and followed uniformly.

Discussion

This study results show that the combined prevalence of overweight and obesity was 3.3% using BMI for age and gender. Though it is lower than few studies conducted in India in this age group; it is higher than the figure (1.6%) reported in NFHS data [4]. Although the prevalence of obesity is relatively low in this study; it has important public health implications because unhealthy weight status (under-weight, overweight and obesity) has been seen in studies conducted in various part of India urban as well as rural school children.

The combined prevalence of overweight and obesity in the developed world is much higher. National Child Measurement Programme data (2010) from UK showed that 23% children aged 4-5 years were overweight [7]. In a study from USA the reported prevalence of overweight and obesity was 49% [8].

The rates in Asian countries are lower than the western countries. In a study conducted in Chinese children of 2-6 years of age group; the prevalence of overweight and obesity has been reported as 10.7% and 4.2%, respectively [9]. The prevalence of underweight, overweight and obesity has been found to be 4.77%, 9.81% and 4.77% in boys and 4.77%, 10.31% and 4.49% in girls, respectively in a study conducted in Tehran, Iran [10].

A study conducted in South India (2008) has found the combined prevalence of overweight and obesity as 5.9%, [11] and a similar study carried out in nursery schools of Amritsar city of Punjab has found the combined prevalence of overweight and obesity as 10.42% [12].

The western countries have higher rates of overweight and obesity than Asian countries. This can be attributed to differences in infant feeding practices, the methods of assessment and different growth standards used to define overweight and obesity.

The combined prevalence of overweight and obesity was slightly higher among boys (3.4%) than girls (3.05%), but this difference was statistically non-significant. Similar findings have been reported in study conducted in the nursery schools of Amritsar city of Punjab [12]. Thongbai et al. in their study have reported that boys were at a higher risk for being overweight than girls [13]. There are studies, however that have shown that preschool girls were at risk for being overweight than the boys [14].

This difference in prevalence between boys and girls may be due to cultural factors and social taboos.

The proportion of children who are overweight using 'BMI for age' criteria is higher as compared to 'Weight for age' criteria; which were similar to other Indian studies [15,16]. But both these studies have used different criteria as compared to ours. A higher age group was studied and sample size was large in their study.

This study results show that the prevalence of underweight is 30.24% using BMI for age as criteria; whereas the prevalence of underweight is 10.51% using Weight for age as criteria. Thus Growth standards using BMI as a criterion to define nutritional status overestimates prevalence of underweight.

This study demonstrates the existence of the dual burden of malnutrition among preschool children. Similar findings have been reported in NFHS-3 data wherein the prevalence of overweight and obesity was 1.6% and that of underweight was 42% in population based study.

Anthropometric measurements i.e. Weight for age, Height for age and wasting (weight for height irrespective of age) are used to assess nutritional status. Of these, weight for age is the most widely used indicator for assessment of nutritional status because of ease of measurement. Current energy status is better assessed by using BMI as criteria because it is computed from present weight and height of children. As BMI indicates current energy / Calorie intake, it can help in early detection of unhealthy nutritional status [17]. BMI should be calculated in all settings where length /height measurements are possible and be plotted on Growth chart to assess the current nutritional status.

Conclusion

In India very few studies have been conducted in urban preschool children to assess nutritional status. This study shows high prevalence rate of undernutrition with increasing prevalence of overweight & obesity. Children in this age group from urban preschools and middle socioeconomic group are in a stage of nutritional transition. This suggest the need of balanced approach to detect factors associated with under nutrition and to undertake preventive interventions targeted at the high risk group for overweight / obesity simultaneously.

Limitations: Being cross sectional study past nutritional status of these children is not known and future trend cannot be assessed. It was not possible to prove any causal relationship between overweight / obesity and its risk factors. The results of this age group may not be indicative of general population. Purposive sampling, small sample size and disproportionate boys to girls' ratio are other limitations of this study.

Contributions: Authors had full access to all of the data in the study.

Study concepts and design: SP and DA, Statistical Analysis – SR

All authors had equal contributions in writing this manuscript and all have read and approved the final manuscript.

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