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Original Article

Prevalence of overweight in preschool children using the new WHO growth standards

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SUMMARY

Background & Objective: Limited data are available on the prevalence of overweight in infants and children using the new WHO reference. Therefore, the objective of this study was to establish the prevalence of overweight in Saudi preschool children using the 2006 WHO child growth standards in comparison with the 2000 CDC reference in order to suggest the most suitable reference.

Subjects and Methods: the data set of the 2005 Saudi reference was used to calculate the BMI for age in children below 60 months of age. The prevalence of overweight was calculated based on the two references using the WHO cutoffs (weight for height or BMI for age above +2 standard deviation score). A lower cutoff for excess weight, BMI for age > +1 SDS (equivalent CDC cut off for overweight) was also used. All calculations were performed using the WHO and CDC software as appropriate. Chi-square test was used to compare proportions and a *p*-value <0.05 was considered significant.

Results: There were 15554 children from birth to 60 months of age, in which the prevalence of BMI > +2 SDS (WHO cutoff for overweight) using the WHO standards was 6%. Using the WHO and CDC reference, the prevalence of overweight by WHO cut off in the age group 24–60 months was 5% and 5.8% respectively (*p*=0.100). Prevalence values using lower cut off for BMI for age > +1 SDS were 15.7% and 12.2% based on the WHO and CDC references respectively (*p*=0.001). Conclusions: the prevalence of BMI > +2 SDS (overweight by WHO definition) in Saudi infants and young children is intermediately high, calling for preventive measures to prevent further increases described in other countries. The WHO child growth standards appear to be a more suitable reference for the surveillance of overweight in preschool children. However, this assumption needs confirmation by further studies on the relationship between cutoffs and health outcome.

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1. Introduction

In almost all reports from different parts of the world, a high prevalence of overweight and obesity in children was documented. For example, in the United States of America (USA) the prevalence of BMI >95th percentile (cutoff for obesity) in 1999–2000 was 15.5% among 12- through 19-year-olds, 15.3% among 6- through 11-year-olds, and 10.4% among 2- through 5-year-olds, compared with 10.5%, 11.3%, and 7.2%, respectively, in 1988–1994.¹ Similarly, reports from

the United Kingdom (UK) indicated increased prevalence of BMI >95th percentile (obesity) in 11–15 year-olds from 17% in 1996 to 25% in 2004.² Reports from developing countries show disparity in the prevalence of overweight and obesity. High prevalence, similar to developed countries, has been reported from transitional countries like Brazil,³ United Arab Emirates,⁴ and Saudi Arabia;⁵ whereas low prevalence of overweight (4.94% in 2003 and 6.67% in 2005) has been reported from India⁶ and a prevalence of 6.2% and 1.8% for overweight and obesity in 2002–2003 in schoolchildren from Yemen.⁷

Most above-mentioned reports involve schoolchildren and adolescents and information on the prevalence of overweight and obesity in preschool children is scarce worldwide and mostly based on older references such as National Center for Health Statistics

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Table 1

Prevalence of BMI > +2 SDS in Saudi children 0–60 months using the WHO child growth standards.

Age (months)	No. of children (%)		
	Boys	Girls	Combined
0–5	3022 (3.4)	2845 (3.8)	5867 (3.6)
6–11	1304 (9.3)	1290 (8.6)	2594 (8.9)
12–23	1278 (9.9)	1221 (11.4)	2499 (10.6)
24–35	696 (7.2)	727 (6.1)	1423 (6.6)
36–47	714 (5.2)	784 (5.2)	1498 (5.2)
48–60	844 (3.9)	829 (2.5)	1673 (3.2)
0–60	7858 (6.0)	7696 (6.0)^a	15554 (6.0)

^a*p* = 0.531.

(NCHS),⁸ the Center for Disease Control and Prevention (CDC)² or on extrapolation from the International Task Obesity Force (ITOF) cut offs in adults.⁹ All these references do not include BMI below 2 years of age. The recent publication of the World Health Organization (WHO) child growth standards (WHO reference), which includes a BMI reference from birth to 60 months,¹⁰ provided a new tool for the assessment of prevalence of overweight in infancy and early childhood. The objectives of this report are to establish the prevalence of overweight in a preschool Middle-Eastern population from birth to 60 months of age using the WHO reference and to provide a comparison with the 2000 CDC reference for the available age group (24–60 months) in an attempt to identify the most suitable reference for early detection of excess weight in infants and young children.

2. Subjects and methods

The prevalence of overweight in Saudi preschool children (birth to 60 months) was calculated from the data set collected for the 2005 growth charts for Saudi children and adolescent survey (Saudi reference). The design and methodology of this study have been reported in details elsewhere.¹¹ Briefly, the study sample was cross-sectional, selected by multistage probability sampling procedure from a stratified listing based on the population census in the Kingdom of Saudi Arabia. Accordingly, the sample is representative of all the socioeconomic strata and consists of a majority of children with combined breast and formula milk feedings. Data collection was made by house-to-house visits where a survey questionnaire, clinical examination and body measurements were completed by primary care physicians and nurses. Weight, length and height measurements were performed by trained physicians and nurses. In children less than 2 years, weight was measured in the supine position on a sliding scale and length was measured in the supine position as well, whereas children above 2 years of age were weighed and their height was measured in the upright position according to standard recommendations.¹² For both age groups body measurements were performed by 2 members of the field team. Intra- and inter-observer variability were checked once in

every 100 measurements. Body mass index (BMI) was calculated according to the formula (weight/height²). Percentiles and z-scores of BMI for age were constructed and smoothed using the LMS Methodology.^{13–15} The prevalence of overweight was calculated based on the two newest references (the 2006 WHO child growth standards and the 2000 CDC reference). The prevalence of overweight was defined according to the WHO cutoffs for this age group as the proportion of children whose BMI was above +2 standard deviation score (SDS). Another cutoff for excess weight, BMI for age > +1 SDS, similar to the BMI >85th percentile (CDC cut off for overweight), was used to investigate the difference in prevalence between the two references at lower cut offs used by other references. All calculations were performed using the WHO and CDC software as appropriate.^{16,17} Chi-square test was used to compare proportions and a *p*-value <0.05 was considered significant.

3. Results

The total national sample size in the Saudi data set was 35, 279 healthy children and adolescents of which 15554 children from birth to 60 months of age were the subjects of this report. Table 1 presents the prevalence of BMI > +2 SDS using the WHO reference (overweight by WHO cutoff), indicating an overall prevalence of 6% with a peak prevalence of 10.6% between the ages 12–23 months, but no significant difference between boys and girls (*p* = 0.531). Comparison of the prevalence of BMI > +2 SDS (overweight, according to the WHO cutoff) in the age group 24–60 months between the WHO and CDC reference is shown in Table 2 with prevalence of 5% and 5.8% respectively, a difference that is not significant (*p* = 0.100). Prevalence values using a lower cut off for BMI for age > +1 SDS (equivalent to CDC cutoff for overweight) were 15.7% and 12.2% based on the WHO and CDC references respectively (Table 3), indicating a significant difference (*p* = 0.001) but no difference between boys and girls neither in the WHO (*p* = 0.671) nor in the CDC reference (*p* = 0.977). The Fig. 1 shows the prevalence of excess weight at different cutoff levels and age groups using the WHO standards as reference demonstrating variability with cut off and age.

4. Discussion

Most studies demonstrating increasing prevalence of overweight involve schoolchildren and adolescents where the problem has been shown to persist in adolescence and in adulthood leading to major health problems.¹⁸ In addition, it has been shown that overweight preschool children (BMI > 85th percentile) were at least 5 times as likely to be overweight at 12 years than those who are not overweight,¹⁹ and that rapid increases of weight for length in the first 6 and 4 months of life were associated with increased risk of obesity at 3 and 7 years of age respectively.²⁰ These reports and others demonstrate the importance of surveillance of overweight infants and young children.

Table 2

Comparative prevalence of BMI > +2 SDS by age and sex.

Age groups (months)	WHO standards			CDC reference		
	No. of children (%)			No. of children (%)		
	Boys	Girls	Combined	Boys	Girls	Combined
24–35	696 (7.2)	727 (6.1)	1423 (6.7)	705 (6.5)	730 (5.9)	1435 (6.2)
36–47	714 (5.2)	784 (5.2)	1498 (5.2)	718 (6.5)	786 (6.4)	1504 (6.5)
48–60	844 (3.9)	829 (2.5)	1673 (3.2)	770 (5.5)	766 (3.7)	1536 (4.6)
Overall	2254 (5.4)	2340 (4.6)	4594 (5.0)^a	2193 (6.2)	2282 (5.3)^a	4475 (5.8)

^a*p* = 0.100.

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