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Longitudinal observations on growth patterns of obese infants: Developing country perspectives. Preliminary study

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ABSTRACT

Background: Infantile obesity is considered a risk factor for childhood obesity in the developed countries. There is lack of data on infantile obesity from developing countries. **Methods:** Anthropometric records (mean weight, length/height and BMI z-scores) of 8 infants attending the Pediatric Endocrinology Clinic for parental concern of obesity between 2004 and 2010 were compared with matched controls. All children were followed up at 6 monthly intervals till completion of 5 years of age. **Results:** The mean weight and BMI z-scores were significantly higher in the obese group as compared to control group at all age points. The mean BMI z-scores fell below +2 z-scores after 1½ yr of age in the obese group but remained significantly higher till 5 years of age. **Conclusions:** The growth patterns of obese infants suggest a trend of higher BMIs persisting into childhood. Larger studies are required to confirm these findings.

Introduction

Childhood obesity has reached epidemic proportions over the past few decades [1]. Its prevalence has increased from 16.5% in 1980 to 23.2% in 2013 in the developed countries with a similar trend observed in the developing countries in terms of percentage increase (from 8.2% in 1980 to 13.2% in 2013) [1]. In India, a prevalence of overweight and obesity of 18.2% by the IOTF classification and 23.9% by the WHO standards has been documented in a recent study, similar to global trends of childhood obesity [2]. Childhood obesity contributes significantly to adulthood obesity [3] and has been linked to several adverse health outcomes in adults [4, 5]. Prevention of childhood obesity before it is firmly established is therefore desirable and has been recognized as a global health priority. It is important to identify risk factors for childhood obesity for developing effective preventive

strategies. Of the several risk factors, obesity during infancy has been identified as a major modifiable factor to prevent childhood obesity [6–8]. Understandably, targeted interventions to reduce obesity during infancy have been suggested as primary preventive strategies for childhood obesity [9–12].

However, infantile obesity (occurring earlier than 2 years of age) has generally been considered benign and believed to require no intervention [13–15]. This belief is derived from traditional observations and studies on growth patterns of infants before 1980s [13–15]. Consequently, the childhood obesity prevention programs in developing countries do not primarily focus on infants [16] unlike in developed countries [9–12]. There is no longitudinal study from a developing country on the growth patterns of obese infants to see if their obesity is truly a risk factor for childhood obesity as observed in several developed countries. With an aim to understand the growth patterns over first 5 years of life, we retrospectively analyzed the anthropometric data of obese infants followed up at our center.

Patients and methods

Children <2 years of age who attended the Pediatric Endocrinology Clinic of our hospital for parental concern of obesity between April 2004 and April 2010 were included in the analysis. Those with clinical features or signs of pathological obesity, incomplete information or lack of follow up were excluded. Data regarding birth weight, weight and length/height at each follow up visit, parents' socioeconomic status (SES), and infant feeding practices were extracted from the clinic files. All infants were followed up at 6 monthly (±7 days) intervals till completion of 5 years of age. An advice about increasing the general physical activity was given during all physician encounters. At each clinic visit, weight was measured on electronic weighing machine (Avery, India) to the nearest 50 g with child wearing light clothing. Recumbent length/standing height was measured with an infantometer/stadiometer to the nearest 1 mm. Body mass index (BMI) was calculated as weight (kg)/[height (m)]^2. For each subject, an age and gender matched control was selected from the infants attending the Growth Clinic of our hospital for routine growth monitoring during the same period. Weight, length/height and BMI z-scores were calculated using WHO Anthroplus software (version 1.0.4 WHO, Geneva, Switzerland), applicable globally for children up to 19 years of age [17], as similar reference data are not available for Indian children. Obesity was defined as BMI z-score of ≥+2 (color coding red). A comparison of growth (weight, length/height and BMI) between obese and control infants/children was made. Unpaired Student's t-test was used to compare the mean weight, length/height and BMI z-scores between obese and control children at different age points. A two-tailed p-value <0.05 was considered statistically significant.

Results

Eighteen infants were registered with a diagnosis of infantile obesity over the study period; only 8 (5 boys and 3 girls)

Fig. 1 – Clinical photographs of 2 infants showing generalized fat distribution

were found eligible for inclusion. The reason for exclusion was lack of anthropometric records at 6 monthly intervals due to lack of follow-up. Seven of the 10 parents who were lost to follow-up when contacted telephonically informed that they did not feel the need for further follow-up as the rapidity of infants' weight gain had decreased subsequently. A family history suggestive of infantile obesity was available in 2 subjects. All families belonged to middle SES. The number of exclusively breast fed infants during the first 6 months was similar (6 each) in the 2 groups. The mean age (±SD) at the time of first visit was 9.25 ± 6.49 (range 3–24 months). All infants showed generalized body fat distribution (Fig. 1). Birth length was not recorded in any infant. The mean birth weight of obese infants was similar to control group (3 ± 0.35 kg, −0.68 z-score versus 2.9 ± 0.24 kg, −0.85 z-score; p-value 0.60). The mean length/height z-scores were similar in the 2 groups at all ages. However, the mean weight and BMI z-scores were significantly higher in the obese group as compared to control group at all age points (Table I). The weight and BMI velocity was the highest between 6 months and 1 year in both groups but significantly higher in the obese group (Fig. 2a and b). The mean BMI peaked at 1 year and showed a consistent decline till 5 years of age in obese group (Fig. 2b). None qualified for obesity after 1½ yr of age as BMI z-scores fell below +2 z-scores. However, the mean BMI z-scores remained significantly higher in the obese group till 5 years of age (Table I).

Discussion

Recent data from the developed countries indicates that obesity during infancy is a significant risk factor for childhood obesity that further contributes to the burden of adulthood obesity [6–8]. There is a growing understanding amongst physicians that unhealthy dietary and weight patterns are established early in life and lead to adverse health outcomes into adulthood [3]. Therefore interventions that aim to modify the physical activity, dietary and weight patterns during the first few years of life are considered most useful for preventing childhood obesity in the developed countries [9–12]. During the past 2 decades, several developing countries including India have seen a major rise