

Prevention and Impact of Childhood Obesity in India

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ABSTRACT

Background: Childhood obesity has become a prominent health issue in developed countries and has now gained access in the developing world as well. Secular trends indicate increasing prevalence rates of childhood obesity in India, from 9.8% (2006) to 11.7% (2009). Similar increase can be seen in other developing countries; 4.1% (1974) to 13.9% (1997) in Brazil and from 12.2% (1991) to 15.6% (1993) in Thailand. Important determinants of childhood obesity include poor dietary habits, sedentary lifestyle, high socioeconomic status, unawareness and false beliefs about nutrition, marketing by transnational food companies, increasing academic stress, and poor facilities for physical activity. Obesity among children has medical as well as psychosocial impact leading to huge economic impact on the individual family, health sector as well as the country. Successful prevention/reduction and management of childhood obesity requires a multilevel approach involving the family, school, peer group, government and the society as a whole. (*J Clin Prev Cardiol.* 2014;3(1):5-11)

Keywords: obesity; childhood obesity; Asian Indians; diabetes; metabolic syndrome; subclinical inflammation.

Introduction

Obesity has reached epidemic proportions globally and its prevalence has doubled in the last two decades (1). Over the last 5 years, most developing countries have reported prevalence rates of obesity (inclusive of overweight) > 15% in children and adolescents aged 5–19 year (2–4). Childhood obesity is increasing at an alarming pace in India, giving rise to adult diseases in youth, like high blood pressure, type 2 diabetes mellitus (T2DM), heart disease and osteoporosis.

Defining Childhood Obesity: Diagnostic Criteria

The criteria for assessing childhood obesity have been the subject of debate and research. The following criteria for age- and gender-specific body mass index (BMI)

cutoffs have been applied by different groups to diagnose childhood obesity.

1. IOTF (International Obesity Task Force) cutoffs. Cole *et al.* (2000) developed international cutoffs for children aged 2–18 year from varied ethnicities (Brazil, United Kingdom, Hong Kong, The Netherlands, Singapore, and USA, including 97,876 males and 94,851 females from birth to 25 year of age) (5). Percentile curves that corresponded to the BMI cutoff points of 25 and 30 kg/m² at the age of 18 year were used to define overweight and obesity, respectively. These cutoffs are meant to provide more internationally comparable prevalence rates of overweight and obesity in children.

2. CDC (Centers for Disease Control and Prevention) BMI percentiles (6). BMI percentile curves were developed in a nationally representative population of North American children, aged 2–20 year (overweight 85–94th percentile; obese >95th percentile).

3. WHO (World Health Organization) growth reference curves (7). These curves were developed in 2007 for children and adolescents aged 5–19 yr to align with the recommended adult cutoffs for overweight and obesity at 19 yr (overweight: > +1 SD; obese: > +2 SD).

4. WHO growth standards (1995) (8,9). These standards were based on data collected in USA as recommended by a 1995 WHO Expert Committee. Weight-for-height Z score >1 and >2 were used to define overweight and obesity, respectively, in preschool children (< 5 year).

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5. New WHO growth standards in preschool children (2006) (10). These standards were developed using data collected in the WHO Multicenter Growth Reference Study (1997–2003) from approximately 8500 children from widely different ethnic backgrounds and cultural settings (Brazil, Ghana, India, Norway, Oman, and the USA). The new growth curves are expected to provide a single international standard for best physiological growth for all children from birth to 5 years of age and to establish the breastfed infant as the normative model for growth and development. Overweight is defined as BMI-for-age Z score of 1 or higher and obesity as BMI-for-age Z score of 2 or higher.

Prevalence

There is a wide variation in the prevalence data for childhood obesity globally. In 2010, 43 million children (35 million in developing countries) were estimated to be overweight and 92 million were at risk of being overweight (11). The worldwide prevalence of childhood overweight and obesity increased from 4.2% (95% CI: 3.2%, 5.2%) in 1990 to 6.7% (95% CI: 5.6%, 7.7%) in 2010. Data from many developing countries show an increase in prevalence of obesity in children and adolescents (12–17).

To date, very few nationally representative reports are available on the prevalence of obesity among Asian Indian children and adolescents living in India. The prevalence of overweight/obesity in urban post-pubertal children in Delhi showed an increase from 16% in 2002 to about 24% in 2006 (15). A high prevalence was seen in the private schools (catering to children from upper socioeconomic stratum) 29% versus 11% in government schools (catering to lower socioeconomic stratum) (12, 16, 17). A recent multicentric cross-sectional study in 38,296 children from five urban cities located in different geographical regions of India showed that the prevalence of overweight and obesity in 8- to 18-year-old children was 14.4% and 2.8% by IOTF cutoffs, 14.5% and 4.8% by CDC cutoffs, and 18.5% and 5.3% by WHO cutoffs, respectively (17). Also, the overall prevalence of abdominal obesity (defined according to the International Diabetes Federation consensus statement for at-risk children and adolescents) (18) in these children was 4.5%.

Determinants

The increasing trend of overweight prevalence is documented among children/adolescents (5–19 year) because of the following sociocultural factors:

- *Unhealthy nutrition.* Comparatively low cost of energy-dense foods, improved purchasing power, television advertisements targeting children and junk foods being sold in the school cafeterias are shifting the children's dietary habits from healthy foods to fried fatty and processed foods.
- *Working status of parents.* Parents these days are both working and have a hectic lifestyle. They are often overworked and it is easy to let children order "fast foods" and hardly have any time to oversee balanced nutrition for children.
- *Lack of physical activity.* Shift from outdoor play to indoor entertainment; television viewing, Internet and computer games has attributed to increased childhood obesity. Children no longer want to ride a cycle and parents feel it is safer to ride a car than a cycle in a chaotic city.
- *Academics.* Increasing burden of academic competitiveness among students have led to decreased participation in sports and any other form of physical activity. This is particularly true for girls who are sedentary from school years. Many of the studies from India show that females have more obesity and the metabolic syndrome as compared to males.
- *Increased Socioeconomic status.* Increased purchasing power in the form of daily allowance (pocket money) to purchase foods/snacks available in school cafeteria or nearby fast food joints could be a major reason for this.
- *Wrong parental approach.* Parents in India and other developing countries usually have a general misconception that an obese child is a healthy child. And that if the child is fat, "baby fat" will go away with time. In an effort to keep child "healthy," he/she is fed in excess. Many of these children remain obese for the lifetime.
- *Technology.* Most importantly with the advancement in technology, especially in the field of entertainment more time is spent in front of television, computers and video games at the expense of sports and physical activity, making it a sedentary lifestyle for the children.

Impact of Childhood Obesity

In the last one decade, childhood obesity has been increasingly implicated as a primary childhood health

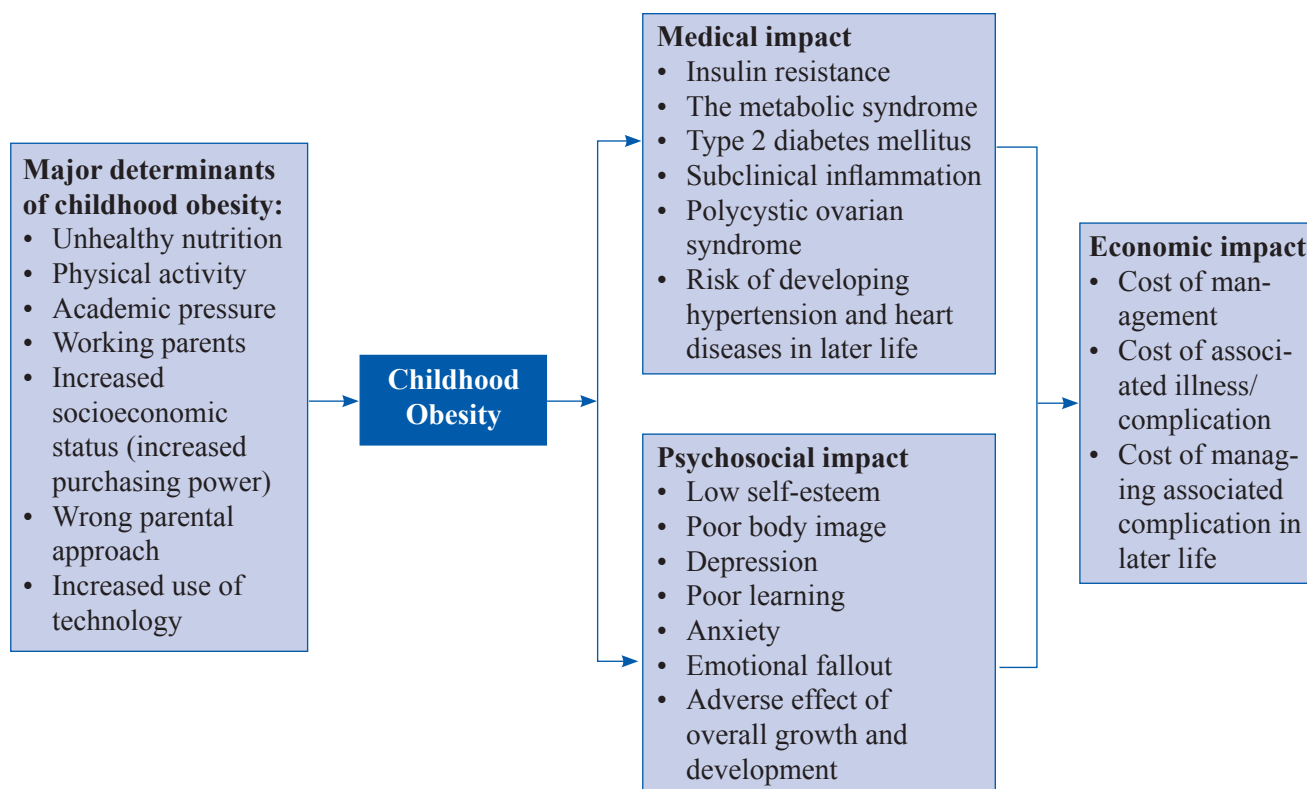


Figure 1. Overview of childhood obesity: determinants and impact.

problem. Obesity is associated with several comorbid conditions: dyslipidemia, hypertension, hyperglycemia, non-alcoholic fatty liver disease (NAFLD) and a conglomeration of conditions known as the metabolic syndrome (19). As a result of childhood obesity, health problems such as hypertension, T2DM and hypercholesterolemia that were once confined to adults are now being diagnosed in children. Figure 1 gives an overview of childhood obesity (determinants and impact).

Medical Impact

Insulin resistance and the metabolic syndrome

Association of multiple factors like central obesity, dyslipidemia (hypertriglyceridemia and low levels of high-density lipoprotein-cholesterol), hypertension and impaired glucose tolerance (IGT) characterizes the metabolic syndrome. About one-third of overweight or obese urban Asian Indian children have insulin resistance (13). Interestingly, higher level of hyperinsulinemia and related metabolic derangements has been recorded in Asian Indian neonates and children as compared to white Caucasian neonates (20). Similar comparative data are available for young children indicating early

occurrence of insulin resistance in Asian Indians (14). Data pertaining to the metabolic syndrome in children and adolescents are limited due to lack of a well-established definition for the metabolic syndrome in children. Importantly, the pattern of weight gain, particularly rapid weight gain after the age of 2 year, has been shown to be significantly associated with a higher prevalence of the metabolic syndrome in young (26–32 year) Asian Indians (21). Recently, in a factorial analysis, obesity/insulin factor (BMI, waist circumference [WC], triceps skinfolds, subscapular skinfolds, and fasting insulin) was shown to be independently associated with a high cumulative risk of the metabolic syndrome in urban Asian Indian adolescents (22). Insulin resistance has been reported to be present as early as 8 year of age in Asian Indian children (23), with an overall prevalence of fasting hyperinsulinemia in 29.0% and 63.9% normal weight and overweight adolescents (BMI > 23 kg/m²), respectively (24).

Type 2 diabetes mellitus

Obesity, especially abdominal obesity, is among the strongest risk factors for T2DM. Globally, T2DM is being reported at an early age, primarily contributed by obesity and the metabolic syndrome in early childhood.

We have reported that generalized obesity and abdominal obesity were significantly higher in children and adolescents with T2DM in North India (24). Important independent risk factors for development of T2DM in Asian Indian adolescents and young adults were hypertriglyceridemia, high waist-to-hip ratio and family history of diabetes (25).

Subclinical inflammation

Obesity contributes to the development of vascular inflammation which raises markers of inflammation. Subclinical inflammation, typified by markers such as high-sensitivity C-reactive protein (hs-CRP), is associated with atherosclerosis and has been shown to predict T2DM and CAD (26). Generalized and abdominal adiposity has been shown to be independently associated with increased levels of hs-CRP in Asian Indian adolescents and young adults (aged 14–25 year) (25). In this study, high hs-CRP levels were seen in 13% of Asian Indian adolescents overall, in approximately 22% of overweight (BMI 85th percentile) and in approximately 25% of those with excess body fat (percent body fat >85th percentile). CRP levels show an association with percentage of body fat, waist-to-hip ratio, WC and triceps skinfold thickness in Asian Indian children. Interestingly, excess dietary intake of saturated fat was a strong correlate of high CRP levels in Asian Indian adolescents (27).

Polycystic ovarian syndrome (PCOS)

Obese adolescent girls are more likely to suffer from PCOS, a syndrome of variable combinations of menstrual irregularity, hirsutism or acne, with obesity and insulin resistance. Higher prevalence of PCOS was reported in South Asian women than white Caucasians in a recent study (28). South Asians present and seek treatment of PCOS at a younger age than white Caucasians, have more severe symptoms, and higher fasting insulin concentrations and lower insulin sensitivity than white Caucasians. The prevalence and course of PCOS in developing countries has not been adequately investigated.

With the rapid rise in childhood obesity, there has also been an increase in the prevalence, recognition and severity of pediatric NAFLD (29). Although prevalence of NAFLD is high in some developing countries (30), relevant data in children from developing countries are not available, and this issue needs to be researched further.

Psychosocial impact of childhood obesity

Overweight and obese adolescents tend to have poor body image and low self-esteem. Social isolation and stress could interfere with their learning and lead to depression, anxiety and emotional fallout. These negative factors work against the child with a weight problem and thus hamper his/her overall growth and development (31). In this context, no other data are available from developing countries like India.

Economic impact

Apart from medical and psychosocial impact, childhood obesity also causes huge economic impact on the individual families, healthcare sector as well as the country. It would be difficult to estimate the total financial burden caused by childhood obesity as this computation would not only include the cost involved in managing the condition but also the complete analysis of cost of illness caused as a complication of childhood obesity and also its medical impact in later life, if left unmanaged. There is hardly any data in India to quantify the economic impact of childhood obesity; however, in the developed countries there have been attempts to estimate the cost factor associated with childhood obesity and its management, based on the impact of obesity on healthcare utilization and expenditures during childhood. Hampl *et al.* (2007) found that children in a large pediatric integrated delivery system diagnosed with obesity during a healthy-child visit had US\$172 higher annual healthcare expenditures than children with a normal BMI (32). An analysis of the 2001–2003 Medical Expenditure Panel Survey (MEPS) identified that overweight children, defined by the American Medical Association Expert Committee and other national associations as children with a BMI in the 85–94th percentile for age and sex, had annual total healthcare expenditures US\$180 higher than children with a normal BMI, while obese children, or children with a BMI in the 95th percentile or greater for age and sex, had US\$220 higher expenditures on average (33, 34).

Prevention

For prevention of obesity especially during childhood emphasis should be laid on a healthy and active lifestyle and creating a nurturing environment that helps the youth recognize their own worth and respect cultural food ways. It is recognized that obesity, eating disorders, hazardous weight loss, nutrient deficiencies and size discrimination are all interrelated and need to be

addressed in a comprehensive manner, thus requiring a multilevel approach. Some of the recommendations that can help in preventing and reducing childhood obesity in developing countries are shown in Table 1.

Table 1.

Recommendations for reducing childhood obesity in developing countries (adapted from Ref. 35)

Monitoring and surveillance	Periodic monitoring of nutritional and obesity status of children and adults Maintain a nationwide database on secular trends in obesity and diabetes
Education	Nutrition and physical advice through audiovisual media and culturally conducive methods Endorsement of healthy lifestyle by prominent people and local champions
Community	Organization and participation in health walks and healthy food festivals Information about nutrition to parents (particularly mothers) Children-specific nutrition information workshops for newly married women Safe walk/bicycle routes to school
Perinatal and neonatal period	Balanced nutrition to pregnant mothers Encourage breastfeeding Avoidance of catch-up obesity in children Maintenance of correct growth velocity under guidance of physicians Avoid excess nutrition to stunted children
School-based programs	High importance of physical activity Healthy foods in cafeteria, ban on sweetened beverages and energy-dense junk food Training of teachers regarding health education Incorporation of more knowledge about nutrition and physical activity and nutrition related diseases in school curriculum
Home	TV/computer time to be restricted to 2 h/d Mandatory 60 min of physical activity daily to be supervised by parents Restriction on eating out and junk foods
National health authority	Creation of national task force for obesity Decrease in taxes and prices of fruits and vegetables More playgrounds, parks and walking and bicycle tracks Restriction on advertisement of commercial foods on television at prime time and during children's programs Encourage transnational food companies to manufacture healthy snacks Ban on unfair nutrition claims for commercial products Prohibition of promotional gifts with junk foods Restrictions on monetary sponsorship of youth festivals by cola companies
Legislative	Food labeling and quality monitoring Food policy to include country-specific guidelines for healthy nutrition for adults and children

Community-based interventions should aim at providing a conducive environment for children to follow a healthy lifestyle, promote healthy food alternatives and bring awareness and need about an increase in physical activity.

Community intervention programs for childhood obesity in India

Community-based interventions are aimed at generating awareness and providing a conducive environment for children to follow a healthy lifestyle (balanced diet and increased physical activity) and promote healthy food alternatives. In India, we have initiated comprehensive programs aiming at childhood obesity, namely "CHETNA" (Children Health Education through Nutrition and Health Awareness program, Hindi for "The Awareness"), which was carried out in New Delhi and "MARG" (Medical Education for Children/Adolescents for Realistic Prevention of Obesity and Diabetes and for Healthy Ageing, Hindi for "The Path"), carried out in 15 cities of North India covering nearly 700,000 children. Under these programs, children are given nutritional and physical activity education with the help of lectures, leaflets, debates and skits. These comprehensive programs initiated on a large scale for the first time in South Asia aimed to impart education regarding healthy lifestyle not only to children, but also to teachers and parents. The MARG program is the first large-scale community intervention project in South Asia, which focuses 100% on primary prevention of not only diabetes, but on non-communicable diseases in general.

Conclusion

Childhood obesity is associated with a number of health problems such as hypertension, T2DM and hypercholesterolemia, IGT, which were once confined to adults. It is also associated with significant other morbidities including gallstone, dyslipidemia, obstructive sleep apnea syndrome, early puberty or menarche, eating disorders, skin infections, orthopedic disorders, asthma and other respiratory disorders. Apart from medically impacting the individual, childhood obesity also adversely impacts the psychosocial development of the child as well as the financial economy of the individual household as well as the country. Thus, for prevention of obesity, emphasis should be laid on a healthy and active lifestyle and creating a nurturing environment that helps the youth recognize their own worth and respect cultural food ways. It is recognized that obesity, eating disorders, hazardous weight loss, nutrient deficiencies and size discrimination are all interrelated and need to

be addressed in a comprehensive manner. Community-based interventions should aim at providing a conducive environment for children to follow a healthy lifestyle, promote healthy food alternatives, and generate awareness about an increase in physical activity.

Conflict of Interest

Authors do not have any conflicts of interest.

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