

Review

Current status on obesity in childhood and adolescence: Prevalence, etiology, co-morbidities and management



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ABSTRACT

Obesity and its associated co-morbidities increased throughout the world in the last 50 years, mainly due to increased amount of consumption of calorie-dense food and sedentary lifestyle. It is essential to combat with obesity at all available means and levels, including medical, societal and international measures. Childhood obesity persists into adulthood depending on the presence of parental obesity and severity of obesity. There are several windows of opportunity for interventions starting from pre-conception, to in-utero nutritional environment, from early infancy to adolescence to prevent obesity. In this paper, epidemiology, etiopathogenesis, co-morbidities, prevention and treatment of obesity in children will be reviewed.

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1. General scope and epidemiology (Fig. 1)

Obesity is simply defined as excess amount of body fat and associated with number of health risks including Type-2 diabetes and cardiovascular problems. Obesity-related co-morbidities are among the leading public health problems worldwide since prevalence of obesity in adults as well as in children has been in rise in many countries over the last decades. In clinical practice, body mass index [(BMI) = weight (kilograms)/height (meters) squared], is the most commonly used surrogate measure of obesity in childhood. Calculated BMI value is plotted on published BMI reference standards. The definition of overweight/obesity varies according to the growth charts compiled by the Centers for Disease Control (CDC), the World Health Organization (WHO), and the International Obesity Task Force. The most commonly used definition of overweight is BMI between >85th and 95th percentile for age and sex and that of obesity is BMI \geq 95th percentile for age and sex (CDC) (Shields and Tremblay, 2010). Severe obesity is defined as BMI \geq 120 percent of the 95th percentile values corresponding to approximately the 99th percentile, or BMI Z-score \geq 2.33 (ie, 2.33 standard deviations [SD] above the mean) (Skinner and Skelton, 2014; Flegal et al., 2009).

Although preventable, the prevalence of obesity has been

continuously rising in both adults and children. According to WHO, worldwide obesity has more than doubled since 1980. Overall, 1.9 billion adults were overweight and 600 million of them were obese in 2014 covering 39% and 13% of total world's population respectively (www.who.int). This terrifying clinical picture also holds true for children. In year 2013, 43 million children under the age 5 were overweight/obese and this figure expected to reach 60 million by the year 2020 (de Onis et al., 2010). It is well known that many of the today's obese children and adolescents will become future's obese adults. The likelihood of persistence of childhood obesity into adulthood (tracking) depends on the age, the presence of parental obesity and severity of obesity (Guo et al., 1994; Parsons et al., 1999).

Once considered as a problem of developed world, some of the developed countries, succeeded in stopping or slowing down obesity epidemic in children and adolescents owing mostly to the effect of awareness campaigns and public health measures taken to prevent obesity. The prevalence of obesity in USA increased dramatically from 1970's to year 2000 (from 6.5 to 18.0 percent in children, and from 5.0 to 18.4 percent in adolescents) after which time it seems to stabilize and even decrease in some subgroups (Ogden et al., 2002, 2012, 2014). Reviewing the weight and height records of 11.1 million children aged 2–4 years who participated in federally funded health and nutrition programmes in 40 states, Pan et al. reported that from 2008 through 2011, the aggregated obesity prevalence decreased by 0.4–0.9% among all racial/ethnic groups except American Indians/Alaska Natives (Pan et al., 2015). The prevalence of obesity was 19.1% in young Southern Californians in

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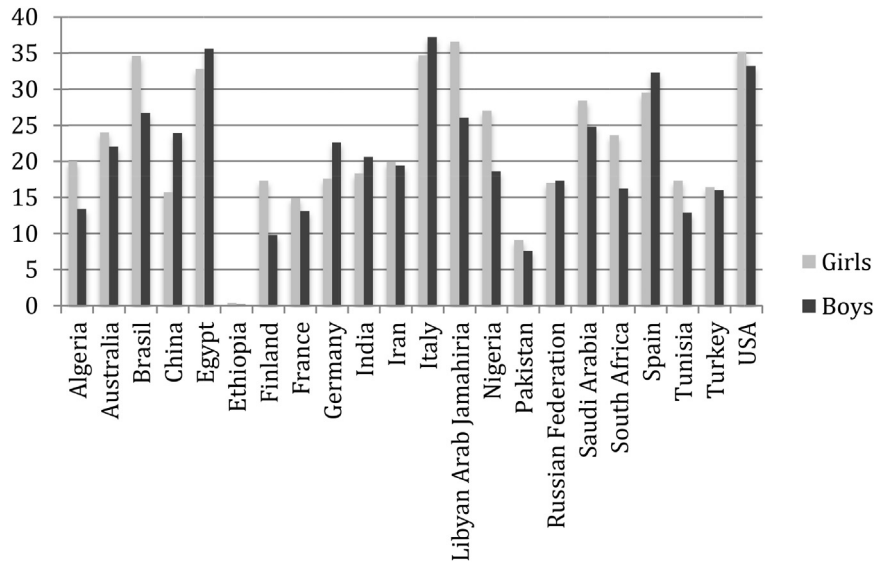


Fig. 1. The prevalence of childhood overweight and obesity in various countries in the world (data available from <http://www.worldobesity.org/resources/trend-maps/>).

year 2008 and decreased by 1.6% by 2013, corresponding to a relative decline of 8.4% (Koebnick et al., 2015). In a report from Israel, no increase in the prevalence of childhood obesity was observed between the years 2005–2007 and 2010–2012 (Almagor et al., 2015). Similarly, no difference in overweight prevalence between 2003 and 2011 among 12-year-old children in Sweden was reported (de Munter et al., 2016). Prevalence of overweight decreased in Dutch girls from 12.6% to 10.9% while it increased in children of immigrant descent from 14.6% to 21.4% from year 1999 through 2007 (de Wilde et al., 2014). Although, a third of children is obese/overweight, the trends showing that childhood overweight and obesity has also been stabilized recently with a small annual increase of 0.4% during 2004–2013 in England (van Jaarsveld and Gulliford, 2015).

On the contrary, obesity trend is still on rise in low (LI) and middle-income (MI) countries. It has been noted that the prevalence of overweight/obesity in an LMI or LI country is similar to that in many western European countries 40 years ago (Poskitt, 2014). Urbanisation, so called westernisation with greater possession of domestic appliances – televisions, cars and electronic equipment leading to a sedentary life; food secure environment, easy access to processed food and sugar-sweetened beverages which increases caloric intake could somehow explain this rising trend. The fact that the prevalence tends to be higher in low socioeconomic groups in affluent countries (where calorie-dense processed food are cheap, but healthy fresh food are expensive) whereas higher in high socioeconomic groups in LI and MI countries (where healthy local food (low calorie) and water are more available than processed food, sugar-beverages, fast-food) supports this. Unfortunately, cultural perceptions of obesity indicating good nutrition, well-being and beauty together with public unawareness about the future problems related to obesity are the other factors that add to the rising tide of obesity in those countries. China could be one of the most obvious example for those countries in which obesity has entered into an epidemic stage. According to a recent study from Shandong, China; the prevalence of overweight and obesity (defined by WHO criteria) increased from 2.76% to 0.45% for boys, 2.46% and 0.11% for girls in 1985 to 20.30% and 18.16% for boys, 18.89% and 6.58% for girls in 2014, respectively (Zhang et al., 2015).

In transitional (between low to high income) countries figures show heterogeneity. The prevalence of overweight (including

obese) children has been reported to range from 14.4% to 19.2% for boys and from 11.8% to 17.6% for girls in the transitional countries of Eastern and Central Europe which include Belarus, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Russian Fed., Slovakia, Slovenia and Turkey. Frequency Prevalence of overweight and obese children in Hungary increased between the 1980s and the beginning of the 2000s (Bodzsar and Zsakai, 2014). In Turkish children and adolescents, several local studies from different regions of the country performed between 2000 and 2010 demonstrated that prevalences of overweight and obesity in children aged 6–16 years vary between 10.3%–17.6% and 1.9%–7.8% respectively. The differences in the figures obtained in these regions are thought to be due to variations in the sampling of the subjects in regard to residential (urban vs rural) and economical conditions. The risk factors identified most commonly were; high income family, living in metropolis, having obese parents, large birthweight, consumption of soft beverages and time spent by TV and PC (Bereket and Atay, 2012).

In the Middle-Eastern countries, figure are more heterogenous. Obesity rates are alarmingly high in oil-rich countries, whereas they are lower in the middle-and low income countries. A total of 12,701 children (6281 boys and 6420 girls) with ages 1–18 years were screened in 2002 in different provinces of Saudi Arabia showed that the overall prevalence of overweight was 10.68 and 12.7 percent and that of obesity was 5.98 and 6.74 percent in the boys and girls, respectively (El-Hazmi and Warsy, 2002). Girls were more obese than boys. However, the situation is worsening, as a recent study in 6–10 years schoolchildren from Saudi Arabia, demonstrated the prevalence of overweight or obesity as 34.8% in girls and 17.3% in boys (Al-Mohaimmed et al., 2015). In Kuwait, the prevalence of overweight was 21.6% and obesity was 30.5% in 6–18 years of age and boys had a higher percentage of obesity (Elkum et al., 2015).

A meta analysis from Iran reported that the overall prevalence of obesity was 5.13% and 7.25% in 1995–1999 and 2005–2010, respectively. In the same period the prevalence of overweight remained relatively constant and estimated to be about 10.43% and 10.88%, respectively. Despite this relative stability, the authors drew attention to the point that until a few years ago underweight was the main nutritional problem of Iranian children. (Kelishadi et al.,

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