

ABSTRACT

Obesity is now a global epidemic affecting developing and developed countries. It arose as a consequence of societal and environmental factors which promote weight gain. Chronic diseases are now appearing in childhood and adolescence, and will contribute to future morbidity and mortality in adulthood. The primary goal of childhood and adolescent obesity interventions is to adopt and maintain healthy lifestyle behaviours, so as to decrease morbidity and mortality.

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INTRODUCTION

In 1998, the World Health Organization designated obesity as a global epidemic, affecting both children and adults¹. This arose as a consequence of societal and environmental factors which promote weight gain. The increasing prevalence of childhood and adolescent obesity is occurring even in the developing countries, and childhood obesity is an important predictor of adult obesity². As a consequence, many chronic diseases are now appearing in childhood and adolescence, and will contribute to future morbidity and mortality in adulthood.

In a recent review of all major anthropometric studies in Singapore over the past five decades, although the heights of pre-schoolers and school age children appears to have optimised according to their genetic potential, the weights of children still appear to be increasing from 6-18 years for both sexes, and the body mass indices also appear to be increasing in tandem with this trend in weight increase³.

The persistence of obesity into adulthood depends on the age at which the child becomes obese, the severity of obesity, and the presence of obesity in at least one parent. Overweight in a child under three years of age does not predict future obesity, unless at least one parent is also obese. After three years, the likelihood that obesity persists increases with advancing age of the child, and is higher in children with severe obesity in all age groups. The presence of obesity in at least one parent increases the risk of persistence in children at every age⁴.

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CLINICAL EVALUATION**Definition**

Obesity is defined as excessive fat accumulation which presents a risk to health. In adults, obesity is assessed from the body mass index (BMI), which is calculated based on the person's weight (in kilograms) divided by the square of his / her height (in metres). Based on previous studies which have demonstrated an increased risk for cardiovascular events, the adult BMI cut-offs for those above 18 years who are overweight is 25.0 kg/m², and for obesity, 30 kg/m²⁵.

However, in normal children, the BMI increases after birth, decreases around two years, and increases again between the ages of five and eight years. Since the BMI changes with age during childhood and adolescence, single BMI cut-offs cannot be used. In the past, surrogate measures of childhood adiposity include skin-fold thickness and percentage of ideal weight for height. More recently, it is now accepted that the clinical assessment of obese children and adolescents should be based on determination of the BMI percentiles (for age and sex). Many countries are adopting gender-specific BMI charts for their paediatric populations, and overweight is defined as a BMI between the 85th to 94th percentiles, while obesity is defined as a BMI at or more than the 95th percentile for age⁶.

Exclusion of pathological causes for obesity

While common exogenous obesity is very common, it is important to first exclude any pathological cause for obesity. Exogenous obesity is usually associated with increased linear growth, and these individuals are generally taller than their age-matched peers, with an advanced bone age. Conversely, most pathological causes of obesity are short with a suboptimal height velocity (< 4 cm/year), and would include genetic syndromes (Prader Willi syndrome) and endocrine disorders such as hypothyroidism, growth hormone deficiency, hypopituitarism and Cushing syndrome.

Complications of obesity

The complications of obesity can be classified into psychosocial and medical problems.

Psychosocial problems

Childhood obesity has a significant impact on the emotional development of the child and adolescent, who may suffer from discrimination and stigmatisation. It has been observed that by six years of age, children have picked up societal messages that overweight is undesirable, and overweight children may encounter rejection and become socially isolated, or they

may develop a distorted body image⁷. The social burden of obesity may affect educational attainment and interpersonal relationships⁸. Obese children are more likely to have a poor body image, a low self-esteem and confidence⁹. In general, obese children and adolescents have an increased risk of psychosocial and psychological problems that can persist into adulthood.

Medical problems

Obese children are also at risk of developing obstructive sleep apnoea syndrome and orthopaedic disorders (genu varus, genu valgus deformity, slipped capitate femoral epiphysis), in addition to components of the metabolic syndrome, which include hypertension, dyslipidemias, insulin resistance and glucose intolerance¹⁰. The increased prevalence of obesity partly accounts for the increased incidence of type 2 diabetes mellitus in children and adolescents. Odds ratios in obese children are 2.4 for raised diastolic blood pressure, 4.5 for raised systolic blood pressure, and 3.0 for raised low density lipoprotein fraction of cholesterol¹¹.

In addition, obese children are also at higher risk of developing non-alcoholic fatty liver disease, which can present as a spectrum ranging from steatohepatitis to cirrhosis. This is characterised by elevated liver transaminases with a hyperechoic liver on ultrasonography, and is a diagnosis of exclusion.

MANAGEMENT¹²

The primary goal of childhood and adolescent obesity interventions is to adopt and maintain healthy lifestyle behaviours, so as to decrease morbidity. However, these interventions should allow height growth to continue, so that height eventually becomes appropriate for weight, or the BMI percentile becomes reduced. The management of childhood and adolescent obesity incorporates the following components:

Dietary changes

All diets should be nutritionally balanced and designed to meet growth requirements. A balanced reduced calorie diet which focuses on eating fewer calorie dense foods, was generally more effective than no diet. These dietary guidelines could include Epstein's traffic light diet, which divides foods into coloured groups, according to whether they can be consumed freely (green), consumed with discretion (yellow) or whether they should be strictly limited (red).

It is clear that calories should not be restricted in infants; rather, prevention of overfeeding should be emphasised¹³. Diets consisting of drastically altered portions of various nutrients may be dangerous and should be avoided¹⁴.

Very low calorie diets and protein sparing modified fast regimens do not offer any significant improvements in reducing weight, as compared with less restrictive diets¹⁵.

Physical activity

Regular exercise encourages long-term continuation, and is an essential component of the weight management program¹⁴. Initial recommendations should be small, and exercise levels should be increased slowly to avoid discouragement.

Since younger children are generally incapable of focused activity for long periods of time, they need creative activities appropriate for their age, with generous periods of free play¹⁵.

In the older obese pre-adolescent and adolescent, a moderate-intensity progressive exercise programme with increasing levels of obesity has been recommended¹⁶⁻¹⁷. For overweight children, weight-bearing activities can be recommended. For obese children, the exercises should be primarily non-weight bearing, and can include swimming, cycling, or interval walking (walking with frequent rests, gradually working up to longer walking periods with fewer rest stops).

However, decreasing time spent in sedentary pursuits (watching television, video games, computer uses) and substituting with an alternative form of physical activity is a useful strategy in weight loss¹⁸⁻¹⁹. Encouraging decreased sedentary time will help the children to identify their own areas of interest regarding physical activity, and will improve compliance.

Behaviour modification

Behaviour-treatment programs have shown consistent success in weight loss²⁰. However, the implementation requires a multi-disciplinary team, which not only provides knowledge about diet and physical activity, but more importantly, has a consistent focus on principles of behaviour change.

The components of behaviour modification include²¹⁻²²:

- i) Educating the parents and children on the need for lifestyle changes
- ii) Setting achievable weight maintenance and weight loss goals
- iii) Teaching skills for weight loss
- iv) Self-monitoring using food and activity logs, which increase awareness of eating and exercise patterns
- v) Stimulus control, which includes limiting the amount of unhealthy food stocked at home
- vi) Reinforcement through contracts, praise for behaviours, and rewards (but do not use food as a reward)

Family involvement

Familial aggregation of risk factors for obesity is common. The long-term effects of a weight control program (diet, physical activity, behaviour modification) are significantly improved when the intervention is directed at both the parents and the child, rather than the child alone²²⁻²³. This also avoids stigmatisation of the obese child, and provides social support and encouragement.

With regard to other strategies in the management of obesity:

Pharmacotherapy

There is little data on the long-term efficacy and safety of medication in childhood and adolescent obesity. At present, only Orlistat is indicated for the obese adolescent, and is still an adjunct therapy to lifestyle recommendations.

Bariatric surgery

There is no role for bariatric surgery in childhood obesity. In limited case series, bariatric surgery has been performed in severely obese older adolescents who achieved significant post-operative weight reduction and improvement in co-morbid conditions²⁴⁻²⁶, but were at increased risk of developing post-operative nutritional deficiencies²⁵⁻²⁷. This cannot be recommended for most, but only for those at the highest risk of mortality from obesity, and with both patient and parental understanding of the consequences of surgery²⁶.

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LEARNING POINTS

- **The persistence of obesity into adulthood depends on the age at which the child becomes obese, the severity of obesity, and the presence of obesity in at least one parent.**
- **Overweight in a child under three years of age does not predict future obesity, unless at least one parent is also obese.**
- **Since the BMI changes with age during childhood and adolescence, single BMI cut-offs cannot be used. It is now accepted that the clinical assessment of obese children and adolescents should be based on determination of the BMI percentiles (for age and sex).**
- **The long-term effects of a weight control program are significantly improved when the intervention is directed at both the parents and the child, rather than the child alone.**