

## Evidence Update

# Management of Childhood Obesity: A rational approach

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Today, the non-communicable disease (NCD) burden is increasing at an alarming rate, posing a huge liability on a country's health system and economy. Obesity is the main contributory factor for the development of NCD and the obesity epidemic has negated many of the achievements made by the health sector over the last few centuries. Childhood obesity is a major risk factor for the development of adult obesity and the effects are cumulative. More than 75% of obese children will become obese adults [1]. From 1980 to 1990 childhood obesity has risen by 47.1% [2]. Although the incidence is higher in high-income countries, absolute numbers are greater in low and middle income countries [2]. Although there is a high focus on control of NCD among adults, the attention paid by public health authorities to childhood obesity is not adequate. The WHO has highlighted the importance and complexity of controlling childhood obesity in a recent document (WHO/NMH/PND/ECHO/15.1).

Childhood obesity can affect any part of the body and is the precursor of many comorbidities such as high blood pressure, insulin resistance and dyslipidaemia, key elements of the metabolic syndrome, that are increasingly seen in children, even in Sri Lanka [3]. Longitudinal data have shown that childhood obesity can leave a permanent imprint on the health of the individual so that even if the body mass index (BMI) is controlled later in life they have an increased risk for NCD related comorbidities [4].

Socioeconomic transition leading to behavioral changes, such as nutritional transition from a traditional diet to a high fat, refined carbohydrate diet, increase in physical inactivity and sedentary behavior and target oriented education, has made childhood obesity an emerging problem in many developing countries.

Obesity is defined as the accumulation of excess fat in the body, associated with adverse health outcomes [5]. The literature shows that body fat content of >25% in boys or >32% in girls is associated with morbidity [6,7]. The fat percentage resulting in the development of the metabolic syndrome in Sri Lankan children has been calculated to be 28.6 % for boys and 32.6% for girls [8]. However, as direct measurement of body fat is not practical in day to day clinical and epidemiological practice, BMI is used as a surrogate marker.

Obesity affects children physically as well as psychologically. It can affect any organ of the body from head to toe. Physical ailments could be either due to mechanical effects (slipped capital femoral epiphysis, genu valga, tibia vara, flat foot, scoliosis or osteoarthritis) or metabolic effects (diabetes mellitus, cardiovascular disease, non-alcoholic fatty liver disease (NAFLD) or non-alcoholic steato hepatitis (NASH), metabolic syndrome, glomerular disease, polycystic ovarian syndrome, gall stones or pseudotumour cerebri). Psychological effects intensify with increasing age. Bullying, peer rejection, lack of friends and lack of self-

confidence could be seen at school and low job opportunities and lack of companionship later in life [9].

Obesity occurs due to energy imbalance in the body. Calorie intake in excess of need (basal metabolism, thermal effect of food, physical activity and growth) will be deposited as fat in the body for later utilization. This has been advantageous during evolution but with increased availability of food, and in the absence of an energy excretory mechanism in humans, it has become disadvantageous. The only way of preventing excess calorie deposition is by consuming only the required amount of calories and/or utilizing them through physical activity.

It is clear that obesity is a complex illness which requires a multidisciplinary approach in its management. This evidence update describes a rational approach to the management and prevention of childhood obesity.

## Diagnosis

Childhood obesity is diagnosed when the BMI for age is  $>+2SD$ . A value between  $+1$  to  $+2SD$  is considered as overweight or at risk of obesity. Gender specific BMI for age and WHO growth charts are available in the local Child Health Development Record (CHDR). Both overweight and obese children need complete clinical evaluation and management.

## Aetiology

The majority of cases are due to excess calorie deposition in the body, which is known as simple obesity. Only a minority are due to pathological causes such as syndromes (Bardet Biedel, Alstrom, Prader Willi, Down) or an endocrine disorder (Cushing disease/syndrome, hypothyroidism, growth hormone deficiency, pseudohypoparathyroidism) or are iatrogenic (prolonged steroid therapy, sodium valproate therapy, improper use of insulin in IDDM adolescents). Clinical history and examination will help in identifying these conditions. Children with simple obesity will achieve near optimum height. Therefore, these children, apart from being heavy, are also tall. However, their weight would overtake their height, leading to obesity. Children with obesity due to pathological causes are usually short. The only notable exception is the condition termed 'growth without growth hormone' where there is concomitant hypersecretion of androgens and cortisol by an adrenal tumour [9]. Leptin deficiency, although a pathological condition, behaves like simple obesity as the effects are due to uninhibited intake of food [10].

## Clinical evaluation

A complete clinical history, including birth history, family history (obesity, diabetes, hypercholesteraemia, cardiovascular etc), drug history and medical and psychological effects is important to identify the aetiology and complications. A detailed feeding history will help to provide some insight into feeding habits. A detailed activity history should include frequency and duration spent on physical activity both at home and at school, type of physical activity and sedentary behavior pattern (especially screen time).

Complete physical evaluation includes measuring waist circumference [11], blood pressure measurement, [12], examining for acanthosis and looking for clinical features suggestive of aetiology and complications.

## Investigations

Children above 5 years of age with nutritional or simple obesity are investigated to identify associated morbidity. After a 12 hour overnight fast, blood glucose levels, lipid profile and aspartate transaminase (AST) and alanine transaminase (AST) levels are done. A load of anhydrous glucose 1.75g/kg body weight (1.93g of monohydrous) to a maximum of 75g

(82.5g of monohydrous) is given dissolved in water (taken within 5 minutes) and a random blood sugar is done 2 hours later.

An ultrasound scan (USS) of the abdomen is performed to detect NAFLD. Presence of hepatic steatosis with an elevated ALT and a ALT:AST ratio  $>1$ , is suggestive of NASH, provided there has been no other illness within the recent past that may account for hepatitis. Elevated ALT levels for  $>6$  months is suggestive of NASH. However, it is advisable to exclude other chronic liver conditions. Although a liver biopsy provides a definitive diagnosis, it may not be practical. In simple obesity bone age is advanced but matches the height age of the child. Investigations need to be repeated once every 6-12 months depending on the degree of abnormality and response to management.

## Management

The mainstay of management is behavior modification and should involve the whole family. Targets need to be set depending on the pubertal stage. Reduction in the fat mass and control/prevention of any complications is the ultimate goal and can be achieved through attaining an appropriate weight for height (BMI). The initial target for pre-pubertal children (Tanner stage  $\leq 2$  in girls and  $\leq 3$  in boys) is to maintain a static weight till the pubertal growth spurt occurs. Height spurt, during the growth spurt, helps to reduce the BMI. If weight could be reduced it is advantageous. The BMI should reach below  $+1SD$  for age. Children who have passed the pubertal growth spurt need to lose weight to achieve a satisfactory BMI. Through enthusiasm initial targets could be achieved rapidly, but sustaining them is not easy. A gradual change in behavior, bringing in changes in diet and physical activity over a considerable period of time, is more sustainable and should involve changes in the whole family.

It is important to bear in mind that children are growing. Therefore it is important to provide adequate calories to prevent protein catabolism. Providing about 80% of total daily calorie requirement is important while ensuring adequate protein, micronutrient and essential fatty acid intake. A high fiber diet and low glycaemic foods are important. Refined carbohydrates and fatty foods should be restricted. Less ripe fruits and raw vegetable salads provide less digestible carbohydrates. Non-fat milk is recommended for children over 2 years of age. Food based portion sizes are the best guide to determine the variety and amount of food that each child should receive [13,14]. The most important factor is to restrict the portion size. The practical way to restrict the intake of refined high calorie food is by not storing them at home. While this helps to treat the obese child it would also help to prevent overweight/obesity among other members. Meals should not be skipped and "grazing" throughout the day should not be allowed. Fizzy sweetened beverages should be replaced by water. This will not only help to reduce obesity but will also improve dental health.

## Physical activity

Physical activity, apart from reducing weight, will also help to improve body composition and cardiovascular fitness. A minimum of 60 minutes of moderate to vigorous physical activity per day is recommended [9]. Initially, children may not be able to engage in physical activity for a long period of time due to easy fatigability. Lack of endurance and a thick subcutaneous fat layer preventing dissipation of heat leads to easy fatigability. Therefore, during initial stages, physical activity should be done in short spells alternating with relaxation. However, the child should complete the entire exercise session (60 minutes) although the cumulative time would be  $>60$  minutes. Building of endurance and thinning of subcutaneous fat over time helps to engage in physical activity for a longer period of time with less relaxation. Physical activity, alone, will not bring down the weight. Calorie restriction is important. Only water and fruits should be given after an exercise session. Children engaged in competitive sports should reduce their portions sizes during the off season as physical activity levels are reduced.

Sedentary activity should be reduced. Not more than 1-2 hours of screen time should be allowed each day. Children should be encouraged to engage in daily household activities and automated appliances should be used sparingly. Whenever possible children should be allowed to physically exert.

### **Psychosocial issues**

Parental support is mandatory for psychological adjustment. Motivating children to adhere to the management is the most difficult issue. Parents should understand the magnitude of the problem. Parents should be educated about healthy diet and the importance of engaging in physical activity. Bringing in the required changes would help all members of the household. Parents need to set an example of good behavior (food and physical activity). It is important to teach children coping skills to overcome psychological stresses created by peers.

### **Pharmacological therapy**

At present there are no medications specifically targeting obesity in children but conditions like abnormal glycaemic control and dyslipidaemia need pharmacotherapy if not responding to dietary and physical activity changes.

### **Bariatric Surgery**

Bariatric surgery is used in a highly selective manner in children and is not established practice in the management of childhood obesity [15].

### **Prevention of Obesity**

Preventive measures should begin from the neonatal period itself. The growth potential of children should be identified and they should be fed properly. Trying to elevate children with low birth weight to a high growth trajectory is unhealthy. Early rapid post-natal growth leads to development of obesity and comorbidities later in life [16]. It is important to have strict growth monitoring and provide the required nutrients to allow the child to grow along the same trajectory that he/she has followed during intra uterine life. Breast feeding has been shown to have a protective effect on later obesity. Parents should be educated that there is a healthy upper, as well as a lower, limit between which growth should occur.

The mass media should be used to educate the public and the school based curriculum to educate children about a healthy lifestyle. Industry should be compelled to provide healthy food and comply with advertising regulations, especially those that prohibit direct targeting of children.

Clinicians need to pursue active case detection, as many parents still consider obesity/overweight in a child as a sign of health and do not seek medical assistance. Furthermore, steps should be taken to address the whole family, as other members could be either obese or highly vulnerable to become obese.

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