

CHILDHOOD OBESITY: A CHALLENGE FOR THE CURRENT TIMES

Rita P. Raman, MD, MS, JD, CNS, MACN,
Professor of Pediatrics,
University of Oklahoma Health Sciences Center,
Oklahoma City, Oklahoma, USA

Abstract: Global increase in obesity rates poses a major challenge to overall health of populations. Etiology of obesity is considered to be multi-factorial, with genetics, diet, and physical activity and socio-economic factors all playing an interactive and/or contributory role. Impaired growth in early life is associated with increased risk of obesity and cardiovascular disease in later life. At critical stages during early life a limit may be set for the upper limits of metabolic competence. The interaction of the impaired competence with an environment that challenges the upper limits of the metabolic capacity may possibly increase the risk of disease development.

Inadequate nutrition in early pregnancy results in increased frequency of obesity in adulthood as compared with control group. The exact mechanisms by which these influences are mediated remain unclear. Deviation in birth weight from normal has also been associated with increased risk for morbidity from obesity, insulin resistance, hypertension and cardiovascular disease in adult life. Thus factors in early life significantly impact long term impact.

Management of obesity requires a multi-pronged approach that involves not only the child, but the family. Diet, physical activity, behavioral therapies and problem solving strategies all appear to have a role in the management of childhood obesity.

Complications of obesity include type 2 diabetes, dyslipidemias, hypertension, cardiovascular disease, non-alcoholic steato-hepatitis, and sleep apnea. Orthopedic disorders such as slipped femoral epiphyses may also be seen in obese adolescents and tibial bowing may be seen in obese children. Hence, optimal management of an obese child includes a multifactorial approach that addresses not only the management of body weight but also assessment for and management of all of these issues in a manner tailored to the needs of the individual child and family.

Introduction: Incidence of obesity in adults and in children has been increasing (1). There are long term consequences associated with the obesity not only in adults but also with childhood obesity (2, 3). Overweight children and adolescents have been reported to have higher mortality rates and are at risk for higher rates of morbidities in adult life.

Assessment of obesity: There are several methods that directly measure body fat, including dual energy x-ray-absorptiometry (DEXA), magnetic resonance imaging (MRI), hydrodensitometry and bioimpedance measures. While these methods serve as research tools, in practice assessment of body mass index (BMI) is the current practically applicable method in the tracking, prevention and management of obesity. In persons who are stocky and muscular, BMI may result in spurious assessments. Definition of obesity in childhood remains a challenge. The studies of morbidity in later life helps define the ranges of body mass index that might be desirable. In adults, the upper limit of BMI of 25 kg/m² with a range of 20 to 23 kg/m² appears

to be desirable (4). In children reference ranges have been published but variations in the onset of puberty with associated variations in the accumulation of body can make interpretation difficult. Also because BMI differs in males and females age and gender specific charts are available (5).

Assessment of children for obesity must include an assessment for medical and genetic disorder that might be associated with obesity. Also, diet and exercise history, family history, psychosocial history and assessment for any complications resulting from obesity are an integral part of a comprehensive assessment of childhood obesity. There are several genetic and medical disorders associated with obesity, including Prader Willi Syndrome, isolated growth hormone deficiency, x-linked mental retardation, Cushing Syndrome and hypothyroidism to identify but a few (6). These would require further appropriate assessments and therapeutic interventions.

Etiology of obesity: The etiology of obesity is considered multi-factorial with prenatal factors, growth in infancy, weight gain in childhood, diet, activity and psychosocial factors in addition to possible medical and genetic factors playing a role (4). Intrauterine growth retardation has been shown to play a role in the onset of obesity in later life (7). Additionally macrosomia resulting from pregnancy complicated by gestational diabetes and long term insulin dependent diabetes has also been shown to increase risk of obesity (8). Famine exposure during first and second trimesters of pregnancy results in impaired growth of the fetus and has also been associated with increased risk for obesity in later life (9). These experiences suggest that there are vulnerable periods for development of propensity to obesity and the early phase of pregnancy represent one such vulnerable period. Exposure to famine in fetal life appears to limit the nutrients available to the fetus and thereby modify the hypothalamus and the set point for energy regulation. Other mechanisms have also been postulated and the terms entraining process (10) and in utero programming have been used to characterize the process (11). In early life a limit appears to be set for metabolic competence and interaction of modified competence with an environment that challenges the capabilities of the individual is proposed as a factor contributing to the etiology of obesity in later life.

Breast feeding of infants has been associated with lower risk of obesity (12). Leptin levels in breast fed infants are higher than in formula fed infants (13). Human milk leptin levels have been shown to be correlated with the rates of weight gain in breast fed infants (14). At toddler age when table foods have been introduced into the diet, these diets are characterized by high sugar and fat content, a problem that is similar to that seen in the diets of older children and adults (15) and regulation of portion size by educating care-givers is crucial in regulating caloric intake.

In preschool children increased weight gain has been associated with higher intakes of fat (16) and with low levels of physical activity (17) with the levels of physical activity of the child being associated with the activity level of the parents. Television viewing and presence of television in the bedroom have also been shown to be associated with obesity and overweight (18) in preschool children.

As children progress further into the school years the rate of obesity increases (19). As children progress through the school years physical activity levels decrease by 2.7% per year in boys and by 7.4% per year in girls (20). In adolescence, females have increased deposition of fat and insulin resistance is noted during pubertal changes. Age at menarche affects body composition and girls with early menarche also have higher glucose, insulin and blood pressure measurements as compared with girls who had average or late-onset menarche (21). In contrast early maturing boys are leaner than control boys (22).

Complications of Obesity: Insulin resistance is more frequently seen in obese children and contributes to the development of metabolic syndrome and cardiovascular disease (23). Metabolic syndrome is diagnosed when three of the following six features are seen: 1. increased abdominal obesity, 2. elevated triglycerides at >150 mg/dl, 3. low high density lipoprotein (HDL) cholesterol of <40 mg/dl, 4. increased low density (LDL) cholesterol of >130 mg/dl, 5. increased blood pressure and 6. impaired fasting glucose of >100mg/dl or random glucose of >200mg/dl.

Proinflammatory and prothrombotic characteristics and hyperuricemia may also be seen in metabolic syndrome. Sleep apnea, type 2 diabetes and hypertension are associated with increased BMI values (24). Of the adolescents who are obese 80% will become obese adults with increased risk for osteoarthritis, cancers, psychological disorders. In females obesity is also associated with lower educational levels, lower socioeconomic status and higher poverty rates (25). Also, in the assessment of an obese adolescent female, the possibility of polycystic ovarian disease should be borne in mind.

Blount's disease with bowing and knee pain, slipped femoral epiphysis and hepatomegaly with non-alcoholic steatohepatitis are also possible sequelae of obesity.

Treatment/Management of Obesity: A comprehensive approach to the treatment of childhood obesity includes longitudinal monitoring of BMI in children, early identification of overweight children, early identification of risk factors in these children that predispose to obesity and early intervention. In infancy breast feeding should be encouraged. Thereafter health care providers should encourage healthy eating behaviors at each pediatric office visit, discourage unhealthy eating behaviors such as consumption of high fat and high sugar foods and beverages, encourage physical activity, decrease television viewing and video-game times and promote parenting skills. Some of the interventions, namely of changes in physical activity, behavior therapy, family involvement, cognitive behavior therapy with relaxation, with mastery and contingent reinforcement and of problem solving has been assessed by Cochrane Review (26). It appears that increasing exercise and reducing sedentary time are important in weight loss strategies. Parental involvement results in more effective management of the weight of child than when children are the solely responsible for their own weight management. Behavioral therapy was associated with significant weight loss, and the addition of cognitive behavioral therapy did not confer added benefit. Parent training in problem solving skills resulted in significant decreases in percent overweight children versus children in behavioral therapy and instruction alone group. Thus family involvement appears to be critical in weight loss programs for children. Any effort at weight management would be incomplete without also addressing physical activity in school, education programs and school meal programs to ensure they contribute to an optimized regimen for the children.

Assessment and Treatment of Obesity related morbidities: The morbidities associated with childhood obesity include onset of type 2 diabetes, non-alcoholic steatohepatitis (NASH), hypertension, dyslipidemia, sleep apnea, slipped femoral epiphysis, Blount's disease and depression. In each of these instances, comprehensive history taking along with physical examination and appropriate laboratory tests will enable the primary health care provider to identify the scope of the problem and either institute appropriate management or refer to appropriate specialist for management of the morbidity.

The surgical management of the morbidly obese child is an area that is gaining interest and utilization. Since weight management measures require balancing of growth of the child with other coexisting morbidities, the surgical management of morbid obesity in children should be individualized and be based on the balancing of the specific risks with the benefits for that child.

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