

REVIEW ARTICLE

Childhood obesity-an insight into preventive strategies

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ABSTRACT

Childhood obesity is now a global problem throughout the world. The major factors affecting weight regulation and the development of obesity in children are the result of a large number of biological, behavioral, social, environmental, and economic factors and the complex interactions between them that promote a positive energy balance. The changes in the dietary habits with the adoption of sedentary life style increases manifold obesity-related diseases and their complications. An obese child later on grows up to become an obese adult. Therefore, the role of primary prevention along with methodical diet control, behavioral changes, and physical activity are the important strategies against the battle of childhood obesity.

Key words: Childhood, obesity, prevention

INTRODUCTION

Childhood obesity in developed as well as developing countries has now reached epidemic levels. About 70% of obese adolescents grow up to become obese adults.^[1-3] Over the last 20-30 years, however, increasingly high rates of overweight and obesity have been reported irrespective of the socioeconomic and income status.^[4-6] There is also increasing evidence of plateauing in some age groups in developed countries in Europe, USA^[7] and Australia.^[8] The factors participating in weight regulation and the development of obesity in children include genetic, environmental factors, and developmental influences ("metabolic programming" or epigenetics). The relative importance of each of these mechanisms is the subject of ongoing research and probably varies considerably between individuals and populations. The rapidly changing dietary habits along with the adoption of sedentary lifestyle increases enormously the obesity-related non-communicable diseases like insulin resistance, type 2 diabetes mellitus, metabolic syndrome, etc., In developed countries, it is seen that greater social inequality is associated with increase chance of obesity contrary to developing countries.^[9] Once obesity is established, it is very difficult to reverse through interventions.^[10] In this

context, the role of primary prevention is of paramount importance besides incorporating strategies of behavioral changes, diet control, and physical activity.

DEFINITION OF THE PROBLEM

The criteria for assessing childhood obesity have been the subject of debate and research. Although definition of obesity and overweight has changed over time,^[11,12] it can be defined as an excess of Body Fat (BF). The current expert opinion recommends the use of body mass index (BMI) cutoff points to determine the weight status. Now, the measurement of BMI percentile for age and gender is the most practical tool for clinicians to identify and track overweight and obesity.^[13-15] A rapid increase in weight-for-height or BMI is an important predictor of future obesity even in children who are currently within a healthy weight category.

BMI percentiles are grouped into the following categories:

- Overweight: BMI 85th to 95th percentile
- Obese: BMI ≥ 95th percentile
- Severe obesity: BMI ≥ 99th percentile, or > 120 percent of the 95th percentile.

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Other methods for measuring obesity or adiposity include dual energy x-ray absorptiometry (DEXA) and air displacement plethysmography. These techniques measure fat mass directly but are too cumbersome and expensive for clinical use. Use of waist circumference and skin-fold thickness measurements is limited by discrepancies in normative data, and they are not accurate indices of body fat in many patients.^[16-18]

The commonly used BMI percentiles are Centers for Disease Control and Prevention (CDC) BMI percentiles^[19], International Obesity Task Force (IOTF) cutoffs^[11], World Health Organization (WHO) growth standards (1995)^[12,20], New WHO growth standards in preschool children (2006),^[21] and WHO growth reference curves.^[22]

Overweight and obesity in childhood are known to have significant impact on both physical and psychosocial health.^[4]

Assessment of comorbidities of childhood obesity

As a lot of comorbidities are associated with obesity [Table 1], a thorough physical examination is mandatory and it should include the review of linear growth (height velocity) and blood pressure.^[23,24] Periodic measurement of a fasting lipid profile, hemoglobin A1c or fasting glucose level, and aminotransferase levels is suggested for children and adolescents with obesity (BMI \geq 95th percentile). Additional assessment may be required in selected children with symptoms or signs of weight-related comorbidities.

Determinants of childhood obesity

Key determinants of childhood obesity in developed countries are not very different from that of the developing countries. However, faulty dietary habits and reduced physical activity remain significant problems.

Lack of physical activity

Overindulgence in indoor leisure activities and entertainment (e.g. television viewing, internet, and computer games) alone or in combination with factors like unsafe neighborhoods for walking and other outdoor activities, lack of open spaces and playgrounds in schools and communities along with increasing pressure on children to perform in academics and reduced emphasis on sports contribute to childhood obesity.

In developed countries, sedentary activity is usually in the form of "screen time," e.g. television, video games, internet and computer, and other media. According to national surveys in the United States, children between 8 and 18 years spend an average of 7.5 hours daily viewing media and those under age 6 spent nearly two hours daily.^[25] Television

viewing is perhaps the best established environmental influence on the development of obesity during childhood. The association between obesity and use of other media is somewhat weaker.

Combining a clinical assessment of baseline activity levels with the barriers to increased activity will provide the clinician with a basis with which to begin behavior changes. Reducing sedentary activities is a particularly important target for intervention and should be incorporated into any clinical approaches toward obesity treatment and prevention.

Excess caloric intake

Because of unrestricted access to energy-dense fast foods in school cafeteria, school vending machines, and school neighborhood combined with low knowledge about dietary components in school children, there is often increased caloric intake per body weight per day. The practice of overfeeding low-birth-weight babies for catch-up growth, if continued, also contributes to obesity later.

High-income group with high socio-economic status

Daily allowance (pocket money) to purchase lunch, easy availability of domestic help to take care of household chores, commuting to school by bus or car instead of walking or bicycling, and aggressive advertising by transnational fast-food and cola companies are some of the practices which predispose children to obesity.

Sociocultural factors and urbanization

Overprotection and forced feeding by parents, false traditional beliefs about health and nutrition, and low knowledge about nutrition in parents and caregivers also contribute to obesity. Again, limited availability of open spaces and parks due to population expansion and illegal settlements along with abundance of fast-food outlets and eating points increase the chance of the child becoming obese.

Age and female gender

More obesity in prepubertal phase compared with postpubertal phase is somewhat attributed to self-consciousness among postpubertal children about weight gain and physical appearance. Also, females who are mostly engaged in household chores and less involved in playground activities develop obesity during early childhood, including those in some developed nations with strong sociocultural beliefs against sports and outdoor physical activity being pursued by girls.

Methodical approach of managing weight

A staged approach to pediatric weight management is provided by the American Academy of Pediatrics.^[26] Multiple factors influence treatment at the initial stages, including age, BMI percentile, and previous weight management history. The recommendations emphasize on counseling on obesity prevention irrespective of their BMI percentile or previous treatment history.

Additional intervention to address overweight or obesity is divided into stages (Stage 1: Prevention, Stage 2: Structured weight management, Stage 3: Comprehensive multidisciplinary evaluation, and the Stage 4: Tertiary care intervention) representing escalating degrees of supervision, counseling, and intervention. The first two stages should involve the primary care provider.

Taking about the sensitive issue of weight

In developed world, in most cultures, there is some bias against individuals with obesity, which presumes that obesity is a character flaw. Despite progress in understanding the complex origins of obesity, which include genetic, epigenetic, cultural, and environmental factors, this bias remains widespread. The bias is also present within the medical community,^[27] where it often causes providers to take a blaming approach toward obese persons. Such an approach often jeopardizes the therapeutic alliance,^[28] and there is development of barriers to behavioral change like low self-esteem, self-criticism, and hopelessness. Due to this bias, many families with obesity are extremely sensitive about discussing the issue. Therefore, the blaming approach should be condemned, and the focus should be on the modifiable environmental risk factors. This approach will firmly establish a therapeutic alliance.

Prevention

All health care personnel unanimously agree that prevention is the key strategy for controlling the current epidemic of obesity.^[29] Prevention may include primary prevention of overweight or obesity itself, secondary prevention or avoidance of weight regains following weight loss, and prevention of further weight increases in obese individuals unable to lose weight. Till recently, most exclusively focused approaches were based on behavioral changes of individuals, dietary modifications, and exercise; it is seen that these strategies have had little impact on the growing increase of the obesity epidemic. Therefore, the prevention efforts are now best focused on key behaviors associated with the development of obesity, although other factors including genetics undoubtedly also contribute to the risk for obesity.^[26]

There is modest evidence to suggest that modification of the following factors may help to prevent the development of obesity.

Maternal factors

Maternal weight prior to conception and weight gain during pregnancy should be recorded. Breastfeeding may have a weak protective effect on the development of obesity but it is probably not a major determinant of obesity risk.

Psychosocial factors

Establishing a healthy feeding relationship early in life (avoiding overly restrictive and overly permissive feeding patterns) is definitely helpful. Encouraging a family to eat meals together usually helps the parents to monitor the type of food intake in children.

Dietary goals

Some of the dietary goals include limiting consumption of sugar-sweetened beverages, including juice, encouraging a diet with ample servings of vegetables and fruits, limiting eating at restaurants (particularly fast-food restaurants), and limiting portion size (which, for young children, is often less than a "serving size" as listed on a food label).

Activity goals

Encouraging moderate to vigorous physical activity for one or more hours daily^[26] and limiting television and other screen time-no screen time for children under two years of age; less than two hours daily after age two.^[30]

Priority age group for starting prevention

Children are the priority population for intervention strategies as weight loss during adulthood is difficult, and there are more potential interventions for children than for adults. Schools are a natural setting for influencing the food and physical activity environments of children. Other settings, such as preschool institutions and after-school care services, will have similar opportunities for action. Prevention may be achieved through a variety of interventions targeting built environment, physical activity, and diet.

Built Environment

It is a challenge to identify obesogenic environments and modify them so that healthier choices are made available, more accessible, and widely promoted to a large proportion of the community. The neighborhood is a main setting that can be used for intervention. It encompasses the walking network (footpath, sand trails, etc.), the cycling network (roads and cycle paths), public open spaces (parks), and recreation facilities (recreation centers, etc.). While the amount of public open space is limited within an existing built environment,

protecting the loss of such spaces requires strong support and motivation within the community. The home environment is also very important in relation to shaping children's eating behaviors and physical activity patterns. Astonishingly, very little is known about specific home influences and as a setting, it is difficult to influence because of the total numbers and heterogeneity of homes and the limited options for access.^[31] Of all aspects of behavior at home, however, television viewing has drawn the utmost attention among the researchers.^[32-34]

Physical activity

Stone *et al.*^[35], after reviewing the impact of 14 school-based interventions on physical activity knowledge and behavior, observed that most of the outcome variables showed significant improvements after the intervention. An intervention program in the United States used a curriculum-based approach to influence eating patterns, reduce sedentary behaviors (with a strong emphasis on television viewing), and promote higher activity levels among children in Grades 6–8. After two years, when evaluated, it showed a reduction in obesity prevalence in girls. The reduction in television viewing (by only 30 min/day) was highly significant for both boys and girls. Increases in sports participation and/or physical education time definitely needs policy-based changes at both school and education sector levels.^[36] Also, increases in active modes of transport to and from school (walking, cycling, and public transport) would require policy changes as well as support from parents and the community. In some communities, a variety of such programs have been implemented, e.g. road crossings, “walking bus,” and designated safe walking and cycling routes.^[37]

Effects of dietary pattern and TV watching

Restricting television viewing appears to prevent obesity. Similarly, reduced eating in front of the television is also as important as increasing physical activity.^[33] Fast foods are one of the most advertised products on television and children are often the targeted market. Reducing the huge volume of marketing of energy-dense foods and drinks and fast-food restaurants to young children, particularly through the powerful media of television, is a potential strategy that has been advocated. Television advertising to children less than 12 years of age has not been permitted in Sweden, although children's television programs from other countries through satellite television probably dilute the impact of the ban in Sweden. Norway, Denmark, Austria, Ireland, Australia, and Greece also have some restrictions on television advertising to young children.^[37]

Nutrition sector

There is a marked influence of food prices on food-buying behavior and then on nutrient intake.^[38] A tax, large enough

to affect sales, levied on high-volume foods of low nutritional value, such as soft drinks, confectionery, and snack foods, may discourage their use. Such taxes are currently applied in some parts of the United States and Canada.^[39] In addition, food labeling and nutrition “signposts” such as logos that indicate that a food meets specific nutrition standards might help consumers choose healthy foods. An example is the “Pick the Tick” symbol program run by the National Heart Foundations in Australia and New Zealand.^[40] The “Pick the Tick” symbols made it easier for consumers to identify healthier food choices. Moreover, in addition to the nutrition criteria, the products serve as “defacto” standards of product formulation for the manufacturers.

Effectiveness of the prevention methods

It has been shown that focusing on reducing sedentary behavior and encouraging free play has been more effective than focusing on forced exercise or reducing food intake in preventing already obese children from gaining more weight.^[41,42]

Recent efforts in preventing obesity include the initiative of using school report cards to make the parents aware of their children's weight problem. Health report cards are believed to aid prevention of obesity. In a study in the Boston area, parents who received health and fitness report cards were almost twice as likely to know or acknowledge that their child was actually overweight than those parents who did not receive a report card. They also were over twice as likely to plan weight control activities for their overweight children.

Specific recommendations

The following practices are recommended, which are based primarily on expert opinion and some are supported by clinical studies, usually with short-term outcomes.

Surveillance

Periodic monitoring of nutritional and obesity status of children and adults.

- Regular measurement of BMI and plotting of results on a BMI chart to track changes over time
- Assessment of all children for obesity-related risk factors to allow for early intervention. This includes recording the obesity status (BMI) of the biological parents and assessing key nutritional and physical activity habits
- For children with obesity, weight-related comorbidities should be assessed through a focused review of systems, physical examination, and laboratory screening.

Maintain a nationwide database on secular trends in obesity and diabetes.

Education

- or all children and their families, routine healthcare should include obesity-focused education
- Nutrition and physical advice through audiovisual media and culturally conducive methods
- Endorsement of healthy lifestyle by prominent people and local champions
- For children who are overweight or obese, a series of clinical counseling interventions in the primary care setting is suggested
- Educational materials are available from a variety of sources to facilitate the counseling. These materials have much in common and have not been directly compared; it is reasonable for providers to select materials with messaging that is best suited to their community
- For patients who do not respond to a brief clinical intervention or for those with severe obesity, higher-intensity approaches are needed in tertiary care centers.

Community

- Organization and participation in health walks and healthy food festivals
- Information about nutrition to parents (particularly mothers)
- Children-specific nutrition information and workshops for newly married women
- Safe walk/bicycle routes to school
- To establish a therapeutic relationship and enhance effectiveness, communication and interventions should be supportive rather than blaming, and family-centered rather than focused on the child alone
- Long-term changes in behaviors that are related to obesity risk should be emphasized rather than diets and exercise prescriptions, which tend to set short-term goals.

Early infancy and perinatal 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 interventions

- 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-based interventions

- Key goals to address are the common diet-related problems encountered in children, set firm limits on television and other media early in the child's life, and establish habits of frequent physical activity.
- TV/computer time to be restricted to maximum 2 hours/day
- Mandatory 60 min of physical activity daily to be supervised by parents
- Restriction on eating out and junk foods.

Health authority and legislation

- 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 trans-national food companies to manufacture healthy snacks
- Ban on unfair nutrition claims for commercial products
- Prohibition of promotional gifts with junk foods
- Ban on monetary sponsorship of youth festivals by cola companies
- Food labeling and quality monitoring
- Food policy to include country-specific guidelines for healthy nutrition for adults and children.

CONCLUSION

Obesity is a chronic disorder with varied underlying etiology. Obesity in childhood has significant impact on both physical and psychological health, and over-consumption of calories and reduced physical activity are the two main factors involved in it. Therefore, the role of primary or secondary prevention is the mainstay plan for controlling this epidemic. Moreover, these strategies seem to be more effective in children than in adults. A good number of effective plans are thus implemented to target built environment, physical activity, and diet. These strategies can be initiated at home and in preschool institutions, schools, or after-school care services.

Table 1: List of medical and psychosocial problems of childhood obesity

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|-----------------------|---|
| Medical problems | The metabolic syndrome, type 2 diabetes, insulin resistance, subclinical inflammation, polycystic ovarian syndrome, adulthood obesity, non-alcoholic fatty liver disease, hypertension, high cholesterol, gallstones, dyslipidemia, obstructive sleep apnea syndrome, early puberty or menarche, eating disorders, skin infections, pseudotumorcerebri, orthopedic disorders, asthma and other respiratory diseases |
| Psychosocial problems | Discrimination, social stigmatization, subject to bullying, poor body image, low self-esteem, low self-confidence, stress, depression, anxiety, emotional fallout, poor learning |

However, further research needs to be conducted to examine the most effective strategies of intervention, prevention, and treatment of obesity. These strategies should be culture specific, ethnical, and consider the socio-economical aspects of the targeting population.

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