

Childhood Obesity

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Abstract: The purpose of this review is to highlight the risk factors of childhood obesity. The prevalence of childhood overweight and obesity has increased worldwide in recent decades. Obesity in childhood is associated with a wide range of serious health complications and an increased risk of premature illness and death later in life. This book presents childhood obesity trends across multiple demographics. It discusses the contributing genetic and environmental factors of childhood obesity and shows the adverse health consequences of childhood obesity, both as they relate to childhood and as they last into adulthood. The final section presents multiple methods for obesity treatment included community and family-based intervention, pharmacotherapy, and surgical procedures. As childhood obesity increases, scientists think that heart disease, including the condition that may have killed Jonathan, will become a common pediatric disorder. Obesity increases a child's risk of high cholesterol, high blood pressure, and thickening of the arteries, all of which can lead to heart disease. Obesity also increases a child's risk of type 2 diabetes, in which the body becomes resistant to insulin, and metabolic syndrome, in which the body simultaneously develops several different risk factors that make a young person more likely to develop heart disease or diabetes, or to have a stroke.

Introduction

Overweight and obesity are excessive fat accumulations in the body which are linked to serious diet-related noncommunicable diseases that affect human health (F. Ofei, 2005). Globally, obesity is more than twice folded since 1980; more than 1.5 billion adults were overweight and obese. Overweight and obesity are the fifth leading risks for global deaths and are major contributor to the leading killer diseases worldwide, including diabetes, heart disease, and some cancers (WHO, 2014). The World Health Organization (WHO) states that "childhood obesity is one of the most serious public health challenges of the 21st century" (WHO, 2013). The incidence of childhood obesity has tripled during the past thirty years, and WHO estimates that as of 2007, at least 22 million children under age five and 155 million aged five to seventeen were affected worldwide. In response to this alarming trend, WHO and other international and regional health agencies have initiated programs to prevent children from becoming overweight or obese. Although the terms overweight and obese are sometimes used interchangeably, health experts generally distinguish the two conditions by defining overweight as increased body weight relative to height based on standard height-weight tables, and obese as having an excessive amount of body fat compared to lean body mass. Research has shown that both conditions contribute to numerous health problems. Fortunately, says WHO, overweight and obesity, as well as their related chronic diseases, are largely preventable. The prevalence of childhood overweight and obesity has increased worldwide in recent decades. Obesity in childhood is associated with a wide range of serious

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health complications and an increased risk of premature illness and death later in life. This book presents childhood obesity trends across multiple demographics. It discusses the contributing genetic and environmental factors of childhood obesity and shows the adverse health consequences of childhood obesity, both as they relate to childhood and as they last into adulthood. The final section presents multiple methods for obesity treatment included community and family-based intervention, pharmacotherapy, and surgical procedures.

Traditionally, a fat child is considered as an 'attractive' child, and is often referred to as a 'healthy' child. Psychological stigmatization may not be a big problem in our country, and severe complications of obesity (such as obstructive sleep apnea, and pseudotumor cerebrii) are rare. However, obese children have substantial risks for morbidity such as hypertension and dyslipidemia even before they reach adulthood (Freedman et al., 1999, Tounian et al., 2001). Type 2 diabetes is beginning to emerge in children (Fagor, 2000). Importantly, 50 to 80 per cent of obese children become obese adults and all complications of adult obesity are made worse if the obesity begins in childhood (Styne, 2001).

Several elegant reviews and recommendations by expert committees have been published for prevention and treatment of childhood obesity in the developed countries (Barlow et al., 1998, Williams et al., 2002).

Epidemiology and Prevalence

Pediatric obesity has rapidly become one of the leading international public health challenges. Since the 1980s, rates have more than doubled for preschool-aged children (2 to 5 years) and adolescents (12 to 19 years) and have more than tripled for school-aged children (aged 6-11 years) in the United States (Lustig, 2006). In Australia, a recent study showed a prevalence of overweight and obesity of 25 per cent in children aged 2 to 18 years (Paluska and Schwnk, 2000). A study of Indonesian adolescents showed obesity rates of 10 per cent (van der Heijden et al., 2009). In Spain, researchers have found rates of overweight and obesity in 4-year-olds of up to 32 per cent in certain regions (Wats et al., 2005). Worldwide, there are estimates that more than 22 million children under the age of 5 are obese, and one in ten children are overweight (Taveras et al., 2007). This demonstrates the tremendous scope of the pediatric obesity problem, which appears to affect almost all nations worldwide. Childhood obesity involves both immediate and long-term risks to physical health, including diabetes, hypertension, liver disease, heart disease, and osteoarthritis, as well as significant psychosocial burdens among numerous other concerns (Heelan and Eisenmann, 2006). Obese children have also been shown to have significantly lower health-related quality of life than children and adolescents who are normal weight, with ratings similar to children diagnosed with cancer (Martinez et al., 2009). Pediatricians play a particularly important role in pediatric obesity. As primary care providers, pediatricians are involved in a child's health from birth through adolescence, which gives them a unique role and involvement in the life of a child and family. Children generally see their pediatrician anywhere from one to ten-plus times a year, especially in the younger age groups. Pediatricians are already involved in regularly scheduled well-child visits dedicated to discussions of health, growth, development, nutrition, safety, and overall well-being. These visits also provide opportunities to form rapport with families and children.

According to WHO (2000) at least 50 per cent of adults and 20 per cent of children in U.K. and U.S.A. are currently overweight. Prevalence of overweight amongst Australian children has increased from 11 per cent in 1985 to 20 per cent in 1995 (WHO, 2000). Childhood obesity has tripled in Canada in last 20 years. It has been estimated that, in 1995, the direct costs of treatment of obesity in USA accounted for \$70 billion with far greater indirect costs (Reddy et al., 2002).

Obesity does not seem to have spared developing countries either. Thailand, Iran, Nigeria and Brazil have all reported unprecedented levels of obesity with trends that are substantially rising every year (Lobstein et al., 2004). The calculated global prevalence of overweight (including obesity) in children aged 5-17 years is estimated by the International Obesity Task Force (IOTF) to be approximately 10 per cent, but this is 'unequally distributed' with prevalence ranging from over 30 per cent in Americas to <2 per cent in sub Saharan Africa (Lobstein et al., 2004).

In a recent study by Reddy, et al., more than 28 per cent of adult males and 47 per cent of adult females in urban Delhi were overweight by WHO standards (Reddy et al., 2002). In the same study the corresponding figures for overweight in a neighbouring Haryana rural area were 7 per cent in males and 9 per cent in females. Conversely, as many as 38 per cent of males and 36 per cent of females in the rural area were actually 'underweight' by BMI standards. Such an 'urban, rural divide' has been documented in other Indian studies too (Chadha et al., 1997). In children, the difference between the rich and the poor is fairly evident in recently conducted urban studies. Ramachandran, et al. studied children from six schools in Chennai, two each from high, middle and lower income groups (Ramachandran et al., 2002). The prevalence of overweight (including obese) adolescents ranged from 22 per cent in better off schools to 4.5 per cent in lower income group schools. In a Delhi school with tuition fees more than Rs. 2,500 per month, the prevalence of overweight was 31 per cent, of which 7.5 per cent were frankly obese (Kapil et al., 2002). In Pune the figures for overweight children are 24 per cent in a well off school and 6 per cent in a 'corporation' school (unpublished data).

Measurement of Obesity

Body weight is reasonably correlated with body fat, but is also highly correlated with height. Therefore, weight adjusted for height squared [body mass index (BMI in kg/m²)] is a useful index to assess overweight and is a fairly reliable surrogate for adiposity. It is calculated easily from weight and height and it correlates with other measures of body fatness in children and adolescents. BMI also correlates with markers of secondary complications of obesity, including current blood pressures, blood lipids and with long-term mortality (Gidding et al., 1995). A limitation of BMI however, is that it cannot differentiate an obese individual from a muscular one. It also cannot locate the site of fat *e.g.*, people with 'central obesity' may have normal BMI. In spite of several limitations, BMI as of now appears to be the most practical way of measuring and comparing obesity for clinical and epidemiological purposes.

As per WHO classification (for adults) BMI >25 = overweight and BMI >30 = obesity. However, as these WHO criteria may underestimate obesity in Asians, the International Obesity Task Force (IOTF) has proposed the standards for adult obesity in Asia and India as follows (WHO, 2000).

Genetic and Environmental Factors

Genetics of Childhood Obesity: Obesity is a major health problem in modern societies, with a prevalence of up to 25 per cent in Western societies and an increasing incidence in children (Troiano and Flegal, 1995). Obesity, plus the associated insulin resistance (Reaven, 1988, DeFronzo and Ferrannini, 1991), is also considered a contributor to the major causes of death in the United States and is an important risk factor for type 2 diabetes (T2D), cardiovascular diseases (CVD), hypertension, and other chronic diseases. Approximately 70 per cent of obese adolescents grow up to become obese adults (Nicklas et al., 2001, Whitaker et al., 1997, Parsons et al., 1999). The main direct adverse effects of childhood obesity include orthopedic complications, sleep apnea, and psychosocial disorders (Dietz, 1998). Obesity present in adolescence has been shown to

be associated with increased overall mortality in adults (Must, 2003); overweight children followed up for 40 (Mossberg, 1989) and 55 years (Must et al., 1992) were more likely to have CVD and digestive diseases, and to die from any cause as compared with those who were lean. Obesity is a complex disease that involves interactions between environmental and genetic factors. Excess in adipose tissue mass can be seen as a disruption in the balance between energy intake and expenditure. In modern times, this excess in adipose tissue fuel storage is considered a disease; however, a better viewpoint would be that obesity is a survival advantage that has gone astray that is, what is now considered a disease was probably advantageous when food was less available and a high level of energy expenditure through physical activity was a way of life (Eckel, 2003). The true prevalence of childhood obesity is difficult to empirically quantify as there is currently no internationally accepted definition; however, in general terms, childhood obesity is considered to have reached epidemic levels in developed countries. Approximately 25 per cent of children in the US are overweight and approximately 11 per cent are obese. In the 10-year period between the National Health and Nutrition Examination Survey (NHANES) II (1976–1980) and NHANES III (1988–1991), the prevalence of overweight children in the USA had increased by approximately forty per cent (Troiano and Flegal, 1995). Examination of historical standards for defining overweight in children from many countries tells us that the distribution of BMI is becoming increasingly skewed (Flegal and Troiano, 2000). The lower part of the distribution has shifted relatively little whereas the upper part has widened substantially. This finding suggests that many children may be more susceptible (genetically or socially) to influence by the changing environment.

Environmental Factors: With improving standards of living, and availability of food in plenty, the upper class societies of India in recent years have urbanized to western levels. The components of life style changes are:

Unhealthy Eating Patterns, Wrong Choices of Food: Traditional micronutrient rich foods are being replaced by energy dense highly processed micronutrient poor foods with greatly increased portions ‘Dil Mange More’. High calorie snacks, junk food revolution, cool cola (‘thanda matlab’) colonisation, and food as rewards or demonstration of love are all part of new life styles. All celebrations and festivals seem to be centered around rich foods. Poor diet and nutrition can negatively affect mood, self-esteem, and school performance as well as weight and the risk for diabetes and other health problems. According to the U.S. Department of Health and Human Services dietary guidelines, a healthy, nutritious diet needs to include daily servings of foods that provide important nutrients. The number of daily servings recommended varies with the person’s size and caloric needs, but generally includes four to six servings of whole grains; four or five servings of fruits and vegetables; two or three servings of low or non fat dairy products; one or two servings of lean meat, poultry, or fish; three or four servings of nuts and legumes; and plenty of water. In addition, the Department of Health and Human Services recommends that people consume certain amounts of vitamins and minerals such as calcium each day.

Sedentary Pursuits: TV and movie watching, video games, internet gazing and telephone gossip sessions are now important activities of children. TV also affects by heavy marketing of colas and other fatty foods. The number of TV sets and telephone connections are touted as indices of development. An important factor for obesity in India is the intense competition for admissions to schools and colleges with flourishing tuition classes right from nursery levels. Children are forced to use their play time for additional studies. Games or physical training sessions are restricted or non existent in many schools. Some schools do not have any playgrounds at all.

Inadequate Play Areas: Due to unsafe roads (traffic, crime) children are discouraged from walking or cycling to school. Motorized vehicles are popular and they are perceived to be quicker and safer for transport. Erosion of open spaces for exercise and lack of parental time to supervise play are all part of new obesogenic lifestyles. As against food as rewards, ironically exercise is meted out as a punishment - '100 sit ups,' 'run round the field.'

The high glycemic index of our predominantly carbohydrate diet may be responsible for hyperinsulinism, weight gain and eventual type 2 diabetes (Nelson and Baur, 2002). Yet other factors controlling body weight regulation such as 'low body metabolic rate (BMR)' and probably governed by hypothalamus - these factors as of now are all speculative (Styne, 2001, Lobstein et al., 2004).

Treatment

Once a child or teen becomes obese, media and societal pressures to lose weight may motivate that individual to resort to dangerous methods in an attempt to shed pounds and inches quickly. Such extreme attempts to control weight drain essential minerals (electrolytes) from the body. Kidney damage, abnormal heartbeat, muscle weakness, seizures, and heart attack are some of the serious problems caused by abrupt mineral loss. Even if young people are informed of these dangers, they may lack the good judgment needed to believe and avoid them, so they require guidance and support from health-care professionals and family members. Following a weight-loss program can interfere with a child's growth and development, so it is rarely the primary treatment for childhood obesity. Instead, the aim is to slow or stop weight gain so a child can grow into his or her appropriate weight. However, a gradual weight-loss program may be recommended for extremely obese children with a BMI for age and sex greater than the 95th per centile.

Behaviour Modification: Behaviour modification treatment, which aims to change behaviors such as eating unhealthy foods and not exercising, is appropriate when an obese child does not have serious medical complications. Several factors affect the outcome of behaviour modification. First, treatment should begin as early as possible; the older the child, the more likely his or her obesity will persist into adulthood. Second, both child and family need to be willing to change. If the family is unwilling, family counseling may be recommended to explore why. When the child and the family are ready to change, education is their most valuable tool. Health-care providers can train family members to be more aware of what they eat and how active they are and show them how to track and improve both. An appropriate behaviour modification strategy encourages gradual, manageable changes in diet and activity and keeps motivation high through praise rather than criticism.

Improving Diet: Dietary improvements emphasize nutritious meals and a healthy approach to eating. Since the risk of diabetes, cardiovascular disease, and some cancers increases dramatically with weight, support organizations for these diseases advocate diet guidelines that are similar to those put forth by the U.S. Department of Health and Human Services and the American Dietetic Association. One factor that these organizations say is important in improving the diet of family members is ensuring that families eat meals together to improve closeness and communication, model healthy eating behaviour, and strengthen the family support system. As Sheah Rarback of the American Dietetic Association notes, "Research has found strong links especially between the food mothers eat and the choices made by their children."

Increasing Physical Activity: Dietary changes alone cannot help a child reach or maintain a healthy weight. Physical activity is an essential part of an effective weight management program. The American Heart Association recommends that parents limit children's sedentary activities to allow them more time for physical activity. "Limit television time to at most 2 hours per day," (Kavey et al., 2003) they advise in an article in the journal *Circulation*. For adolescents, an effective activity program should combine resistance training with aerobic activity. In resistance training, the muscles work against an opposing force to develop strength, such as in lifting weights. Aerobic activity, on the other hand, improves heart and lung fitness and stamina. Walking, jogging, running, swimming, and dancing provide good aerobic workouts.

Family Involvement: Obese children need family support if they are to enjoy the benefits of exercise and improved diet. A recent nutrition and physical activity survey by the American Dietetic Association Foundation showed that parents are strong role models for their child's behaviour, including their eating habits more so than anyone else. Parents may wish to be good role models, but some may be concerned about triggering an eating disorder in their overweight child or damaging their self-esteem. Some parents may therefore be reluctant to bring up the issue of overweight. Others may hope their child will grow into their weight without outside intervention. Some do not even realize their child is overweight, interpreting the extra pounds as a sign that their child is receiving adequate nutrition. Still others assume their child is healthy if they do not currently have serious medical problems with highly visible symptoms. When parents are unwilling to play a role in reducing a child's obesity, the child may need to leave the home, perhaps moving to a foster home and obtaining treatment from there, or attending a weight-loss summer camp or residential pediatric obesity program that offers behaviour modification therapy, physical activities, nutrition education, and peer support. Wherever these lifestyle changes are promoted, sometimes they are not enough to offset life-threatening complications of obesity. In such circumstances, radical treatment methods may be considered.

Dieting could also increase prevalence of inadequate nutrients, such as iron, calcium, zinc and vitamins A, C and E. High degrees of parental dietary control may in fact have adverse psychobehavioural effects on young children with treatment failures (Hood et al., 2000). Hence the aim should be provision of well balanced healthy meals with a healthy approach to eating. Several different dietary studies have shown successful reduction of calorie intake and improved eating behaviors (Ikeda and Mitchell, 2001). The advice usually centres around reducing calories from fat, saturated fats, cholesterol and sugars (high density foods) while increasing fruits, vegetables and whole grain cereals (lower density foods). Counting of calories can be tedious and inaccurate and it is more advantageous to supply indigenous versions of Food Guide Pyramids or Epstein's traffic light diets (Epstein and Squires, 1988). Trials of hypocaloric diets, protein modified fasts, fibre supplementation and anorectic drugs have been shown to be by and large, ineffective in children in the long range (Edmunds et al., 2001).

Conclusion

In conclusion, this study was a first step in determining whether weight loss was achievable with our interdisciplinary approach and highlighted potential success of a continuous care weight control program to lower BMI. An early weight change seems to be a marker for children's long-term treatment response. Pre existing regular physical activity, normal timing of puberty, baseline daily water and soda intake, motivation and some family characteristics predict the early response to the treatment. Better prevention policy and parental support may thus improve the success of the childhood obesity treatment. Our data may provide a better understanding of the factors in-

volved in better weight control and may help to optimize/adapt our strategies for participants who do not benefit from treatment.

Now, however, the problem must be approached in a more global manner. The public health community must consider the urgent need to institute preventive programs. Since policy makers are reluctant to introduce changes, especially if the changes are unpopular or expensive, it is important, Caprio explains, to prove that preventive or treatment programs would be helpful and effective. In the United States, social policy and political decision makers are responding to medical experts' testimony that childhood obesity is endangering the health and longevity of millions of people and placing an increasingly heavy strain on the health-care system. National health organizations such as the National Institutes of Health (NIH) and the CDC are promoting research and prevention programs in an effort to reduce the incidence and devastating effects of the childhood obesity epidemic in the future. Nutritional based interventions need to be promoted and implemented by concerned bodies to prevent future risks linked to overweight and obesity. Besides, frequency of eating food out of home needs attention to prevent overweight and obesity. Moreover, physical activities should be promoted to engage students in physical exercises in order to prevent fat accumulation.

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