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Survey Prevalence and Prevention of Childhood Obesity.

Pourhassan M*, Najafabadi A T**.

*Msc. Dietetics, Health Science Department, Pune University, Pune,India, ** Msc. Geoinformatics, Geoinformatics Department, Pune University, Pune, India.

Correspondence: A. R. Taravat, Geoinformatics Department, Pune University, Pune, India, Telephone: +91(20) 9960-1265-00, Fax: +91(20) 9960-1265-00, E-mail: Alireza.Taravat@gmail.com

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Abstract:

Childhood obesity is now being recognised as a global epidemic. Children in developed or industrialised countries, such as the UK and US currently demonstrate high levels of overweight and obesity. The rise in childhood obesity is likely due to a complex set of interactions across a number of relevant social, environmental, and lifestyle factors. Each of these factors play pivotal roles on their own, and each requires their own interventions. In general, overweight and obesity are assumed to be the result of the excessive intake of the type of calories, fat, and sugar that are commonly found in soda drinks and purchased in "fast food" outlets. These convenience foods are becoming increasingly popular not just in industrialised nations, but in the developing world as well, causing a rise in obesity rates all around the world.

Most researchers agree that prevention is the key strategy for controlling the current epidemic of obesity. Prevention may include primary prevention of overweight or obesity, secondary prevention or prevention of weight regains following weight loss, and avoidance of additional weight increase in obese persons unable to lose weight. Prevention may be achieved through a variety of interventions, such as by targeting the built environment, through physical activity, and by changing the individual's diet. Some of these strategies can be adapted for children and implemented in preschool institutions, schools, or after-school care services, providing a natural setting for influencing diet and physical activity. Furthermore, Geographic Information Systems (GIS) are now being used to prevent childhood obesity by generating school-level and neighbourhood environmental indicators, which can be useful in designing targeted interventions.

Keywords: Childhood Obesity, Overweight, Prevalence, Prevention, Geographic Information System (GIS).

Introduction:

Childhood obesity has reached epidemic levels in many developed countries. Most recent estimates indicate that 17.6% of children in the US are obese, of which approximately 70% will grow up to become obese adults.[1-3] The prevalence of childhood obesity in industrialized countries has been on the rise since 1971 (table 1), with some variability in its incidence. For example, in some European countries, such as the Scandinavian countries, the prevalence of childhood obesity is lower in comparision to Mediterranean countries; nonetheless, the proportion of obese children is rising in both regions.[4] The highest prevalence rates of childhood obesity have been observed in developed countries, however, the prevalence of childhood obesity is increasing in developing countries as well, such as in the Middle East, and Central and Eastern Europe.[5] In 1998, The World Health Organization's MONICA project, which tracks of the prevelance and incidence of cardiovascular diseases, reported that Iran is among the seven countries with the highest prevalence of childhood obesity. In girls, BMI rankings in the 85th to 95th percentile range were significantly higher than in boys (10.7, SD = 1.1 vs. 7.4, SD = 0.9). The same pattern was seen for the prevalence of BMI > 95th percentile (2.9, SD = 0.1 vs. 1.9, SD = 0.1).(6) In Saudi Arabia, one in every six children aged 6 to 18 years old is obese.[7] Furthermore, in both developed and developing countries there are proportionately more overweight girls than boys, particularly among adolescents.[6, 8, 9]

Table 1: Changes in the prevalence of overweight and obesity in USA and UK[67,68,70,(NHANES)].

Country/Year	Age/yr	Change in obesity
USA		
1973–1994	5–24	Mean level increased 0.2 kg/yr, twofold increase in prevalence of obesity
1971–1974	6-19	Relatively stable
1976–1980	6-19	Relatively stable
1988–1994	6-19	Doubled to 11%
1999-2000	6-19	Increased by 4%
1999-2002	6-11	Increased by 4.5%
2003-2006	6-11	Increased by 1.2%
UK		
1984–98	7–11	Changed from 8% to 20%
1999-2000	11-15	Changed from 20% to 17.5%
2001	11-15	Relatively stable
2002	11-15	Increased by 2.5
2003	11-15	Increased by 1%
2004	11-15	Increased by 4.2%

Overweight and obesity issues in childhood have a significant impact on both physical and psychological health; for example, overweight and obesity are associated with hyperlipidaemia, hypertension, abnormal glucose tolerance, and infertility. Nine-year-old obese children have greater blood pressure and plasma cholesterol than non-obese controls, and obese adolescents have an increased prevalence of hypertension, sleep-disordered breathing, and orthopaedic disorders of the hips and knees.[2, 10, 11] In addition, the psychosocial consequences of obesity include social isolation, difficulty fitting in with peers, and dissatisfaction with body shape.[12, 21] In addition, overweight adolescent girls were found to have lower educational attainment, lower incomes as young adults, and were less likely to marry than those of normal weight.[22, 27] All of these studies emphasise the detrimental effects that obesity can have on a child's health and well being, and highlights the need to understand its etiology in order to derive practical and effective prevention and treatment strategies.[28]

Definition of childhood obesity

Although the precise definition of obesity and overweight has changed over time [13,14], it can generally be defined as a condition where an individual has an excess of body fat (BF), however, there is no consensus on what an appropriate cutoff point to define excess fat in overweight or obese children and adolescents should be. Williams et al.[15] measured the skin fold thickness of 3320 children aged 5–18 years and classified children as fat if their percentage of body fat was at least 25% and 30% for males and females, respectively. The Center for Disease Control and Prevention defines overweight as a BMI at or above the 95th percentile for the age group, and "at risk for overweight" with a BMI between 85th to 95th percentile for the age group.[16,17] European researchers classified overweight as a BMI at or above the 85th percentile, and obesity as a BMI at or above the 95th percentile.[18]

In addition to the complexity of defining overweight and obesity, there are also several methods to measure the percentage of body fat, each with its own set of advantages and limitations. In research, techniques include underwater weighing (densitometry), multi-frequency bioelectrical impedance analysis (BIA), and magnetic resonance imaging (MRI). In the clinical environment, techniques such as body mass index (BMI), waist circumference, and skin fold thickness have been used extensively. Although these methods are less accurate than research methods, they are satisfactory for the purpose of identifying those at risk. In addition, while the BMI seems appropriate for differentiating adults, it may not be as useful in children due to the changes in body shape that occur as they progress through normal growth. In addition, the BMI fails to distinguish between fat and fat-free mass (muscle and bone) and may exaggerate obesity in large, muscular children. Furthermore, maturation patterns differ between genders and among ethnic groups. Studies that used the BMI to identify overweight and obese children based on percentage of body fat have found high specificity (95– 100%), but low sensitivity (36–66%) for this sys-

tem of classification.[19] Because the health consequences of obesity are related to carrying excess fat, the ideal method of classification should be a direct measure of the amount of excess fat being carried on the body, rather than some other factor that may be contributing to an increase in mass. Although methods such as densitometry can be used in research practice, they are not feasible for clinical settings.

For large population-based studies and clinical situations, bioelectrical impedance analysis (BIA) is widely used. Cross-sectional studies have shown that BIA accurately predicts total body water (TBW), fat-free mass (FFM), and fat mass or percentage of body fat (%BF) among children.[20-23] Also, it has been shown that BIA provides an accurate estimate of change in %BF and FFM over time.[24] Waist circumference, as a surrogate marker of visceral obesity, has been added to refine the measure of obesity related risks.[25] Waist circumference seems to be more accurate for children because it targets central obesity, which is a risk factor for type II diabetes and coronary heart disease. To the best of our knowledge, there is no evidence for a specific cut off point for waist circumference measures, but studies are ongoing.

Causes of Childhood Obesity

Although the precise mechanisms of obesity development are not fully understood, it is certain that obesity is more likely to occur when energy intake exceeds energy expenditure. There are multiple etiologies for this imbalance, and therefore the rising prevalence of obesity cannot be addressed by targeting one factor alone. For example, in a small number of cases, childhood obesity can be caused by genes conferring leptin deficiency or to physiological causes such as hypothyroidism and growth hormone deficiency, or to drug side effects (e.g. steroids).[30] Most of the time, however, personal lifestyle choices and the cultural environment are the agents that are primarily responsible for the rise of childhood obesity.[26-29]

Behavioral and social factors

I. Diet

Over the last decade, food has become more affordable to a larger number of people as the price of food has decreased substantially relative to income. Additionally, the concept of 'food' has changed from a means of nourishment to a marker of lifestyle and a source of pleasure. Because of this, increases in physical activity are not likely to offset an energy rich, poor nutritive diet. It takes an average of one to two hours of extremely vigorous activity to counteract a single large-sized (i.e., >=785 kcal) children's meal at a fast food restaurant. Frequent consumption of such food can hardly be counteracted by the average child or adult.[31]

Calorie intake

Although overweight and obesity are mostly assumed to be the result of increased in caloric intake, evidence supporting this remains mixed. Food frequency methods measure dietary pat-

terns, but are a poor measure of calorie intake.[32] Other methods such as 24-hour recall or food diaries evaluate caloric intakes more accurately; however, they only estimate calorie intake in the short term.[32] This is important because a small caloric imbalance (within the margin of error of estimation methods) can, over time, lead to the development of obesity. For example, the National Health and Nutrition Examination Survey (NHANES) revealed that only subtle changes in calorie intake among US children from the 1970s to 1988–1994. In this study, increases in energy consumption were only found among white and black adolescent females. The same pattern was observed in the latest NHANES (2003–2006). Data from both NHANES surveys (1976–1980 and 2003–2006) show that the prevalence of obesity has increased by 5.0% to 12.4% in children who are 2–5 years old; 6.5% to 17.0% in 6–11 year olds; and 5.0% to 17.6% in 12–19 year olds. The Bogalusa study, which has been tracking the health and nutrition of children in Bogalusa (Louisiana) since 1973, reported that total calorie intake of 10-year old children remained unchanged during 1973–1988, but a small but significant decrease was observed when energy intake was expressed per kilogram body weight.[33] In addition, the results of a survey carried out during the past few decades in the UK suggest that average energy intakes, for all age groups, are lower than they used to be.[34] Some small studies also found similar energy intake among obese children and their lean counterparts.[6, 35-37]

Fat intake

For many years it has been claimed that the increase in pediatric obesity is due to an increase in fat intake, however, contradictory results have been obtained in cross-sectional and longitudinal studies. Results from the NHANES study have shown that fat consumption among American children has fallen over the last three decades. For instance, mean dietary fat consumption in males between 12–19 years fell from 37.0% (SD = 0.29%) of total caloric intake in 1971–1974 to 32.0% (SD = 0.42%) in 1999–2000. The same pattern was observed in the latest administration of NHANES (2003–2006). The pattern was the same for females, whose fat consumption fell from 36.7% (SD = 0.27%) to 32.1% (SD= 0.61%) [38,39]. Gregory et al.[40] reported that the average fat intake in children aged 4–18 years in the UK is close to the government recommendation of 35% of total energy consumption. On the other hand, some cross-sectional studies have found a positive relationship between fat intake and adiposity in children even after controlling for confounding factors.[41, 42] The main objection to the notion that dietary fat is responsible for the accelerated pediatric obesity epidemic is the fact that the prevalence of childhood obesity is increasing, while the consumption of dietary fat in many populations is decreasing. Although it is certain that fat eaten in excess leads to obesity, evidence does not support the hypothesis that fat intake is the primary reason for the increased prevalence of childhood obesity.

II. Physical Activity

It has been hypothesized that a steady decline in physical activity among all age

groups has contributed heavily to the rising rates of obesity all around the world. Lack of physical activity strongly influenced weight gain in a study of monozygotic twins.[50] In addition, numerous studies have shown that sedentary behaviors like watching television and playing computer games are associated with the increased prevalence of obesity.[51, 52] Furthermore, time constraints have made it more common for parents to encourage their children to watch television at home, allowing parents to complete their chores while supervising their children.[53] In addition, reports indicate that children are less likely to walk to school or participate in sports and physical education, particularly among adolescent girls.[51] These factors are all associated with the increased prevalence of childhood obesity. Since both parental and children's choices fashion these behaviors, it is not surprising that overweight children tend to have overweight parents and are themselves more likely to grow into overweight adults than normal weight children.[54] In response to the significant impact that the cultural environment plays in the onset of childhood obesity, it is important to promote active lifestyles through strong public health initiatives and outreach.

Prevention

Almost all public health researchers and clinicians agree that prevention should be the key strategy for controlling the current epidemic of obesity.[55] 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. Until recently, most approaches have focused on changing the behavior of individuals in terms of diet and exercise, however, it seems that these strategies have had little impact in terms of reducing childhood obesity rates.

What age group is the priority for starting prevention?

Children are often considered the priority population for intervention strategies because weight loss in adulthood is difficult and there are a greater number of potential interventions for children than for adults. Because it is difficult to reduce excessive weight in adults once established, it would be more sensible to initiate prevention and treatment of obesity during childhood. Prevention may be achieved through a variety of interventions targeting the built environment, physical activity, and dietary habits. 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 intervention. Furthermore, GIS is now being used to help childhood obesity by identifying school-level neighborhood environmental indicators. These indicators can be used to map such things as food sources around a neighborhood, distances children must walk to and from school, and the accessibility of spaces for physical activity.[38] All of these are important because kids today don’t get as much exercise as they should and are also consuming unhealthy foods. With GIS, we can identity prob-

lems within the environment and therefore be better equipped to develop effective solutions.[36] For example, GIS technologies are being used to examine the "walkability" of communities [36,38], availability of recreational facilities [36], and the accessibility of stores that sell fresh produce to food pantry clients who do not have access to fresh fruits and vegetables through most emergency food assistance programs.[38] As more community information is available in online and mapped formats, increased opportunities will become available for mapping multiple facets of community life and identifying the unique strengths and challenges to physical activity and healthy eating that a given community is faced with.[38] In addition, sharing data with community stakeholders could be an important tool in engaging and tracking community obesity prevention efforts, particularly because they can be focused on a local geographic area. The committee encourages increased exploration and use of GIS and other relevant technologies for the development and evaluation of community-level interventions to promote energy balance in youth.

Built Environment

The challenge ahead is to identify obesogenic environments and influence them so that healthier choices are more available, easier to access, and widely promoted to a large proportion of the community (table 2). The neighborhood is a key setting that can be used for intervention. It encompasses the walking network (footpaths and trails, etc.), the cycling network (roads and cycle paths), public open spaces (parks) and recreation facilities (recreation centers, etc.). While increasing the amount of public open space might be difficult within an existing built environment, protecting the loss of such spaces should be a vital component to ensuring the built environment is conducive to physical activity. For children, the smaller scale of the home environment is very important for shaping children's eating behaviors and physical activity patterns, although the local environment at school and the wider community also play important roles. Surprisingly, we know very little about specific home influences and as a setting, it is difficult to influence due to the private nature of home life and the heterogeneity of families and their circumstances.[56] Of all aspects of behaviour in the home environment, however, television viewing has been researched in the greatest detail.[57-59]

Physical activity

Stone et al.[60] reviewed the impact of 14 school-based interventions on physical activity knowledge and behavior. Most of the outcome variables showed significant improvements following intervention. One interdisciplinary intervention program in the USA featured a curriculum based approach for influencing eating patterns, reducing sedentary behaviours (with a strong emphasis on television viewing), and promoting higher activity levels among children in grades 6 to 8. Evaluation at two years showed a reduction in obesity prevalence in girls (OR = 0.47; 95%CI: 0.24 – 0.93), but not in boys (OR = 0.85;95%CI: 0.52 – 1.39) compared to controls. Reduction in television viewing (by approximately 30

min/day) was highly significant for both boys and girls in terms of obesity reduction, as were increases in sports participation and/or physical education time. These results support the need for policy-based changes that encourage these behaviours in the school setting.[61] Similarly, increases in active modes of transport to and from school (walking, cycling, and public transport) would require policy changes at the school and local government levels, as well as support from parents and the community. In some communities, a variety of such programs have been implemented, such as road crossings, the 'walking bus', and designated safe walking and cycling routes.[51]

Effects of dietary pattern and TV watching

It appears as if gains can be made in obesity prevention through restricting television viewing, through initiatives directed at increasing energy expenditure.[58] In addition, fast foods are one of the most advertised products on television and children are often the targeted by manipulative marketers. Restricting the marketing of fast food and energy-dense foods and drinks to young children, is a potential strategy that is strongly supported.

Table 2: Some interventions strategies that could be considered for prevention of childhood obesity.

I. Built environment
1. Walking network
a. Footpaths (designated safe walking path)
b. Trails (increasing safety in trails)
2. The cycling network
c. Roads (designated cycling routes)
d. Cycle paths
3. Public open spaces (parks)
4. Recreation facilities (providing safe and inexpensive recreation centers)
II. Physical activity
1. Increasing sports participation
2. Improving and increasing physical education time
3. Use school report cards to make the parents aware of their children's weight problem
4. Enhancing active modes of transport to and from school
a. Walking e.g. walking bus
b. Cycling
c. Public transport
III. TV watching
1. Restricting television viewing
2. Reducing eating in front of the television
3. Ban or restriction on television advertising to children
IV.GIS Methods
1. the walkability of communities
2. access to recreational facilities
3. the accessibility of stores

Conclusion:

Obesity is a chronic disorder that has multiple causes. Overweight and obesity in childhood have a significant impact on both physical and psychological health. In addition, psychological disorders such as depression occur at a higher rate in obese children, and overweight children are more likely to develop cardiovascular and digestive diseases in adulthood in comparison to their leaner counterparts. It is believed that both over-consumption of calories and reduced physical activity are in the main culprits behind childhood obesity. It appears as if primary or secondary prevention could be the key strategy for controlling the current epidemic of obesity and these strategies seem to be more effective in children than in adults. A number of strategies can be implemented that target the built environment, physical activity, and diet. In addition, Geographic Information Systems (GIS) are being used to help reduce childhood obesity by identifying school-level neighborhood environmental indicators. These strategies (built environment, physical activity, diet) can be initiated at home, preschool institutions, schools, and workplaces. Further research is needed to examine the most effective strategies for the intervention, prevention, and treatment of obesity. These strategies should be culturally-appropriate and appropriate for the socioeconomic conditions of the targeted population.

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