

Causes for childhood obesity the strategies for prevention

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Overweight and obesity in childhood show a negative impact on both physical and psychological health. The mechanism of obesity development is not fully understood and it is believed to be a disorder with multiple causes. Environmental factors, lifestyle preferences, and cultural environment play pivotal roles in the rising prevalence of obesity worldwide. Obesity is an excess proportion of total body fat. A person is considered obese when his or her weight is 20 per cent or more above normal weight. The most common measure of obesity is the body mass index or BMI. A person is considered overweight if his or her BMI is between 25 and 29.9; a person is considered obese if his or her BMI is over 30. On the other hand, there are supporting evidences that excessive sugar intake by soft drink, increased portion size, and steady decline in physical activity have been playing major roles in the rising rates of obesity all around the world. Consequently, both over-consumption of calories and reduced physical activity are involved in childhood obesity. Almost all researchers agree that prevention could be 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 more weight increase in obese persons unable to lose weight. Until now, most approaches have focused on changing the behavior of individuals in diet and exercise. Prevention may be achieved through a variety of interventions like targeting built environment, physical activity, and diet. The increased risk of chronic diseases requires effective strategies to promote health, facilitating the adoption of proper life styles from childhood.

Key Words : Multi-factorial, Genetic factors, Hyperlipidaemia, Body mass index, Waist circumference

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INTRODUCTION

Childhood obesity has reached epidemic levels in developed countries. The highest prevalence rates of childhood obesity have been observed in developed countries, however, its prevalence is increasing in developing countries as well. It is widely acknowledged that the causes of obesity are multi-factorial, but those mainly responsible for such an increase are associated with certain modifications of life style, such as sedentary habits and decrease of physical activity, associated with higher and unbalanced food consumption.

Overweight and obesity in childhood have significant impact on both physical and psychological health. For example: overweight and obesity are associated with Hyperlipidaemia, hypertension, abnormal glucose tolerance, and infertility. In addition to this psychological disorders such as depression occur with increased frequency in obese children (Daniels *et al.*, 2005). Obesity is characterized by an excess of adipose tissue relative to lean body mass. With rare exceptions,

it simply reflects a long-term imbalance in energy intake vs. expenditure. The excess energy is stored as fat.

Definition of childhood obesity:

Although definition of obesity and overweight has changed over time (Kuczmarski and Flegal, 2000, Flegal *et al.*, 2002), it can be defined as an excess of body fat (BF). There is no consensus on a cutoff point for excess fatness of overweight or obesity in children and adolescents. There are also several methods to measure the percentage of body fat. 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 to identify risk (Table 1). While health consequences of obesity are related to excess fatness, the ideal method of classification should be based on direct measurement of fatness.

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Table 1. Classification of over weight and obesity by BMI for Indians

Sr. No.	Classification	Obesity class	BMI (Kg/m ²)
1.	Under weight	-	< 18.5
2.	Normal	-	18.5 to 22.9
3.	Over weight	-	23 to 27.9
4.	Obesity	I	28 to 32.9
5.	Obesity	II	33 to 37.9
6.	Obesity	III	> 38

Cross-sectional studies have shown that BIA predicts total body water (TBW), fat-free mass (FFM), and fat mass or percentage of body fat (%BF) among children (Deurenberg *et al.*, 1989 and 1990, Danford *et al.*, 1992). Also, it has been shown that BIA provides accurate estimation of changes on per cent BF and FFM over time (Phillips *et al.*, 2003). 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 (Stevens, 1995). To the best of our knowledge there is no publication on specific cut off points for waist circumference, but there are some ongoing studies.

Causes of obesity:

It is confirmed that obesity occurs when energy intake exceeds energy expenditure. There are multiple etiologies for this imbalance, and, hence the rising prevalence of obesity cannot be addressed by a single etiology. Genetic factors influence the susceptibility of a given child to an obesity-conducive environment. However, environmental factors, lifestyle preferences, and cultural environment seem to play major roles in the rising prevalence of obesity worldwide (Goodrick *et al.*, 1996; Grundy, 1998; Eckel and Krauss, 1998; Hill and Peters, 1998). In a small number of cases, childhood obesity is due to genes such as leptin deficiency or medical causes such as hypothyroidism and growth hormone deficiency or side effects due to drugs (*e.g.* steroids) (Link *et al.*, 2004). Most of the time, however, personal lifestyle choices and cultural environment significantly influence obesity.

Behavioral and social factors:

Diet:

Over the last decades, food has become more affordable to larger numbers of people as the price of food has decreased substantially relative to income and the concept of 'food' has changed from a means of nourishment to a marker of lifestyle and a source of pleasure. Clearly, increases in physical activity are not likely to offset an energy rich, poor nutritive diet. Frequent consumption of such a diet can hardly be counteracted by the average child or adult (Styne, 2005).

However, a small caloric imbalance (within the margin of error of estimation methods) is sufficient over a long period of time to lead to obesity. While for many years it has been claimed that the increase in pediatric obesity has happened because of an increase in high fat intake, contradictory results have been obtained by cross-sectional and longitudinal studies. Some cross-sectional studies have found a positive relationship between fat intake and adiposity in children even after controlling for confounding factors (Maffeis *et al.*, 1996; Tucker *et al.*, 1997).

There is a growing body of evidence suggesting that increasing dairy intake by about two servings per day could reduce the risk of overweight by up to 70 per cent (Heaney *et al.*, 2002). In addition, calcium intake was associated with 21 per cent reduced risk of development of insulin resistance among overweight younger adults and may reduce diabetes risk (Pereira *et al.*, 2002). Higher calcium intake and more dairy servings per day were associated with reduced adiposity in children studied longitudinally (Heitmann *et al.*, 1997; Carruth and Skinner, 2001).

The heights and weights of each child is compared with NCHS standards; height for age and weight for age were categorized as below normal (BN), normal (N) and above normal (AN) (Table 2).

It has been hypothesized that a steady decline in physical activity among all age groups has heavily contributed to rising rates of obesity all around the world. Physical activity strongly influenced weight gain in a study of monozygotic twins (Swinburn and Egger, 2002). Numerous studies have shown that sedentary behaviours like watching television and playing

Table 2. Distribution of children according to their heights and weights for their age

Sr. No.	Age in years	M /F	Heights of children				Weight of children			Total
			AN %	N %	BN %	Total	AN %	N %	BN %	
1.	< 5 years	M	-	50	50	100	-	50	50	100
		F	-	33.3	66.7	100	-	100	-	100
2.	< 5 years	M	-	53.3	46.7	100	-	40	60	100
		F	5.9	35.3	58.8	100	-	58.8	41.2	100
3.	11-15 years	M	10.5	36.9	52.6	100	-	47	63	100
		F	-	35.7	64.3	100	7.2	35.7	57.1	100

An= Above normal;

BN=Below normal;

N=Normal

computer games are associated with increased prevalence of obesity (Swinburn and Egger, 2002; Tremblay and Willms, 2003). Furthermore, parents report that they prefer having their children watch television at home rather than play outside unattended because parents are then able to complete their chores while keeping an eye on their children (Gordon-Larsen *et al.*, 2004). In addition, increased proportions of children who are being driven to school and low participation rates in sports and physical education, particularly among adolescent girls (Swinburn and Egger, 2002), are also associated with increased obesity prevalence. 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 (Carriere, 2003). In response to the significant impact that the cultural environment of a child has on his/her daily choices, promoting a more active lifestyle has wide ranging health benefits and minimal risk, making it a promising public health recommendation (Table 3).

Table 3. Distribution of sample according to their utilitarian physical activity

Sr. No.	Age in years	M /F	Physical activity (%)		
			Sedentary work	Moderate work	Heavy work
1.	2-5 years	M	100	-	-
		F	100	-	-
2.	6-10 years	M	100	-	-
		F	100	-	-
3.	11-15 years	M	100	-	-
		F	100	-	-

Genetics:

Obesity (and thinness) tends to run in families. In a study of adults who were adopted as children, researchers found that participating adult weights were closer to their biological parents' weights than their adoptive parents'. The environment provided by the adoptive family apparently had less influence on the development of obesity than the person's genetic makeup. In fact, if the biological mother is heavy as an adult, there is approximately a 75 per cent chance that her child will be heavy. If the biological mother is thin, there is also a 75 per cent chance that her child will be thin. Nevertheless, people who feel that their genes have doomed them to a lifetime of obesity should take heart. Many people genetically predisposed to obesity do not become obese or are able to lose weight and keep it off.

Health effects of childhood obesity:

Childhood obesity has both immediate and long-term effects on health and well-being.

Immediate health effects:

- Obese youth are more likely to have risk factors for cardiovascular disease, such as high cholesterol or high blood pressure. In a population-based sample of 5 to 17 year olds, 70 per cent of obese youth had at least one risk factor for cardiovascular disease (Freedman *et al.*, 2007).
- Obese adolescents are more likely to have prediabetes, a condition in which blood glucose levels indicate a high risk for development of diabetes (Li *et al.*, 2009).
- Children and adolescents who are obese are at greater risk for bone and joint problems, sleep apnea, and social and psychological problems such as stigmatization and poor self-esteem (Daniels *et al.*, 2005).

Long-term health effects :

- Children and adolescents who are obese are likely to be obese as adults 11-14 and are therefore, more at risk for adult health problems such as heart disease, type 2 diabetes, stroke, several types of cancer, and osteoarthritis. One study showed that children who became obese as early as age 2 were more likely to be obese as adults.
- Overweight and obesity are associated with increased risk for many types of cancer, including cancer of the breast, colon, endometrial, esophagus, kidney, pancreas, gall bladder, thyroid, ovary, cervix, and prostate, as well as multiple myeloma and Hodgkin's lymphoma.

Prevention:

Because the prognosis for the nonsurgical treatment of obesity-only 10 per cent to 30 per cent of patients achieve and maintain a weight loss regardless of the type of therapy (Bray, 1978). However, there are a number of complex issues involved in the treatment of children who are already obese.

Almost all public health researchers and clinicians agree that prevention could be the key strategy for controlling the current epidemic of obesity (Muller *et al.*, 2001). Prevention may include primary prevention of overweight or obesity itself, secondary prevention or avoidance of weight regain following weight loss, and prevention of further weight increases in obese individuals unable to lose weight. Until now, most approaches have focused on changing the behaviour of individuals on diet and exercise and it seems that these strategies have had little impact on the growing increase of the obesity epidemic.

Obesity is probably the somatic expression of a group of behavioral, metabolic, and regulatory syndromes. No single, preventive measure or treatment would be expected to be both safe and effective in all instances. Children are often considered the priority population for intervention strategies. 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. Secondly, it is difficult to reduce excessive weight in adults once it becomes established. Therefore, it would be more sensible to initiate prevention and treatment of obesity during childhood. Prevention may be achieved through a variety of interventions targeting built environment, physical activity and diet. The role of moderate exercise in the prevention and treatment of obesity is not entirely clear. Therefore, regular exercise should be encouraged in children, but the justification for it perhaps should not be placed entirely, or even largely, on weight regulation.

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.

Although, it seems that reduced eating in front of the television is at least as important as increasing activity (Robinson, 1999). 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.

What age group is the priority for starting prevention?

Children are often considered the priority population for intervention strategies because, firstly, weight loss in adulthood is difficult and there are a greater number of 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. Secondly, it is difficult to reduce excessive weight in adults once it becomes established. Therefore, it would be more sensible to initiate prevention and treatment of obesity during childhood. Prevention may be achieved through a variety of interventions targeting built environment, physical activity and diet.

Strategies for prevention of childhood obesity:

Built environment :

- Walking network
 - Footpaths (designated safe walking path)
 - Trails (increasing safety in trails)
- The cycling network
 - Roads (designated cycling routes)
 - Cycle paths
- Public open spaces (parks)
- Recreation facilities (providing safe and inexpensive recreation centers)

Physical activity:

- Increasing sports participation

- Improving and increasing physical education time
- Use school report cards to make the parents aware of their children's weight problem
- Enhancing active modes of transport to and from school
 - Walking *e.g.* walking bus
 - Cycling
 - Public transport

TV watching :

- Increasing sports participation
- Restricting television viewing
- Reducing eating in front of the television
- Ban or restriction on television advertising to children

Food sector :

- Applying a small tax on high-volume foods of low nutritional value (*e.g.* soft drinks, confectionery and snack foods)

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. 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 requires strong support within the community. Although the local environment, both school and the wider community plays an important role in shaping children's physical activity, the smaller scale of the home environment is also very important in relation to shaping children's eating behaviours and physical activity patterns. Surprisingly, we know very little 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 (Campbell *et al.*, 2002). Of all aspects of behaviour in the home environment, however, television viewing has been researched in greatest detail (Gortmaker, 1999; Robinson, 2002).

Physical activity:

Stone *et al.* (1998) reviewed the impact of 14 school-based interventions on physical activity knowledge and behaviour. Most of the outcome variables showed significant improvements for the intervention. One interdisciplinary intervention program featured a curriculum based approach to influence eating patterns, reduce sedentary behaviours (with a strong emphasis on television viewing), and promote higher activity levels among children of school grades 6 to 8. The reduction in television viewing (by approximately 30 min/day)

was highly significant for both boys and girls. Increases in sports participation and/or physical education time would need policy-based changes at both school and education sector levels (Dwyer *et al.*, 1983). 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.

Effects of dietary pattern and TV watching:

It appears that gains can be made in obesity prevention through restricting television viewing. Although, it seems that reduced eating in front of the television is at least as important as increasing activity (Robinson, 1999). 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. The fact that children would still be seeing some television advertisements during adult programmes or other types of marketing, such as billboards, does not contradict the rationale for the control on the television watching of young children.

Food sector:

Food prices have a marked influence on food-buying behaviour and, consequently, on nutrient intake (Guo *et al.*, 1999). A small tax (but large enough to affect sales) on high-volume foods of low nutritional value, such as soft drinks, confectionery, and snack foods, may discourage their use. In addition, food labeling and nutrition 'signposts' such as logos that indicate that a food meets certain nutrition standards might help consumers make choices of healthy foods. The 'Pick the Tick' symbols made it easier for consumers to identify healthier food choices and are frequently used by shoppers. In addition, the nutrition criteria for the products serve as 'de facto' standards for product formulation, and many manufacturers will formulate or reformulate products to meet those standards.

Conclusion:

Obesity is a chronic disorder that has multiple causes. Overweight and obesity in childhood have significant impact on both physical and psychological health. In addition, psychological disorders such as depression occur with increased frequency in obese children. Overweight children are more likely to have cardiovascular and digestive diseases in adulthood as compared with those who are lean. Apparently, primary or secondary prevention could be the key plan for controlling the current epidemic of obesity and these strategies seem to be more effective in children than in

adults. A number of effective plans can be 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 as natural setting for influencing the diet and physical activity and at home and work for adults.

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