

Physical Activity: A Key for the Preclusion of Obesity in Children

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Abstract Childhood obesity is one of the serious problems globally which keeps on increasing with a high rate. Physical activity plays an important role in handling childhood obesity. Physical activity has long been considered an integral component of weight management, but exercise alone is a reasonably ineffective means for reducing fat percentage. Physical activity along with healthy nutrition boosts the process of fat percentage discount and is also helpful in monitoring the hypothalamus part of the brain which plays an important role in regulating food intake. Data suggest that anthropometry is a key component of nutritional status assessment in children, especially body mass index, which is quite effective and reliable. Without engaging children in physical activity leads to increased chances of obesity, cardiovascular diseases, cancer, and diabetes in the future and that fastenings the attention of fitness personal and policy makers. Hence, parents and policymakers have to plan accordingly to make their child healthy and fit. This article reviews the available literature regarding the role of physical activity and nutrition in the prevention and handling of childhood obesity along with various anthropometric assessment methods.

Keywords: childhood obesity, physical activity, nutrition, anthropometry

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1. Introduction

Obesity is emerging as one of the most serious problems of the present century, especially childhood obesity, which is the major public health crunch globally that are on the rise. According to WHO, 22 million children (under 5 years of age) are overweight [1]. The prevalence has increased at an alarming rate. Globally, in 2010 the number of overweight children under the age of five is estimated to be over 42 million. Close to 35 million of these are living in developing countries [2]. Obesity is defined as a BMI equal to or greater than 95th percentile for age and sex. It is normally measured in children by plotting body mass index on a standard growth chart using a defined cut-off point [3] and generally caused by imbalance between calories consumption and consumed [4]. Overweight and obese children are likely to stay obese into adulthood and more likely to develop non-communicable diseases like diabetes and cardiovascular diseases at a younger age. Prevention of childhood obesity therefore needs high priority [5,6,7,8]. Children represent the future, and ensuring their healthy growth and development ought to be a prime concern of all societies [9]. Physical inactivity has been identified as the fourth leading risk factor for global mortality causing an estimated 3.2 million deaths globally. Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure [10]. Regular moderate intensity physical activity – such as walking,

cycling, or participating in sports – has significant benefits for health. [11,12,13]. Nearly half of American youths 12-21 years of age are not vigorously active on a regular basis. Moreover, physical activity declines dramatically during adolescence [14]. Therefore the purpose of this paper is to highlight the importance of physical activity and nutrition in controlling childhood obesity along with the assessment techniques.

2. Epidemiology of Childhood Obesity

Obesity was first included in the international classification of diseases in 1948. Since then, an epidemic has developed internationally, affecting all age groups [15]. The combination of our genetic propensity to store fat, the ready availability of calorie dense foods, and sedentary lifestyle promotes overweight. The child's food environment at home and parental obesity are strong determinants [16]. Over the past 40 years, rates of obesity have doubled in 2- to 5-year-olds, quadrupled in 6- to 11-year-olds, and tripled in 12- to 19-year-olds. The causes of childhood obesity are complex and interconnected [17]. Puberty and the following adolescent period are acknowledged as particularly vulnerable times for the development of obesity due to sexual maturation and, in many individuals, a concomitant reduction in physical activity [18]. Childhood obesity and the accompanying health consequences are growing at a fast rate in India [19]. A new study carried out by American researchers suggests that community involvement is important in the

fight against childhood obesity [20]. Maternal instinct can be a dicey, since mothers want their child to be well fed, which is not a bad thing. But now-a-days home theatre, play station, unlimited internet has locked up kids at home. Lack of exercise or activity has expanded our children's waste line, making them prone to lifestyle diseases and health problems [21]. Childhood obesity builds a ticking time bomb of sickness in later life - and action to avert ill health should start before the kids attain school going age [22]. A new AIIMS study on 10,000 Delhi schoolchildren has found that 3-4% of them suffered from hypertension, the most common cause of heart-related deaths. Among these were children as young as five year's old [23].

3. Physical Activity and Childhood Obesity

Current research suggests that physical inactivity is inversely correlated with the risk of obesity [24,25,26]. The World Health Organization, the U.S. Dept. of Health and Human Services, and other authorities recommend that for good health, adults should get the equivalent of two and a half hours of moderate-to-vigorous physical activity each week [27,28,29]. Worldwide, people are less active today than they were decades ago. While studies find that sports and leisure activity levels have remained stable or increased slightly [30,31,32,33]. Regular physical activity 45-60 min per day prevents unhealthy weight gain and obesity, whereas sedentary behaviours such as watching television promote them. Regular exercise can markedly reduce body weight and fat mass without dietary caloric restriction in overweight individuals [34]. Local health departments (LHDs) play a crucial role in the identification, management and prevention of obesity [35]. Physical activity and health has been late to emerge as a scientific field and as a target of research, beyond the early impetus provided by medical epidemiologists [36]. The continuum of physical activity behaviour ranges from being inactive to being very physically active. Some individuals can be considered physically active if they are meeting the current recommendations for moderate to vigorous physical activity, yet they may also be very sedentary throughout the rest of their day [37]. The reality is that attaining a healthy weight is difficult if physical activity is not a part of child's lifestyle. One probable cause of childhood overweight and obesity is decreased daily energy expenditure [38]. Evidences clearly showed that regular physical activity helps in reduction of body fat percentage. Children are more active than adults, but their activity levels decline as they move toward adolescence, and significant numbers of young people do not participate in recommended levels of physical activity [39]. Inactivity among children has likely increased because of factors such as dependence on cars for transportation, increased screen time (e.g., television, videogames, internet), and the constraints of the built environment (e.g., urban sprawl, lack of recreational facilities, neighbourhood safety) [40]. Physical activity also has several other aspects that are positive for the obese child's health, such as improving the metabolic profile and psychological wellbeing [41]. In recent years, physical education and recess have been reduced in many schools, resulting in long periods of inactivity during the school day. Without opportunities for

physical activity in school, many children will fail to meet minimal activity requirements. Physical education provides youths with meaningful amounts of daily physical activity [42,43,44]. Exercise has long been considered an integral component of weight management, but available evidence suggests that exercise alone is a relatively inefficient means for losing weight. In contrast, regular exercise appears crucial in the prevention of weight gain and successful maintenance of weight loss, and in the fostering of cardiovascular health [45].

4. Endurance Exercise and Obesity

Endurance is the ability to do a single movement under the condition of fatigue. Research suggests that endurance play an important role in preventing the obesity. Endurance exercise helps in reducing skeletal muscle-specific and systemic oxidative damage while improving insulin resistance and cytokine profile associated with obesity, independent of weight loss [46]. Endurance exercise training decreased plasma leptin levels independently of changes in plasma insulin levels and body fat percentage [47]. The relationship between fat mass and leptin, which is also found in humans (48), might be affected by mechanisms acting on fat mass. The insulin hormone is thought to be important in this control mechanism (49). A continuous exercise training protocol can elicit high rates of fat oxidation, increases the contribution of fat to substrate oxidation during exercise [50]. One of the fundamental mechanisms for the positive effects of exercise training in obesity may be related to its effects on fat utilization. Researches proved that an endurance exercise programme is more effective in increasing fat oxidation during exercise [51].

5. Nutrition and Obesity

Good nutrition is just like a good antibiotic or vaccine in preventing illness [52]. Changes in diet and sedentariness are fuelling the obesity epidemic. Good nutrition play an essential parts of a person's overall health and well-being. Insufficient nutrient intake during childhood has been linked to physical and mental health problems as well as emotional and behavioural problems, learning deficiencies, and lower grades [53]. Fundamental causes of the obesity epidemic are sedentary lifestyles and high-fat energy-dense diets, both resulting from the profound changes taking place in society and the behavioural patterns of communities as a consequence of increased urbanization and industrialization and the disappearance of traditional lifestyles [54]. According to the study overweight children, particularly girls, reported eating less bread, cake, and cream, adding less sugar to beverages, and eating sweets and ice cream less frequently than thin and normal-weight children. A higher percentage of the obese group reported skipping one meal and eating no snack at school. Overweight teen-agers appear to be more conscious of their food intake than under- and normal-weight children [55]. As schools have been proposed worldwide as a major setting for tackling childhood obesity it is essential that future policy evaluations measure the long term effectiveness of a range

of school food policies in tackling both dietary intake and overweight and obesity [56]. People living in urban areas consume diets distinctly different from those of their rural counterparts. One of the more profound effects is the accelerated change in the structure of diet, only partially explained by economic factors. A second is the emergence of a large proportion of families with both currently malnourished and overweight members [57]. Low birth-weight babies whose families were food insecure in early childhood are almost 28 times more likely than their peers to be overweight or obese at age 4 ½ [52,53]. Gregory et al. [58] reported that the average fat intake of children aged 4-18 years in the UK is close to the government recommendation of 35% energy. 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 [59,60]. Soft drink intake has been also associated with the prevalence of obesity [61] and type II diabetes [62,63,64,65] among children. While it is possible that drinking soda instead of milk would result in higher intake of total energy, it cannot be concluded definitively that sugar containing soft drinks promote weight gain because they displace dairy products [66]. 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 [67].

6. Anthropometric variables for the Assessment of Obesity in Children

Obesity can be assessed by a variety of anthropometric variables namely Body mass index, Waist Circumference, hip circumference, Waist to height ratio, waist to hip ratio, different skinfolds of the body, standing height & weight measurement and predictive equations. In addition to this there are some more variables that may also help in assessing the childhood obesity namely upper arm & leg length, head and mid arm circumference. Anthropometry is a key component of nutritional status assessment in children as well as in adults. Comparing anthropometric data from children of different ages is complicated by the fact that children are still growing (We do not expect the height of a 5-year-old to be the same as the height of a 10-year-old!) [68]. But the question is which anthropometric variable is more reliable in comparison to others. One of study suggested that the validity of the anthropometric skinfold thickness in the obese children is low and BMI provides the best estimate of body fat [69]. The childhood obesity working group of the international obesity taskforce recommended the use of body mass index (BMI) cut off points to categorize children as normal weight, overweight, or obese based on age, gender, and BMI [70]. A new function for egen has been developed to allow transformation of child anthropometric data to z-scores using the LMS method. An additional function allows for children to be categorized according to body mass index (weight/height²) using international cut off points recommended by the Childhood Obesity working group of the international obesity taskforce [68].

7. Molecular Mechanism of Obesity

The command centre for communication between the brain and the body is the hypothalamus. It controls all homeostatic systems, including circadian rhythms, sleep, body temperature, stress regulation, sexual behaviour, and water balance. The hypothalamus also regulates food intake. Hormonal regulators of energy homeostasis can also act on brain reward circuits, most notably on the mesoaccumbens dopamine system [71], to increase or decrease the incentive value of food depending on energy requirements. However, electrical or chemical stimulation of brain areas that regulate food reward can trigger binge-like overeating even in recently fed animals in which homeostatic satiety signals have been engaged [72,73]. Recent research has identified specific molecular mediators of the link between inflammation and insulin resistance in obesity. Study of these mediators and the specific mechanisms underlying inflammation and insulin resistance in obesity holds the promise for novel pharmacotherapy for obesity-related metabolic disease [74]. Leptin, a key appetite-regulating hormone derived from the white adipose tissue, primarily acts on hypothalamic neurons to activate catabolic pathway and inhibit anabolic pathway, which can result in anorexia and weight reduction [75].

8. Conclusion

After gone through the related literature, we may conclude that childhood obesity emerging as an epidemic serious health problem like cardiovascular diseases, cancer, diabetes and many more. Physical inactivity has been identified as the leading risk factor for global mortality. Regular physical activity especially endurance exercise plays an important role in prevention of childhood obesity by enhancing the process of fat oxidation. On the other side research suggested that physical activity, alone is unable to give an effective results towards obesity. Nutrition also have important role to play in reducing the excessive fat percentage along with physical activity. Good nutrition is just like a good antibiotic or vaccine in preventing illness, while high-fat energy-dense diets boost the process of fat formation. Physical activity and diet especially high fat and calorie diet are inversely related in view of reducing extra fat from the body. Parents have to provide such an environment to their child which gives an opportunity for participating in physical activities. We can assess the fat percentage with the help of many anthropometric measures such as body mass index, weight & height of child (growth pattern) and different body parts circumferences. **“Sweat is the Most Effective Medicine for Future Shock”.**

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