



INTRODUCTION



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The survival of an animal species requires a continuous supply of energy for physiological functioning even though the supply is intermittent. This requirement has been met by the evolution of a mechanism for storing energy in fuels, mainly the triglycerides of fat, from which it can be quickly mobilized. The mechanism, controlled by the so-called thrifty genes, was an obvious asset to our hunter-gather ancestors. But, in affluent societies that combine sedentary lifestyles with an ample supply of calorie-rich foods, it is the cause of an increasing medical problem-obesity

It soon dawned on the medical fraternity that overweight and obesity were predisposing factors for most of the lifestyle disorders that had begun to plague the human race in the twentieth century. Western scientists began to study their possible etiologies, effects on the various body systems and modalities of treatment. But, little is still known about specific effects on the Oriental population. Besides, a burgeoning middle class has brought us on the verge of a major epidemic- obesity in children and adolescents, with authorities claiming that one in ten urban middle class Indian children is either overweight or obese. Several studies have shown that overweight and obesity negatively influence various pulmonary parameters. This study was carried out to review the same on the adolescent obese

An escalating global epidemic, obesity is the most common nutritional disorder in children and adolescents and represents a serious concern to the medical and lay communities. Between 16 % and 33 % of children and adolescents in the US are obese. Unhealthy weight gain due to poor diet and lack of exercise is responsible for over 3, 00,000 deaths in the US each year. Obesity is among the easiest medical conditions to recognize, but among the most difficult to treat.

The WHO definition of obesity: Obesity is defined as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired (WHO consultation on obesity, 2000)

Teenage obesity is complex in that both the potential physical and psychosocial consequences of obesity at this age need to be taken into account.

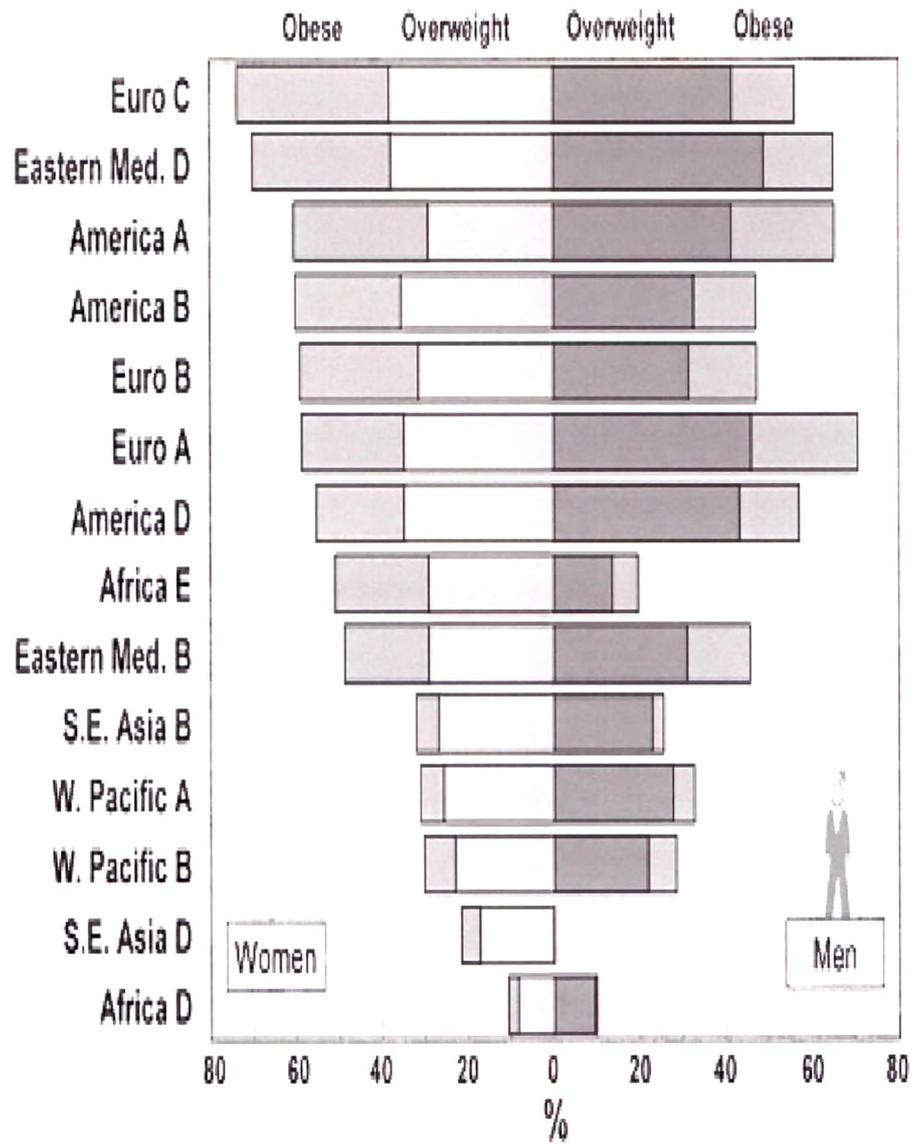
Obesity most commonly begins in childhood, between the age of 5 and 6 and during adolescence. Studies have shown that a child who is obese between the ages of 10 and 13 has an 80 % chance of becoming an obese adult. However, the prevalence of obesity increases with age among both male and females (Lohman, 1987), and there is a greater likelihood that obesity beginning even in early childhood will persist through the life span (Epstein, Wing, et al, 1987)

Because acute medical complications of obesity are far less common in children and adolescents than in adults and because

longitudinal data on the relation between childhood weight and adult morbidity and mortality are difficult to interpret, no single definition of obesity in childhood and adolescence had gained universal approval

The BMI co-relates closely with the total body fat (TBF) estimated by dual energy X-ray absorptionmetry (DEXA) scan in children who are overweight & obese. Normal values for BMI vary with age, sex and pubertal status and standard curves representing the 5th through the 95th percentile for BMI in childhood and adolescence have been generated using data from the **National Health and Nutrition Examination Surveys (NHANES) of 1988-1994**. Recently consensus committees have recommended that children and adolescents be considered overweight or obese if the BMI exceeds the 85th or 95th percentile on curves generated from the 1963 -1965 and 1966-1970 surveys or is more than 30kg/m² at any age

OBESITY LEVELS WORLDWIDE



(International obesity Task Force, 2000).

Causes of childhood and adolescent obesity: The causes of obesity are complex and include nutritional, psychological, familial and physiological factors

The family history of obesity: If one parent is obese, there is a 50 percent chance that the children will also be obese. The risk of becoming obese is 80% among children who have two obese parents (Dietz, 1983).

Low-energy expenditure (couch potato kids): The average American child spends several hours every day watching television; time which in previous years might have been devoted to physical pursuits. Obesity is greater among children and adolescents who frequently watch television (Dietz & Gortmaker, 1985), not only because little energy is expended while viewing but also because only one-third of elementary children have daily physical education, and fewer than one-fifth have extracurricular physical activity programs at their schools (Ross & Pate, 1987).

Heredity: Heredity has recently been shown to influence fatness, regional fat distribution, and response to overfeeding (Bouchard et al., 1990) In addition, infants born to overweight mothers have been found to be less active and to gain more weight by age three months when compared with infants of normal weight mothers, suggesting a possible

inborn drive to conserve energy (Roberts, Savage, Coward, Chew, & Lucas, 1988)

Miscellaneous:

- *Overeating or bingeing*
- *Medical illnesses (endocrine, neurological problems)*
- *Medications*
- *Stressful life events or changes (Separations, divorce, moves, deaths, abuse)*
- *Family and peer problems*
- *Low self esteem*
- *Depression or other emotional problems*

Risk and complications of childhood and adolescent obesity: For many years, complications arising from obesity were considered unusual in childhood. However, a plethora of minor and major problems may arise in children and adolescents with obesity, most of these problems have considerable impact on quality of life, and some reduce life expectancy.

The epidemiological data, although limited, indicate that adolescent obesity is associated with increased morbidity and mortality.

from all causes, especially cardiovascular and type II diabetes, especially in males with adolescent obesity.

Among sexually mature adolescents, changes in serum lipids and androgens seem to correlate more strongly with body fat distribution than with absolute weight. Thus, adolescents with central obesity (i.e. android or abdominal fat pattern) are more likely to manifest these cardiovascular risk factors than individuals with peripheral obesity (i.e. gynoid or gluteal pattern). The increased long term risk appears most pronounced for adolescent males with moderate-to-severe obesity.

Sleep apnea and sleep disordered breathing accompanied with neurocognitive dysfunction, orthopedic disorders including genu valgum, slipped capital femoral epiphysis and tibia vara, liver dysfunction with elevated plasma concentration of transaminases are also frequently observed.

Childhood and adolescent obesity and pulmonary function: In children with primary obesity, reduction in FRC (Functional Residual Capacity) is the commonest pulmonary abnormality. There is a statistically significant negative correlation between this correlation and the degree of obesity as assessed by Dual Energy X-ray Absorptionmetry (DEXA) scan.

Diminished DL_{CO} is also a primary finding in obese children and adolescents. The reduction in DL_{CO} may suggest structural changes in the lung interstitium resulting from lipid deposition and/or decreased alveolar surface area (Li A M et al, 2004)

O₂ Consumption and CO₂ production: Both are increased in obese patients as a result of metabolic activity of excess fat and increased workload on supportive tissues. In exercise O₂ consumption rises more sharply than in the non obese.

Gas exchange: Only modest defect in gas exchange is noted in the obese patients with a reduction in PaO₂, increase in AaO₂ gradient with increase in shunt fraction.

Compliance and resistance: Increased BMI exponentially decreases compliance. As fat content increases, compliance decreases. This is due to increase in pulmonary blood volume, increased total respiratory resistance and shallow rapid breathing, which can limit maximum ventilatory capacity. These are more markedly observed in supine position.

Work of breathing: 30% increase is observed in work of breathing. If hypoventilation occurs in daytime, the work of breathing may approach four times than predicted.

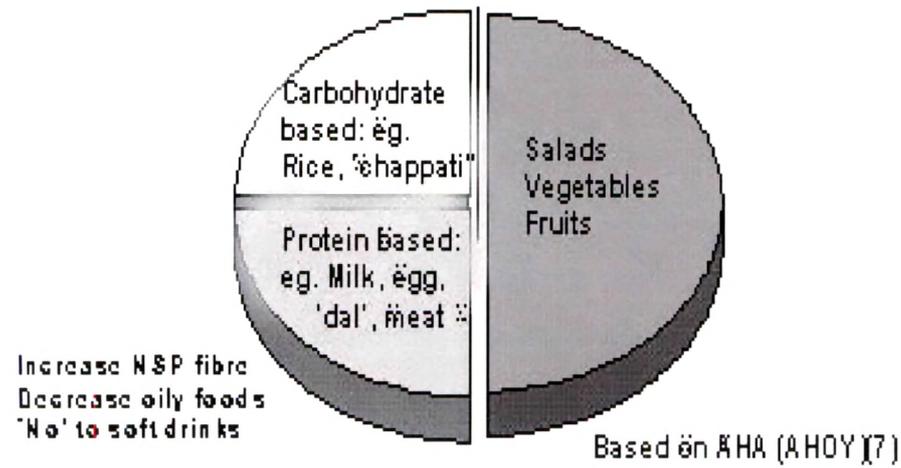
Treatment of childhood and adolescent obesity: Obesity treatment programs for children and adolescents aim to slow or halt weight gain rather than lose weight (Dietz, et. al, 1983).

Physical activity:- Physical activity, though valuable to burn fat, is not a successful strategy to burn fat, unless coupled with another intervention, such as nutrition education or behaviour modification (Wolf et. al, 1985). In Brazil, an ambitious program to promote physical activity in children was launched in 1997, in Sau Paolo, and because of its impact has now been adopted throughout the country – Agita Brasil (Matsudo V et al, 2002)

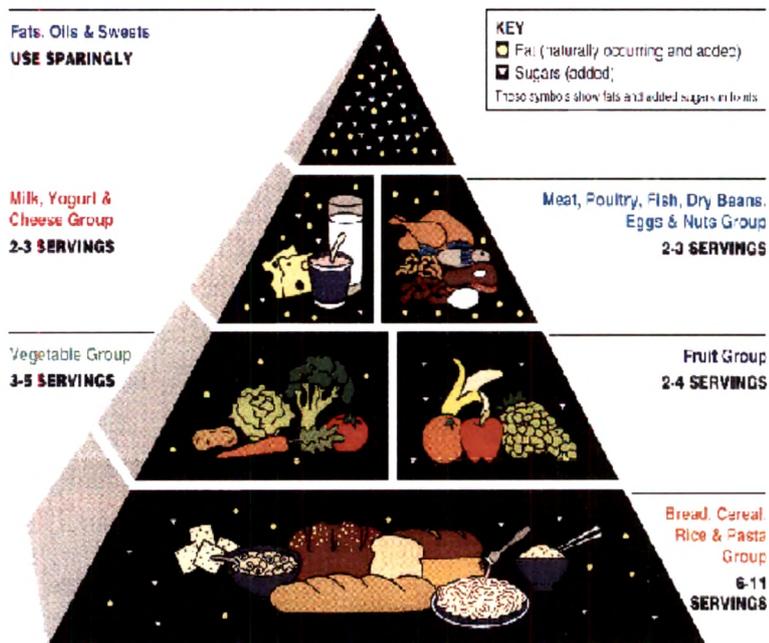
Diet management: - Fasting or extreme caloric restriction is not advisable for children for it may not only prove psychologically stressful but it may adversely affect growth and the child's perception of normal eating. Balanced diets with moderate caloric restriction, especially reduced dietary fat, have been used successfully in treating obesity (Dietz, et al, 1983). Diet management coupled with exercise is an effective treatment for childhood obesity (Wolf et. al, 1985).

Indian setting: - A simple Indianised message based on recommendations of AHA could be—"think of a day's food composition as a 'Thali' wherein 50% (half) is full of vegetables, salads and fruits. A quarter (25%) should be made up of cereals such as rice and/or chapattis and the remaining quarter should be protein based

(dal/milk/egg/animal protein)". Fried, snacks and 'sweet dishes' are only for a very few special occasions !



FOOD PYRAMID



Behaviour modification: - Many behavioural modification strategies used with adults have been successfully applied to children and adolescents; self monitoring and recording food intake and physical activity, limiting the time and place of eating, and using rewards and incentives for desirable behaviors. Particularly effective are behaviorally based treatments that include parents (Epstein et al, 1987). The CATCH (Childhood and Adolescent trial for Cardiovascular Health) in multiracial American school children and the 'Go girls' (Resnicow K et al, 2000) community based study in African American girls showed that children can be taught to eat less and exercise more.

Prevention of childhood and adolescent obesity: Obesity, as with other chronic diseases, is easier to prevent than to treat, and prevention should focus on a large measure on parent education.

[1] In infancy, parent education should center on promotion of breastfeeding, recognition of signals of satiety, and delayed introduction of solid foods

[2] In early childhood, education should include proper nutrition, selection of low-fat snacks, good exercise/ activity habits, and monitoring of television viewing

[3] In cases, where preventive measure cannot totally overcome the influence of hereditary factors, parent education should focus on building self-esteem and address psychological stresses.

School interventions: Experts quizzed teens about probable methods they would adopt to lose weight. Teens across the board wanted fun, interactive activities – such as in-line skating, aerobics and yoga- within a supportive environment. They asked for physical fitness facilities and programs to be available both during and after school hours and requested appealing, healthy foods. Teens recommended focusing on healthy lifestyle, instead of specific weight issues and offering programs to all students, regardless of weight, to avoid stigmatizing those with a problem.

Eat smart, but how? Experts suggest that parents should set a positive example by practicing healthy living through diet and exercise. They recommend that families stick to three meals and two or three snacks per day with age appropriate serving sizes of food. Meals should consist of three to four food servings and snacks should be smaller portions of one or two servings, with stress on moderation. The programs for overweight families could be summarized as under:

1. LESTER (Let's Eat Smart And Then Exercise Right for children aged six to eleven)
2. THINK (Teaching Healthy Habits And Improving Nutrition Knowledge)