Management of Adolescent Obesity

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ABSTRACT

This article highlights the basic concept about obesity and its management. It focuses on the prevalence of obesity in Western country. Metaanalysis study in India has shown increasing prevalence of childhood obesity. Measurement of obesity is quite challenging, but better predictors are BMI plotted on a CDC chart and waist-hip ratio measurement. Management is basically to identify the cause. Behavior and lifestyle modification are the cornerstone of success. Importance of exercise is to be highlighted. Pharmacotherapy is the last avenue, especially when complication due to obesity is around the corner. Bariatric surgery and newer drugs are experimental.

INTRODUCTION

Obesity is defined as the presence of abnormally large amount of adipose tissue. This excessive accumulation leads to physical, mental and social insult to the individual. Recent focus on adolescent obesity is being projected because it triggers future morbidity and mortality.

In the evolution of human race, the period of famine have changed to plenty. An active life has regressed to sedentary habit; keeping in view the thrifty gene hypotheses (i.e.) our body is good in converting food to fat. This mechanism might have helped our ancestor to survive when calories were few. As decades role the reset mechanism for satiety signals is altered and lot of external cues influence the biological mechanism with regard to eating behavior and lifestyle modification. Genes and neurochemical agents influence eating behavior and fat storage.

Cross-talk between adipose tissue and hypothalamic center results in proper feeding behavior, energy utilization, metabolic conservation and resetting the mechanism for thermic energy expenditure.

Obese adolescent population has altered eating pattern (i.e.) they eat little at some meals and excessively at other constituting to increase fat deposition. The habit of rapid eating might influence obesity because eating faster permits greater intake of food and lesser post-ingestive satiety.

PREVALENCE OF CHILDHOOD OBESITY

Data from the United States show that nearly 25% of children are obese, a prevalence which increased dramatically by over 20% in ten years. In United Kingdom, evaluation of a nationally representative sample of 2630 English children showed that the frequency of overweight ranged from 22% at six years to 31% at age 15 years and that of obesity ranged from 10% at age six years to 17% at age 15 years.

India

Published data from India are few. Among 3861 school children between the ages of 5 and 15 years, 292 (7.56%) were considered obese in Aligarh. Another study from Jaipur showed that among 237 children between the ages of 13 and 17 from middle and upper-middle class, 24 (10.1%) were obese, as defined by BMI above the 90th percentile.

Sridhar et al, using the ICMR centile for weight and height has shown that in girls 13 (44.62%) were above the 95th centile and 37.93% between the 50th and 95th centile.

Studies conducted at Institute of child health at Chennai (Sundararaman & Venkataraman) revealed that majority of obese children (73.4%) were from upper middle class, whereas 53% of cases belonged to upper lower class. This study also looked into the risk factors for obesity using multivariate analysis; risk factors such as excess calorie intake, consumption of junk foods, decreased play time, TV viewing, parental obesity and family history of metabolic syndrome are independently associated with obesity (Table 1).

MEASUREMENT OF ADIPOSE TISSUE

Adipose tissue mass is difficult to measure clinically hence various yardsticks have been formulated.

1. BMI: It clearly relates body fat independent of height. In adolescent population, this can be plotted on a BMI curve and value above 95th centile is taken as obese (at risk refer Table). The only pitfall in BMI calculation, that it doesn't

Fig. 1: Obese Child

Fig. 2: Obese Adolescent

Table 1: Risk Factors For Obesity: Multivariate Analysis

Risk Factor	Adjusted OR	P-Value	95% CI for OR
1. Excess calorie intake	20.634	0.001	(18.9, 22.4)
2. Consumption of junk foods	29.094	< 0.001	(27.4, 30.8)
3. Absence of exclusive breast feeding	13.113	0.009	(11.2, 15.0)
4. Absence of playtime at school	30.485	< 0.0001	(28.5, 32.5)
5. TV viewing	11.338	0.002	(9.8, 12.9)
6. Both parents obese	248.4	< 0.00001	(220.2, 267.2)
7. One parent obese	126.3	< 0.00002	(112, 124.3)
8. Family risk of metabolic syndrome	136.62	< 0.00001	(134.3, 138.8)

take musculature and differential adipose tissue into account. (Refer BMI Chart for Boys & Girls).

2. Skin-fold thickness: It is used to measure fat distribution. Disadvantages are observer's error and failure to accommodate the fat contour.
3. Measurement of body circumference: Waist-hip ratio higher than 0.72 are abnormal. The only pitfall is to evolve standards for a particular ethnic population. At puberty there is a significant increase in percentage of fat distribution among females when compared to males, but total body weight increases in both sexes after puberty.

MANAGEMENT OF OBESITY

The ideal programmer for obese children should be as follows:

- Controlled weight loss of about 0.5 kg a week
- No deceleration of height growth
- Metabolically safe
- Minimal hunger
- Lean body mass preserved
- No psychological problems

The principles include a diet that reduces the daily caloric intake below the child's usual intake, increased physical activity, some behavior modification techniques and parental support.

Dietary prescription

A reasonable goal would be to have the child lose about 0.5 kg a week. Excess weight is not all-excess fat. Obese children have an increased lean body mass and increased basal metabolic rate compared with lean children, and may need increased protein during caloric restriction to avoid loss of lean body mass.

Successful implementation also requires behavior modification strategies and parental involvement.

Behavior modification steps

Stimulus control

Stimulus control involves limiting the amount of high calorie foods kept in the house to small quantities or none at all. Efforts should be also made to help the child avoid situations where overeating may be a prominent theme.

Eating behavior

Modification of eating behavior involves taking smaller bites of food and chewing food longer.

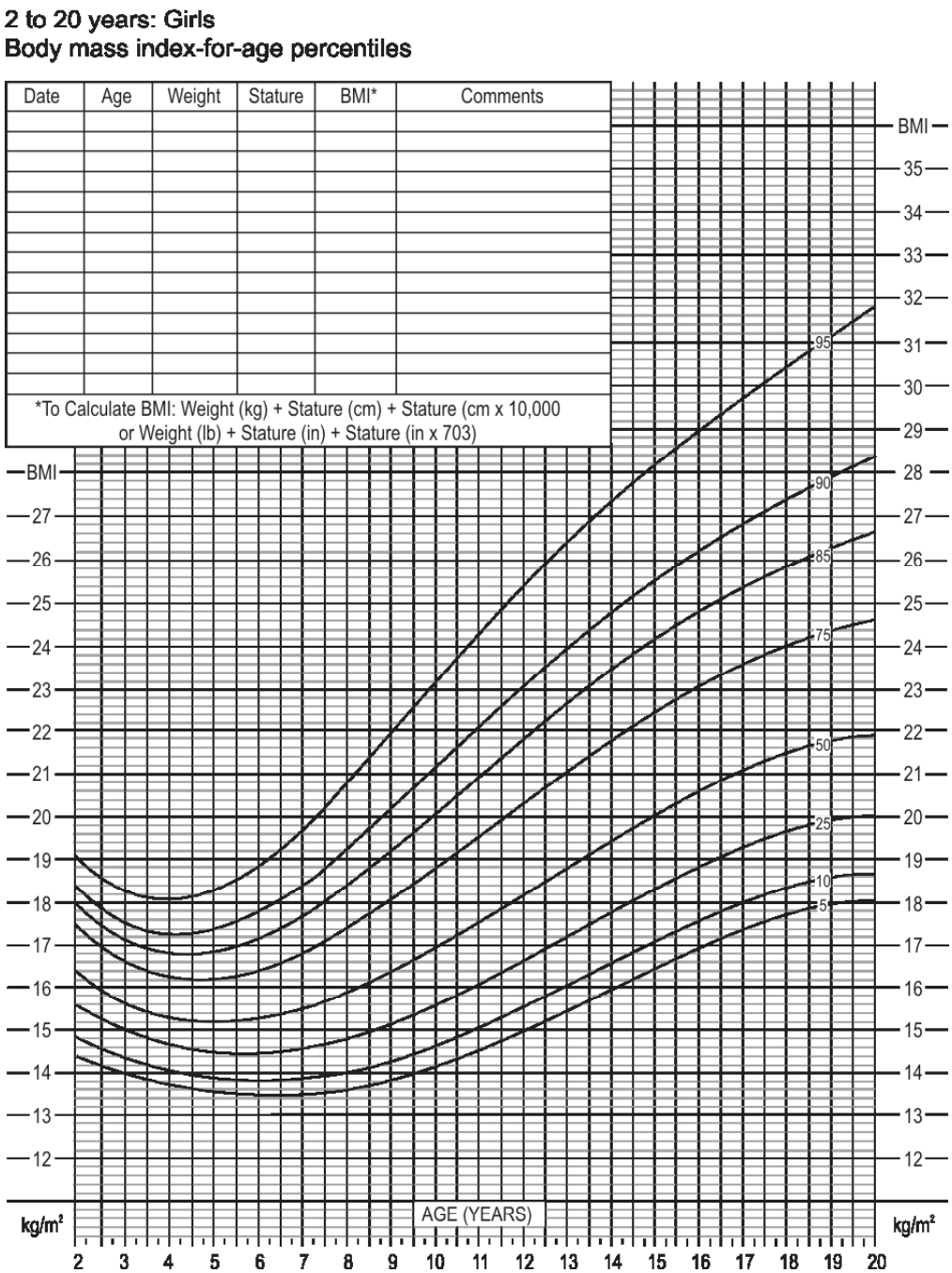
Attitude change

Children must be helped to change negative self-statements into positive ones. For example if the child overeats, she can be encouraged to tell herself they are going to keep on trying and do better the next time.

Reinforcement

Performance of targeted behavior should be rewarded by verbal praise from the physician and family members.

CDC BMI Chart - Girls



Exercise prescription

Exercise is ideally combined with dietary prescription. Caloric restriction often results in a drop in BMR, making it harder to lose weight. Besides caloric restriction may lead to loss of lean weight. Increasing physical activity increases BMR and lean body mass.

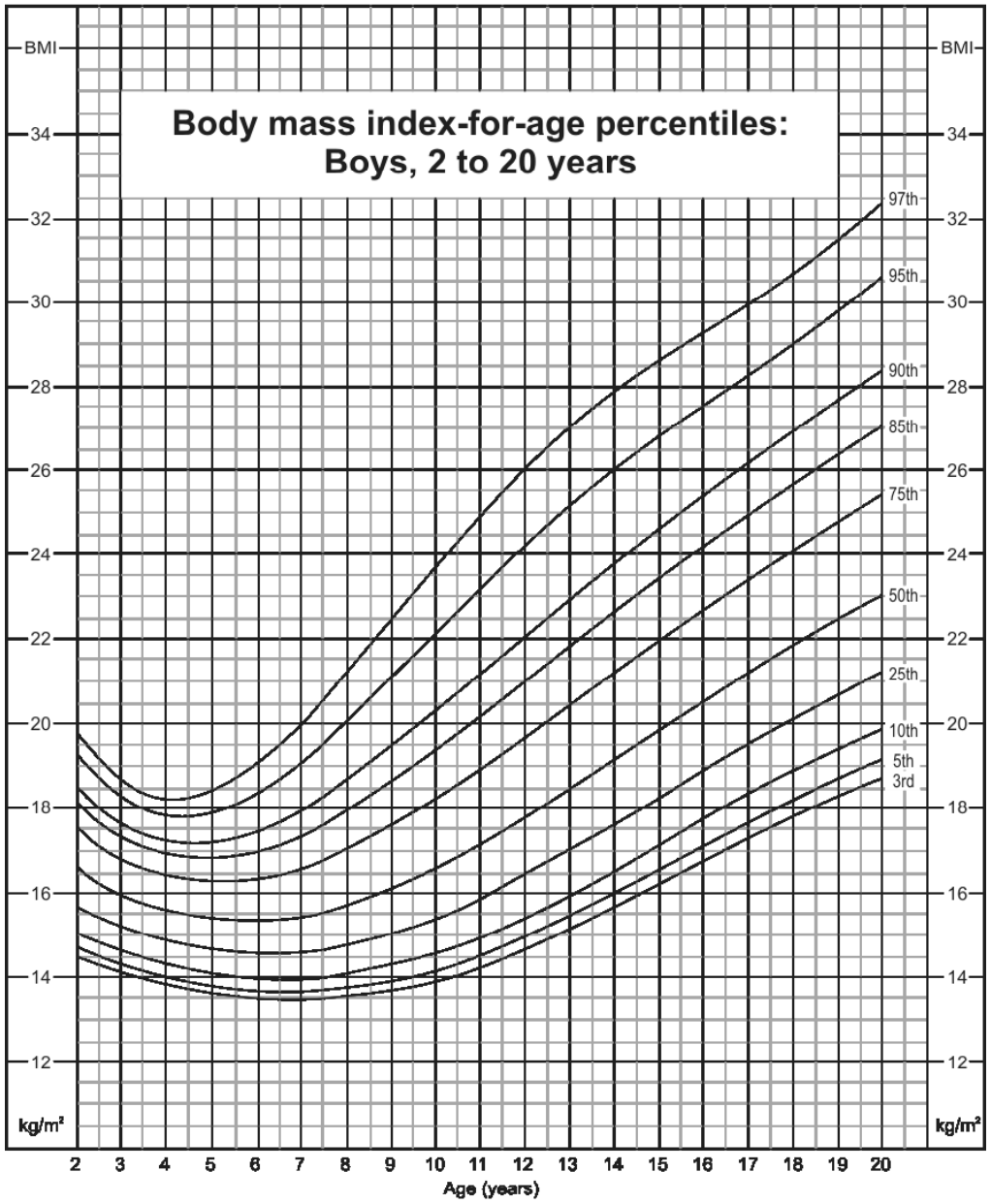
Specific guidelines for physical activity must be provided including type, duration and intensity of activities, as a handout. A reasonable goal could be to aim for an added 90 minutes a day of moderate physical activity in addition to whatever exercise the child might be getting at school.

Twenty minutes of walking, dancing, swimming, or cycling or 10 minutes of running might burn off 100 calories or more. The more calories expended the less restrictive the diet must be to lose weight.

Reasons for failure

Reasons for failure include lack of flexibility (same diet for all), lack of specific recommendations, lack of emphasis on increasing

CDC BMI Chart - Boys



SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Diseases Prevention and Health Promotion (2000)

physical activity, lack of behavior modification strategies and lack of maintenance phase.

Practical tips to increase children's physical activity

- Have the children try out a variety of sports and activities and let them choose what they enjoy most
- Help children choose activities appropriate to their age and ability
- Plan family outings that involve exercise and physical activity
- Try to incorporate exercise in family's daily routine
- Limit television time to no more than one hour a day
- Be a role model to children by exercising

Pharmacological approach

Drugs acting on central Nervous System

A. Drug acting as catecholamines neurotransmitter": These drugs are used as anorexiant agent; at present these drugs are not used in children and adolescent because of habituation and cardiac and psychological ill effects.

B. Drugs which decrease reuptake of nor-epinephrine and serotonin such as sibutramine now being used in adolescent age between 13-17 years. This drug commonly employed

with BMI above 85[h] percentile. There was substantial decrease in concentration of serum triglycerides, VLDL cholesterol and uric acid but not in concentration of LDL cholesterol. These changes were maintained for up to 2 years were proportional to weight loss. In contrast, HDL cholesterol concentration increases substantially after 6 month of therapy. The main contraindications are cardiac arrhythmias, psychiatric disorders, teenage pregnancy and severe hypertension. Commonly employed dose: Initial dose of 5mg/day increases to 10mg/day at week three, 15mg/day at 7th week. Drug should be stopped when BP rises >10mm of Hg or PR increases by >15% for two or more consecutive visit.

C. Drugs modulating serotonin metabolism influences body weight such as fluoxetine but long-term therapy and usage in adolescent is not practiced commonly.

D. Diphenylhydantoin (100 to 200 mg)) are used in obesity relating due to compulsive or binge eating.

Naloxone drugs that block action of opioid and cause decrease in food intake; is administrated in the dose of 2mg/kg body weight. Higher dose of naloxone resulted in hepatic dysfunction. Hence newer opioid antagonists are currently being evaluated

Thermogenic Drug

Interest in triiodothyronine (T3) as a treatment of obesity has been implied by two observations.

A. Dieting with very low carbohydrate diet, concentration of T3 in serum falls

B. Administration of T3 can prevent the decline in metabolic rate that occurs during the treatment with very low calorie diet; but 75% of extra weight loss produced by T3 however can be accounted for by the loss of fat-free mass.

Drugs affecting Gastro-intestinal absorption

A. *Benzoquin:* It is a topical anesthetic that can anaesthetize mouth and upper GI tract and subsequently decrease hunger and numb taste buds. No recent efficacy or safety data are published.

B. Dietary fiber: substance made up of plant cell wall materials including polysaccharides, hemicellulose, alginates, lignins that resist hydrolysis by human GI secretion. Their compound cause delayed gastric emptying, perception of fullness and decreased absorption of energy-rich food. It increases certain GI hormones, which bring about satiety and decrease in appetite. The dose of fiber ranges between 6 to 30 g per day. The main pitfalls with fibres are decreased palatability and abdominal pain.

C. *Sucrose polyester:* It is an indigestible fat produced by esterifying sucrose with fatty acids of appropriate length to give its characteristics of normal cooking oil. Addition of this agent to the diet will reduce the absorption of cholesterol leading on to loss of weight. These substances were added as cooking medium, which resulted in decreased caloric consumption.

D. *Inhibitors of gastric emptying:* Threo-chlorocitric acid or its derivatives that decrease gastric emptying may increase satiety.

E. *Orlistat:* This is a lipase inhibitor prevents fat absorption thus restricting calorie intake. It results in oily frequent stools and vitamin deficiency

Hormones

A. *Satietin*: It is a glycoprotein that seems to have centrally mediated effects on food consumption. It remains an exciting possibility for therapeutic intervention.

B. *Somatostatin*: Somatostatin (5 to 15 microg/kg/d sc. for 6 months) is useful in hypothalamic obesity.

Regional fat mobilization

Local application of cream containing aminophylline to increase beta-adrenergic like effects or yohimbine, alpha-2 adrenergic blocking drug increase the mobilization of fat from the treated area. This form of topical application waits further testing.

Surgery

Bariatric surgery is indicated when other means of intervention have failed especially in morbid obesity with metabolic insult. This therapy is experimental in children and adolescent population.

Future drugs

Drugs in the pipeline for usage in the future are PYY3-36, which decrease appetite and incretin, a future drug in diabetes and for obesity. Designer drug for obesity, a novel drug that targets unwanted fat tissue by means of apoptosis.

PREVENTION OF CHILDHOOD OBESITY

Trends in obesity appear to be likely related to reduction in energy expenditure than to an increase in caloric intake. Prevention of obesity through the promotion of a healthy lifestyle is among the important challenges for the new millennium, and should start in childhood.

CONCLUSION

The yardsticks for detecting obesity during growing period of the human race have been defined with multipronged approach, though ethnic variation and secular trends must be kept in mind. Developing nation like India with growing prevalence of metabolic syndrome, curtailing obesity at this young age will prevent future morbidity and mortality. In addition, it cuts down the cost expenditure incurred on population with physical handicap during the productive period of life. Management is tempered with better awareness, understanding the core issue not only by the individual but the whole family for better lifestyle modification, starting with nutritious low calorific value food intake by the whole family, sitting together in the dining table along with the youngsters and briefing them about behavioral nuances and the practice of daily exercise in an interesting way. Drug intervention must be the last resort when other avenues for slimming wane.

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