

Review Article

Adolescent Obesity

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Abstract

Obesity is public health burden and affects all age groups, including children and adolescents. For children aged between 2 and 19 years having a BMI \geq 85th percentile but $<$ 95th percentile is defined as being overweight. Being obese is defined as having a BMI \geq 95th percentile. Nutrition during early development is directly associated with future obesity. In case of having an obese mother; offspring's obesity onset occurs earlier regardless of race or ethnic groups. Obesity brings psychosocial problems with itself. Obese children may have difficulties in interacting socially with environment; may have problems particularly with their age groups. Withdrawal from the society may be a major problem. Preventive measures focusing parents, family and environment should begin at preconception. Maternal factors of childhood obesity can be eliminated, and risk factors for developing adolescent and adult obesity may be avoided. These measures may help us first to decrease the rate of obesity and achieve a downward trend in prevalence. This in turn; may decrease the number of people with obesity and obesity related diseases.

Keywords: Adolescent; Obesity

Adolescent Obesity

Definition of Adolescent Obesity

Obesity can be defined as having excessive body fat. Williams et al. in their study that involved 3320 children aged between 5 and 18 years stated that; risk factors for cardiovascular disease was more common in case of having at or above 25% fat in males and at or above 30% fat in females even after adjusting for age, race, fasting status, and trunkal fat pattern (D. P. Williams et al., 1992). For children aged between 2 and 19 years having a BMI \geq 85th percentile but $<$ 95th percentile is defined as being overweight. Being obese is defined as having a BMI \geq 95th percentile (Barlow, 2007).

Epidemiology

Obesity is a global pandemic (WHO, 1998). It a matter of public health burden and spreading to all the age groups, including children and adolescents. A global epidemic of obesity occurred in recent years among adolescents, and prevalence of obesity is continuing to rise in this population (Reilly, 2006). Given the high prevalence and chronic nature of obesity, coordinated models of care for health-service delivery for the management of paediatric obesity are needed (Baur et al., 2011). In a study conducted by Freedman et al. (1999) the rate of being overweight was 10.8% in examined school children, while a 10.5% obesity prevalence was

found in more recently studied school population in Greece (Jelastopulu et al., 2012).

Age- standardized prevalence of overweight was 17.8% among boys and 15.8% among girls in a study conducted in India (Ramachandran et al., 2002). Though obesity prevalence increases as a global problem; a study based on data from 1998 through 2011 conducted in Denmark, showed that the prevalence rates of overweight and obesity in infants, children and adolescents were largely still on a plateau with tendencies for a decline among children and adolescents (Schmidt Morgen et al., 2013). But this may be far from representing the global picture.

In the Jelastopulu et. al (2012) study which was conducted in Greece, it was found that the prevalence of overweight and obesity in the studied population of 10–13 year old children it was 32% and 10.5%, respectively, while in children with parents of lower educational level, the odds of being overweight/obese was higher.

In all paediatric age groups there is an increasing prevalence of being overweight and obese. National Health and Examination Surveys (NHANES) in the US showed constant increases in the prevalence of overweight among children and adolescents at age 2 to 18 years. According to the data approximately %14 of children aged 2 to 5 years and 19% of

children aged 6 to 11 years were overweight (Ogden et al., 2006).

Nutrition during early development is directly associated with future obesity. The monthly family income, self-attitude toward obesity, taking extra salt and spending time with computer all are part of a vicious cycle that lead children and adolescents toward obesity (Ghosh, 2007). In a study, it was reported that breakfast skipping was associated with BMI strongly compared to other factors. Missing breakfast increased consumption of snacks and fast foods (Ghosh, 2014). In case of having an obese mother; offspring's obesity onset occurs earlier regardless of race or ethnic groups. And the combination of having an obese mother and an earlier onset of obesity affects young adulthood causing higher BMI and weight (Gordon-Larsen et al., 2007). The environmental factors are very effective in children. The proximity of fast food restaurants to the schools clearly causes bad eating habits and being overweight (Davis and Carpenter, 2009). For development of obesity many factors are described like intrauterine conditions, diabetes mellitus, smoking of the mother, breast-feeding duration, feeding during early life, weight gain in early childhood and at puberty (Fisberg et al., 2004).

Both genetic and environmental factors are effective in body mass index and waist circumference in children as a result of a study carried out in twin pairs at age of 8 to 11 years (Wardle et al., 2008).

An interesting result was the finding of decrease in the prevalence of obesity among adolescents with high-socioeconomic status, where among the low-socioeconomic status adolescents' obesity prevalence was continuing to increase (Frederick et al., 2014). This may be due to the fact that obesity is highly influenced from environment. Probably the social environment is better in adolescents with high socioeconomic status. This in turn may be supported with the finding that obesity in school-aged children is associated with parental factors like parental obesity and health literacy (Chari et al., 2014).

Related clinical problems

Adolescent obesity is associated with increased mortality and morbidity related to a variety of chronic diseases later in life (Must et al., 1992). Obesity brings up many problems which affect the whole life span of the youngster and has adverse effects on the lipid, insulin, and blood pressure levels (Berenson et al., 1993; Freedman et al., 1985; D P Williams et al., 1992). Adiposity causes fatty streaks, raised lesions, and calcifications in the aorta

and coronary arteries in adolescents and young adults (Berenson et al., 1998; Mahoney et al., 1996; McGill et al., 1995). Overweight children are also at increased risk for various chronic diseases in later life and some evidence suggests that this association may exist independently of obesity status in adulthood (Must et al., 1992; Power et al., 1997). Also in a study that enrolled 1076 adolescents aged 14-16 years, birth weight and attained size at 20th and 43rd months were related to being overweight and having obesity during adolescence period. However; four of five obese adolescents were normal weight during childhood and that makes us to focus on normal weight children with bad eating habits or environmental conditions that are prone to become obese in adolescence (Monteiro et al., 2003).

Among 3,861 school children in the age group 5-15 years 292 (7.56%) were identified as obese in a study by Gupta. Further, 10 (3.4%) of the 292 obese subjects were detected to have sustained elevations in BP levels suggesting a close association between childhood obesity and essential hypertension (Gupta and Ahmad, 1990). Release of non-esterified fatty acids, cytokines and other factors from the adipose tissue in obese individuals causes development of insulin resistance. Addition of pancreatic islet beta cell dysfunction causes failure in blood glucose control (Kahn et al., 2006).

Being overweight during childhood is related to having type 2 diabetes mellitus, adult obesity, cardiac disease, low self-esteem and depressive disorders (Fisberg et al., 2004). Obesity brings psychosocial problems with itself. Obese children may have difficulties in interacting socially with environment; may have problems particularly with their age groups. Withdrawal from the society may be a major problem. They may have less self-confidence due to perception of their body shape. Obesity in adolescence is associated with depression or anxiety. In a study in conducted adolescents; obesity was a predictor of an increased risk for developing major depressive disorder in females but not males (Anderson et al., 2007). In adolescent females obesity but not being overweight was significantly associated with future depressive symptoms but not major depression in a study that was conducted in 2010. The authors said "these results suggest that weight status could be considered a factor along the pathway of development of depression in some adolescent females" (Boutelle et al., 2010). According to Goodman and Whitaker; having depression in adolescence, increases risk of obesity in adolescence and persistency of it. In conclusion

they said “understanding the shared biological and social determinants linking depressed mood and obesity may inform the prevention and treatment of both disorders” (Goodman and Whitaker, 2002).

Treatment

In adolescence obesity; the main approach should be prevention. We are now aware that Preconception maternal factors have much more influence on child obesity than prenatal factors (Ehrental et al., 2013). We must consider effect of social environment and friends on adolescent health. Adolescents develop certain behaviours probably to feel comfortable. This may be the explanation of overweight adolescents having twice as likely to have overweight friends as reported by Valente et al. (Valente et al., 2009). Interventions focusing behavioural changes must be a part of preventive therapy. Interventions may cause modest changes and modifying TV watching, physical activity, eating behaviours must be some of the goals. Of course not only the adolescent but parents, grandparents, sibling must also be targeted. The social environment, school has great effect and must be in scope. But this is a global burden and the governments must take serious preventive measures to prevent and treat the disease itself. Education of mother or woman of child-bearing age may provide control early at preconception. Maternal factors of childhood obesity can be eliminated, and risk factors for developing adolescent and adult obesity may be avoided. These measures may help us first to decrease the rate of obesity and achieve a downward trend in prevalence. This in turn; may decrease the number of people with obesity and obesity related diseases. Orlistat; a pancreatic lipase inhibitor, reduces fat absorption and used in treatment of obesity is used in adolescents in combination with diet, exercise and behavioural modification without safety issues but with more common gastrointestinal side effects (Chanoine et al., 2005). Sibutramine also was used in adolescents and caused significantly more weight loss compared to behavioural therapy and placebo (Berkowitz et al., 2003). Metformin; combination of caffeine and ephedrine all reduced body weight index in adolescents (Freemark and Bursey, 2001; Molnár et al., 2000). Surgical procedures are applied when more conservative treatment options fail (Kumar et al., 2012).

Conclusion

Adolescent obesity is a global health burden which will affect future generations' health. Treatment options are diverse but pharmacological and surgical

therapies possess serious disadvantages in this age group. Preventive measures focusing parents, family and environment should begin at preconception. Interventional strategies should cover all population and the main objective should be eliminating causative factors.

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