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Adolescent Obesity – Emerging Public Health Problem of 21st Century

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ABSTRACT

Many Countries struggle to tackle the consequences of under nutrition and infectious diseases. At the same time, they are also now showing a rapid increase in non-communicable diseases and their risk factors like obesity and overweight, especially in urban areas. In the present era, it is quite common to find co-existence of under nutrition and obesity within a country, within a community and even within a household. Children living in developing and under-developed countries are more susceptible to poor nutrition during antenatal period, infancy and childhood. On the contrary, children also have easy access to food products with increased salt and fat percentage, decreased levels of micro nutrients and more junk calories. The synergistic effects of high calorie intake and low physical activity lead to increase in prevalence of childhood overweight and obesity. This article discusses about the aetiology, epidemiology and determinants of adolescent obesity.

Keywords: Overweight, health impact, obesity, childhood

INTRODUCTION

Obesity refers to increase in fat cells size or number which is called as hypertrophic obesity or hyperplastic obesity respectively.[1] Obesity is one of the significant risk factors for Non-Communicable diseases. Globally, the prevalence of obesity has nearly increased thrice since 1975. In the year 2016, around 1.9 billion adults were found to be overweight and nearly 650 million of them were obese.[2] Majority of the World's population live in countries where the mortality due to obesity and overweight is more when compared to mortality due to underweight. Once obesity was considered a public health threat only in high-income countries like United States; But now it is on the rise in developing nations like India, China and Nepal, especially in urban areas.[3,4]

Obesity and overweight in adolescents

World Health Organization (WHO) has defined a child is as "a person less than 19 years of age unless there is a separate definition as per the national law". Adolescent period refers to the age group of 10 to 19 years.[5] The prevalence of obesity is mounting at an alarming rate in this Century. It is a risk factor which is highly preventable and primordial prevention is the key to bring down the rates of adolescent obesity. In the year 2016, around 340 million children were noted to be overweight across the world. The prevalence of obesity in childhood has risen four-fold since 1980s. WHO has set cut off values for identifying overweight and obesity for children aged 5-19 years taking into consideration the age and sex of children as body weight varies accordingly.[6,7]

A etiology of obesity and overweight

The vital cause of obesity and overweight is the energy imbalance due to increased calorie intake and decreased calorie expenditure.[8] The pathogenesis of obesity is extremely complex and the risk factors for obesity are broadly classified as modifiable risk factors and non-modifiable risk factors.[9]

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Table 1: Risk factors for obesity

Non modifiable factors	Modifiable factors
Age	Dietary pattern
Sex	Regular Physical activity
Ethnicity	Socio economic status
Genetic factors	Endocrine disorders
	Psycho social factors

In recent days, worldwide there has been an increase in intake of food items that are rich in fat and poor in nutrients. This is coupled with reduction in physical activity due to sedentary nature of work, increasing urbanization, advances in science and technology and faster modes of transportation. The changes seen in the recent days in physical activity and dietary pattern are the outcomes of rapid societal and environmental transformations along with lack of supportive policies in areas such as health, food processing, distribution and marketing, education, transport, agriculture, urban planning and environment.[2]

Determinants of adolescent obesity

Multiple social and environmental factors play a complex role in development of obesity. A study conducted by Kotecha et al. among urban adolescents classified the determinants broadly into the categories of health, nutrition, academics, physical growth and development.[10] The establishment of healthy eating habits in the early years of life is important as rapid physical growth and development in adolescence is strongly associated with increased nutritional requirements.[11] One important factor is the dietary pattern of adolescents. The adolescent children generally do not decide their daily meals at home or at school. But in the present era, with easy availability of junk foods and snacks, limited restriction by parents and influence by their peer group, adolescents end up opting for unhealthy dietary choices.[12]

Quite often, an adolescent's time allotted to physical activity is decided by parents. Parents choose to ignore physical activity and give more time for academic activities. In a study done by Whitaker et al, researchers reported that the chance of child becoming obese in future is around 24% if the parents were not obese. The same odds increased to 62% if at least one parent was obese.[13] Another important contributing factor is the increasing proportion of women workforce and a study by Anderson et al, a positive correlation was noted between women workforce and childhood obesity among families of high socioeconomic class.[12] Other factors which contribute to obesity were access to recreational activities, family dietary practices, sedentary lifestyle due to technological advances.[6,14] Regular consumption of excess calories over a period of time increases the odds of development of obesity.[15] Qualitative methods of research should focus on the changes that have taken place in our society that makes adults and children leading to the rise in obesity among children.[16,17]

Global scenario - prevalence and determinants

Obesity in adolescence is considered as an "***forerunner***" of obesity in adulthood. Adolescent obesity is known to have a potential impact on physical as well as mental wellbeing of individuals.[18] The prevalence of childhood and adolescent obesity is known to be high in developed countries. Similar trend is noted among developing countries in recent years due to various reasons like improvement in social status, economic development, environmental influences and lifestyle changes.[19] The prevalence of obesity among adolescents in the year 2016 has increased more than four times when compared to the prevalence in the year 1975 (from 4% to 18%) and this rise is noted in both adolescent boys and girls.[7] Table 2 shows the percentage of children in WHO regions predicted to have increased body mass index by the year 2020.[20]

Table 2: Proportion of children with higher body mass index – Predictions in WHO regions

WHO region	Percentage of children predicted to be overweight by 2020
North American	40
Eastern Mediterranean	40
European	38
Western Pacific	27
South East Asian	22

Adolescent period is the crucial period in life which will decide the adult behaviors and health status in the future. Overweight and Obesity have emerged among the top five risk factors for mortality globally.[21] It is referred to as '***New World Syndrome***' and is creating an enormous public health impact in developing countries.[22] In 21st century, mortality due to overweight and obesity is high compared to mortality due to underweight.[7] Obesity is significantly associated with hypertension, insulin resistance, and abnormal lipid profile.[23,24] To design effective interventions, the environmental and behavior determinants of obesity need to be recognized to bring in an effective control.

Rathnayake KM et al in their study among girls aged between 14-18 years, they studied 100 matched cases and controls.[25] Various factors such as dietary, behavioural and socioeconomic factors, physical activity, pubertal characteristics like age at menarche, menstrual pattern were studied. Family income, first born child of the family, habit of skipping breakfast, less frequency of fruits consumption (<4 days/ week), more intake of fast foods (>4 times/week), >2 hours' screen viewing time per day, irregular menstruation, low energy output from physical activity were the factors which were significantly associated with obesity. This study stressed the importance of

improving the family environment to promote healthy eating habits among adolescents.[25] The Framingham Children's Study reported that children who spent more time watching television had increased body fat over a period of time.[26] Spending time in physical activity in schools has been found to be low and this decreases further with age. Children who engage in daily physical activity routinely during school hours or leisure time were likely to continue similar physical activity pattern in adulthood.[27]

Bhuiyan et al conducted a Case control study among school children in Dhaka, the capital city of Bangladesh to know the risk factors for overweight. A total of 198 adolescents were studied with half of the them as cases and rest as controls. Spending >30 minutes per day in exercise was found to be a protective factor whereas at least one parent being overweight and sedentary behaviour for more than four hours per day were found to be risk factors on statistical analysis. Factors like gender, education of the mother, time spent in physical activity at school didn't show statistical significance.[28] The authors suggested further exploratory research to understand the physical activity practices of children which could help in designing better public health programmes with the aim to promote physical activity. Due to rapid urbanization, there is a decrease in the open spaces for recreation for children and this grossly affects the time spent in outdoor games. Children spending more time in front of televisions and computers were found to be at greater risk of overweight or obesity. The authors made a recommendation that schools are the best places to implement primordial and primary prevention.[28]

In a Case control Study done in Brazil, the researchers studied 106 cases and 233 controls and collected data on socio demographic information, dietary habits and physical activity.[29] The factors which were significantly associated with overweight and obesity were male sex, BMI of the mother, history of overweight during childhood and fruits consumption less than once per day.[29] A similar case-control study among adolescents of private schools in Brazil, showed that obese parent and overweight in childhood increased the risk for overweight and obesity.[30] A cross-sectional study by Kumar et al. showed that overweight children had breakfast less frequently when compared to children with a body weight within normal limits.[31] The habit of irregular breakfasting in the morning was noted as an indicator of unhealthy life style.[32,33] Biochemical studies have shown that regular breakfast intake is associated with lower levels of blood cholesterol and low weight gain.[33]

A national level survey done covering around 77,113 adolescent students studying in 2500 schools in Italy analyzed the risk factors for the obesity and the reported factors were low education of parents and improper breakfast consumption. The authors suggested that increasing awareness on the importance of having breakfast regularly should be done among parents and children through health education.[34] A study from South Africa investigated the determinants of obesity among adolescent school children and collected data on demographics, family circumstances, physical activity, dietary intake and anthropometry. The factors identified to be associated with obesity were decreased physical activity and children living in nuclear families.[35]

Indian scenario - prevalence and determinants

In the year 2014, India was among the top five countries with high obesity burden, ranking 5th and 3rd for obesity in men and women respectively.[36] The National Family Health Survey (NFHS-4) in the year 2015-16, fourth survey in the NFHS series, provided information on the population, their health and nutrition for each state and union territory and for the nation as a whole.[37] The national level data of NFHS-4 showed that the prevalence of obesity among children and adolescents in the year 2016 was 2%, compared to 0.3% in the year 2000 and the increase is nearly seven fold. Studies have shown that prevalence of obesity in adolescents in different parts of the country varies from 6% to 9%.[38–40] Kaur et al in a study among adolescents in Delhi reported the prevalence of obesity among the study population as 9.3%.[40] Similar study by Khadilkar et al among adolescents in Pune reported the prevalence of obesity to be 8.1%.[38]

Gautam and Jeong in a study done among adolescents in Udupi, Karnataka noted the prevalence of obesity as 6.2%.[41] If the present trend in obesity continues, by the year 2025, our country will have 65 million obese people including 17 million obese children and the rise will be noted more in urban areas.[36,42] Kotian MS et al in their study among adolescent school children in India reported that there is seven times increased risk of overweight among children who spent ≥ 4 hours/day as screen time compared to those who didn't.[43] Arifa QA et al in a study on diet and physical activity pattern among school going children in Jammu observed that consumption of fast foods, carbonated drinks, calorie intake in excess, low physical activity and taking food from school canteen were significantly associated with obesity and overweight.[44]

A study was done among 1440 urban adolescents in Baroda, India to assess their food habits and preferences and the results showed that nearly 40% skipped their breakfast at least once a week. Regarding consumption of fast foods, nearly 35% reported eating them at least four times a week. Half of the students reported taking chocolates and soft drinks in the last 24 hours.[10] In the study by Goyal RK et al on adolescent school children in Ahmedabad, the researchers found the prevalence of obesity to be more among high socioeconomic status group of children. Factors that were found to be significantly associated with obesity were family history of obesity, family history of diabetes, eating junk food, chocolates, eat-

ing outside at weekend and the habit of sleeping in the afternoon.[45]

In a study by Panda SC in Eastern part of India, lifestyle factors found to be associated with adolescent obesity were fast food intake, breakfast skipping and family history of obesity. Physical activity was found to play a significant protective role against obesity.[46] Kar S and Khandelwal B studied the risk factors for obesity among 979 adolescent children in Sikkim, India and the factors identified were limited outdoor activities, fast food intake and increased screen time.[47]

A multi centric study in five cities in India covering 38,296 adolescent children from urban areas studied the prevalence of obesity and its associated factors. Female gender and those from high economic status were found to be significantly associated with obesity. The authors suggested comprehensive health education campaigns in schools in urban areas for prevention and control of obesity.[48] A study on overweight and obesity among school going adolescents in Lucknow reported the factors which predisposed the children to develop obesity: high socio-economic status, consumption of fast foods and less outdoor activities. The authors recommended health and nutrition education programmes to be incorporated in the school curriculum to encourage practice of healthy lifestyles among children.[49]

A study done among adolescent school children in Davengere, Karnataka reported factors such as family history of obesity, lack of physical activity and consuming high calorie junk foods as the significant contributors to obesity. This study suggested that health education should be given to children, parents and teachers on healthy dietary habits and physically active lifestyle.[50] Goyal JP et al in a similar study done in Surat, Gujarat identified intake of junk foods, snacks and carbonated beverages, low physical activity and spending more time in watching television or playing computer games as risk factors for obesity among adolescent children.[51]

Scenario in Tamil Nadu - prevalence and determinants

According to NFHS-4 data for the year 2015-16, in Tamilnadu, the percentage of persons in the age group of 15-19 years who had a BMI≥25 (overweight) was 6.7% in girls and 7.1% in boys. The percentage of persons in the age group of 15-19 years who had a BMI≥30 (obese) was 1.5% in girls and 1.1% in boys.[52] Few studies have been done in Tamilnadu among adolescents to estimate the prevalence of overweight and obesity. Kowsalya T in a study done in Erode district, Tamilnadu reported a combined prevalence of overweight and obesity as 11.3% among adolescent school children.[53] Suganthi et al in a similar study done in Coimbatore, a district in western Tamilnadu noted the prevalence of adolescent obesity as 5%.[54] Jagadesan S et al in their study among adolescents in private schools in Chennai noted the prevalence of obesity to be 18.1% which is high compared to studies done in other districts in the state.[55]

Few studies have analyzed the factors associated with obesity in children in the adolescent age group. Sonya et al in their ORANGE study reported on overweight and obesity and associated factors among children aged 6-17 years in Chennai.[56] The prevalence was assessed using International Obesity Task Force guidelines and a comparison was done between children in government and private schools. The researchers found out the prevalence of overweight and obesity was higher among girls than boys, among adolescents than children and in private schools.[56]

A study by Shabana T and Vijay V reported the risk factors for overweight and obesity among children aged 8-15 years. The risk factors identified were upper socioeconomic status and >2 hours of watching television.[57] This study stressed the need for early intervention programs, targeting the children especially those from the affluent society.

A study done by Kowsalya T et al among adolescents in Salem, Tamilnadu, analysed the prevalence and risk factors for adolescent obesity and reported that girls when compared to boys were more likely to be obese. This could be due to pubertal changes which happen during adolescent period. The authors also analysed the relationship between anthropometric measurements and BMI and noted waist hip ratio as a poor predictor for obesity.[53] Rexlin G et al conducted a study among school children in Madurai and the risk factors found to be associated with obesity were unhealthy snacking, deprivation of sleep, sedentary lifestyle and birthweight. Beneficial factors identified were outdoor games, adequate physical activity, fruits and vegetables intake and rare restaurant visits.[58]

In a study by Suganthi V et al in Coimbatore, obesity was noted more among female children and those with screen viewing time >2 hours. They also reported that waist hip ratio is a better predictor of obesity. The authors suggested that national health programmes for adolescents should aim at periodic screening of children at schools for obesity and health education highlighting the importance of regular physical activity, healthy food intake and hazards of sedentary behaviour.[54] Danasekaran et al in their study in a rural area in Kancheepuram district assessed the prevalence of obesity among 934 adolescent school students. The prevalence of obesity was 4.4% and prevalence of overweight was 8.89% among the study population. Obesity was seen more among adolescent girls than adolescent boys.[59]

CONCLUSION

India is facing a huge burden of Non-Communicable Diseases (NCDs) and obesity is a major risk factor for

development of NCDs. Obesity among children and adolescents is even more alarming, as the dietary pattern and physical activity have changed a lot due to westernization, lifestyle changes and advancement in technology. The prevalence of obesity among children has increased to a great extent and India will soon face the consequences of the rising burden of adolescent obesity. Policy makers should emphasize on preventive actions to reduce the mortality and morbidity directly and indirectly associated with obesity in childhood.

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