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Original Article

Obesity among adolescents of ahmedabad city, gujarat, india- a community based cross-sectional study

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ABSTRACT

Background and objectives: Overweight and obesity are important determinants of health leading to adverse metabolic changes and increase the risk of non communicable diseases. Following the increase in adult obesity, the proportion of overweight and obese adolescents has also been increasing. Hence, the present study was undertaken to study the magnitude of overweight/obesity and find out the associations of obesity among adolescents in Ahmedabad city in Western India and suggest interventions. Materials and Methods: A community based cross sectional study was conducted in all the six zones of Ahmedabad Municipal Corporation. A total of 900 subjects, aged 10-19 years were included. Probability proportionate to size of population technique (PPS) was used to decide the number of adolescents to be included from each zone, Simple random sampling technique was used to select the ward and area from each zone. Pre-tested semi-structured questionnaire was used to elicit the information on individual characteristics. Height and weight was measured and BMI was calculated. Overweight and obesity was assessed by Body Mass Index (BMI) for age. Adolescents who had BMI for age >85th and < 95th percentile of reference population were classified as overweight and BMI for age >95th percentile of reference population were classified as obese. Results: Out of 900 study population, 439(48.8%) were females and 461(51.2%) were males. Total 120(13.3%) adolescents were found overweight, while 49(5.4%) were found obese. Overweight-obesity was significantly associated with Higher socio-economic status, inadequate sleep duration at night, lack of physical activity, consumption of junk foods Conclusion: Interventions should be done at adolescence period to prevent the obesity in adulthood. Life style modification can play very important role not only in preventing obesity among adolescents but also inculcating good habits for adulthood.

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1. Introduction

Adolescence (10-19 years) is a period of transition from childhood to adulthood, it assumes critical position in the life cycle of human beings characterized by an exceptionally rapid rate of growth [1]. The World Health Organization (WHO) describes Obesity as one of today's most important 'Public Health Problems', and has designated Obesity as a 'Global Epidemic' and also one of today's most neglected Public Health Problems [2].

Adolescents constitute 18-25% of the population in countries of South East Asia Region (SEAR), in India, account for one fifth of the total population and are a significant human resource that needs to be given ample opportunity for holistic development towards achieving their full potential [3]. In India obesity is emerging as an important health problem particularly in urban areas, paradoxically co-existing with under-nutrition imparting 'Double Burden of Disease' [4]. Adolescent Obesity is increasingly being observed with the changing life style of families, with increased purchasing power and increasing hours of inactivity and dietary and cultural transition [5]. The consequences which are associated with adolescent obesity include increased incidence of hypertension, obstructive sleep apnea, psychological dysfunction, decreased self esteem, coronary artery diseases, Type 2 diabetes, metabolic syndrome and overall increase in morbidity and mortality in later life [6].

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The most significant long term consequence of adolescent obesity is its persistence in later life [4].

An important step to prevent and control adolescent obesity is identification of risk factors contributing to rapid increase of adolescent obesity. Relevant research in particular field in India is minimal [7]. Therefore, this study was carried out to determine the prevalence and determinants of overweight and obesity among adolescents in Ahmedabad, which is economically, industrially and culturally fast growing city.

2. Materials and Methods

2.1. Study area

Present study was carried out in Ahmedabad Municipal Corporation area. According to Census 2001, the population of Ahmedabad Municipal Corporation (AMC) was 35.1 lakh with 18.5 lakh males and 16.5 lakh females [8,9]. The estimated population of AMC in 2007 was 48.4 lakh. There are six zones in AMC namely Central, North, South, East, West and New west [10]. (Table 1)

Study population comprised of adolescents (age 10-19 years) were included in the study. Persons not fitting into the age group criteria and not willing to give consent, were excluded.

2.2. Sample size

In the various studies carried out at National and International level, prevalence of Adolescent Obesity was found between 10-30% [5,11,12,13,14]. Estimated sample size for survey was 900, as calculated by taking expected prevalence of 10% and allowable error of 20%. $(4pq/L^2)$ [p=prevalence=10%, q=1-p=90%, L=allowable error=20%] It was planned to include minimum of 900 people of 10-19 years of age to know the prevalence of adolescent obesity in AMC area.

2.3. Sampling technique

The required sample size was stratified into the different zones depending on the population size of the respective zone, for equal representation. (Table 2) One ward was randomly selected from each zone by simple random sampling, for the purpose of study. One area was randomly selected from the selected ward. If the desired number of adolescents were not there in that area then the remaining number was covered from the area nearby to it in that ward and in the direction towards V.S. Hospital. Study Period: Study was carried out during May 2008 to July 2009.

2.4. Study material

Pre-tested, semi-structured performa was used for the study. Initially pilot study was carried out of 30 adolescents in the Kocharab area of West zone of Ahmedabad Municipal Corporation, for testing questionnaire and to get rough idea about the response rate. Preliminary analysis was done to reformulate the questionnaire and then the final performa was prepared.

2.5. Study method

From the center of the selected area, the pen was dropped and the house in the corresponding direction towards the tip of the pen was selected as the first house and towards the right side of the

first house, every third house was selected till the desired number of study subjects were enrolled. All the eligible participants were first explained about the aims of the study. Informed verbal consent was taken from all the participants and their guardian. The subjects who were eligible as per inclusion criteria were included in the study. Information was collected in the proforma for each respondent. Study population was categorized into socio economic status (class) as per Modified Prasad's classification. (All India Consumer Price Index for July 2009: 624) Time spent physically active considered as any time spent playing outdoor games, doing household work or doing any physical exercise. Sitting idle considered as time spent in watching TV, playing computer games or chatting with friends. Calorie intake was calculated by '24hrs recall method'. Potato chips, chocolates, french fries and similar other 8 items list was given to the participants, to tick mark against the items which they consumed in last three days with numbers of consumption, to calculate the calories derived from junk foods.

Weight(kg) was taken with the help of weighing scale measuring the weight in the unit "kg" with an error of 0.1kg without shoes and heavy clothing, the weighing scale was regularly checked with known standard weights. Portable anthropometric rod was used to measure height(cm), with an error nearest to 0.1cm, the participants were instructed to stand in erect position with their feet not wide apart and eyes looking straight, Based on age and sex specific percentile given by WHO for adolescents [21,22], the adolescents having BMI \geq 85th to <95th percentile, were considered "Overweight", \geq 95th percentile were considered "Obese" and <5th percentile were considered "Underweight" [5,19].

After completion of the interview, participants and their family members were given health education regarding the importance of adopting the healthy lifestyle and promoting and maintaining the same.

Double checking of data entry was done to rectify errors in data entry and was analysed with SPSS (Statistical Package For Social Sciences) software. Appropriate statistical tests which includes 'students t test' and 'chi-square' were applied, 'p value' of less than 0.05 was considered statistically significant

3. Results

In the present study, total 900 adolescents of 10-19 years of age, from all six zones of AMC were included. 27 adolescents refused to give consent and were not included in the study. Out of 900 study population, 439 (48.8%) were females and 461 (51.2%) were males. Amongst both sexes, females and males, the highest proportion of study subjects were from 14-15 year age group. (Figure 1) The mean age of adolescents was 14.85 \pm 2.57 years, while mean age for females and males was 14.93 \pm 2.56 and 14.78 \pm 2.58 years respectively. (t: 0.92, p value > 0.05). Highest number of adolescents belonged to SES class II followed by class III.

Total 120(13.3%) adolescents were found overweight, while 49(5.4%) were found obese. (Table 3)The prevalence of overweight-obesity found in females was 6.2% and 2.6% respectively, while in males it was 7.1% and 2.9%. (t: 0.58, p value>0.05). Prevalence of overweight- obesity found in this study is very high in comparison to the findings of a study done in Vardha (Central India) by Bharati et al.17 among 10-17 years school girls. While Aggarwal et al 30 reported prevalence of overweight and obesity 12.7% and 3.4% respectively among affluent adolescents from Ludhiana (North India) and he reported significantly greater prevalence of overweight among boys (15%) as compared to girls(10.2%). The higher prevalence of overweight and obesity in males compared to females was also reported by Singh et al [4],and by Marwaha et al [18] .While Kumar et al [20] reported higher prevalence in females.

Figure 1. Age and Sex wise distribution of study population

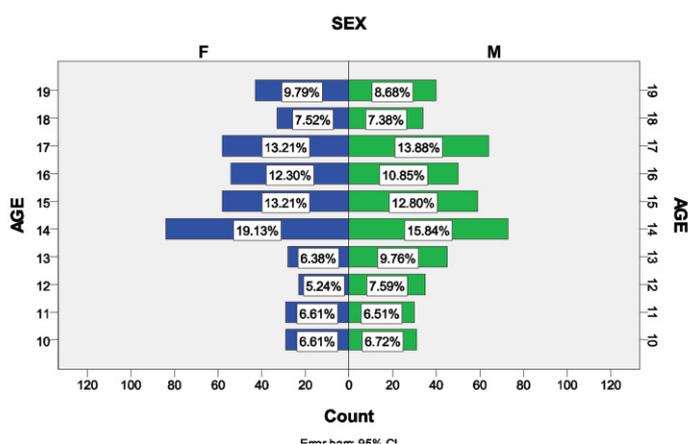


Table 1: Estimated Population of AMC in 2007

Zone	Population
Central	6,26,460
North	8,91,719
South	8,44,114
East	9,13,889
West	7,24,085
New west	8,37,276
Total	48,37,543

Table 2: Zone wise distribution of study sample

Zone	Population
Central	116
North	166
South	150
East	170
West	135
New west	156
Total	900

Table 3: Age wise nutritional status of study population

Age (Yrs)	Normal (%)	Overweight (%)	Obese (%)	Underweight (%)	Total (%)
11-12	82(9.1)	15(1.7)	5(0.6)	17(1.9)	119(13.2)
13-14	81(9.0)	18(2)	7(0.8)	25(2.8)	131(14.6)
14-15	189(21)	30(3.3)	11(1.2)	44(4.9)	274(30.4)
16-17	128(14.2)	33(3.7)	17(1.9)	48(5.3)	226(25.1)
18-19	89(9.9)	24(2.7)	9(1)	28(3.1)	150(16.7)
Total	569(63.2)	120(13.3)	49(5.4)	162(18)	900(100)

The prevalence of overweight and obesity was highest in the age group 16-17 years, the prevalence in this age group for overweight and obese was 3.7% and 1.9% respectively. This age wise difference of prevalence was not statistically significant. (t:1.65, p value>0.05). The mean age of overweight-obese adolescent was 15.15±2.58, while that of normal adolescent was 14.79±2.55. The difference was not statistically significant. (t:1.65, p value>0.05). When age≥ 15yrs was taken as a risk factor, overweight-obese as cases and the rest as controls, the odds ratio found was 1.44(CI:1.031-2.019) (χ^2 :4.60, p value<0.05). Similar findings were found by Bharati et al [17].

The highest prevalence of overweight (Overweight) and obesity was found in socio economic status Class I and Class II, this difference was statistically highly significant. (χ^2 :50.51, p value<0.0001) When socio economic status class I and II was taken as risk factor and Overweight and obese were taken as cases and the rest as controls and the odds ratio found was 2.33(CI:1.63-3.23). Kaneria et al [14]. in a study done on adolescents aged 12-17 years in Rajasthan (North India) also reported similar findings. He found that the prevalence of overweight and obesity was 4.85%, and 3.73% respectively in affluent group. On the contrary, in non-affluent group 1.6% of total children were found to be overweight while obesity was calculated as 0%. The similar findings were there by Marwaha et al [18],Mehta et al [29] and by other studies [4,5,14,15,20].

The mean birth order of overweight-obese adolescent was 2.29±0.89, while that of normal adolescent was 2.13±1.11, the difference was found statistically not significant. (t:0.68, p value>0.05). The difference was statistically not significant in both sexes. (p value>0.05). Kojiel and Kolodziej in their study on birth order and BMI in teenage girls done in Wroclaw, Poland found significant positive relationship between birth order and prevalence of overweight [30].

Mean time spent sitting idle by overweight-obese adolescents was 1.79±0.93 hrs, while that of normal adolescent was 1.35±0.8 hrs. The difference was found statistically significant (t:2.08, p value<0.05). When time spent sitting idle for ≥2hrs was taken as a risk factor, Overweight-obese were taken as cases and the rest as controls, the odds ratio found was 2.51(CI:1.79-3.53) (χ^2 :29.35, p value<0.0001)

more than 7 hours sleep at night was taken as adequate sleep duration, <7 hours as inadequate sleep duration. When <7 sleep hrs was taken as risk factor, Overweight-obese as cases and the rest as controls, the odds ratio found was 1.63(CI:1.15-2.29) (χ^2 :7.46, p value<0.001). Shaikh et al. in their study done on 16-19 years adolescents in Karamsad, Gujarat reported similar findings [25]. Inadequate sleep duration at night was found as a risk factor in two other studies also [26,27].

The mean time spent physically active by females was 34.26±24.91, while that of males was 29.10±21.06, the difference was found statistically significant (p value<0.05)

The mean time spent physically active by adolescents aged 10-14 yrs was 33.45±23.37, while that of 15-19 yrs was 30.10±22.88, (p value<0.05).

The mean time spent physically active by Overweight-obese adolescent was 18.93±14.38, while that of normal adolescent was 34.55±23.80, (p value<0.0001). The similar findings reported by Bharati et al [17] and by other studies [4,14,15,16].

The mean time spent physically active by Overweight-obese female was 37.71±25.14, while that of normal female was 18.54±16.41, (p value<0.0001).

The mean time spent by Overweight-obese male was 19.28±12.42, while that of normal male was 31.48±22.02, (p value<0.0001).

The correlation of time spent physically active with BMI was found statistically highly significant. (r: -0.24, p value<0.0001). When time spent physically active for ≥30minutes was taken as protective, the odds ratio found was 0.22 (CI:0.15-0.32) (χ^2 :69.22, p value<0.0001)

Similar findings were reported by Vereecken et al [24], Lowry et al [23] and by other studies [17,18].

The mean calorie intake by adolescents was 1925.40±500.88, the mean calorie intake by females was 1716.37±341.22, while that of males was 2124.45±545.93.

The mean calorie intake by Overweight-obese adolescent was 2348.89±407.47, while that of normal adolescent was 1827.49±468.65, (t:13.43, p value<0.0001).

The correlation of calorie intake with BMI was found statistically highly significant. (r:0.51, p value<0.0001) The similar findings were reported by Aggarwal et al. [29] and by other studies [4,5,7].

The mean calories taken from junk food by adolescents was 315.20±239.47, the mean calories from junk food taken by females was 286.89±143.00, while by males was 342.17±301.84.

4. Conclusion

Present study was carried out in Ahmedabad Municipal Corporation area and included 900 adolescents aged 10-19 yrs. Developing countries, like India are facing Double burden of disease as 18.7% adolescents were found overweight or obese and 18% were found underweight. Higher socio-economic status, lack of physical activity, junk foods, inadequate sleep duration at night were strongly associated with overweight and obesity. Interventions should be done at adolescence period to prevent the obesity in adulthood. Life style modification can play very important role not only in preventing obesity among adolescents but also inculcating good habits for adulthood

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