

Prevalence of obesity and central obesity in middle aged population of Ahmedabad

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DOI: 10.5455/jcer.201424

ABSTRACT

Objectives: To find out the prevalence of obesity using Body Mass Index (BMI) and prevalence of central obesity using Waist Circumference (WC) and to find out association between obesity, central obesity and socio-economic status (SES). **Materials and Methods:** A cross sectional study was conducted with 552 males and females aged 20-50 years was selected from community of Ahmedabad. People with kyphosis, scoliosis and subjects on anti-hyperlipidemic drugs or related anti-obesity drugs were excluded. Height, weight measurement and waist circumference of every subject was done and socio economic status was taken by using Kuppuswamy's socio-economic scale. **Results:** Prevalence of obesity was found to be 15%. Forty seven percent had normal waist circumference, 32% were at mild risk and 21% were at moderate risk of cardiovascular disease according to the WC. A positive correlation between BMI and SES was found using Spearman correlation $r = 0.53$ ($p < 0.0001$). Moderate positive correlation between WC and SES, $r = 0.42$, $p < 0.0001$ was seen. Using linear regression, association was found between BMI and SES components (education, income, occupation). The result showed statistically significant association between income, occupation with BMI in both males and females. Association of education with BMI was statistically significant in males but not in females. **Conclusion:** The prevalence of obesity was 15%, more in females than males. The study showed a moderate positive correlation of BMI with SES and WC with SES. An association was found between BMI and SES components (income, occupation).

Key words: Body mass index, gender, obesity, socioeconomic status, waist circumference

INTRODUCTION

Obesity is a major public health problem and has become an important epidemic in both developed and developing countries. Obesity is a predisposing factor for diabetes mellitus, cardiovascular disease, osteoarthritis, and sleep apnea. Socioeconomic and demographic factors are also associated with abdominal obesity and the identification of these characteristics may permit more effective interventions for the treatment and prevention of this condition. India is facing an obesity crisis among its newly wealthy middle class even as millions of its rural poor still struggle for enough to eat.

Overweight and obesity is a worldwide public health problem and its great increase is mainly due to the increase in energy consumption owing

to the availability of highly palatable foods of high caloric density and to the reduction of energy expenditure by regular physical activity.^[1] Obesity and the related health risks have been noted to be an epidemic problem worldwide, especially in developing countries.^[2] Obesity, general and abdominal, is one of the greatest public health challenges for the current century with particularly alarming trends in several parts of the world. There are various risk factors which cause weight gain and obesity in humans. The metabolic factors such as leptin, and lifestyle such as low physical activity, have a significant effect on overweight and obesity.^[3] Hence, the need of the study to find out the prevalence of obesity and central obesity of Ahmedabad's population and to find out the association of obesity and central obesity with their socio-economical status.

MATERIALS AND METHODS

A cross sectional study was conducted in the community of Ahmedabad from March to September 2012. 552 subjects were included in the study by convenience sampling. Males and females in the age group of 20-50 years who were willing to participate were included. People with kyphosis, scoliosis, hypertension, diabetes mellitus, psychiatric illness or subjects on anti-hyperlipidemic drugs or related anti – obesity drugs were excluded. The outcome measures used were Body Mass Index (BMI), Waist Circumference (WC), and Modified Kuppuswamy's Socio-economic status scale (SES).

Ethics committee clearance was obtained. Subjects were chosen according to the inclusion and exclusion criteria taken in to account for the study. The nature of the study was explained thoroughly to the subjects. Written consent was obtained from the subjects. All the subjects were then asked to fill a questionnaire about their demographic and socio-economical status where questions about their education, income and occupation were asked.

For BMI, height was measured using a measure tape. Subjects were asked to stand against a wall. With the use of a scale, a mark was done on the wall at the highest point on the vertex and then distance from marked point to the floor was measured. Weight was measured using a standard weighing scale. After measuring height and weight BMI was calculated using the formula, $BMI = \text{Body weight in kg} / (\text{height in meter})^2$.

To find out central obesity waist circumference was measured. Waist circumference measurement was made using a flexible steel tape placed horizontally around the abdomen parallel to the floor at the level of the umbilicus.

Data was represented in tables and graphs. Correlation between BMI and WC and SES was found using Graph pad prism. Level of significance was kept at 5%. Logistic regression analyses was done using SPSS version 10.0; SPSS, Inc were used to investigate the effect of each of the variables on odds ratios for obesity. First, separate analyses were carried out for men and women, after which the significance of gender interaction effects was examined. To test formally for gender interactions, logistic regression models were constructed that included

SES components (education, income, occupation) and BMI.

RESULTS

Of the total 552 subjects 276 were women and 276 were men as shown in Table 1. The findings of the study are shown in Tables 2 and 3 and Graphs 1 to 4. A linear regression analysis was done to find association between BMI and components of SES [Table 4].

Table 1: Demographic profile

Age group (years)	Males	Females	Total
20 -30	97	110	207
31 -40	91	80	171
41 -50	88	86	174
Total	276	276	552

DISCUSSION

The present study was conducted to find out prevalence of obesity and central obesity in the middle aged population and its association with socioeconomic status. In this study total prevalence of obesity was found to be 15%. 13% males and 17% females were found to be obese. In central obesity 47% had normal waist circumference values, 32% were at mild risk and 21% were at moderate risk of cardiovascular risk. Out of that 53% males were normal, 30% males were at mild risk and 17% males were at moderate risk. 42% females were normal, 32% females were at mild risk, and 26% females were at moderate risk.

In the global context, it is clear that obesity has become the most prevalent public health problem. The results of the present investigation were in concordance with two recent Indian studies, one among North Indians (15.60%) reported by Misra et al and another from the Kashmiri population (23.69%) studied by Zargar et al.^[4] The present study done in India in Gujarat in Ahmedabad also found that the prevalence of obesity is 15%.

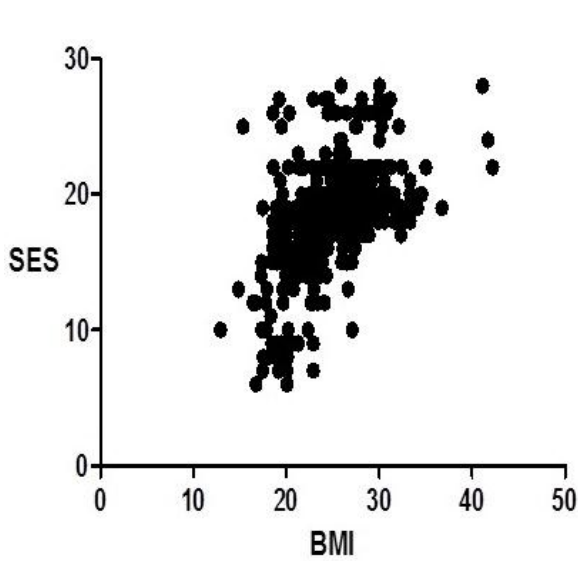
Sekhar K et al found the prevalence of overweight/obesity was 25% in Hyderabad in comparison to 15% in present study. Among males they found 34.82% obese and females were 19.76%. In contrast, present study found females were more obese than males. In their study among sedentary workers 95.82% were overweight/obese. In present study statistically significant association between occupation and BMI was found which is similar to their study. They found

Table 2: Body mass index (BMI) classification of subjects

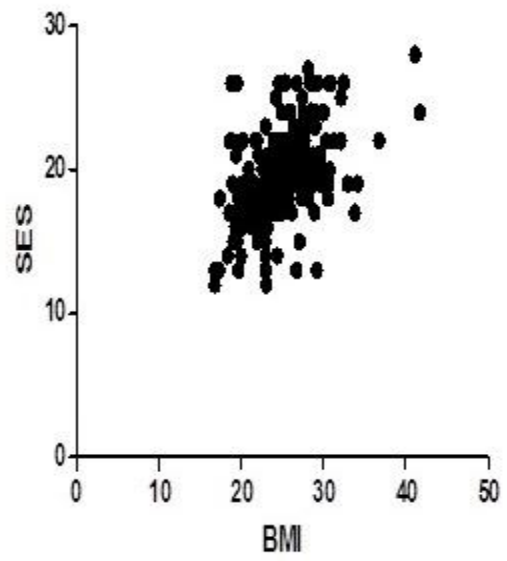
BMI	BMI Class	Males	Females	Total subjects (%)
Underweight	<18.5	3 (1%)	6 (2%)	9 (2%)
Normal	18.5-22.9	113 (41%)	90 (34%)	203 (36%)
Overweight	>23	125 (45%)	132 (47%)	257 (47%)
Obese	>25	35 (13%)	48 (17%)	83 (15%)
Total	-	276	276	552

Table 3: Gender wise distribution of waist circumference classification of subjects

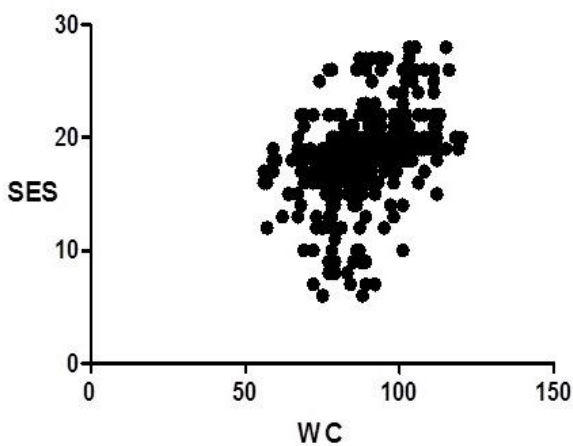
Group	Normal	Mild risk	Moderate risk	Total
Male	148 (53%)	83 (30%)	45 (17%)	276
Female	116 (42%)	89 (32%)	71 (26%)	276
Total	264 (47%)	172 (32%)	116 (21%)	552



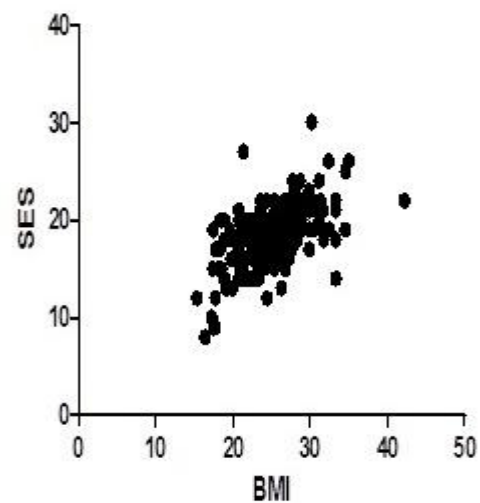
Graph 1: Correlation between BMI and SES



Graph 3: Correlation between BMI and SES in males



Graph 2: Correlation between WC and SES



Graph 4: Correlation between BMI and SES in females

Table 4: Correlation between BMI and SES components in females and males

SES components	Females	Females	Males	Males
	95% CI	P - value	95% CI	P - value
Education	-0.06348 to 0.02793	0.4466	0.1812 to 0.1946	< 0.0001
Occupation	0.2472 to 0.3894	< 0.0001	0.2379 to 0.2639	< 0.0001
Income	0.2012 to 0.6011	< 0.0001	0.2531 to 0.2734	< 0.0001

that as the age increases overweight/obesity also increases along a gradient till 60+yrs. High literacy, alcoholism and low physical activity were significantly associated with overweight/obesity. As BMI increases morbidities tended to increase in rural area.^[5]

In present study a positive correlation between BMI and SES was found using Spearman correlation $r = 0.53$ ($p < 0.0001$). Moderate positive correlation between WC and SES $r = 0.42$ ($p < 0.0001$) was seen. Moderate positive correlation between WC and SES in males $r = 0.52$ ($p < 0.0001$) and females $r = 0.56$ with ($p < 0.0001$) was seen. Correlation between BMI and SES in males $r = 0.55$ with ($p < 0.0001$). Correlation between BMI and SES in females using Spearman correlation $r = 0.52$ with ($p < 0.0001$) was seen. Association between BMI and SES components (Education, income, occupation) using linear regression analyses in females at 95% confidence interval found significant association between BMI and occupation and income but education was not significantly associated with BMI. In males, association between BMI and SES subgroup (Education, income, occupation) using linear regression analyses at 95% confidence interval found significant association between BMI and occupation, income and education.

A higher prevalence of overweight among high-SES women has been postulated to be linked to cultural norms that may favor fat body shapes. Their finding suggests that the positive association between BMI and SES was observed at every age and indirectly suggests that higher BMI among high-SES women could also reflect beliefs and social expectations concerning body size, although this is likely to be less prevalent among younger women. Cultural practices concerning food and physical activity are also possible explanations for the higher BMI among high-SES women. It has been shown that higher-income groups in India consume a diet containing 32% of energy from fat compared with 17% in lower-income groups. It is possible that high-SES women in India still face multiple barriers to engaging in physical activity and eating healthy despite having more knowledge about healthy

food, healthy behavior, and resources. This could be the reason for finding higher obesity in females than males in present study.

Salonen MK et al found the prevalence of obesity was 22.3% in men and 27.2% in women. They found lower educational attainment and lower adult social class were associated with higher BMI in both men ($p = 0.03$, $p < .01$) and women ($p < 0.001$, $p = 0.01$). Childhood social class was inversely associated with BMI only in men ($p < 0.001$), lower household income was associated with higher BMI in women only ($p < 0.001$). Household income was found to be the strongest predictor of obesity among women. Overweight and obesity were inversely associated with socioeconomic status. Men seemed to be more susceptible to adverse childhood socioeconomic circumstances than women, while adult socioeconomic indicators were more strongly associated with obesity in women. Present study is in contrast to above study as occupation and income both are significantly directly associated in both males and females. Education was significantly associated with BMI in males not in females.^[6]

Charumathi S et al found that in developed countries in the West, lower socioeconomic status (SES) was associated with a higher prevalence of overweight/obesity. They examined the association between SES defined by education and income and overweight/obesity in a population-based cohort of 2807 individuals of Malays in Singapore. The prevalence of overweight/obesity in men and women was 50.4% and 65.1%, respectively. In women, the prevalence of overweight/obesity increased with lower levels of education and income. Compared with the higher categories of SES, the odds ratio (95% confidence interval) of overweight/obesity in women was 1.42 (1.06-1.89) for education and 2.08 (1.33-3.26) for income. In contrast, in men, the prevalence of overweight/obesity decreased with lower levels of education and income. Lower SES was positively associated with overweight/obesity in Malay women, and the association was in the opposite direction in Malay men. A higher BMI in individuals with lower SES

in developed countries has been shown to be related to restricted knowledge and access to healthy foods which may be expensive and to safe exercise, less interest in weight control, discrimination against socioeconomic advancement, and cultural standards of physical effectiveness. The present study was done in India on an urban population where a positive association was found between BMI and SES in both genders. Occupation and income was found to be significantly associated with BMI in both genders but education was significantly associated with BMI in males but not in females.^[7]

Subramanian SV et al found that the ratio of underweight to overweight women decreased from 3.3 in 1998–1999 to 2.2 in 2005–2006, there were still considerably more underweight women than overweight women. It was only in the top wealth quintile and in groups with higher education that there was a slight excess of overweight women as compared with underweight women. There was a strong positive relation between SES and body mass index at both time points and across urban and rural areas in their study. A positive relation between SES and body mass index was also observed for men in 2005–2006. They had **concluded that** the distribution of underweight and overweight in India remained socially segregated. Despite rapid economic growth, India had yet to experience a situation in which underweight and overweight coexist in the low-SES groups. In present study found more women overweight than normal and very few underweight. Also found that a positive correlation existed between SES and BMI in both genders.^[8]

Jane Wardle et al found that obesity risk was greater among men and women with fewer years of education and poorer economic circumstances and among women, but not men, of lower occupational status. They concluded that higher educational attainment and higher socio economic status were associated with a lower risk of obesity in both men and women, whereas higher occupational status was associated with a lower risk only for women. In present study also other SES factors were found to be associated with overweight and obese, but education was not significantly association with BMI in females.^[9]

Limitation of the study was that the data about their dietary pattern, exercise and life style were not assessed.

Future research can be conducted on children studying the socio-economic determinants of obesity and the gender differences in the association of SES with obesity.

CONCLUSION

The study concluded that the prevalence of obesity was found to be 15%. Out of that 13% males and 17% females were found to be obese. In central obesity 47% were within normal waist circumference, 32% were at mild risk and 21% were at moderate risk of cardiovascular disease. Out of that 53% males were normal, 30% males were at mild risk and 17% males were at moderate risk. In females 42% were normal, 32% females were at mild risk, and 26% females were at moderate risk.

The results of this study also showed that there was a moderate positive correlation between BMI with SES, WC with SES both in males and females. A significant association was found between BMI and SES components (income, occupation) in both males and females but education was significantly associated in males not in females.

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Cite this article as: Vyas NJ, Chaudhary MI, Sheth MS. Prevalence of obesity and central obesity in middle aged population of Ahmedabad. *J Clin Exp Res* 2014;2:123-128.

Source of Support: Nil, **Conflicts of Interest:** None declared