Prevalence of generalized and abdominal obesity: India’s big problem

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ABSTRACT

Background: The rising prevalence overweight and obesity in India has a direct correlation with the increasing prevalence of obesity-related co-morbidities; hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetes mellitus, and cardiovascular disease. The risk for these disorders appears to start from a body mass index (BMI) of about 21 kg/m². The objective of the study was to know the prevalence of generalized and abdominal obesity in the field practice area.

Methods: A community based cross-sectional study conducted among 309 people in the rural field practice area of medical college from January to March, 2017.

Results: In the present study prevalence of generalized, abdominal and combined obesity was 56%, 71.2% and 51.3% respectively.

Conclusions: Prevention of obesity should begin in early childhood. Obesity is harder to treat in adults than it is in children. The control of obesity centers on the weight reduction. Information Education and Communication (IEC), Behaviour change communication (BCC) is used to encourage individuals of the society to adopt healthy behaviours like dietary modifications, increased physical activity and a combination of both.

Keywords: Overweight, Body mass index, Waist circumference, Generalized obesity, Abdominal obesity, Systematic random sampling

INTRODUCTION

Worldwide, overweight and obesity cause more deaths than underweight. The combined burden of these diet-related risks and physical inactivity in low and middle income countries is similar to that caused by HIV/AIDS and tuberculosis. Obesity is generally classified as generalized obesity (GO) and abdominal obesity (AO). Obese have higher rates of mortality and morbidity compared to non obese individuals.1

In India, obesity is emerging as an important health problem particularly in urban areas, replacing the more traditional public health concerns including undernutrition. Overweight or obesity is seen in 30-65% of adult urban population.2 ICMR-INDBAB Study (Phase-I) study showed the prevalence of generalized and abdominal obesity was higher in India now compared to earlier studies. Prevalence of abdominal obesity was higher than the generalized obesity. However both forms of obesity is high in urban residents than the rural residents. This study is of significance because it shows large increases in prevalence of obesity not only in urban areas but also in rural areas in India.3

The rising prevalence has a direct correlation with obesity-related co-morbidities; hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetes
mellitus (T2DM), and cardiovascular disease (CVD). As it was evident based on 33 cohort studies carried out within the Asia-Pacific region found that that adult BMIs of >21 kg/m² were associated with the development of type II diabetes (diabetes mellitus), ischaemic heart disease, stroke, hypertensive heart disease, osteoarthritis, and cancers of the postmenopausal breast, colon, endometrium and kidney. Present study was conducted to know the prevalence of generalized and abdominal obesity in the field practice area.

**METHODS**

**Study design**

It was a community based cross-sectional study conducted in rural field practice area under the Department of Community Medicine, Dr. Pinnamaneni SIMS&RF, A.P. Study has been done or a period of 3 months from January to March, 2017.

**Study population**

Study population was constituted by people ≥20 years of age residing in field practice area.

**Inclusion criteria**

Purpose of the study was explained and those who showed interest to participate after giving consent were included in the study.

**Exclusion criteria**

Exclusion criteria were those who are not willing to participate in the study.

**Sample size and samplings**

Rural health and training center caters services to 9 villages with a population of 31,420. According National Family Health Survey 2015-16 (NFHS-4) 28% of men and 27.6% of women in rural areas of Andhra Pradesh are overweight or obese. Taking prevalence of 28% and 95% confidence interval, the required sample size for 31,420 population was 309 with the assumption of 20% non response rate. From nine villages one village with population 4579 was selected randomly and systematic random sampling was used for selecting the households. Fortunately non response rate is zero and continued the study till the sample size reaches 309.

**Formula used for sample size calculation**

\[ n = \frac{Z_{\alpha/2}^2 \times P \times (1-P)}{d^2} \]

**Systematic random sampling**

Suppose the N units in the population are numbered 1 to N in some order. Suppose further that N is expressible as a product of two integers n and k, so that N = nk. To draw a sample of size n,

- Select a random number between 1 and k.
- Suppose it is i.
- Select the first unit whose serial number is i.
- Select every \( k^{th} \) unit after \( i^{th} \) unit.
- Sample will contain i, i+k, i+2k,...,i+(n-1)k serial number units.

Here \( N = 4579 \) & \( n = 309 \).

\[ k = \frac{\text{Number of units in population}}{\text{Number of sample units required}} \]

\[ = \frac{4579}{309} \]

\[ = 14.81 \text{ rounded to } 15 \]

First selected random numberi (1 to 15) = 2.

Second unit \((i+k)^{th} = 2+15 = 17\).

Third unit \((i+2k)^{th} = 2+34 = 36 \) and so on..

Selected households in the study are 2nd, 17th, 34th ………til the required sample.

**Study instruments and data collection**

Data regarding Socio-demographic variables, behavioural risk factors was collected and physical measurements were recorded. The data was collected by personally interviewing the study participants.

**Recording of anthropometric measurements**

Height (in centimeters) was measured using a stadiometer. The individual was asked to stand upright without shoes with his/her back against the vertical back board, heels together and eyes directed forward.

Weight (in kilograms) was measured with an electronic weighing scale that was kept on a firm horizontal flat surface. Subjects were asked to wear light clothing, and weight was recorded to the nearest 0.5 kg.

Body mass index (BMI) was calculated using the formula

\[ \text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2} \]

Waist circumference (in centimeters) was measured using a non-stretchable measuring tape. Waist circumference was measured at the smallest horizontal girth between the costal margins and the iliac crest at the end of expiration.

**Definitions**

Overweight was defined as a BMI ≥23 kg/m but <25 kg/m² for both genders (based on the World Health Organization Asia Pacific guidelines) with or without abdominal obesity (AO).
Generalized obesity (GO) was defined as a BMI ≥ 25 kg/m² for both genders (based on the World Health Organization Asia Pacific guidelines) with or without abdominal obesity (AO).

Abdominal obesity (AO) was defined as a waist circumference (WC) ≥ 90 cm for men and ≥ 80 cm for women with or without GO.

Isolated generalized obesity (IGO) was defined as a BMI ≥ 25 kg/m² with waist circumference of < 90 cm in men and < 80 cm in women.

Isolated abdominal obesity (IAO) was defined as a waist circumference of ≥ 90 cm in men or ≥ 80 cm in women with a BMI < 25 kg/m².

Combined obesity (CO): Individuals with both GO and AO.

Non obese subjects: Individuals without either GO or AO.

Ethical issues

Ethical clearance was obtained from the institutional ethical committee prior to the start of study. Written informed consent was obtained after explaining the importance of the study in detail. Questionnaire does not contain any identification details of the participant and confidentiality was maintained throughout the study.

Statistical analysis

Data entry and statistical analysis was done using SPSS v 16. The results were explained in simple proportions. Difference between groups was assessed using chi square test for their statistical significance. P value less than 0.05 was considered significant.

RESULTS

In the present study prevalence of generalized, abdominal and combined obesity was 56%, 71.2% and 51.3% respectively.

Table 1 shows the socio-demographic characteristics such as age, sex, and religion of non obese (n=136) and generalized obesity (n=173) groups. The GO was significantly higher in individuals between 41-50 years. There was significant difference in the two groups with respect to age. There were predominantly Hindus in the study.

Out of these 173 GO subjects, previous history of hypertension was given by 26 (15.1%) subjects and 38 (22.0%) subjects reported history of diabetes. There was significant difference in GO prevalence among those with history of hypertension, diabetes and alcoholism.

| Variable         | Categories | BMI <25 non obese | BMI ≥25 generalized obesity | Chi-square value | P value |
|------------------|------------|-------------------|-----------------------------|------------------|---------|
|                  |            | Count  | %         | Count  | %         |          |          |
| Age              | ≤ 30       | 45     | 33.1      | 21     | 12.1      | 36.67    | <0.001   |
|                  | 31-40      | 24     | 17.6      | 46     | 26.6      |          |          |
|                  | 41-50      | 20     | 14.7      | 59     | 34.1      |          |          |
|                  | 51-60      | 24     | 17.6      | 34     | 19.7      |          |          |
|                  | 61-70      | 17     | 12.5      | 10     | 5.8       |          |          |
|                  | 71-80      | 4      | 2.9       | 3      | 1.7       |          |          |
|                  | 81-90      | 2      | 1.5       | 0      | 0.0       |          |          |
|                  | Total      | 136    | 100.0     | 173    | 100.0     |          |          |
| Gender           | Female     | 85     | 62.5      | 101    | 58.4      | 0.54     | 0.46     |
|                  | Male       | 51     | 37.5      | 72     | 41.6      |          |          |
|                  | Total      | 136    | 100.0     | 173    | 100.0     |          |          |
| Religion         | Hindu      | 99     | 90.0      | 117    | 83.0      | 4.47     | 0.11     |
|                  | Christian  | 8      | 7.3       | 22     | 15.6      |          |          |
|                  | Muslim     | 3      | 2.7       | 2      | 1.4       |          |          |
|                  | Total      | 110    | 100.0     | 141    | 100.0     |          |          |
| Education        | Primary    | 30     | 36.1      | 48     | 39.0      | 7.66     | 0.11     |
|                  | Secondary  | 19     | 22.9      | 35     | 28.5      |          |          |
|                  | Intermediate | 11  | 13.3      | 15     | 12.2      |          |          |
|                  | UG        | 20     | 24.1      | 14     | 11.4      |          |          |
|                  | PG and above | 3  | 3.6       | 11     | 8.9       |          |          |
|                  | Total      | 83     | 100.0     | 123    | 100.0     |          |          |
| Marital Status   | Unmarried  | 11     | 8.1       | 4      | 2.3       | 5.5      | 0.02     |
|                  | Married    | 125    | 91.9      | 169    | 97.7      |          |          |
|                  | Total      | 136    | 100.0     | 173    | 100.0     |          |          |

Continued.
| Variable | Categories | BMI |  |  | Chisquare Value | P value |
|----------|------------|-----|-----|-----|----------------|---------|
|          |            | ≤25 non obese | ≥25 generalized obesity | Count | % | Count | % |
| Smoking  | No         | 121 | 89.0 | 145 | 83.8 | 1.69 | 0.19 |
|          | Yes        | 15  | 11.0 | 28  | 16.2 |       |       |
|          | Total      | 136 | 100.0 | 173 | 100.0 |       |       |
| Consume Alcohol | No | 123 | 91.1 | 137 | 82.0 | 5.14 | 0.02 |
|          | Yes        | 12  | 8.9  | 30  | 18.0 |       |       |
|          | Total      | 135 | 100.0 | 167 | 100.0 |       |       |
| HTN      | Non HTN    | 128 | 94.1 | 146 | 84.9 | 6.59 | 0.01 |
|          | HTN        | 8   | 5.9  | 26  | 15.1 |       |       |
|          | Total      | 136 | 100.0 | 172 | 100.0 |       |       |
| Diabetes | No         | 127 | 93.4 | 135 | 78.0 | 13.91 | <0.001 |
|          | Yes        | 9   | 6.6  | 38  | 22.0 |       |       |
|          | Total      | 136 | 100.0 | 173 | 100.0 |       |       |

Table 2: Abdominal obesity.

| Variable | Categories | WC-AO |  |  | Chisquare Value | P value |
|----------|------------|-------|-----|-----|----------------|---------|
|          |            | Normal (non obese) | Abnormal (obese) | Count | % | Count | % |
| Age      | ≤30        | 35   | 39.3 | 31  | 14.1 | 31.86 | <0.001 |
|          | 31-40      | 22   | 24.7 | 48  | 21.8 |       |       |
|          | 41-50      | 10   | 11.2 | 69  | 31.4 |       |       |
|          | 51-60      | 13   | 14.6 | 45  | 20.5 |       |       |
|          | 61-70      | 8    | 9.0  | 19  | 8.6  |       |       |
|          | 71-80      | 1    | 1.1  | 6   | 2.7  |       |       |
|          | 81-90      | 0    | 0.0  | 2   | .9   |       |       |
|          | Total      | 89   | 100.0 | 220 | 100.0 |       |       |
| Gender   | Female     | 45   | 50.6 | 141 | 64.1 | 4.84 | 0.03 |
|          | Male       | 44   | 49.4 | 79  | 35.9 |       |       |
|          | Total      | 89   | 100.0 | 220 | 100.0 |       |       |
| Religion | Hindu      | 66   | 85.7 | 150 | 86.2 | 0.21 | 0.89 |
|          | Christian  | 9    | 11.7 | 21  | 12.1 |       |       |
|          | Muslim     | 2    | 2.6  | 3   | 1.7  |       |       |
|          | Total      | 77   | 100.0 | 174 | 100.0 |       |       |
| Education| Primary    | 18   | 27.7 | 60  | 42.6 | 9.66 | 0.05 |
|          | Secondary  | 18   | 27.7 | 36  | 25.5 |       |       |
|          | Intermediate| 12   | 18.5 | 14  | 9.9  |       |       |
|          | UG         | 15   | 23.1 | 19  | 13.5 |       |       |
|          | PG and above| 2    | 3.1  | 12  | 8.5  |       |       |
|          | Total      | 65   | 100.0 | 141 | 100.0 |       |       |
| Marital Status | Unmarried | 11   | 12.4 | 4   | 1.8  | 15.25 | <0.001 |
|          | Married    | 78   | 87.6 | 216 | 98.2 |       |       |
|          | Total      | 89   | 100.0 | 220 | 100.0 |       |       |
| Smoking  | No         | 76   | 85.4 | 190 | 86.4 | 0.05 | 0.82 |
|          | Yes        | 13   | 14.6 | 30  | 13.6 |       |       |
|          | Total      | 89   | 100.0 | 220 | 100.0 |       |       |
| Consume Alcohol | No | 74   | 84.1 | 186 | 86.9 | 0.42 | 0.52 |
|          | Yes        | 14   | 15.9 | 28  | 13.1 |       |       |
|          | Total      | 88   | 100.0 | 214 | 100.0 |       |       |
| HTN      | Non HTN    | 81   | 92.0 | 193 | 87.7 | 1.19 | 0.28 |
|          | HTN        | 7    | 8.0  | 27  | 12.3 |       |       |
|          | Total      | 88   | 100.0 | 220 | 100.0 |       |       |
| Diabetes | No         | 84   | 94.4 | 178 | 80.9 | 8.92 | 0.003 |
|          | Yes        | 5    | 5.6  | 42  | 19.1 |       |       |
|          | Total      | 89   | 100.0 | 220 | 100.0 |       |       |
Table 3: Combined obesity: Individuals with both GO and AO.

| Variable          | Categories | BMI and WC- CO | Chisquare value | P value |
|-------------------|------------|----------------|-----------------|---------|
|                   |            | Non obese      | Obese           |         |
|                   |            | Count | %   | Count | %   |         |         |
| Age               | ≤30        | 49     | 32.5 | 17    | 10.8 | 36.54  | <0.001 |
|                   | 31-40      | 30     | 19.9 | 40    | 25.3 |         |         |
|                   | 41-50      | 22     | 14.6 | 57    | 36.1 |         |         |
|                   | 51-60      | 27     | 17.9 | 31    | 19.6 |         |         |
|                   | 61-70      | 17     | 11.3 | 10    | 6.3  |         |         |
|                   | 71-80      | 4      | 2.6  | 3     | 1.9  |         |         |
|                   | 81-90      | 2      | 1.3  | 0     | 0.0  |         |         |
|                   | Total      | 151    | 100.0 | 158  | 100.0 |         |         |
| Gender            | Female     | 90     | 59.6 | 96    | 60.8 | 0.04   | 0.84   |
|                   | Male       | 61     | 40.4 | 62    | 39.2 |         |         |
|                   | Total      | 151    | 100.0 | 158  | 100.0 |         |         |
| Religion          | Hindu      | 112    | 89.6 | 104   | 82.5 | 3.83   | 0.15   |
|                   | Christian  | 10     | 8.0  | 20    | 15.9 |         |         |
|                   | Muslim     | 3      | 2.4  | 2     | 1.6  |         |         |
|                   | Total      | 125    | 100.0 | 126  | 100.0 |         |         |
| Education         | Primary    | 32     | 33.0 | 46    | 42.2 | 9.59   | 0.05   |
|                   | Secondary  | 26     | 26.8 | 28    | 25.7 |         |         |
|                   | Intermediate | 14   | 14.4 | 12    | 11.0 |         |         |
|                   | UG         | 22     | 22.7 | 12    | 11.0 |         |         |
|                   | PG and above | 3   | 3.1  | 11    | 10.1 |         |         |
|                   | Total      | 97     | 100.0 | 109  | 100.0 |         |         |
| Marital Status    | Unmarried  | 12     | 7.9  | 3     | 1.9  | 6.12   | 0.01   |
|                   | Married    | 139    | 92.1 | 155   | 98.1 |         |         |
|                   | Total      | 151    | 100.0 | 158  | 100.0 |         |         |
| Smoking           | No         | 131    | 86.8 | 135   | 85.4 | 0.11   | 0.74   |
|                   | Yes        | 20     | 13.2 | 23    | 14.6 |         |         |
|                   | Total      | 151    | 100.0 | 158  | 100.0 |         |         |
| Consume Alcohol   | No         | 131    | 87.9 | 129   | 84.3 | 0.82   | 0.37   |
|                   | Yes        | 18     | 12.1 | 24    | 15.7 |         |         |
|                   | Total      | 149    | 100.0 | 153  | 100.0 |         |         |
| HTN               | Non HTN    | 141    | 94.0 | 133   | 84.2 | 7.56   | 0.006  |
|                   | HTN        | 9      | 6.0  | 25    | 15.8 |         |         |
|                   | Total      | 150    | 100.0 | 158  | 100.0 |         |         |
| Diabetes          | No         | 141    | 93.4 | 121   | 76.6 | 16.89  | <0.001 |
|                   | Yes        | 10     | 6.6  | 37    | 23.4 |         |         |
|                   | Total      | 151    | 100.0 | 158  | 100.0 |         |         |

Table 2 shows the sociodemographic characteristics of non obese (n=89) and abdominal obesity (n=220) groups. It can be seen that there was no significant difference in religion, smoking, history of alcohol, known hypertensives in the two groups. The abdominal obesity was significantly higher in women, married and those who are known diabetics (p=0.003).

Table 3 shows the sociodemographic characteristics of non obese (n=151) Individuals with both GO and AO i.e. combined obesity (158) groups. There was significant difference in CO prevalence among those with history of hypertension (p=0.006), diabetes (p≤0.001), age (41-50 yrs) (p≤0.001) and marital status (p=0.001).

DISCUSSION

In the present study prevalence of generalized, abdominal and combined obesity was found to be 56%, 71.2% and 51.3% respectively. Andhra Pradesh, 44.4 per cent urban men suffered from obesity, while the percentage in rural parts was 28 per cent. Similarly, 45.6 per cent of the
urban women in the state were obese against the 27.6 per cent women in rural Andhra Pradesh.8

In a study conducted in urban north India (New Delhi), the overall prevalence of generalized obesity was 50.1 per cent, while that of abdominal obesity was 68.9 per cent.10

Study conducted by Pradeepa et al, reported that prevalence of GO, AO and CO were significantly higher among urban residents compared to rural residents in all the four regions studied.3

The Chennai urban rural epidemiology study (CURES) conducted in Chennai city in Tamil Nadu reported age standardized prevalence of generalized obesity to be 45.9 per cent, while that of abdominal obesity was 46.6 per cent.11

The present study showed that the prevalence of generalized, abdominal and combined obesity was significantly higher in women and individuals in the age group of 41-50 years. Pandey et al, in their study reported higher prevalence of obesity among women.12

CONCLUSION

It appears clear to us that the problems of overweight and obesity are no longer limited to the urban rich. The strong association of obesity with cardiovascular disease, diabetes, high blood pressure and some cancers necessitates the importance of prevention and control of obesity. Prevention of obesity should begin in early childhood. Obesity is harder to treat in adults than it is in children. The control of obesity centers around the weight reduction. Information education and communication (IEC), Behaviour change communication (BCC) is used to encourage individuals of the society to adopt healthy behaviours like dietary modifications, increased physical activity and a combination of both.

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