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A Study of Select Epidemiological Factors Associated With Obesity in Women above 20 Years of Age in an Urban Slum Area

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Abstract

Introduction: National Family Health Survey III (2005-06) India figures highlighted the fact that India already faces a dual burden of chronic malnutrition i.e. obesity besides under nutrition. Higher BMI and increased abdominal fat is an important determinant of development of diabetes.

Aim: To understand the epidemiology of obesity among adult women above the age of 20 years in an urban slum area.

Materials and Methods: Community based, Cross sectional study (Sample size= 500) by systematic random sampling, including measurement of anthropometry and assessing random blood sugar level.

Results: 22.6% women were found to be obese. Statistically significant association was found between obesity and age, parity, certain dietary factors like lower frequency of green leafy vegetables consumption, higher frequency of junk food etc., total duration of sleep, random blood sugar level etc.

Conclusion: This community based study was able to understand certain factors associated with pathophysiology of obesity in slum dwelling adult women

Keywords: Obesity, Adult women, Community based.

Introduction

For many years now India has been grappling under the pangs of undernutrition, poverty and maternal and child deaths [1]. In an attempt to escape this vicious circle of poverty, undernutrition, poor quality of life and eventually death, a large number of people migrate from rural areas to more urbanized settlements where they usually settle down in slums and take up daily wage jobs. Several lifestyle alterations result from this transition: changes from their traditional eating habits; exposure to severe stress; decreased physical activity; and increase in smoking, tobacco chewing and alcohol intake [2]. A significantly large part of India's population seems to be going through such a so-called 'Nutrition Transition'. Hence, India with its substantial burden of undernutrition across age groups; sees a picture of 'dual burdens'- one where obesity is now rapidly increasing across regions, and often coexisting in the same population (even same households) with chronic under-nutrition.

WHO defines obesity as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired [3].

National Family Health Survey (NFHS)-III (2005-06) India, found that 33.0% of Ever-Married Adults (age 15-49 years) had Body Mass Index-BMI below normal range whereas 14.8% in the same age group had BMI in the ranges of overweight and obese. This prevalence was 10.6% in NFHS-II. These figures highlighted the fact that besides under-nutrition, India already faces a new form of chronic malnutrition- obesity [4].

The obesity epidemic moves through a population in a reasonably consistent pattern over time and this is reflected in the different patterns in low- and high income countries3. In the transition phase, people with less education and lower socio-economic status (SES) are more likely to be obese, and the gap is generally larger in women[5]. Data from NFHS III shows that in India, the trend of overweight and obesity is a rising one especially among women [3].

Higher BMI and especially increased abdominal fat clearly is an important determinant of blood glucose levels, insulin resistance, and the development of diabetes [6]. Asian populations appear to develop diabetes at a lower BMI than other populations [6].

Considering these facts, it was considered imperative to conduct a study on epidemiology of obesity in adult women dwelling in an urban slum area. As WHO has defined adolescents as age group from 10 to 19 years, adult women above the age of 20 years were decided upon to be the study population

Aim

To understand the epidemiology of obesity among adult women above the age of 20 years in an urban slum area.

Objectives

1. To assess prevalence of obesity among women in an urban area.
2. To study the socio-demographic factors associated with obesity e.g. – age, education, occupation, monthly income, parity etc.
3. To study the dietary habits and physical activity pattern of the study population
4. To study prevalence of certain co-morbidities in obese women like Diabetes Mellitus, Hypertension etc.
5. To assess their anthropometry

Materials and Methods

The present study has been conducted in the population served by one randomly selected health post of an urban slum area of a metropolitan city. It was a community based, cross sectional study

where necessary dietary- demographic, physical activity and anthropometric data was collected.
Sample size was calculated by using the Formula:

$$\text{Sample size (n)} = Z^2_{(1-\alpha/2)} \times \frac{P * Q}{d^2}$$

Considering variations in population prevalence all over the country as well as in review of relevant literature, population prevalence of obesity in women above 20 years (P) was considered as 50% for the present study (as it gives maximum sample size) [7].
Calculated sample size: N=384
Therefore the round figure of 500 was decided to be the sample size. Sampling unit was "a household with a woman above 20 years of age".
The households were sampled by a circular systematic random sampling method [8]. The sampling interval was calculated to be 33 (approx.). The slum area under the health post had a total population of 16809 houses. No formal list of households comprising of women above 20 years was available. Hence, data available from the health post was referred to and the aid of Community Health Volunteers was taken in identifying the households served by the health posts.
The approval of Institutional Scientific Review and Ethics Committee was taken prior to conducting the study. Written informed consent was taken from all respondents prior to including them in to the study.

a) Inclusion criteria:

- Any woman above 20 years of age giving consent to participate in the study

b) Exclusion criteria:

- Pregnant women or women upto 6 weeks post-partum
- Known case of any endocrine disorders all except Diabetes Mellitus
- Person known to have ascites or oedema.
- Person with known physical disability or psychiatric illness
- Person currently on any medications whose side-effects are known to be water-retention (oedema) or weight gain- e.g. Oral contraceptive pills, Steroids etc.

The proposal of the study was submitted as per the protocol given by Institutional Scientific Review Committee and Ethics Committee. The approval & ethical clearance was sought prior to the study.
The respondents were given information about the study by using patient information sheet in their understandable language. If the respondent was illiterate, the sheet was read out to them. Written informed consent was taken from all respondents prior to including them in to the study
Data was collected using following data collection tools:

1. Predesigned pretested semi-structured interview schedule
2. Clinical examination
3. Anthropometric measurements by use of Electronic Weighing Scale, Measuring Tape (non-stretchable, calibrated)
4. Accucheck Glucometer
5. Sphygmomanometer- standardized and calibrated

A single interviewer collected data by conducting personal face-to face interview of the eligible women and completed the semi-structured interview schedule. A seven-day dietary recall was conducted to assess detailed dietary intake patterns. Also detailed physical activity assessment was done including daily chores and exercise if any. Clinical examination in the form of general & systemic health examination was conducted in the house of the respondent and any abnormality was noted.
Anthropometric measurements of weight [9], height [9], waist [9] and hip circumference [9] were taken along with blood pressure [9]. Also Random blood sugar (RBS) level was assessed with an Accucheck Glucometer [10].
In case the woman disagreed to participate in the study, or the household was locked, no re-visit was made; the adjacent household was approached. If any woman was found not meeting the eligibility criteria she was excluded from the study and again the adjacent household was approached. The sampling frame was treated like a circle [8] and sampling was continued till the expected sample size (n=500) was reached. Oral Health education was given to all 500 respondents regarding obesity, its health related implications, prevention and control.
BMI values were calculated for all 500 respondents interviewed using WHO Asian classification for BMI [5], and all those whose BMI was found to be ≥ 25 kg/m^2 were considered to be obese.
Data was collected and compiled using Microsoft Excel 2010 and then analysed using SPSS 20.0 version and Open Epi Software Version 2.3 by calculating frequency, percentage and cross-tabulations between various parameters. Chi square test was applied to test the significance of association wherever necessary. BMI values of Respondents were divided into two broad categories for analysis of data- those who were found to be obese (BMI $\geq$25.00) and those who were not obese (BMI <25.00). The non-obese category includes those who were underweight, in normal range as well as those who classified as overweight according to their BMI.

Results & Discussion

Table 1: Distribution of Respondents according to Socio-demographic profile

Factor	Frequency (N= 500)	Percentage (%)
Age Group		
20-29	138	27.6
30-39	159	31.8
40-49	108	21.6
50-59	50	10.0
60-69	35	7.0
>70	10	2.0
Religion		
Hindu	275	55.0
Muslim	204	40.8
Christian	21	4.2

Marital Status		
Unmarried	28	5.6
Currently Married	429	85.8
Widow	38	7.6
Divorced	5	1.0
Type of Family		
Nuclear	373	74.6
Extended	26	45.2
Joint	101	20.2

Table 1: Distribution of Respondents according to Socio-demographic profile continued

Factor	Frequency N= 500	Percentage (%)
Literacy Status		
Illiterate	255	51.0
Primary	120	24.0
Secondary	96	19.2
Higher Secondary	17	3.4
Graduate	9	1.8
Post Graduate	3	0.6
Occupation		
Home Manager	445	89.0
Semi Professional	6	1.2
Skilled	3	0.6
Semi-Skilled	12	2.4
Unskilled	30	6.0
Student	4	0.8
Type of work		
Sedentary	99	19.8
Moderate	401	80.2
Socio-economic Status (Modified B.G. Prasad Classification- 2013)		
Upper	10	2.0
Upper Middle	39	7.8
Middle	162	32.4
Lower Middle	256	51.2
Lower	33	6.6

Table 1: Distribution of Respondents according to Socio-demographic profile continued

Factor	Frequency N= 500	Percentage (%)
Parity		
0	57	11.4
1	48	9.6
2	124	24.8
3	140	28.0
4	85	17.0
5	39	7.8
6	4	0.8
7	3	0.6
BMI Categories (WHO Asian Classification)		
Underweight (<18.5)	47	9.4
Normal (18.5-22.9)	184	36.8
Overweight (23-24.9)	156	31.2
Obese I (25-29.9)	75	15.0
Obese II (≥30)	38	7.6
Total	**500**	**100**

Table 1 shows detailed frequency distribution of all 500 respondents according to various socio-demographic parameters. Only 15 respondents amongst the total (3%) had family history of Diabetes Mellitus or Hypertension or both in either or both parents. This finding was unlike the findings of Basagoudar S *et al* (2013) [11], who found that there was a statistically significant higher occurrence of overweight or obesity among the women respondents) in the present study; which is slightly higher than prevalence found by Benkeser R M *et al* (2012) [14] i.e. 78.9%.

with the family history compared to those not having the family history. The prevalence of obesity was found to be 22.6% from the present study. Anuradha R *et al* (2011) [12] found prevalence of obesity in women to be 19.8%, (also using WHO Asian classification) which is similar to the findings of the present study. Percentage prevalence of abdominal obesity according to Waist-Hip ratio (WHR) measurement[13] was found to be 65% (325

Table 2: Comparison of anthropometric and other measurements of respondents

Anthropometric Factor	Overall (N=500)	Non-Obese (N=387)	Obese (N=113)
	Mean ± SD	Mean ± SD	Mean ± SD
Weight (kg)	54.52 ± 10.56	50.34 ± 6.78	68.85 ± 8.38
Height (m)	1.52 ± 0.04	1.52 ± 0.04	1.52 ± 0.05
BMI (kg/m^2)	23.54 ± 4.39	21.72 ± 2.56	29.85 ± 3.81
Waist circumference (cm)	81.74 ± 13.59	77.68 ± 11.61	96.54 ± 14.95
Hip circumference (cm)	94.29 ± 13.92	90.24 ± 12.38	108.14 ± 9.22
Waist-Hip Ratio	0.87 ± 0.06	0.86 ± 0.06	0.89 ± 0.11
Systolic BP (mm Hg)	119.31 ± 14.98	117.40 ± 14.19	125.84 ± 15.85
Diastolic BP (mm Hg)	77.68 ± 9.12	76.69 ± 8.81	81.06 ± 9.39
RBS (mg/dl)	115.25 ± 53.84	105.23 ± 45.78	149.58 ± 64.47

Table 2 shows mean values of various anthropometric factors evaluated in the study. The overall Mean BMI of the respondents was 23.54 kg/m^2 (SD- 4.39 kg/m^2), which comes under the category of overweight according to the WHO classification of BMI for Asian population. Vadera B *et al* (2010) [15] found that the Mean BMI of their study population was 22.87kg/m^2 which was similar to findings of the present study. The mean Random blood sugar (RBS) level was 115.25 mg/dl amongst the general respondents (N=500). Amongst those who were obese the mean RBS was higher than the general population i.e. 149.58 mg/dl. In the present study, 86 women out of total (17.2%) were found to be Hypertensive. Similar to RBS, Mean Systolic and Diastolic BP was also higher among the obese respondents (Sys. BP = 125.84, Dias. BP = 81.06).

Only 42 respondents (8.4%) reported some or the other form of addiction, all of whom reported being addicted to Smokeless forms of tobacco. Similarly, Hasan I *et al* (2012) [16] also found that 10% female respondents of their study gave history of addiction to tobacco chewing.

Table 3: Association of Epidemiological Parameters and Obesity Status

Independent Variable	BMI Category				Total (N=500)	Chi square Value	P value
	Non-obese (N=387)		Obese (N=113)				
	Freq.	%	Freq.	%			
Age group (years)							
20-39	244	82.2%	53	17.8%	297	**10.32 (d.f-2)**	**0.005 Signif.**
40-59	109	68.9%	49	31.1%	158		
≥60	34	75.6%	11	24.4%	45		
Religion							
Hindu	209	76%	66	24%	275	**4.61 (d.f-2)**	**0.10 Not Signif.**
Muslim	165	80.9%	39	19.1%	204		
Christian	13	61.9%	8	38.1%	21		
Education							
Illiterate	199	78%	56	22%	255	**2.49 (d.f-2)**	**0.29 Not Signif.**
Primary & secondary	169	78.2%	47	21.8%	216		
Higher education	19	65.5%	10	34.5%	29		
Occupation							
Home manager	335	76.5%	103	23.5%	438	**1.69 (d.f-1)**	**0.19 Not Signif.**
Others	52	83.9%	10	16.1%	62		

Table 3: Association of Epidemiological Parameters and Obesity Status continued

Independent Variable	BMI Category				Total (N=500)	Chi square Value	P value
	Non-obese (N=387)		Obese (N=113)				
	Freq.	%	Freq.	%			
Type of work							
Sedentary	70	70.7%	29	29.3%	99	**3.16 (d.f-1)**	**0.08 Not Signif.**
Moderate	317	79.1%	84	20.9%	401		
Marital Status							
Currently married	335	78.1%	94	21.9%	429	**0.82 (d.f-1)**	**0.37 Not Signif.**
Others	52	73.2%	19	26.8%	71		
Type of Family							
Nuclear	290	77.7%	83	22.3%	373	**0.10 (d.f-1)**	**0.75 Not Signif.**
Others	97	76.4%	30	23.6%	127		
Parity							
≤2	186	81.2%	43	18.8%	229	**6.07 (d.f-2)**	**0.04 Signif.**
3-4	171	76%	54	24%	225		
≥5	30	65.2%	16	34.8%	46		
Socio-Economic Class (SES)							
I & II	33	67.4%	16	32.6%	49	**3.18 (d.f-2)**	**0.20 Not Signif.**

III	128	79%	34	21%	162		
IV & V	226	78.2%	63	21.7%	289		
Type of Diet							
Vegetarian	47	78.3%	13	21.7%	60	**0.03 (d.f-1)**	**0.85 Not Signif.**
Mixed	340	77.3%	100	22.7%	440		

Table 3: Association of Epidemiological Parameters and Obesity Status continued

Independent Variable	BMI Category				Total (N=500)	Chi square Value	P value
	Non-obese (N=387)		Obese (N=113)				
	Freq.	%	Freq.	%			
GLV Frequency							
≤2	21	63.6%	12	36.4%	33	**3.84 (d.f-1)**	**0.05 Signif.**
>2	366	78.4%	101	21.6%	467		
Frequency of Eating Meat per week							
≤2	227	75.4%	74	24.6%	301	**1.70 (d.f-1)**	**0.19Not Signif.**
>2	160	80.4%	39	19.6%	199		
Frequency of Eating Fruits per week							
≤2	316	79.2%	83	20.8%	399	**3.65 (d.f-1)**	**0.06 Not Signif.**
>2	71	70.3%	30	29.7%	101		
Frequency of Eating Fried Foods At Home							
≤2	346	81%	81	19%	427	**22.04 (d.f-1)**	**<0.001 Signif.**
>2	41	56.2%	32	43.8%	73		
Junk Foods Outside							
≤2	371	77.6%	107	22.4%	478	**0.28 (d.f-1)**	**0.59 Not Signif.**
>2	16	72.7%	6	27.3%	22		
Amount of Oil used per person per day (ml)							
≤30	310	79.5%	80	20.5%	390	**4.42 (d.f-1)**	**0.03 Signif.**
>30	77	70%	33	30%	110		

Table 3: Association of Epidemiological Parameters and Obesity Status continued

Independent Variable	BMI Category				Total (N=500)	Chi square Value	P value
	Non-obese (N=387)		Obese (N=113)				
	Freq.	%	Freq.	%			
Total Duration of Sleep							
<7	79	79%	21	21%	100	**7.89 (d.f-2)**	**0.019 Signif.**
7-8	244	80.3%	60	19.7%	304		
>8	64	66.7%	32	33.3%	96		
Sedentary Activities							
<6	304	78.6%	83	21.4%	387	**1.30 (d.f-1)**	**0.25 Not Signif.**
≥6	83	73.5%	30	26.5%	113		

Table 3 shows association between various epidemiological factors observed in the present study and the BMI categories the respondents belonged to. Vadera B *et al* (2010) [15] also found prevalence of obesity increased with rise in age till 50 years, after which it declined (p<0.001); similar to the present study. Gupta S et al (2012) [17] also found significant positive correlations between parity number and various obesity markers in their study. Also, comparable to the findings of the present study, Anuradha R et al (2011) [12] found no statistical association between religion, occupation, type of family and marital status with obesity. However, unlike in the present study where no statistical association was found, Anuradha R *et al* (2011) [12] found highly significant association between education as well socio-economic status and obesity (p <0.001).

Findings of dietary pattern varied in the present study and other literature reviewed. Jayamani V et al (2013) [18] found that the odds of women who took higher calorie diet (whether urban or rural) being overweight or obese was five times more than women who had low calorie diet. Anuradha R et al (2011) [12] found no association between frequency of green leafy vegetable (GLV) consumption, fruit consumption and obesity. Basagoudar S et al (2013) [11] found statistically significant higher occurrence of overweight or obesity among women who had the habit of eating junk foods or snacks in between the meals regularly. Some findings of the present study were comparable to other study findings like no statistical association between type of diet and obesity (Anuradha R et al (2011) [12]); significant association between frequency of eating fried foods at home and obesity (Tiwari R *et al* (2009) [19]); significant association between amount of oil used per person per day (Vadera B et al (2010) [15]); no statistically significantly differences for meat and occurrence of obesity (Andreou E et al (2012) [20]).

In the present study, total duration of sleep taken in the day (which included night sleep as well as any time spent sleeping in the day) was compared with obesity status and the difference was found to be statistically significant (Chi Square value= 7.89, p value= 0.019) comparable to Anuradha R *et al* (2011) [12] (p=0.006). According to the WHO guideline of regular exercise, only 22 respondents (4.4%) were found to be exercising regularly. Out of these 22 respondents, 13 (59.1%) were found to be obese and the

rest 9 (40.9%) were not obese. However, whether they had started exercising after they realized they were gaining weight or as a regular habit was not assessed in the current study. Hence, no association was assessed between obesity and exercising habits.

The current study showed that 30.1% obese respondents had RBS levels ≥200 mg/dl. So, being obese was significantly associated with the risk of having a deranged blood sugar level (p value= <0.001). Deshmukh P R *et al* (2013) [21] analysed fasting blood glucose levels in their study subjects (present study estimated random samples blood glucose). They found that fasting blood glucose level was impaired in 10.7% women in their study.

The percentage prevalence of Hypertension amongst obese women in the present study was 27.4%. This difference was found to be statistically significant (Chi Square value= 10.74, p value= 0.001) similar to the findings of Raina D J *et al* (2009) [22] (p=<0.001).

Conclusions

The present cross-sectional study conducted on women greater than 20 years found significant association between factors like age, parity, frequency of GLV and fried food consumption, duration of sleep etc. with tendency of being obese. Also, all anthropometric parameters were higher among the obese respondents. No statistical association was found between other socio-demographic parameters, type of diet, amount of calories consumed and frequency of meat and other junk food consumption and obesity. Significantly higher number of obese women had RBS levels ≥200 mg/dl and many were Hypertensive. Results of the study strongly suggest that Obesity is associated with numerous factors and their interplay in various combinations rather than a single cause. This predisposes adult women residing in adverse environmental conditions of slums to harmful weight gain. Obesity needs to be curbed at its roots. Measures should be deployed at its various trigger points at the individual and community level to help contain this fast growing epidemic. This cannot be achieved without inter-sectoral co-ordination and active participation of both health professionals and community members.

More detailed community based studies are required & recommended to understand the role of parity; their childhood dietary habits and physical activity patterns; whether they had been exclusively breastfed as children; and whether they have exclusively breast fed their child/children; and its association with obesity. Also, need for community awareness campaigns and programmes regarding ill-effects of obesity and its impact on health.

This study is also not devoid of limitations. No information about childhood factors of the respondents like birth weight, exclusive breast feeding in their childhood, history of childhood obesity etc. were obtained in the study. Psychological factors like body image perception, depression etc. associated with obesity were not considered in the present study. Details of whether she had exclusively breast fed her child/children was not obtained

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