International Journal of Community Medicine and Public Health
Undavalli VK et al. Int J Community Med Public Health. 2018 Apr;5(4):1311-1316
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20180984

Original Research Article

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

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Received: 19 February 2018
Revised: 06 March 2018
Accepted: 07 March 2018

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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/m^2. 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-INDIAB 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).[4] As it was evident based on 33 cohort studies carried out within the Asia-Pacific region found that that adult BMIs of >21 kg/m^2 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.[5] 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.[6] 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[7]

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

Systematic random sampling[8]

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= Number of units in population/Number of sample units required.

= 4579/309
= 14.81 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 2^{nd}, 17^{th}, 34^{th} ……..till 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[3,9]

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 weight (kg)/height (m^2)

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

Definitions[3,9]

Overweight was defined as a BMI ≥23 kg/m but <25 kg/m^2 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/m^2 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/m^2 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/m^2.

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 squaretest 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.

Table 1: Generalized obesity based on BMI.

Variable	Categories	BMI				Chi-square value	P value
		<25 non obese		≥25 generalized obesity			
		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				Chi-square 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				Chi-square 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				Chi-square 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.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Undavalli VK, Ponnaganti SC, Narni H. Prevalence of generalized and abdominal obesity: India's big problem. Int J Community Med Public Health 2018;5:1311-6.