Original Article

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Community Section

The Waist Circumference Measurement: A Simple Method for Assessing the Abdominal Obesity

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ABSTRACT

Introduction: Excess abdominal fat is an independent predictor of the risk factors and the morbidity of obesity related diseases such as type 2 diabetes, hypertension, dyslipidaemia and cardiovascular diseases. The Waist Circumference (WC) is positively correlated with the abdominal fat. Hence, the waist circumference is a valuable, convenient and a simple measurement method which can be used for identifying the individuals who are at an increased risk for the above mentioned diseases.

Objectives:

1. To assess the abdominal obesity by measuring the waist circumference among the women who were aged 20 years and above in an urban slum of Chennai, India.
2. To identify the socio -demographic factors which were associated with the abdominal obesity in the above study population.

Settings and Design: A community based and a cross sectional study was carried out in an urban slum of Chennai, India.

Methods and Materials: The present study was undertaken in an urban slum of Chennai city, among the women who were aged 20 years and above. One slum was selected randomly and the households in the slum were sampled by a systematic random sampling method. A pre-designed and a pre-tested questionnaire was used to collect the information regarding the socio-demographic profile of the women. Their waist circumference was measured by using a flexible inch tape. As per the World Health Organization (WHO), the International Obesity Task Force (IOTF) and the International Association for the Study of Obesity (IASO)(2000), the following cut off values for the waist circumference were used to assess the abdominal obesity for women: WC<80cms – normal and WC ≥ 80cms-abdominal obesity.

Statistical Analysis: It was done by using the Statistical Package For Social Science (SPSS), version 11.5. The prevalence was expressed in percentage and the Chi square test was used to find its association with the factors.

Results: In the study population, the prevalence of abdominal obesity (WC ≥ 80 cms) was 29.8% (95% Confidence Interval [CI] 25.9–34 %). A significant association was found between the age, religion, a higher socio-economic status and the abdominal obesity. No significant association was noted between the educational status, occupation, marital status, type of family and the abdominal obesity.

Conclusion: Abdominal obesity among the urban slum women is on the rise. The abdominal obesity was found to be significantly higher among the slum women with increasing age and in those who belonged to the muslim religion and to a higher socio-economic status.

Key Words: Waist circumference, Abdominal Obesity, Slum women

INTRODUCTION

Excess abdominal fat is an independent predictor of the risk factors and the morbidity of obesity related diseases such as type 2 diabetes, hypertension, dyslipidaemia and cardiovascular diseases. The Waist Circumference (WC) is positively correlated with the abdominal fat. Hence, the waist circumference is a valuable, convenient and a simple measurement method which can be used for identifying the individuals who are at an increased risk for the above mentioned diseases. The evidence to date indicates that the Asian populations have higher body fat for the same Body Mass Index (BMI) values as compared to those in the Caucasian populations. It is the level of the body fat, which is measured by the waist circumference, that is associated with the higher health risks for Non-Communicable Diseases (NCD) in the Asian populations [1,2].

The standard World Health Organization (WHO) recommendations for the body mass index , the waist circumference and the Waist Hip Ratio (WHR) cut-offs for detecting the subjects who are at risk, are based on the Caucasian population, and they may not be accurate for the Asians who have more abdominal fat and morbidity for the same BMI [3,4,5].

The recent WHO monograph on obesity has recommended even lower cut-offs for the BMI and the waist circumference in Asians. The use of Asian cut-offs is therefore recommended for the public health action, especially for defining the at-risk groups and for programs which are aimed at preventing overweight/obesity.

MATERIALS AND METHODS

The present study was undertaken in an urban slum in Chennai city, among women who were aged 20 years and above, from June 2009 to August 2009. Ethical clearance was obtained from Madras Medical College, Chennai, India. From among the 10 zones of Chennai, Zone V was randomly chosen by a lottery method. There were 66 slums in Zone V, from which one slum was randomly chosen by the lottery method. The sample size of 520 was calculated on the basis of the 15.6% prevalence rate of obesity

among the urban slum women in North India [6].The selected slum had a total population of 9089. The total number of women who were aged 20 years and above was 3125 and the total number of house holds in the selected slum was 1958 (source – an updated family register of the selected slum). Antenatal women were excluded from the study. In order to select the 520 women who were aged 20 years and above, the number of households which had to be surveyed in the selected slum was =1958 x 520 /3125 = 326 .The households were sampled by a systematic random sampling method. The sample interval was calculated as the total number of households in the selected slum, divided by the number of households to be surveyed in the selected slum i.e., 1958/326 = 6. The houses in the selected slum were numbered. The first sample household was selected randomly by choosing a number (by a lottery method) within the sample interval. The next household was identified by adding the sampling interval with the first randomly chosen number. In the present study, the first randomly chosen number was 4 and the first household which was to be surveyed was house no 4. The second household was 4+6=10 i.e., the 10th household. The subsequent households were selected by same method till the expected sample size was reached.

Informed consent was obtained from the study subjects. The information regarding the socio-demographic profile like age, education, occupation, socio-economic status, religion, marital status and the type of family were collected by using a questionnaire. The waist circumference was measured at the midpoint between the lower border of the rib cage and the iliac crest by using a flexible inch tape. As per the WHO/IASO/IOTF (2000) [7] the following cut off values of the waist circumference were used to assess the **abdominal obesity for women:** WC < 80cms – normal and WC ≥ 80 cms- abdominal obesity.

The socio-economic status was determined by using the Modified Kuppusamy Classification Scale [8]. The data entry was made in the Excel software in codes and the analysis was done by using the Statistical Package for Social Science (SPSS), version 11.5. The prevalence was expressed in percentage and the Chi square test was used to find its association with the factors.

RESULTS

In the study population, the prevalence of the abdominal obesity (WC ≥ 80cm) was 29.8% (95% confidence interval [CI] 25.9 %–34%) [Table/Fig-1] .

41.6% women who belonged to the age group of 40 to 49 years had abdominal obesity. A significant association was noted between the increasing age and the abdominal obesity (p=0.013) [Table/Fig-2]. The prevalence of the abdominal obesity was higher among those with a higher educational status, but it was found to be statistically insignificant (p>0.05) [Table/Fig-3]. As the socio-economic status increased, the prevalence of the abdominal obesity also increased and the difference was found to be statistically highly significant (p<0.001) [Table/Fig-4]. No significant association was noted between the abdominal obesity and the factors like occupation, marital status and the type of family [Table/Fig-5]. 88.9% of the

Waist circumference	Number of individual	Percentage (%)
< 80cm	365	70.2%
≥ 80cm	155	29.8%
Total	520	100.0%

[Table/Fig-1]: Prevalence of Abdominal Obesity

Age group	Waist circumference (cms)		Trend chi-square	p value
	< 80 n (%)	≥80 n (%)		
20-29 years	212 (77.7%)	61 (22.3%)	6.044	0.013
30-39 years	62 (60.2%)	41 (39.8%)		
40-49 years	52 (58.4%)	37 (41.6%)		
50-59 years	23 (69.7%)	10 (30.3%)		
60 years and above	16 (72.7%)	6 (27.3%)		
TOTAL	365 (70.2)	155 (29.8)		

[Table/Fig-2]: Age and Abdominal Obesity

Education	Waist Circumference (Cms)		Trend chi-square	p value
	<80 n(%)	≥ 80 n(%)		
Illiterate	86 (69.9%)	37 (30.1%)	0.819	0.365
Primary School	73 (75.3%)	24 (24.7%)		
Middle School	80 (62.5%)	48 (37.5%)		
High School	105 (82.7%)	22 (17.3%)		
Higher Secondary	13 (44.8%)	16 (55.2%)		
Graduate	8 (50.0%)	8 (50.0%)		
TOTAL	365 (70.2%)	155 (29.8%)		

[Table/Fig-3]: Education and Abdominal Obesity

Socio Economic Status	Waist Circumference (Cms)		Trend Chi-Square	p value
	< 80 n (%)	≥ 80 n (%)		
Upper Middle	3 (42.9%)	4 (57.1%)	16.07	<0.001
Lower Middle	77 (58.3%)	55 (41.7%)		
Upper Lower	277 (74.5%)	95 (25.5%)		
Lower	8 (88.9%)	1 (11.1%)		
TOTAL	365 (70.2%)	155 (29.8%)		

[Table/Fig-4]: Socio-economic Status and Abdominal Obesity

Variable	Waist circumference (Cms)		Chi-square	p value
	< 80 n(%)	≥ 80 n(%)		
Occupation				
Unskilled worker	89 (75.4%)	29 (25.6%)	7.062	0.132
Semiskilled worker	17 (70.8%)	7 (29.2%)		
Skilled worker	13 (52%)	12 (48%)		
Homemaker	242 (70.1%)	103 (29.9%)		
Retired/old age dependant	4 (50%)	4 (50%)		
Religion				
Hindu	326 (71%)	133(29%)	15.37	<0.001
Muslim	1 (11.1%)	8(88.9%)		
Christian	38(73.1%)	14(26.9%)		
Marital status				
Married	297(68.6%)	136(31.4%)	3.290	0.193
Unmarried	32 (80%)	8(20%)		
Widow/ separated	36 (76.6%)	11 (23.4%)		
Family type				
Nuclear	282(68%)	133 (32%)	4.986	0.082
Joint	78(78.8%)	21(21.2%)		
Living alone	5(83.3%)	1(16.7%)		

[Table/Fig-5]: Occupation, Religion, Marital Status, Family Type and Abdominal Obesity

muslim women had abdominal obesity and it was found to be statistically highly significant (p<0.001) [Table/Fig-5].

DISCUSSION

This study was carried out in an urban slum of Chennai, India to find out the prevalence of abdominal obesity among women who were aged 20 years and above. The prevalence of the abdominal obesity was 29.8% (95% confidence interval [CI] 25.9%–34%). Gupta et al., reported the prevalence of the abdominal obesity in Rajasthan to be 33.2% during 2001 [9], which was found to increase to 45% during 2003 [10] among adults. A study from Chennai reported a high prevalence of abdominal obesity (31%) among adults during 1995 [11]. The South Indian populations from Bangalore in Karnataka, Trivandrum in Kerala and Coimbatore in Tamil Nadu had prevalences of 45%, 32% and 41% respectively.

41.6% women who belonged to the age group of 40 to 49 years had abdominal obesity. A significant association was noted between the increasing age and the abdominal obesity (P=0.013). Similarly, Gupta et al., observed an age-associated increase in the waist size, waist: hip ratio, systolic blood pressure, fasting and total cholesterol, non-HDL cholesterol and the triglycerides in women (p trend <0.01) [12].

The prevalence of the abdominal obesity was higher among those with a higher educational status, but it was found to be statistically insignificant (p>0.05). In Korea, women showed significantly decreased odds for the abdominal obesity, with higher education [13]. A negative association was observed between education and the abdominal obesity among Iranian women [14].

No significant association was found between the abdominal obesity and the factors like occupation, marital status and the type of family. A highly significant association was noted between religion and the abdominal obesity.

As the socio-economic status increased, the prevalence of the abdominal obesity also increased and the difference was found to be statistically highly significant (p <0.001)). Misra et al., reported a prevalence of 17% among the adults who belonged to the lower socio economic groups in Delhi [15]. The socio-economic status was positively associated with adiposity in urban Cameroon [16]. A significant interaction was noted with sex, in the association between the central obesity and the socioeconomic status, where a statistically significant inverse relationship was seen in females only, with a non-significant positive relationship among males [17].

CONCLUSION

Abdominal obesity among the urban slum women is on the rise. The abdominal obesity was found to be significantly higher among the slum women with increasing age and in those who belonged to the muslim religion and a higher socio-economic status. The waist circumference remains a simple and a valid marker of the abdominal and the visceral fat. It is the level of the body fat, which is measured by the waist circumference, that is associated with the higher health risks for non-communicable diseases in the Asian populations. As measuring the serum lipids routinely in all the subjects is expensive, the waist circumference can be used as a mass screening measure for detecting the subjects who are at risk for developing dyslipidaemia. Thus, the waist circumference provides a highly feasible and an inexpensive method for monitoring body fat distribution and for identifying the individuals who are at a greater risk of the disease in a variety of settings.

KEY MESSAGES

1. Abdominal obesity among the urban slum women is on the rise.
2. The waist circumference measurement is a simple and a convenient method for assessing the abdominal obesity.
3. The waist circumference measurement is useful for identifying the individuals who are at an increased risk for metabolic complications.

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