Original Article

The Prevalence of Obesity and Hypertension in Urban Tamilnadu

Community Section

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ABSTRACT

Background: Obesity and hypertension are undesirable outcomes of changing lifestyles and behaviours especially in traditional societies in many developing countries which have experienced rapid and unplanned urbanization.

Objective: To know the prevalence of obesity and hypertension in an urban adult population of Salem, Tamilnadu.

Materials and Methods: An observational cross-sectional study in the Salem town of Tamilnadu was carried out by using a predesigned and a pretested schedule. 10 hospitals of the Salem town were selected randomly, after making a list of all the hospitals. Every 10th adult patient was selected in the hospital OPD clinic, till the number reached 30 during a 2 week duration. Consent was taken before the study. 263 respondents (94 females and 169 males) were selected for the analysis out of 300 adults. The Epi Info software was used for the analysis. The Chi-square test, t test and the Pearson's correlation tests were used for studying the significance.

Results: The age range was 18 to 85 years; the majority (79.8%) was above 35 years of age. The waist circumference (WC) was positively correlated with the body mass index (BMI) and the systolic blood pressure. Females had a significantly higher BMI value than the males. Based on the internationally recommended BMI cut-off points, 44.9% respondents were found to be pre-obese and 19.0% were obese. The estimated risk for the females to have an increased metabolic risk was 9.4 times that of the males. 60.8% persons had abdominal fat accumulation, based on the waist to hip ratio. 43.3% persons were hypertensive. A significantly higher proportion of males were severely hypertensive than the females.

Conclusion: The females were at an increased risk of obesity, but the males were at increased risk of hypertension. Age was found to be a stronger risk factor for obesity and hypertension.

Key Words: Obesity, Hypertension, Body Mass Index, Waist Circumference, Waist to Hip Ratio

INTRODUCTION

Like many developing countries, India today faces the dual burden of the diseases caused by poverty as well as the diseases caused by affluence. Urbanization and the adaptation of the westernized life style is one of the reasons [1] for a rapid epidemiological transition. There is an increase in women's employment due to economic pressure. The gainful employment of women which ensures an increase in the income, may lead to better nutrition for themselves [2,3]. Improved health facilities, increase in the income, availability of food and decrease in physical activity have contributed to this epidemic form of overweight and obesity, especially in the urban areas of the developed and the developing countries [4]. With the rapid urbanization in recent years, there has been a boom in the consumption of fast foods in India which are the causes of obesity [5]. The first adverse effects of obesity to emerge in the population in transition are hypertension hyperlipidaemia and glucose intolerance, while coronary heart diseases and the long term complications of diabetes, such as renal failure, begin to emerge several years later [6].

This study was a small effort to assess the obesity and hypertension in the urban population of Salem, one of the important towns of Tamilnadu, India.

MATERIALS AND METHODS

An observational cross-sectional study in the Salem town of Tamilnadu was carried out by using a predesigned and a pretested schedule. 10 hospitals of the Salem town were selected randomly, after making a list of all the hospitals. Every 10th adult patient was selected in the hospital OPD clinic till the number reached 30, during a 2 week duration. Consent was taken before the study. 263 respondents (94 females and 169 males) were selected for the analysis out of 300 adults.

A predesigned and a pretested schedule was used for obtaining the information, after taking the consent. The socio-demographic information as well as the information about the habits and addiction was collected. After the interview, blood pressure readings and anthropometric measurements (height, weight, waist circumference and hip circumference) were taken.

As recommended by a WHO Study Group [7], the blood pressure readings were taken from the right arm of all the patients in a sitting position. The Korotkoff sounds phase I (the pressure at which the sounds were first heard) were taken as the Systolic Pressure (SBP) and the phase IV sounds (the pressure at which the sounds were first muffled and then disappeared) were taken as the Diastolic Pressure (DBP). Based on the blood pressure measurements, the persons were classified[8] as Normal (SBP <130 mm Hg and DBP <85 mm Hg), High Normal (SBP = 130-139 mmHg or DBP = 85-89 mm Hg), Hypertension (HT) Stage I (mild HT with SBP = 140-159 mmHg or DBP = 90- 99mmHg), HT Stage II (moderate HT with SBP = 160-179 mmHg or DBP = 100-109 mmHg), HT Stage III (severe HT with SBP≥180 mm Hg or DBP ≥110mmHg).

The waist circumference (WC) was measured in centimetres at the midpoint between the lower border of the rib cage and the iliac crest. The hip circumference (HC) was measured in centimetres at the widest part below the iliac crest. Height was measured in centimetres by using a height measuring scale and weight was measured in kilograms by using a weighing machine.

The body mass index (BMI) and the waist to hip ratio (WHR) were calculated. Based on the WHO classification of overweight and obesity[9], the persons were classified as Normal (BMI = 18.5-24.99), Pre-obese (BMI = 25-29.99) and Obese (BMI ≥30). Fat accumulation was considered if the WHR was >0.85 for females and >1 for males[10].

The persons were grouped according to the WC as No Risk (WC < 88 cm for females and < 102 cm for males) and Increased Metabolic Risk (WC ≥ 88 cm for females and WC ≥ 102 cm for males) [11].

The analysis was done with the help of the Epi Info software. Descriptive statistics, Pearson's correlation, the Chi-square test, the odds ratio, the comparison of means (t-test) and the comparison of proportions (z-tests) were used as and when required, to find the significance. p values which were ≤ 0.05 were taken as the critical level of significance. 263 completely filled schedules were analyzed.

RESULTS

Out of 263 respondents, 35.7% were females and 64.3% were males. The age range was 18 to 85 years most of the persons (79.8%) were above 35 years of age.

With the Pearson's correlation tests, age showed a significant positive correlation with WC ($p < 0.01$), HC ($p < 0.05$), SBP ($p < 0.001$) and DBP ($p < 0.01$). WC was positively and significantly correlated with HC ($p < 0.001$), Weight ($p < 0.001$), BMI ($p < 0.001$) and SBP ($p < 0.05$). Height had a significant positive correlation with WC ($p < 0.01$) and weight ($p < 0.001$).

The mean and standard deviations for the different variables are shown in [Table/Fig-1] .Females had a significantly higher BMI value than the males ($p < 0.01$).

A total of 155 (58.94%) patients were hypertensive or pre-hypertensive (having high normal blood pressure). Out of these, 63.2% were males and 36.8% were females. Males (12.4%) were significantly higher in proportion (z value: 2.2; p = 0.03) than the females (4.3%) among 25 (9.5% of 263) severe hypertensive patients [Table/Fig-2].

A significantly larger number of females had an increased metabolic risk than the males ($p < 0.001$) [Table/Fig-3]. The estimated risk for the females to have an increased metabolic risk was 9.4 times (odds ratio = 9.4; 95% confidence limit = 5.14-17.17) as compared to the males.

A significantly ($p< 0.001$) higher proportion of females (91.5%) had abdominal fat accumulation than the males (43.8%) [Table/Fig-3]. For the females, the estimated chance to have abdominal fat accumulation was 13.8 times (odds ratio = 13.8; 95% confidence limit = 6.30-30.23) as compared to the males.

63.9% of the subjects were found to be overweight (obese or pre-obese) and 19.0% were obese. The females (28.7%) were significantly higher in proportion (z value: 2.99; p = 0.0028) than the males (13.6%) among the obese persons [Table/Fig-3].

No female had substance abuse (alcohol and tobacco). Out of the 169 males, 9.5% were using tobacco alone, 17.7% were using alcohol alone and 26% were found to be using both tobacco and alcohol. As compared to these four groups of males (no substance abuse, only smoking, only alcohol, both), a significant proportion ($p < 0.05$) of females was found to have metabolic risk and abdominal fat accumulation.

Variables	Female (n=94) Mean (SD)	Male (n=169) Mean (SD)	Total (n=263) Mean (SD)	Significance level (t test)
Age (year)	47.9 (11.7)	46.5 (13.1)	47.0 (12.6)	NS
WC (cm)	95.4 (10.8)	97.2 (9.2)	96.6 (9.8)	NS
WHR	0.98 (0.1)	1.00 (0.1)	0.99 (0.1)	NS
BMI (kg/m2)	27.4 (5.1)	25.9 (3.9)	26.4 (4.4)	p = 0.007*
SBP (mmHg)	132.8 (19.7)	133.6(20.4)	133.3 (20.1)	NS
DBP (mmHg)	82.6 (10.9)	84.0 (11.5)	83.5 (11.3)	NS

[Table/Fig-1]: Mean and standard deviation of variables
NS =Non significant *Highly significant

Hypertension (HT) Status	Gender		
	Female (n=94) Count (%)	Male (n=169) Count (%)	Total (n=263) Count (%)
Normal BP	37 (39.4%)	71 (42.0%)	108 (41.1%)
High Normal BP	15 (15.9%)	26 (15.4%)	41 (15.6%)
HT stage I (Mild)	24 (25.5%)	35 (20.7%)	59 (22.4%)
HT stage II (Moderate)	14 (14.9%)	16 (9.5%)	30 (11.4%)
HT stage III (Severe)	04 (4.3%)	21 (12.4%)	25 (9.5%)

[Table/Fig-2]: Hypertension status in study subjects
Chi-Square Test: $\chi 2 = 6.54$, p = 0.16; Not Significant

Indicators of obesity		Gender Female (n=94)	Male (n=169)	Total (n=263)	Chi-Square Test
WC	No Risk	19 (20.2%)	119 (70.4%)	138 (52.5%)	$\chi 2 = 61.04$, p = 0.000*
	Increased Metabolic Risk	75 (79.8%)	50 (29.6%)	125 (47.5%)	
WHR	No Fat Accumulation	8 (8.5%)	95 (56.2%)	103 (39.2%)	$\chi 2 = 57.69$, p = 0.000*
	Abdominal Fat Accumulation	86 (91.5%)	74 (43.8%)	160 (60.8%)	
BMI	Normal	28 (29.8%)	67 (39.6%)	95 (36.1%)	$\chi 2 = 9.25$, p = 0.009*
	Pre-Obese	39 (41.5%)	79 (46.8%)	118 (44.9%)	
	Obese	27 (28.7%)	23 (13.6%)	50 (19.0%)	

[Table/Fig-3]: Obesity Indiactors in study subjects
*Highly significant

DISCUSSION

In the present study, 300 subjects were interviewed and 263 (94 females and 169 males) were analyzed. Based on the BMI cut-off points,70.2% females and 60.4% males were found to be overweight (obese or pre-obese), whereas in a National Family Health Survey (NFHS-3) [12], it was found that 15.9% males and 23.5% females were overweight. A study from south India[13]

showed that the prevalence of overweight was 22.3% among the males and 35.4% among the females.

In a study on the urban areas of Haryana, Tamilnadu, Assam, Maharashtra, Kerala and Delhi [14], 30.9% males and 38.7% females were found to be overweight. In all the studies, a significantly larger number of females were found to be obese than the males which is similar to the findings of the present study.

A study by Azadbakht L et al [15] showed consistent results with the present study, that obesity based on the BMI parameters and central obesity based on the WHR parameters were higher in women than in the men (67% women vs. 29% men for obesity and 93% women vs. 74.1% men for central obesity). But in a study on the urban Asian Indian population in Chennai [16], the prevalence of generalized obesity (based on BMI) was 45.9% (women: 47.4%; men: 43.2%, not significant), while that of abdominal obesity (based on WC) was 46.6% (women: 56.2%; men: 35.1%, significant difference). In another study by Hajian-Tilaki KO and Heidari B [17], the prevalence rates of obesity and overweight (based on BMI) were 18.8% and 34.8% respectively. The prevalence rate of central obesity (based on WC) was 28.3%. In both the genders, particularly in the women, the rate of obesity was increased by the increasing age. In the present study also, the WC (central obesity) was well correlated with age.

Waist circumference was a better anthropometric measurement than BMI to predict metabolic morbidities, at least in the older, aged people, as WC was better correlated with SBP, weight and age in the present study. BMI was not well correlated with age and blood pressure. This finding is consistent with the observation of Mohan and Deepa [18], that abdominal adiposity which was assessed by using waist circumference was considered to be more appropriate to predict metabolic disorders than the generalized adiposity which was assessed by BMI.

Hypertension was present in 25% of the urban population of India, in a study by Gupta R [19]. Mehta NJ [20] found that hypertension was 19.1% in the elderly population. But in the present study, 43.3% persons were hypertensive, which was much higher than that which was found in other studies. Ghose et al [21] found an association of body fat and fat distribution with blood pressure, as was found in this study. The WC was found to be positively and significantly correlated with SBP.

More females were at increased metabolic risk and having abdominal fat accumulation than the males, even though the males had substance abuse. But severe hypertension was seen more commonly in the males. Increasing age was a strong risk factor for the development of obesity and hypertension. The present study showed a higher prevalence of obesity and hypertension than that which was found in other urban areas of the country. Whether it is real or whether it is caused because of the differences in sample size and study design needs to be explored further, by undertaking more studies which cover a larger population.

REFERENCES

[1] Drewnowski A, Popkin BM. The nutrition transition: New trends in global diet. *Nutri Review*. 1997; 55: 31-43
[2] D'Souza S, Bhvjza AL. Socio-economic mortality differentials in a rural area of Bangladesh population. *Development Rev*. 1982; 8: 753-759.
[3] Gulati L. Profile of female agricultural labourer. *Eco Pol Weekly*. 1982; 13(12): A27- A36.
[4] Vijayalakshmi P, Parimala R, Brindadevi. Effect of siddha medicine on weight reduction among the selected obese women. *Ind J NutrDietet.* 2005; 42: 442-450.
[5] Kumar S, Mahabalaraju DK, Anoroopa MS. *Prevalence of Obesity and its influencing factor among affluent school Children of Davangere city*. *IndJr Com Med*. 2007; 32(1): 1-5.
[6] WHO. International Agency for Research on Cancer. *IARC Handbooks of Cancer Prevention – Weight Control and Physical Activity*. IARC Press, Lyon. 2002;567.
[7] WHO. *Bull WHO*, 61 (1) 53. 1983;778-887.
[8] WHO. Techn. Rep. Ser., N0. 862. 1996;245-265.
[9] Aykroyd, W.R. and J.Mayer. Food and Nutrition Terminology. In : *WHO Doc NUT/68.6*, Geneva. 1968;667.
[10] Park K. Park's *Textbook of Preventive and Social Medicine*, 20th Edition. Jabalpur, M/s Banarsidas Bhanot. 2009. 348.
[11] Oliver, M.F. Br. Med. Bull. 1981. 37 (1) 49.
[12] International Institute for Population Science (IIPS), ORC Macro. *National Family Health Survey* (NFHS-3), 2005-06: India. 2007; 190-230.
[13] Ramachandra A, Snehalatha C, Vijay V. Temporal changes in prevalence of type 2 diabetes and impaired glucose tolerance in urban southern India. *Diabetes Research and Clinical Practice*, Elsevier. 2002; vol. 58:55-60.
[14] Development of sentinel health monitoring centers for surveillance of risk factors of noncommunicable diseases in India. 2004;587.
[15] Azadbakht L, Mirmiran P, Shiva N, Azizi F. General obesity and central adiposity in a representative sample of Tehranian adults: prevalence and determinants. *Int J VitamNutr Res*. 2005 Jul;75(4):297-304.
[16] Deepa M, Farooq S, Deepa R, Manjula D, Mohan V. Prevalence and significance of generalized and central body obesity in an urban Asian Indian population in Chennai, India. *Eur J ClinNutr*. 2009 Feb; 63(2):259-67.
[17] Hajian-Tilaki KO, Heidari B. Prevalence of obesity, central obesity and the associated factors in urban population aged 20-70 years, in the north of Iran: a population-based study and regression approach. *Obes Rev*. 2007 Jan;8(1):3-10.
[18] Mohan V, Deepa R. Obesity and Abdominal Obesity in Asian Indians. *Indian J Med Res*. 2006; 123: 593-596.
[19] Gupta R: Recent trends in hypertension epidemiology in India. *South Asian J PrevCardiol*. 2003; 7: 90-100.
[20] Mehta N.J.: Motivating successful aging: an experiment in Mumbai. *Current advances in Atherosclerosis Research*. 2003; 5: 253-263.
[21] Ghose et al: Comparison of anthropometric characteristics between normotensive and hypertensive individuals among a population of Bengalee Hindu elderly men in Calcutta, *Ind J Royal Soc Health* 2000; 120:100-106.

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