PREVALENCE OF HYPERTENSION AMONG OBESE AND NON-OBESE PATIENTS WITH CORONARY ARTERY DISEASE

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Background: Globally, obesity is now recognised as an epidemic. The degree of obesity is proportional to the rate of development of cardiovascular diseases, hence, resulting in a dramatic increase in morbidity and mortality. Apart from obesity, hypertension is another well recognised risk factor contributing to coronary artery disease (CAD). The precise prevalence of obesity-related hypertension varies with age, race and gender; and is yet unknown in our population. The objective of this study was to determine the prevalence of hypertension in obese and non-obese patients with diagnosed CAD. **Methods:** This hospital based descriptive study was conducted in Cardiology Department of Postgraduate Medical Institute, Lady Reading Hospital, Peshawar from 15th March 2007 to 30th May 2008. A total of 200 patients with diagnosed CAD were enrolled, 100 were found obese and 100 non-obese. **Results:** Among these, a total of 111 (55.5%) were found to be hypertensive, 66 (59.46%) of these were obese and 45 (40.54%) non-obese (p=0.003). **Conclusion**: Obese patients with CAD had significantly more frequent hypertension.

Keywords: Coronary Artery Disease, CAD, Body Mass Index, BMI, Obesity, Hypertension

INTRODUCTION

Hypertension, diabetes mellitus, hyperlipidemia, smoking and positive family history are established risk factors for coronary artery disease (CAD). The prevalence of these risk factors is more in obese patients with CAD as compared to non-obese patients.[1–4] Body weight and prevalence of obesity and its complications are rising so rapidly in many countries of the world, that WHO has recognised that there is 'Global epidemic of obesity'[5,6], which is clear from the fact that world wide more than one billion adults are overweight and at least 30 million are obese.[6] Up to 130 million people throughout the Asia-Pacific region will suffer from obesity by the year 2010.[5] Body Mass Index (BMI) is frequently used as a surrogate measure of fatness in children and adults.[7]

Data from the long term Fragmington study showed that the degree of obesity is proportional to the rate of development of cardiovascular diseases and that there is dramatic increase in sudden death, among those patients who are 20% overweight as compared to those with normal weight.[8] BMI was significantly associated with systolic and diastolic blood pressure, independent of age, alcohol intake, smoking habit, and sodium and potassium excretion. The precise prevalence of obesity-related hypertension associated with obesity varies with age, race, and gender, and with the criteria used for the definition of hypertension and obesity.[9] Roughly 30% of cases of hypertension may be attributable to obesity, and in men under the age of 45 years, this figure may be as high as 60%.[10,11]

In the Framingham Offspring Study, 78% of cases of hypertension in men and 64% of cases in women were attributable to obesity,[12] and obesity was noted to be the single best predictor of hypertension incidence. Moreover, even after controlling for initial obesity, at 8 years follow-up, obesity remained a major controllable contributor to hypertension.[12] Prospective studies have shown that obesity increases the risk of developing hypertension.[13]

Even a small amount of weight loss in overweight hypertensive individuals is associated with a decrease in arterial pressure. Indeed, over the last decade, most studies have demonstrated that treatment of hypertension with weight loss resulted in a lower blood pressure. This suggests that a decrease in intra-abdominal fat reduces blood pressure in hypertensive patients and supports the use of waist circumference, a surrogate marker for abdominal fat, as a tool to assess and track obesity-related risk.[14]

MATERIAL AND METHODS

This hospital based descriptive study was conducted in Cardiology Department of Postgraduate Medical Institute, Lady Reading Hospital, Peshawar from March 15, 2007 to May 30, 2008. A total of 200 patients who either were admitted with an acute coronary syndrome, or had a positive ETT, or CAD reported at coronary angiogram, were enrolled into the study. Informed consent was obtained from all the patients, and approval of the hospital ethical committee sought. A detailed history was obtained, and physical examination was done, especially recording the BP, height, weight, hip circumference and waist circumference. BMI was calculated for all patients as weight in Kg divided by height^2 in m. Exercise tolerance test and coronary angiogram was

done for patients as and when indicated according to the current guidelines and recommendations.

On the basis of the BMI calculated, patients were categorised either as obese or non-obese. In accordance with the WHO expert consultation on appropriate BMI for Asian population[7], patients with BMI ≤24.9 Kg/m^2 were classified into the non-obese group, while those with BMI ≥25 Kg/m^2 into obese group.

Patients were labelled as hypertensive according to JNC-7 criteria[14], i.e., systolic BP of ≥140 mmHg, or diastolic BP of ≥90 mmHg were labelled as having hypertension.

All continuous variables were expressed as Mean±SD and analysed with independent *t*-test. Discrete variables were expressed as percentages and analysed by Chi-square test. A *p*-value <0.05 was considered as statistically significant. Calculations were performed with SPSS-13.

RESULTS

A total of 200 patients were enrolled, 100 were obese and 100 were non-obese. In both groups, there were more male patients (169.5%) as compared to female (30.5%). In non-obese group, the age range was 32 to 95 (53±12) years, while in the obese group, it was 30 to 80 (54±10) years. The baseline characteristics of the patients are shown in Table-1.

Table-1: Baseline characteristics of patients

Characteristics	Obese n=100	Non-obese n=100
Gender		
Male	66	73
Female	34	27
Age (years)	54±10	53±12
<25	0	1
25–40	12	15
41–60	70	57
>60	18	27
Mean waist circumference (inches)	38±4	33±3
Mean hip circumference (inches)	41±4	35±3
Mean BMI (Kg/m^2)	29.22±3.22	22.99±1.38
Clinical presentation		
Unstable angina	41%	43%
NSTEMI	10%	4%
STEMI	49%	53%
Past history of CAD	81%	88%
Positive ETT result	82%	79%
Coronary angiographic findings		
Normal coronaries	7%	11%
One-vessel disease	19%	35%
Two-vessel disease	24%	25%
Three-vessel disease	50%	29%

Mean BMI in obese was found to be 29.22±3.22 and in non-obese it was 22.99±1.38 (*p*<0.001). Most of the patients had been hypertensive for more than 5 years duration. In both genders, an increasing trend was observed in the prevalence of hypertension with increasing BMI. A total of 111 patients (55.5%) were found to be hypertensive. Out of these, 66 (59.46%) were obese while 45 (40.54%) were non-obese (*p*=0.003), (Table-2).

Table-2: Hypertension Profile

Variables		Obese n=100	Non-Obese n=100	*p*
Total number of Hypertensive patients (n=111)		66 (59.46%)	45 (40.54%)	0.003
Duration of Hypertension (months)	<6	4 (6%)	4 (9%)	
	6–12	10 (15%)	5 (11%)	
	13–60	21 (32%)	7 (16%)	
	60–120	23 (35%)	18 (40%)	
	>120	8 (12%)	11 (24%)	

DISCUSSION

In Pakistan, 46% of cardiac deaths are due to myocardial infarction. In a country where resource availability is scarce, a better option is prevention. Time, money and efforts spent on this preventive strategy in patients and population are rewarding. In both genders, the prevalence of hypertension, diabetes, and hypercholesterolemia is directly proportional to BMI.[1–3]

In our study, the mean BMI in obese patients was 29.22±3.22 and in non-obese it was 22.99±1.38, with significant statistical difference. In Pakistan, average BMI of people aged 15 and above is estimated to be 23–24.9 Kg/m^2 for females and 18–22.9 for males; in India, 23.24 for females and 18–22.9 for males; in Brazil, 25–26.9 for females and 23–24.9 for males, and in USA and Canada, it is above 27 for both females and males.[15] South-Asian populations now show a rapid increase in life-expectancy, changes in life style, decrease physical activity, all of which lead to obesity, and obesity in turn leads to multiple problems.[16]

Most of the patients in our study had hypertension for more than 5 years of duration. Similar results were seen in previous studies conducted in the population of Peshawar.[17,18] In our study, the prevalence of hypertension increased with BMI in both genders. These results are similar to results obtained in large study by Frederique Thomas *et al*,[4] who also reported similar results. When compared with subjects with BMI <25 Kg/m^2 without associated risk factors, overweight subjects without associated risk factors did not have an increased risk of cardiovascular mortality.

Eisentein *et al* reported that obesity is associated with more clinical events over the post-30 day period after cardiac catheterisation, with high cumulative in-patient medical costs and significant differences in unadjusted survival rate at 10 years, because of more vessel involvement in obese patients.[19] Our results correlate well with it showing

high risk TVD more common in obese patients compared to non-obese patients.

In our study, a total of 111 (55.5%) patients were hypertensive. Out of these, 66 were obese (60%) while 45 were non-obese patients (40%), with significant statistical differences (p=0.003). These findings correlate well with INTERSALT study where the relationship between BMI and blood pressure was studied in over 10,000 men and women between the ages of 20 and 59 years, sampled from 52 centres around the world. BMI was significantly associated with systolic and diastolic blood pressure, independent of age, alcohol intake, smoking habit, and sodium and potassium excretion, and obesity was noted to be a single best predictor of hypertension incidence.[9]

Irrespective of BMI, hypertension was present in 59.16% cases in CAD in a study conducted on 813 patients in our unit in 2005.[17] We know that hypertension is a well-established predisposing factor for cardiovascular disease such as CAD, atherosclerosis, left ventricular hypertrophy (LVH), and left ventricular failure (LVF) that have high mortality rates.[20] In another study, 49.3% of total 300 hypertensive patients were obese and 44.3% were having sedentary life style.[3]

The risk factors analysis in four cities in Pakistan showed 31.5% population were hypertensive.[2] The prevalence of CAD among hypertensive individuals was 67.9%, and both hypertension and obesity have marked association with left ventricular mass and geometry, and their influence is additive.[21,22] Our study warrants preventive measures to be adapted to control the epidemic of obesity, which will not only reduce the incidence of hypertension but will also lead to decrease in the incidence of CAD. Such measures need to be integrated in primary healthcare, as secondary and tertiary treatment costs are not affordable to all people of our community.[23] Obesity is often mistaken for prosperity and health, hence public education to address such misconceptions and to promote healthy behaviours, is essential and should be directed both at the individual and community levels, and should be addressed in early child age.[24] Weight loss clearly is one of the most potent non-pharmacological means of lowering blood pressure and ought to be the first line of treatment for hypertension, hence reducing or eliminating the need for antihypertensive medication in our cash-strapped public. However, multifaceted and large-scale interventions are required to reduce the burden of the growing epidemic of obesity.[25]

CONCLUSION

BMI is directly correlated to hypertension, as hypertension was significantly more common in obese patients with CAD compared to non-obese patients with CAD.

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