Original Research Article

Prevalence of metabolic syndrome in urban low socioeconomic group patients with symptomatic coronary artery disease

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Abstract

Introduction: Sedentary lifestyle, low fiber, high fat and energy-rich foods have penetrated even the rural India in the name of globalization. All these will come not without cost. India is now facing the paradox of malnutrition on one hand and epidemic of obesity on the other. Indians three times higher risk of developing Coronary Artery Disease (CAD) compared to Chinese and are 20 times more likely to die due to CAD compared to native black or white South Africans.

The aim of the study: To find out the prevalence of Central Obesity, Hypertension, Impaired Fasting Glucose or Diabetes mellitus, Hypertriglyceridemia and low HDL cholesterol and to analyze the differences in their prevalence among the age groups, sex, social class and chronic and acute coronary syndromes.

Materials and methods: All patients belonged to a low socioeconomic group attended medical outpatient department or those who were getting admitted medical ward of Govt. Dharmapuri Medical College, Dharmapuri with coronary artery disease (CAD) were included.

Results: Mean of age for males (CI: 55.49± 22years) and females (CI: 51.87±24.7years) lied within one standard deviation from the sample mean. 59 patients (52.2%) had central obesity. 64.2% patients in age group <40 years, 41.4% in age group 40-60 years and 72.4% in age group >60 years had central obesity. This increase in the prevalence of central obesity among younger (<40 year) and older age group (>60 years) was significant. 84 patients (74.34%) had hypertension. 71.43% patients in age group <40 years, 77.14% in age group 40-60 years and 68.96% in age group >60 years had hypertension. There was no significant difference in prevalence of hypertension among age group.57 patients (50.44%) had diabetes or IFG. 50% patients in age group <40 years, 40% in age group 40-60

years and 75.86% in age group >60 years had diabetes or IFG. This increase in the prevalence of Diabetes and IFG among younger (<40 year) and older age group (>60 years) was significant. 48 patients (42.48%) had hypertriglyceridemia. 50% patients in age group <40 years, 32.86% in age group 40-60 years and 62% in age group >60 years had hypertriglyceridemia. 54 patients (47.78%) had metabolic syndrome. 50% patients in age group <40 years, 37.14% in age group 40-60 years and 72.41% in age group >60 years had metabolic syndrome. This increase in the prevalence of metabolic syndrome among younger (<40 year) and older age group (>60 years) is significant (X^2- 10.25, p=.006).

Conclusion: The result of the present study suggests that in urban patients who live below poverty line with symptomatic coronary artery disease there in the increased prevalence of metabolic syndrome, central obesity, hyperglycemia, hypertension, and dyslipidemia. The higher prevalence particularly noticeable in those with the premature coronary artery disease and that might have resulted in earlier onset of CAD in them.

Key words

Hyperlipidemia, Central Obesity, Metabolic Syndrome, Sedentary Life Style.

Introduction

Indians three times higher risk of developing Coronary Artery Disease (CAD) compared to Chinese and are 20 times more likely to die due to CAD compared to native black or white South Africans [1]. The SHARE study demonstrated that South Asians had a higher prevalence of cardiovascular disease compared to Europeans and Chinese living in Canada. In India, 2.78 million deaths are due to cardiovascular diseases, of which over 50% is due to CAD, making CAD the number one killer disease in our country [2]. In Jaipur Heart Watch – 2 studies conducted in 2002, the prevalence of CAD was reported to be 8.2%.Over 35 million diabetic patients live in India, making India the diabetic capital in the world. These numbers expected to double by the year 2030. Thus India faces the dangerous dual epidemic of diabetes and CAD [3]. The major root of both epidemics lies in "Metabolic Syndrome". Lots of studies from the west on metabolic syndrome represent middle and higher socioeconomic classes of society [4]. Those studies which assess the burden of metabolic syndrome in CAD patients living below poverty line in India is still lacking. The definition used in WHO report, centers on diabetes and insulin resistance, whereas, the ATP III guidelines gives equal weight to abdominal obesity, hypertension, hyperglycemia, hypertriglyceridemia, and low HDL cholesterol [5]. The IDF is closest to ATP III in that it includes the same variable but it differs in that central obesity is an essential component. Also, waist measurement is set at a lower level than in ATP III and is ethnic-specific and the fasting hyperglycemia is set at the new American Diabetic Association (ADA) cut-point for impaired fasting glucose (IFG). Moreover, it does not include insulin resistance and hyperglycemia is not an obligatory component, which sets it apart from WHO and EGIR definitions [6].

Materials and methods

A cross-sectional study, with analysis of the metabolic parameters for differences were done. All patients belonged to low socioeconomic group (family income <Rs.5100 per month), attended medical outpatient department or those who were getting admitted in the medical ward of Govt. Dharmapuri Medical College, Dharmapuri with coronary artery disease (CAD) were included. Totally 113 patients, i.e. 38 female patients and 75 male patients were studied.

Inclusion criteria: Those who attend medical outpatient department or getting admitted in the medical ward at GDMCH, With family income less than Rs.5100 per month, With age more than

20 years, With symptoms suggestive of a CAD, With ECG features suggestive of CAD or significant CK-MB elevation.

Exclusion criteria: Children, adolescents and those with age less than 20 years, With nonanginal chest pain, With asymptomatic CAD, With ECG changes which are not due to myocardial ischemia or infarction.

Screening for parameters of MS

Waist Circumference: It was measured at a level midway between the lower rib margin and iliac crest with the tape all around the body horizontal position, at the end of normal gentle exhalation, in morning before breakfast after emptying bowel and bladder. Patients were asked to remove their clothes, except for light underwear. If this was not possible cultural reasons, measurement was taken without heavy outer garments. Tight clothing, including the belt, should be loosened and the pockets emptied, standing with their feet fairly close together (about 12-15 cm) with their weight equally distributed to each leg. The tape should be loose enough to allow the observer to place one finger between the tape and the subject's body. Measurements have recorded to the resolution of 0.1cm.

Blood Pressure: Blood pressure was measured in right arm supine position using mercury manometer using appropriate size cuff, recorded in mmHg to the precision of 0.2 mmHg. 2 reading was recorded. Higher reading among systolic and diastolic blood pressure was taken for analysis. The patient was asked for previously diagnosed hypertension and the response recorded.

Fasting Plasma Glucose: It was measured (in mg/dL) by a semi-quantitative O'Toluidine method from a venous blood sample drawn in morning following at least 8 hours of fasting. The patient was asked for previously diagnosed hypertension and the response recorded. Triglyceride measured (in mg/dL) by enzymatic colorimetric method and HDL measured (in mg/dL) by selective immune precipitation the photometric method from a venous blood sample drawn in morning following at least 8 hours of fasting.

Results

Total 113 patients with coronary artery disease whose income less than Rs. 5100 per month participated in the study. 38, (33.6%), were females. 75 (66.4%) were males. Age groups were near normally distributed with the sample mean being 54.27 years (CI: 54.3±23 years). Maximum numbers of patients are in the age groups 40 – 60 years. Youngest patient was 25years and oldest being 80 years old (**Table – 1**). 49 (43.4%) patients had chronic CAD and 64 (56.6%) patients had ACS. Among males, 37 had chronic CAD and 38 had ACS. Among females, 12 had chronic CAD and 26 had ACS. Social groups IV and V had lesser representation in both chronic CAD and ACS.

Table – 1: Age and sex distribution among patients.

Age (Years)	Sex				Total	
	Females		Males			
	Count	%	Count	%	Count	%
20 to 39	6	5.3	8	7.1	14	12.4
40 to 59	25	22.1	45	39.8	70	61.9
Over 60	7	6.2	22	19.5	29	25.7
Total	38	33.6	75	66.4	113	100.0

Mean of waist circumference of the sample was 87.13 (95% CI: 87±21) cm and that of females and males being 84.31 (95% CI: 84±15.7) cm and 88.56 (95% CI: 88.6±22.6) cm, respectively. 59 patients (52.2%) had central obesity. 64.2% patients in age group <40years, 41.4% in age

group 40-60 years and 72.4% in age group >60years had central obesity. This increase in prevalence of central obesity among younger (<40 year) and older age group (>60 years) was significant (X^2- 08.82, p=0.01). 23(60.5%) female patients 36 (48%) male patients had central obesity, respectively. There was no the significant difference in the prevalence of central obesity between females and males (X^2-1.59, p=0.21). 19 (38.78%) patients with chronic CAD and 40 (62.5%) patients with ACS had central obesity. The increase in the prevalence of central obesity in ACS was significant(X^2-6.26, p=0.01) as per **Chart - 1**.

Chart – 1: Distribution of central obesity among patients.

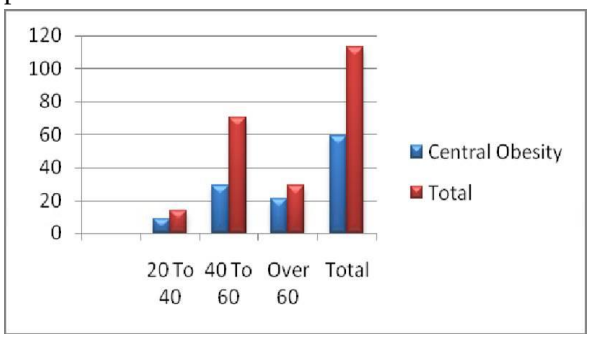


Chart – 2: Hypertension prevalence among patients.

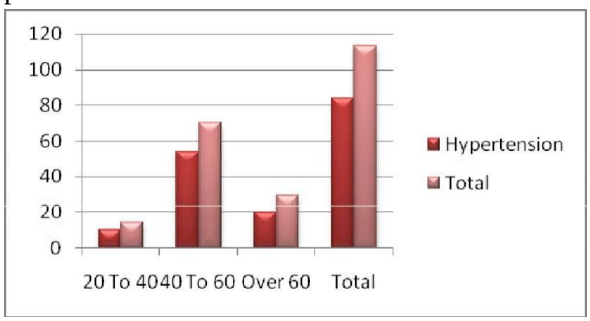


Chart – 3: Diabetes and IFG among patients.

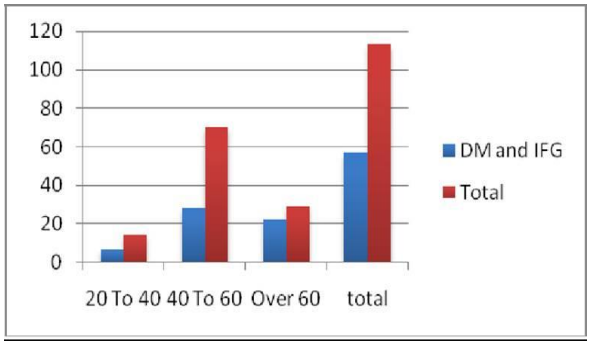


Chart – 4: Hypertriglyceridemia among patients.

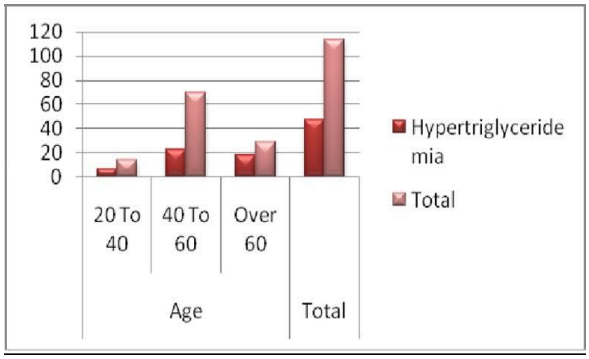
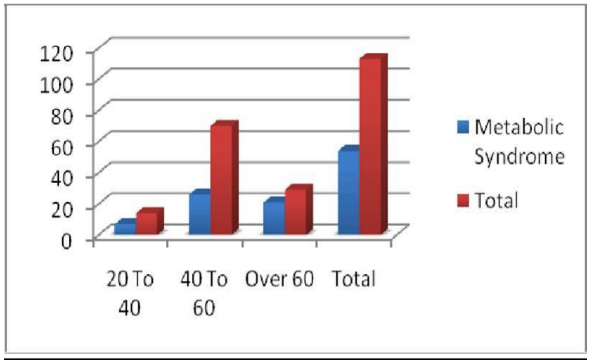


Chart – 5: Metabolic syndrome among patients.



84 patients (74.34%) had hypertension. 71.43% patients in age group <40 years, 77.14% in age group 40-60 years and 68.96% in age group >60 years had hypertension. There was no significant difference in prevalence of hypertension among age group (X^2- 00.79, p=0.67). 33(86.84%) female patients, 51 (68%) male patients had hypertension, respectively. This increase in the prevalence of hypertension among females as compared to males was significant (X^2-04.69, p=0.03). 31 (63.27%) patients with chronic CAD and 53 (82.81%) patients with ACS had hypertension. Increase in the prevalence of hypertension in ACS was significant (X^2-05.56, p=0.02) as per **Chart - 2**.

57 patients (50.44%) had diabetes or IFG. 50% patients in age group <40 years, 40% in age group 40-60 years and 75.86% in age group >60 years had diabetes or IFG. This increase in prevalence of Diabetes and IFG among younger (<40 year) and older age group (>60 years) was significant (X^2- 10.55, p=.005). 21 (55.26%) female patients, 36 (48%) male patients had diabetes or IFG, respectively. There was no

significant difference in the prevalence of diabetes and IFG between females and males (X^2-00.53, p=0.47). 22 (44.9%) patients with chronic CAD and 35 (54.69%) patients with ACS had diabetes or IFG. There was no significant difference in the prevalence of diabetes and between chronic CAD and ACS (X^2-01.06, p=0.30) as per **Chart - 3**.

48 patients (42.48%) had hypertriglyceridemia. 50% patients in age group <40 years, 32.86% in age group 40-60 years and 62% in age group >60 years had hypertriglyceridemia. This increase in the prevalence of hypertriglyceridemia among younger (<40 year) and older age group (>60 years) was significant (X^2- 07.53, p=0.02). 12 (31.58%) female patients 36 (48%) male patients had hypertriglyceridemia, respectively. The therein significant difference in the prevalence of hypertriglyceridemia between females and males (X^2-02.78, p=0.09). 22 (44.9%) patients with chronic CAD and 26 (40.63%) patients with ACS had hypertriglyceridemia. There was no significant difference in the prevalence of hypertriglyceridemia between chronic CAD and ACS (X^2-00.21, p=0.65) as per **Chart - 4**.

54 patients (47.78%) had metabolic syndrome. 50% patients in age group <40 years, 37.14% in age group 40-60 years and 72.41% in age group >60 years had metabolic syndrome. This increase in the prevalence of metabolic syndrome among younger (<40 year) and older age group (>60 years) was significant (X^2- 10.25, p=.006). 18 (47.37%) female patients and 36 (48%) male patients had metabolic syndrome, respectively. There was no significant difference in the prevalence of metabolic syndrome between female and male patients (X^2-0.004, p=00.94). 19 (38.78%) patients with chronic CAD and 35 (54.69%) patients with ACS had metabolic syndrome. There was no significant difference in the prevalence of metabolic syndrome between chronic CAD and ACS (X^2-02.82, p=00.09) as per **Chart - 5**.

Discussion

This increase in the prevalence of hypertension among females as compared to males is significant (p=0.03). Studies have shown that greater prevalence of hypertension among urban Indian population of women compared to men.63.27% patients with chronic CHD and 82.81% patients with ACS had hypertension [7]. Increase in the prevalence of hypertension in ACS is significant p=0.02). 50.44% had diabetes or IFG. This is higher compared to 13.5% in a study conducted in Chennai city and 10.3% in another study conducted in the intracountry migrant population that resides in urban slums [8]. But in these figures, IFG is not included. There was a significant increase (p=0.005) in the prevalence of diabetes and IFG among patients with premature CAD (<40years) and older age group (>60 years) forming a "U" shaped distribution. 55.26% of female patients 48% of male patients had diabetes or IFG, respectively [9]. A recent cross-sectional cohort study conducted in Mysore, India found the prevalence of type 2diabetes to be 40% in women, versus 34% in men. There was no significant difference in the prevalence of hypertriglyceridemia among sexes and between chronic CAD and ACS.47.79% had low HDL as compared to 16.2% in the intracountry migrant population that resides in urban slums.55.26% female patients 44% male patients had low HDL, respectively. 25 (44.9%) patients with chronic CAD and 29 (40.63%) patients with ACS had low HDL [10]. There was no significant difference in the prevalence of hypertriglyceridemia among age groups, sexes and between chronic CAD and ACS. The overall prevalence of metabolic syndrome among the study population was 47.79% using IDF, 2005 definition [11]. There was significant increase (p=0.006) in the prevalence of metabolic syndrome among patients with the premature AD (<40 years) and older age group (>60 years) forming a "U" shaped distribution.47.37% of female patients and 48% of male patients had metabolic syndrome, respectively. 38.78% patients with chronic CAD and 54.69% patients with ACS had metabolic syndrome [12]. There is no significant difference in the prevalence of

metabolic syndrome between males and females and between chronic CAD and ACS. My study concentrates on CAD patients living below poverty line and this study prevalence of MS and its individual metabolic components, i.e., central obesity, hypertension, diabetes or IFG, hypertriglyceridemia, and low HDL, were all found to be high compared to various studies conducted in India, but all of them have been conducted in community which includes subjects with and without CAD [13]. The relation between MS and CVD risk has been explained unequivocally in different studies [14]. Conversely, there must be the increased prevalence of MS and its individual metabolic components in patients with coronary artery disease as compared to its prevalence in general population in the community [15]. Result of our study confirms this fact. Prevalence of central obesity and hypertension were significantly higher in patients with ACS as compared to patients with chronic CAD. Thus the presence of these risk factors means more severe disease to a patient [16]. This finding not observed in hypertriglyceridemia, low HDL, diabetes and IFG. is formed by patients with premature coronary artery disease (age<40). This finding not observed in the case of hypertension and low HDL [17]. Hence, clustering of these metabolic risk factors result in the onset of earlier in these patients. Asian Indians have an earlier and more severe course of CHD compared to other ethnic groups. A striking predisposition to premature coronary artery disease and early myocardial infarction has been observed among Asian Indians [18]. The mean age of an Asian Indian patient suffering a myocardial infarction is only 50 years.25% of all MIs in this population occur under the age of 40 years. Increased prevalence of metabolic syndrome and related risk factors could explain these facts that are observed in above-mentioned studies [19]. It is not clear why subjects who are generally manual laborers hence physically active, poor and cannot afford costly products of food industry should develop these clusters of metabolic risk factors. A simple explanation could be marked changes in their diets and lifestyle [20]. Some data suggest that diets presently consumed by them were highly imbalanced. Specifically, the dietary consumption of saturated fat and cholesterol were high and fiber and antioxidants were low [21]. Globalization and urbanization definitely has made an impact on their food habits, nutrition, and physical activity [22]. According to the "genetically unknown foods" hypothesis, adopting western dietary habits with a high fat and sucrose intake could lead to an epidemic of the IRS Maladaptation, 'stress response' causinghypothalamic pituitary activation, increased smoking, and alcohol drinking may be additional contributory factors [23]. Moreover, we Indians form a special "Asian Indian phenotype". Studies on the relationship of birth weight with insulin resistance syndrome variables in Indian children revealed that a lower birth weight is associated with insulin resistance. It has been hypothesized that lower birth weight followed by increased obesity could lead to IRS during adulthood [24, 25].

Conclusion

Intensive efforts should be made to make them aware that they are at more the risk for development of type 2 diabetes and CAD. Preventive measures should be particularly vigorous for those with the family history of type 2 diabetes and premature CAD. Overweight individuals and those with abdominal obesity should be actively managed to lose weight by lifestyle measures. Detection of one component of metabolic syndrome should prompt the search of other components and its management. Adequate nutrition during the intrauterine period should be given to prevent early life adverse events, which may promote insulin resistance in adulthood. Early identification and treatment of metabolic syndrome and other metabolic risk factors goes long way in preventing coronary artery disease in these patients

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