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Angiographic Profile of Coronary Artery Disease in Patients With Metabolic Syndrome

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Abstract
Aims And Objectives
1. *To study the demographic characteristics of patients of metabolic syndrome with CAD.*
2. *To study the angiographic profile of patients of metabolic syndrome with CAD.*

Materials And Methods: *All patients who underwent coronary angiography at SSIMS & RC, Davangere between January 2015 and January 2016 and in whom all parameters needed for the diagnosis of metabolic syndrome were available was analysed in the study after inclusion and exclusion criteria. All demographic details along with blood investigations, anthropometrics and angiographic profile of these patients were recorded. Patients were also classified according to ACS or chronic stable angina groups. Patients were analysed for the presence and severity of CAD in relation to the number of risk factors for metabolic syndrome.*

Results: *A total of 112 patients were included in the study, who satisfied the inclusion criteria. Majority of patients of metabolic syndrome with coronary artery disease were in the age group of 40-60 years, mostly between 50-59 years. Most common risk factors were hypertension, diabetes mellitus, dyslipidemia and smoking. Mean number of risk factors for metabolic syndrome is 3.87±0.78 and women had more number of risk factors compared to men (4.45±0.63 vs 3.64±0.71). Mean LVEF of patients was 47.67±11.02%. number of risk factors did not influence the LVEF. Almost half of the patients (47.4%) had LVEF more than 45%. As the number of risk factors increased the percentage of patients with multi-vessel disease with or without involvement of left main coronary artery increased. 62.8% and 66.7% of patients had multi-vessel disease with 4 and 5 risk factors respectively. The most common artery involved was LAD(69.6%) followed by RCA(45.5%).*

Conclusion: *Most of the patients with metabolic syndrome had a prior acute coronary event Commonest risk factor for metabolic syndrome seen in our study was high blood pressure followed by high fasting blood glucose, high triglycerides, low HDL and abdominal obesity in the decreasing order. There was no correlation between increasing number of risk factors and left ventricular ejection fraction. Patients with metabolic syndrome had higher double and triple vessel involvement. There was a significant ostial/proximal/diffuse disease or more severe type of lesions (Type B and Type C) with increasing number of risk factors. The chance of multi-vessel disease was significantly higher among patients with more risk factors.*

Keyword: *Coronary Artery Disease, Metabolic Syndrome, Angiographic Profile*

I. Introduction

India is now in the middle of a coronary artery disease(CAD) epidemic with urban Indians having CAD rates similar to overseas Indians, which is four fold higher than Americans. Obesity is also a world wide epidemic[1]. Studies have shown that obesity, especially when linked with truncal and abdominal distribution, is associated with hypertension, hyperinsulinemia and insulin resistance related abnormalities of carbohydrate and lipid metabolism[2,3,4]. The clinical and epidemiological significance of the metabolic syndrome is highlighted by its association with two to four fold increase in risk of CAD and all cause mortality[5,6]. Many prospective randomised studies have shown the significant association of metabolic syndrome and severity of CAD as proven by coronary angiography and progression of the disease. There are several studies to assess the clinical and demographic profile of patients with metabolic syndrome. However, angiographic studies to determine the nature and severity of CAD in such group of patients is less in number. Hence we undertook this study considering the significant impact of modifiable risk factors on the incidence and severity of CAD.

Aims And Objectives

3. To study the demographic characteristics of patients of metabolic syndrome with CAD.
4. To study the angiographic profile of patients of metabolic syndrome with CAD.

II. Materials And Methods

All patients who underwent coronary angiography at SSIMS & RC, Davangere between January 2015 and January 2016 and in whom all parameters needed for the diagnosis of metabolic syndrome were available was analysed in the study following inclusion and exclusion criteria.

Data Collection: clinical data collected included age, gender, traditional risk factors (ie; hypertension, diabetes mellitus, dyslipidemia, smoking and family history of premature CAD), prior history of revascularization(PCI/CABG), fasting blood glucose, blood pressure, and left ventricular ejection fraction at the time of angiography, waist circumference and coronary angiographic data with emphasis on vessels involved and the type of lesions according to ACC/AHA[7] definitions.
Patients were also classified according to acute coronary syndrome(ACS) or chronic stable angina groups. Patients CAD subgroups were classified as chronic stable angina, unstable angina/non ST elevation MI(NSTEMI) and STEMI according to standard definitions. Patients were analysed for the presence and severity of CAD in relation to the number of risk factors for metabolic syndrome.
Inclusion Criteria: Patients who satisfied all the following criteria were included in the study

1. Patients of CAD who underwent coronary angiography for standard indications.
2. Patients in whom all the parameters necessary for diagnosis of metabolic syndrome were available.
3. Patients who had risk factors of metabolic syndrome according to NCEP ATP III[8] definition

- Waist circumference: >102cm(40 inches) for men and >88cm(35 inches) for women
- Blood pressure: ≥130mmHg systolic(SBP) and/or ≥85mmHg diastolic(DBP) or on treatment for hypertension
- Fasting blood sugar(FBS): ≥110mg/dl or on treatment for diabetes mellitus
- Triglycerides(TG): ≥150mg/dl
- High density lipoprotein(HDL)-cholesterol: <40mg/dl in men and <50mg/dl in women

Exclusion Criteria:

1. Patients in whom all parameters necessary for the diagnosis for metabolic syndrome were not available.
2. Patients who had <3 risk factors of metabolic syndrome.

III. Statiscal Analysis

Values are expressed as mean ±SD. Groups were compared with the use of a standard t-test or chi-square test as appropriate. Risk factors for coronary disease (age, sex, total cholesterol level, diabetes mellitus, history of smoking, hypertension and family history of coronary disease) as independent variables.

IV. Results

A total of 112 patients were included in the study, who satisfied the inclusion criteria. The majority of patients(92%) were in the age group of 40-69 years, mostly in 50-59 years(44.6%), with 81 males and 31 females with a male to female ratio of 2.6:1. When individual risk factors were analysed, the most common risk factors were hypertension, diabetes mellitus, dyslipidemia and smoking. Mean number of risk factors for metabolic syndrome is 3.87±0.78 and women had more number of risk factors compared to men (4.45±0.63 vs 3.64±0.71). Mean left ventricular ejection fraction(LVEF) of patients was 47.67±11.02%. number of risk factors did not influence the LVEF. Almost half of the patients (47.4%) had LVEF more than 45%. Of the 112 patients, 37 patients had chronic stable angina, 31 had UA/NSTEMI and the remaining had STEMI. Of the 112 patients 68 had increased waist circumference, 95 had SBP≥ 130 mmHg or DBP≥85 mmHg or were already on treatment for hypertension, 90 had FBS >110mg/dl or was treatment for diabetes mellitus and 86 had low HDL levels and 90 had triglycerides >150mg/dl. As the number of risk factors increased the percentage of patients with multi-vessel disease with or without involvement of left main coronary artery increased. 62.8% and 66.7% of patients had multi-vessel disease with 4 and 5 risk factors respectively. The most common artery involved was left anterior descending(LAD)(69.6%) followed by right coronary artery(RCA)(45.5%). Number of risk factors did not have any influence on the presence of left main disease or LAD involvement. Number of lesions were also independent of number of risk factors and did not have any statistical significance. With increase in risk factors there was increase in the incidence of all Type A, Type B and Type C lesions.

V. Discussion

Mean age in our study was 57.03±.34 years. Most of the western studies showed a mean age of 62-64 years. This issue has been addressed in several studies and proven beyond doubt that CAD occurs about one decade earlier in Indians. Our study shows that hypertension, diabetes mellitus, smoking and hyperlipidemia are the significant risk factors with higher proportion of patients having high FBS and high TG (84% and 80% respectively). As compared to one study which showed 40% and 50% respectively. More number of patients with metabolic syndrome had an acute coronary event compared to published data on angiographic profile in

overall population. Among a total of 112 patients, 67% had a history of ACS and 33% had chronic stable angina. A significantly more number of patients in ACS group had 4 or 5 risk factors (17% had 3 risk factors and 50% had >3 risk factors, p=0.023).

In our study 7 patients had normal coronaries, 10.7% of the total study group had normal or insignificant CAD. 16% of patients had LMCA involvement. The commonest vessel involved was LAD followed by RCA and LCX. The combination of LAD and RCA involvement was significantly higher than the other combinations.

The mean number of lesions per patient was 2.24±1.48. even though there was no difference between the mean number of lesions per patient with increasing number of risk factors, however there was a significant ostial/proximal/diffuse disease or more severe type of lesions with increasing number of risk factors ($p<0.02$ for subgroups with 3 and 4 risk factors and $p<0.05$ for subgroups with 4 and 5 risk factors). In a study by Mehmet[9] et al, the mean total stenosis and extension scores of patients with metabolic syndrome was significantly higher than those with out metabolic syndrome.

The chance of having multi-vessel disease seen in 52.4%, 62.8% and 66.7% of patients with 3, 4, and 5 risk factors respectively was statistically significant (p=0.05 for patients with 3 and 4 risk factors, p=0.01 for patients with 4 and 5 risk factors). Malik[10] et al reported that, compared with individuals with no risk factors, those with one to two risk factors had an hazard ratio of 2.1 for CAD mortality and 3.5 if they had full syndrome. Other investigators also found that the risk for CVD increased with the number of risk factors.

VI. Conclusion

Majority of patients of metabolic syndrome with coronary artery disease were in the age group of 40-60 years, mostly between 50-59 years. Male to female ratio was 2.6:1. Most of the patients with metabolic syndrome had a prior acute coronary event and a significantly more number of patients in acute coronary syndrome group had 4 or 5 risk factors. Commonest risk factor for metabolic syndrome seen in our study was high blood pressure followed by high fasting blood glucose, high triglycerides, low HDL and abdominal obesity in the decreasing order. More number of women had all five risk factors and more number of men had only three risk factors.

There was no correlation between increasing number of risk factors and left ventricular ejection fraction. Patients with metabolic syndrome had higher double and triple vessel involvement. However, there was no significant difference between left main coronary artery and/or left anterior descending artery involvement in patients with increasing number of risk factors. Even though there was no difference between the mean number of lesions per patient, there was a significant ostial/proximal/diffuse disease or more severe type of lesions (Type B and Type C) with increasing number of risk factors.the chance of multi-vessel disease was significantly higher among patients with more risk factors.

VII. Limitations

This study is only an observational study and controls were not taken for comparison. The effect of metabolic syndrome on the progression of CAD and clinical events was not studied as the patients were not followed up. Sample size is small with underrepresented females, so that broad conclusions can not be made based on the results of the study.

Tables:Table1.Baseline Characteristics

	NUMBER OF PATIENTS	PERCENTAGE
RISK FACTOR		
• HYPERTENSION	75	67.0%
• DIABETES MELLITUS	73	65.2%
• SMOKING	43	38.4%
• TOBACCO USE	18	16.1%
• FAMILY H/O CAD	06	5.45%
• DYSLIPIDEMIA	96	85.7%
CAD GROUP		
• CSA	37	33.0%
• UA/NSTEMI	31	27.7%
• STEMI-TOTAL	44	39.3%
○ AWMI	28	25.0%
○ IWMI	16	14.3%
RISK FACTOR FOR METABOLIC SYNDROME		
• WAIST CIRCUMFERENCE		60.7
○ MEN	41	
○ WOMEN	27	
• BLOOD PRESSURE		84.8
○ SBP≥130mmHg OR DBP≥85mmHg	75	
○ ON TREATMENT FOR HTN		

• FBS	20	
○ FBS>110mg/dl		83.9
○ ON TREATMENT FOR DM	87	
• TG>150mg/dl	07	
• HDL	90	80.4
○ MEN		
○ WOMEN	56	69.1
	30	96.8

Table 2.Cad Groups And Angiographic Profile Depending On Number Of Risk Factors

NUMBER OF RISK FACTORS	THREE	FOUR	FIVE
NUMBER OF PATIENTS	42	43	27
CAD GROUPS			
• CSA	23(62.2%)	10(27.0%)	04(10.8%)
• UA/NSTEMI	09(29.0%)	12(38.7%)	10(32.3%)
• STEMI	10(22.7%)	21(47.7%)	13(29.6%)
CORONARY ANGIOGRAPHIC PROFILE			
• NORMAL CORONARIES/INSIGNIFICANT	05(11.9%)	04(9.3%)	03(11.1%)
• SINGLE VESSEL DISEASE	15(35.7%)	12(27.9%)	06(22.2%)
• MULTI-VESSEL DISEASE	22(52.4%)	27(62.8%)	18(66.7%)
LMCA INVOLVEMENT	5	7	7
LAD INVOLVEMENT	31	31	17
LESIONS PER PATIENT	2.23±1.49	2.28±1.50	2.26±1.49
TOTAL NUMBER OF LESIONS	84	92	67
OSTAIL/PROXIMAL/DIFFUSE LESIONS	46(54.8%)	55(55.8%)	42(62.7%)
TYPE B/ TYPE C LESIONS	38(45.2%)	46(50.0%)	36(53.7%)

Table 3. Pattern Of Involvement Of Coronary Artery

VESSEL	SEGMENT INVOLVED	ALL CASES
LMCA	ANY	18(16.1%)
LAD	ANY	78(69.6%)
	• OSTIAL	10
	• PROXIMAL	33
	• MID	31
	• DISTAL	02
	• DIFFUSE	02
LCX	ANY	49(43.8%)
	• OSTIAL	06
	• PROXIMAL	24
	• MID	05
	• DISTAL	13
	• DIFFUSE	01
RCA	ANY	51(45.6%)
	• OSTIAL	03
	• PROXIMAL	35
	• MID	05
	• DISTAL	07
	• DIFFUSE	01

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