METABOLIC AND NON-METABOLIC SYNDROME - ANGIOGRAPHIC SEVERITY OF CORONARY ARTERY DISEASE AND OUTCOME.

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ABSTRACT

Background: Coronary Artery Disease (CAD) is one of the leading causes of mortality in both developed and developing countries. One of the major culprits among the risk factors of CAD is Metabolic Syndrome (MS). Many clinical studies have been done on the association between MS and increased risk of CAD. The prognostic importance of MS compared to the individual components has been repeatedly challenged. This study addresses the issue of objectively assessing the severity of CAD by using standard scores and tools among patients with MS over their counterparts.

Methodology: This is a period based observational study. 100 patients (half having MS while the other half without MS), who were referred coronary artery angiography due to suspected CAD were selected for the study. Every patient was inquired in detail about the case history. The syntax score system is used to show the severity of CAD.

Results: Patients with MS are more prone to CAD compared to patients without MS. In patients with MS- 4% of study participants are having high syntax scores, 72% of study participants are having intermediate syntax score, 24% of study participants are having low syntax score. There is no significant difference P (0.714) in relation to gender and syntax score in developing CAD. Results suggested that elevated waist circumference, reduced HDL-C, and elevated fasting glucose might have the relatively higher association with CAD and MS, whereas elevated TGs and high blood pressure might have weaker association.

Conclusions: This study helped us to understand the severity of disease in patients with MS and compare with their counterparts. It gives the information that MS is in significant relation with

the syntax score and CAD P (0.000). So, angiographic severity of CAD among MS is higher than the counterpart.

Keywords- coronary artery disease (CAD), Angiographic results, Metabolic syndrome, non-metabolic syndrome, Obesity.

INTRODUCTION

Coronary Artery Disease (CAD) is one of the prevailing causes of mortality in both the developed and developing world [1]. The atherosclerotic narrowing of blood vessels leads to decreased blood supply to the heart. One of the major culprits among the risk factors of CAD is Metabolic Syndrome (MS). Angiographic test is used to assess the coronary artery blockade. Metabolic syndrome is defined according to IDF criteria [2] as follows- Central obesity defined by waist circumference (male≥90cm), (female≥80cm) in south Asians in addition to any two of the following factors-1. Raised Triglycerides (TG≥150mg/dl) or specific treatment for this lipid abnormality. 2. Reduced HDL cholesterol (HDL<40mg/dl) in men, (HDL<50mg/dl) in women or specific treatment for this lipid abnormality.3. Raised Blood Pressure (systolic ≥130mmHg) and (diastolic≥85mmHg) or treatment of previously diagnosed hypertension. 4.Raised Fasting Plasma Glucose (≥100mg/dl) or previously diagnosed type 2 diabetes.

Coronary artery disease is responsible for 20% of the deaths in India. The prevalence of metabolic syndrome is estimated to be approximately 20-25 % worldwide [3]. Over the last 30 years the prevalence of CAD has increased in India as shown in many studies conducted in rural and urban India [1]. As the metabolic syndrome is multi fractional in origin, lifestyle modifications reduce the risk of CAD. Many clinical studies have been done on the association between metabolic syndrome and increased risk of coronary artery disease [4]. The prognostic importance of metabolic syndrome compared to the individual components has been repeatedly challenged. This study addresses the issue of objectively assessing the severity of CAD by using standard scores and tools among the patients with metabolic syndrome over the non-metabolic syndrome(normal) counterpart.

MATERIALS AND METHODS:

Study design and population- This is a period based observational study. 100 patients (50-having metabolic syndrome and 50-non metabolic syndrome) who are referred for coronary artery angiography due to suspected coronary artery disease (CAD) are selected for the study.

Study area and time duration - Duration of the study is from January 2018-September 2021. This study is conducted at Dr. Pinnamaneni Siddhartha Institute of Medical Science and Research Foundation, Gannavaram.

Inclusion Criteria –

1. A total of 100 subjects (50-metabolic) and (50-non metabolic) are included in the study, (n=66) male and (n=34) female.
2. Majority of the study population are of age group between 51-60 years.

Exclusion Criteria -

1. Patients age below 18 years and above 65 years.

 2. Patients who had prior coronary artery disease or any percutaneous coronary intervention or coronary artery bypass graft.

 3. Patients with incomplete data and patients who did not consent for this study

Data collection and procedure –All patients were inquired in detail about case histories(record), which included sex, age, hypertension, diabetes. The anthropometric measurements such as body height, body mass, waist circumference, and blood pressure were determined by the same physicians from our department with body mass index (BMI). BMI was calculated as body weight in kilograms divided by the square of height in meters (kg/m^2). Waist circumference was calculated as the average of two measurements taken after inspiration and expiration at the highest point of iliac crest. Blood pressure was assessed while the patient was sitting, and the average of three measurements was calculated. Fasting blood samples were collected after 14-hour fasting by GOD-POD method, triglyceride, high-density lipoprotein (HDL) cholesterol, were measured by using Lipase Glycerol Kinase (LIP/GK), enzymatic clearance method.

Angiographic assessment - The syntax score system used to show the severity of CAD. It also quantitates the complexity and the extent of CAD to aid clinicians in assessing early and late outcomes of PCI and CABG in patients with multivessel CAD and it has become the preferred risk assessment tool for grading lesion complexity.

Data and statistical analysis- Statistical analysis carried out by using Statistical Package for Social Sciences (SPSS) software; Independent t test will be used. Data will be represented in mean ± standard deviation, median (range) or numbers (%) unless specified. Data will be represented in tables.

Ethical Consideration- The Institutional Ethical Committee permissions was taken before beginning the study.

OBSERVATIONS AND RESULTS:

A total of 100 subjects (50-metabolic) and (50-non metabolic) were included in our study with, (n=66) male and (n=34) female. Majority of the study population are of age group between 51-60 years (37%) (Table 1). In patients with MS- 4% of study participants are having high syntax scores, 72% of study participants are having intermediate syntax score, 24% of study participants are having low syntax score. In patients without MS- 8% of study participants are having intermediate syntax score and 92% of study participants are having low syntax score. Patients with MS having intermediate syntax score are 90 % of total study population while patients without MS having intermediate syntax score are 10% (Table 2). Relation between sex and syntax score is not significant P (0.714), so, maybe there is no gender discrimination in developing CAD (Table 3). In patients with normal BMI- 9.4% of total study population are having intermediate syntax score, 91.8% of total study population are having low syntax score. In population with obesity-1 – 81.8% of total study population are having intermediate syntax score, 18.2 % of total study population have low syntax score. In patients with pre-obesity- 3.9% of study population have high syntax score, 54.9% of total study population have intermediate syntax score, 41.2% of total study population have low syntax score. 100% of study population

with underweight are having low syntax score. There is a strong relation between BMI and syntax score with Chi square (32.658), df (8), P (0.000) (Table 4). Results suggested that elevated waist circumference, reduced HDL-C, and elevated fasting glucose might have the relatively higher association with CAD and MS, whereas elevated TGs and high blood pressure might have weaker association (Table 5)

TABLE -1: shows the mean standard deviations (MSD) of demographic details like age (54.81±8.166), height (162.94±8.237), weight (67.80±9.354), BMI (25.54±3.412), waist circumference (90.27±9.091), Systolic blood pressure (SBP)-(127.25±16.566), Diastolic blood pressure (DBP)- (83.35±11.238), Fasting blood glucose (FBG)- (124.09±35.232), Triglycerides (TG)- (147.55±66.626), High density lipid cholesterol (HDL)-(38.02±4.166), syntax score-(16.44±9.676).

Statistics

	Age	Height (cm)	Weight (kg)	BMI	Waist circumference	SBP	DBP	FBG (mg/dl)	TG (mg/dl)	HDL (mg/dl)	Syntax score
Valid	100	100	100	100	100	100	100	100	100	100	100
Missing	0	0	0	0	0	0	0	0	0	0	0
Mean	54.81	162.94	67.80	25.54	90.27	127.25	83.35	124.09	147.55	38.02	16.44
Standard deviation	8.166	8.237	9.354	3.412	9.091	16.566	11.238	35.232	66.626	4.166	9.676

TABLE-2:M/NM syntax grad cross tabulation

			Syntax grad			Total
			High	Intermediate	Low	
M		Count	2	36	12	50
		%within M/NM	4.0%	72.0%	24.0%	100.0%

			100.0%	90.0%	20.7%	50.0%
M/NM		%within syntax grad	100.0%	90.0%	20.7%	50.0%
	NM	Count	0	4	46	50
		%within M/NM	0.0%	8.0%	92.0%	100.0%
		%within syntax grad	0.0%	10.0%	79.3%	50.0%
Total		Count	2	40	58	100
		%within M/NM	2.0%	40.0%	58.0%	100.0%
		%within syntax grad	100.0%	100.0%	100.0%	100.0%

M- metabolic syndrome, NM- without metabolic syndrome.

Chi square value (47.531) df (2) P(0.000) highly significant

TABLE-3: It gives the information of syntax score grading between sex and syntax grade.

			Syntax grade			Total
			High	Intermediate	Low	
Sex	F	Count	1	15	18	34
		%within sex	2.9%	44.1%	52.9%	100.0%
		%within syntax grad	50.0%	37.5%	31.0%	34.0%

	M	Count	1	25	40	66
		%within sex	1.5%	37.9%	60.6%	100.0%
		%within syntax	50.0%	62.5%	69.0%	66.0%
Total		Count	2	40	58	100
		%within sex	2.0%	40.0%	58.0%	100.0%
		%within syntax grad	100.0%	100.0%	100.0%	100.0%

Chi square(0.674),df (2),P(0.714).Relation between sex and syntax score is not significant ,so, maybe there is no gender discrimination in developing CAD.

TABLE-4-BMI Syntax grad cross tab

			Syntax grad			Total
			High	Intermediate	Low	
BMI	Normal	Count	0	3	34	37
		%within BMI	0.00%	9.40%	91.80%	100.0%
		%within syntax grad	0.00%	7.50%	58.60%	32.0%
	Obesity	Count	0	9	2	11

		%within BMI	0.00%	81.80%	18.20%	100.0%
		%within syntax grad	0.00%	22.50%	3.40%	11.0%
	Pre obesity	Count	2	28	21	51
		%within BMI	3.90%	54.90%	41.20%	100.0%
	Underweight	%within syntax grad	100.0%	70.0%	36.20%	51.0%
		Count	0	0	1	1
		%within BMI	0.00%	0.00%	100.0%	100.0%
		%within syntax grad	100.0%	100.0%	1.70%	1.0%
Total		Count	2	40	58	100
		%within BMI	2.0%	40.0%	58.0%	100.0%
		%within syntax grad	100.0%	100.0%	100.0%	100.0%

BMI- Body Mass Index

Chi square (32.658),df(8),P(0.000)highly significant This table shows that there is a strong relation between BMI and syntax score.

TABLE-5- Shows the relation between hypertension and syntax grad crosstab.

			Syntax grad			Total
			High	Intermediate	Low	
Blood pressure	Hypertensive	Count	2	21	27	50
		%within HTN	4.1%	42.9%	54.0%	100.0%
		%within syntax grad	100.0%	52.5%	46.5%	50.0%
	Normotensive	Count	0	19	31	50
		%within HTN	0.0%	38.0%	62.0%	100.0%
		%within syntax grad	0.0%	47.5%	53.4%	50.0%
Total		Count	2	40	58	100
		%within HTN	2.0%	40.0%	58.0%	100.0%

		%within syntax grad	100.0%	100.0%	100.0%	100.0%

Chi square (3.280), df(4),P(0.512) relation between hypertension and syntax score is not significant.

DISCUSSION:

This study was aimed to compare the angiographic severity of coronary artery disease among metabolic syndrome and nonmetabolic syndrome population(normal) using syntax score.

Here in our study, 72% of study participants with MS (metabolic syndrome) are having intermediate syntax score while 8% of study participants without are having intermediate syntax score, 24% of study participants with MS are having low syntax score while 92% of study participants without MS are having low syntax score (table 2), so this study shows that patients with metabolic syndrome are having higher incidence of CAD. In most of the studies similar results have been reflected, the outcome with which the metabolic syndrome was to be related was atherosclerotic vascular disease, either coronary heart disease alone or stroke. In a study done by Yoon et al, it has shown that there is no relationship between MS and coronary atherosclerosis in diabetic subjects [5].

In our study there is no significant difference P (0.714) in relation to gender and syntax score in developing CAD. Furthermore, a recent prospective study in Finland has also shown a similar result that during the 9-year follow-up, 422 deaths occurred, and after multivariable adjustment, no significant differences were found between patients with and without MS for all-cause, CVD, or CAD mortality in all study participants or by gender [6]. A study done by Sarrafzadegan et al. has shown that among symptomatic Korean population, there was no significant difference between MS group and non-MS group regarding their age [7].

The results from an American population showed that although accelerated coronary atherosclerosis progression is observed in the setting of MS, this is due to the presence of individual component risk factors rather than to the presence of the syndrome itself [8].The prevalence of MS was 75% and occurred more frequently in men (62.2% of MS cases), contrast results have been reflected in our study [9].

In our study syntax score is weakly associated with hypertension, P (0.512) relation between hypertension and syntax score is not significant, similar results have been reflected, whether MS score, MS, and its individual components were related to the prevalence of angiographic CAD was also evaluated in the present study. Results showed that elevated waist circumference, reduced HDL-C, and elevated fasting glucose might have the relatively higher association with

CAD, as well as MS score and MS, whereas elevated TGs and high blood pressure might have weaker association [10].

Patients with CAD had a higher prevalence of metabolic syndrome thus it is associated with severity of CAD. This study has similar results with our study [11].

Similar results in this study have been reflected that the ability of MS and its individual components to predict angiographic CAD. Type 2 DM has long been recognized as a significant risk factor for CAD In the present study, increased FBG was the only significant predictor of CAD although high BP, decreased HDL-C, and increased BMI were the three most frequently observed characteristics [12].

While a study conducted outside India has reported that 90% of the study population were found to be fall under the category of metabolic syndrome. This study also gives the information about all the factors included in metabolic syndrome according to IDF criteria are high in patients with metabolic syndrome than the counterpart [13].

CONCLUSION:

This study helped us to understand the severity of disease in patients with MS and compare with their counterparts. It gives the information that MS is in significant relation with the syntax score and CAD P (0.000). So, angiographic severity of CAD among MS is higher than the counterpart.

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