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General Medicine

Study of Metabolic Syndrome in Young Acute Coronary Syndrome

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Abstract		**Original Research Article**

Aim: Study of metabolic syndrome in young patients of acute coronary syndrome. *Objective*: To study the prevalence of Metabolic Syndrome in Young patients with Acute Coronary Syndrome and its various subtypes (Unstable Angina, NSTEMI, and STEMI). *Patients and methods:* A total of 60 consecutive patients presenting with a first-ever acute coronary syndrome. The diagnosis of the metabolic syndrome using International Diabetes Federation (IDF) criteria. *Results:* 56.7% of study population had metabolic syndrome. The mean age of the ACS patients with metabolic syndrome was 37.41 +/-6.21 years. 75% of the female patients had metabolic syndrome and 52% male patients had metabolic syndrome. In our study 70% of patient with metabolic syndrome had history of alcohol consumption and 64.7% had smoking history which was statistically significant. Moreover, 58.8% of metabolic syndrome had heart failure while 30.7% patients without metabolic syndrome had metabolic syndrome. *Conclusion:* The prevalence of metabolic syndrome was high in patients of Acute coronary syndrome. Female preponderance for metabolic syndrome was noted in our study. Alcohol and smoking were significantly associated with presence of metabolic syndrome. Metabolic syndrome was significantly associated with Heart failure and among its components, low HDL was found to be in a greater number of patients with heart failure and was statistically significant.
Keywords: metabolic syndrome, coronary syndrome, International Diabetes Federation (IDF), low HDL.

INTRODUCTION

Metabolic syndrome is a silent epidemic which includes a group of metabolic disorders which increases cardiovascular mortality and morbidity. The metabolic syndrome otherwise called insulin resistance disorder comprises of a multiple metabolic anomalies that leads to higher chance of developing cardiovascular diseases (CVD) and diabetes mellitus. The significant highlights of this syndrome incorporate obesity mainly central, raised levels of serum triglycerides, lower levels of serum high-density lipoprotein (HDL) cholesterol, raised blood glucose, and raised systemic blood pressure.

The individual parts of metabolic syndrome acts synergistically leading to or progressing the preexisting atherosclerosis [59]. The predominance of the metabolic syndrome varies over the globe, depending on the diagnostic criteria used to define the syndrome, age and the populaces considered.

Generally, the prevalence of the syndrome increases with age. The most noteworthy recorded prevalence overall is among local Americans, with almost 60% and 45% of females and males of 45–49 years of age, respectively meeting the measures of the National Cholesterol Education Program and Adult Treatment Panel III. Asian Indians have a more prominent occurrence of coronary disease, while migrants of Asian Indian origin throughout the world have been appeared to have a higher death rate due to coronary disease as compared with local population [57].

South Asians have a higher mean waist-hip ratio, adding to their higher chances of developing insulin resistance, diabetes, hyperinsulinaemia, hypertension, and hypertriglyceridemia when contrasted with European population [58]. The Metabolic syndrome in Indian population is prevalent in 31.4%, and females are more affected than males [1, 2] and its prevalence increases with age [3]. The metabolic factors associated with this syndrome increases the risk and

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410

incidence of cardiovascular disorders and diabetes mellitus.

In India and other countries of South Asia the incidence of insulin resistance, obesity (central) and metabolic syndrome is quickly expanding, prompting expanded mortality and morbidity because of cardiovascular disease and Type 2 Diabetes Mellitus. Around about 33.3% of metropolitan South Asians have proof of the metabolic syndrome.

Moreover, children and adolescents of Asian Indians have nearly 30% findings of the insulin resistance and a large portion of population exhibits features of metabolic syndrome. Since the syndrome x and overweight track into adulthood, these clinical elements should be identified in the younger age for effective counteraction of diabetes mellitus type 2 and CVD. In traveler population having a place with lower financial background dwelling in metropolitan slums have high predominance of metabolic syndrome and related cardiovascular risk factors have additionally been seen. The primary drivers are identified with way of life and financial advances, quick dietary changes, subsequent to expanding wealth, urbanization, automation, and rural to-metropolitan migration [35]. Data likewise show that the Asian Indians have more aetherogenic lipid profile, glucose intolerance, thrombotic propensity, subclinical inflammation, and dysfunctioning of endothelial than the Caucasians. A significant number of such indications are more extreme and are seen at an early age in Asian Indians [35]. Among Indians the Cardiovascular risk additionally manifests at a lower level of adiposity and abdominal obesity [35]. This study targets contemplating the prevalence of metabolic syndrome in patients with premature acute coronary syndrome of age 45years or less. We also attempted to study the relation of metabolic syndrome and its components with various complications of acute coronary syndrome.

MATERIALS AND METHODS

This Study Entitled "STUDY OF METABOLIC SYNDROME IN YOUNG PATIENTS OF ACUTE CORONARY SYNDROME" was conducted at Sri Aurobindo Medical College and PG institute, Indore, a 1200 bedded tertiary care and referral center situated in heart of the city with state of the art technology catering to all sections of the society. The hospital gets referral from a number of states surrounding Indore like Rajasthan, Haryana, Uttar Pradesh, Maharashtra, and other parts of Madhya Pradesh.

Study Design: The present study was an Observational Study.

Duration of Study: The study was conducted over a period of 18 months from December 2018 to May 2020.

Study Population: 60 YOUNG PATIENTS OF ACUTE CORONARY SYNDROME who presented to Sri Aurobindo Medical College and PG institute, Hospital Emergency department during the period of study were studied and analyzed according to inclusion criteria. The informed consent was obtained from patient's attenders.

Sampling: Purposive Sampling (Non-probability sampling) technique was employed to recruit the desired samples from the population of patients with YOUNG PATIENTS OF ACUTE CORONARY SYNDROME who were admitted at Sri Aurobindo Medical College and PG Institute, Hospital that further met the Inclusion-exclusion criteria.

Inclusion Criteria
- Inpatients with Acute Coronary Syndrome and age 45 years or less in Sri Aurobindo Institute Of Medical Sciences, Indore.
- Patients with ACS including unstable angina (UA), non-ST elevation myocardial infarction (NSTEMI) and ST elevation myocardial infarction (STEMI) diagnosed as per ESC criteria will be enrolled in to the study.

Exclusion Criteria
- Patients not willing for the study.
- Pregnant patient.
- Patients with previous history of ACS.
- Patients having chronic inflammatory disorders like Rheumatoid arthritis, Tuberculosis, Gout, Osteoarthritis are ruled out by history.

Procedure Planned
The patient/ Attenders were explained about the complete treatment procedure, and complete information about study, its benefits and its future prospects, in his/her own language and his/her willingness to undergo for the same was recorded in a consent form duly signed by him/her.

All the young patients with acute coronary syndrome were thoroughly investigated. All the relevant medical history was obtained.

OBSERVATIONS AND RESULTS

**Table-1: Metabolic syndrome in relation with different parameters**

	Metabolic Syndrome		Mean	Std. Deviation	P VALUE
Age (Years)	YES	34	37.41	6.214	**0.03**
	NO	26	40.77	5.202	
Weight(cm)	YES	34	79.35	11.105	0.235
	NO	26	75.42	14.278	
Height (kg)	YES	34	161.62	8.532	**0.004**
	No	26	168.15	8.172	
waist circumference (cm)	YES	34	95.53	6.411	**0**
	No	26	85.31	11.38	
BMI (kg/m2)	YES	34	30.71	5.419	**0.003**
	No	26	26.65	4.569	
Systolic blood pressure (mmHg)	YES	34	129.29	16.528	0.208
NO		26	124.08	14.582	
Diastolic blood pressure (mmHg)	YES	34	78.47	10.48	0.157
NO		26	75	7.467	
Hb (gm%)	YES	34	13.32	2.128	0.718
NO		26	13.5	1.449	
WBC (/cmm)	YES	34	9393.35	3779.363	0.746
NO		26	9733.08	4297.549	
Platelet (lac/cmm)	YES	34	2.94	0.851	0.227
NO		26	2.69	0.679	
FBS (mg%)	YES	34	121.29	35.264	0.172
NO		26	108.08	38.568	
Total Cholesterol (mg%)	YES	34	144.74	48.02	0.601
	No	26	150.77	38.169	
HDL (mg%)	YES	34	34.82	9.709	**0.002**
NO		26	43.38	11.031	
LDL (mg%)	YES	34	90.03	33.448	0.833
	No	26	88.19	33.045	
TRIGLYCERIDE (mg%)	YES	34	165.12	101.535	0.175
	No	26	133.65	66.081	

Table-2: Heart failure with metabolic syndrome and its components

Category		Heart Failure		Total	P Value
		Yes	No		
Metabolic Syndrome	Present	20 (58.83%)	14 (41.17%)	34	**0.03**
Absent		8 (30.77%)	18 (69.23%)	26	
Waist circumference	Deranged	17 (39.53%)	26 (60.47%)	43	0.907
	Normal	7 (41.18%)	10 (58.82%)	17	
Systolic Blood Pressure	Deranged	12 (40.00%)	18 (60.00%)	30	1.000
Normal		12 (40.00%)	18 (60.00%)	30	
Diastolic Blood Pressure	Deranged	5 (45.00%)	6 (55.00%)	11	0.683
normal		19 (39.00%)	30 (61.00%)	49	
FBS	Deranged	13 (39.00%)	20 (61.00%)	33	0.916
Normal		11 (41.00%)	16 (59.00%)	27	
HDL Cholesterol	Deranged	11 (30.00%)	26 (70.00%)	37	**0.039**
Normal		13 (57.00%)	10 (43.00%)	23	
TRIGLYCERIDE	Deranged	10 (40.00%)	15 (60.00%)	25	1.000
Normal		14 (40.00%)	21 (60.00%)	35	
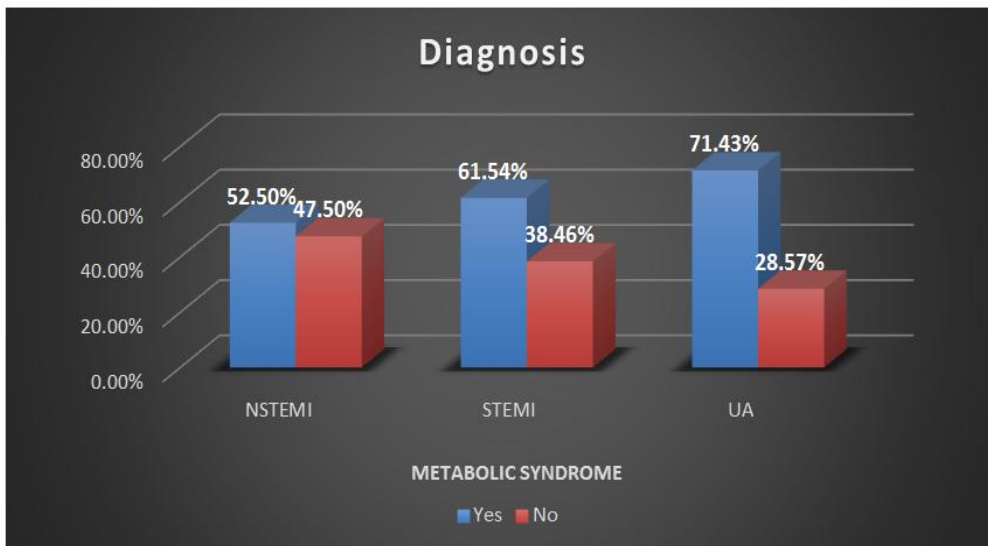
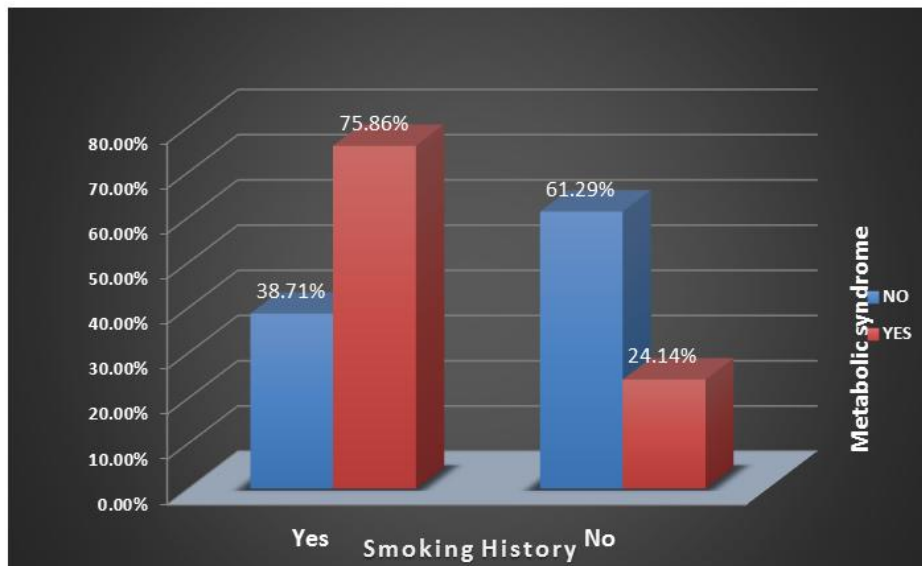**Graph-1: Metabolic syndrome and acute coronary syndrome**
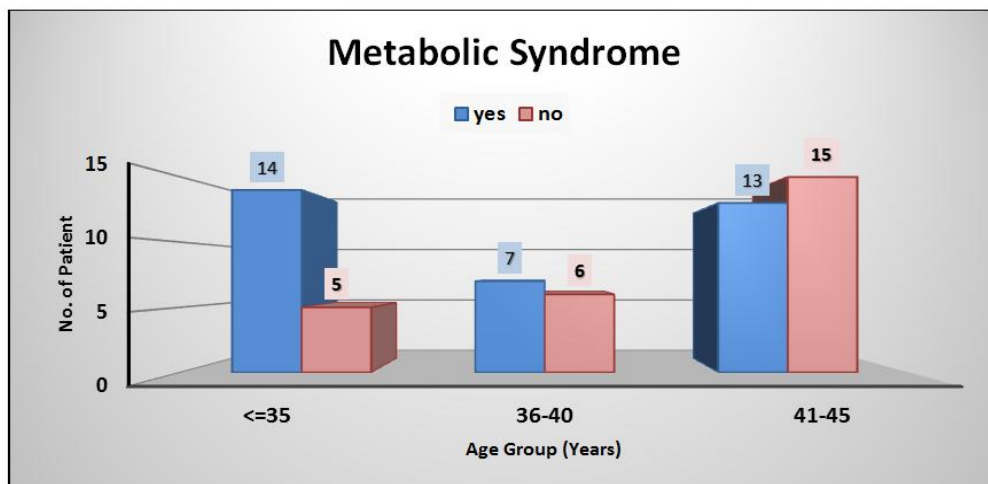
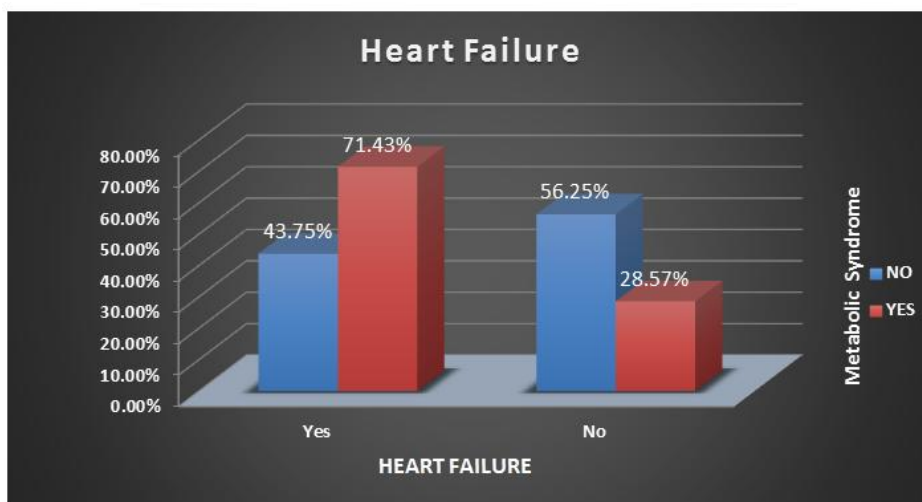**Graph-2: Metabolic Syndrome and Age Group**
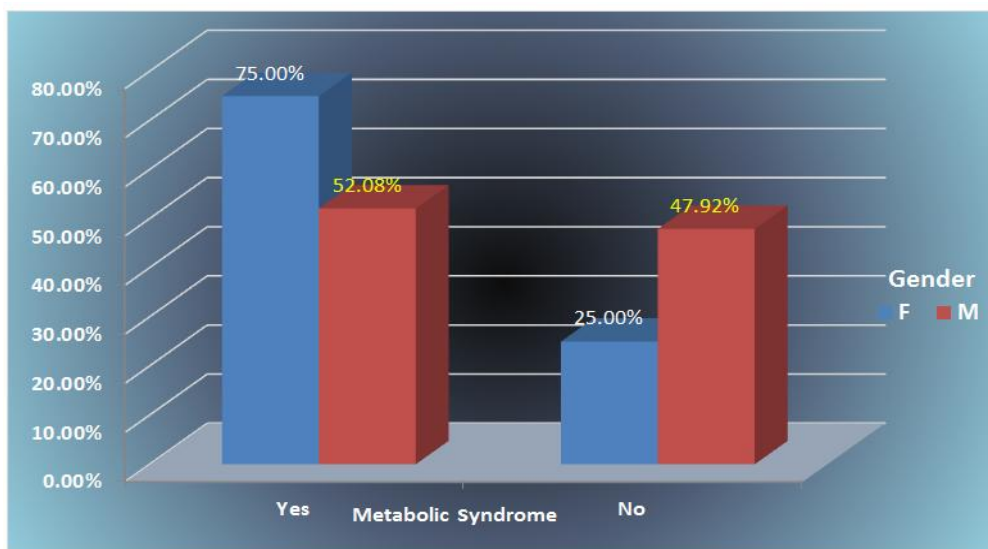
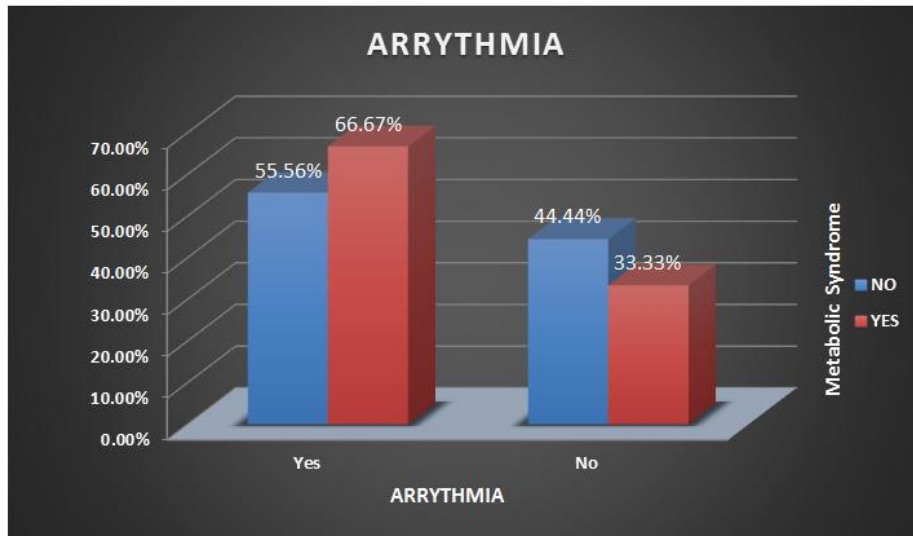**Graph-3: Metabolic Syndrome and gender**

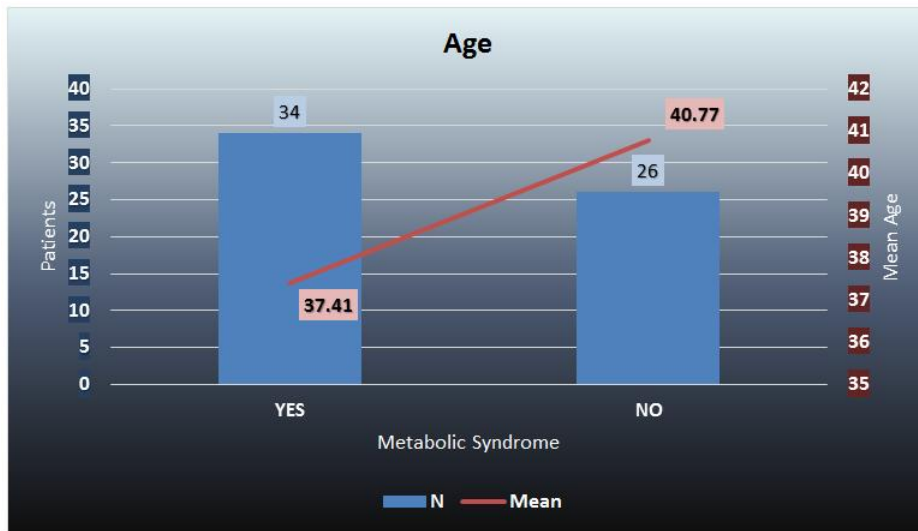**Graph-4: Metabolic Syndrome with history of alcohol intake**

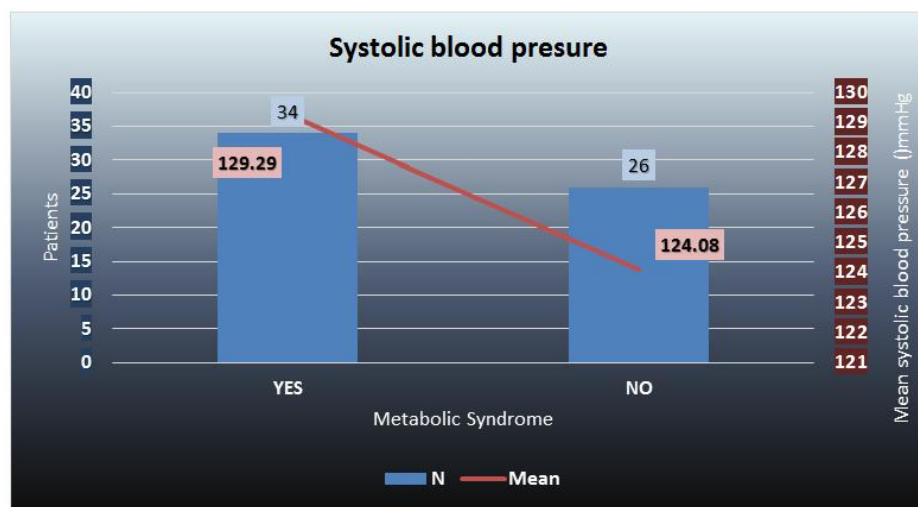**Graph-5: Metabolic Syndrome with history of smoking.**

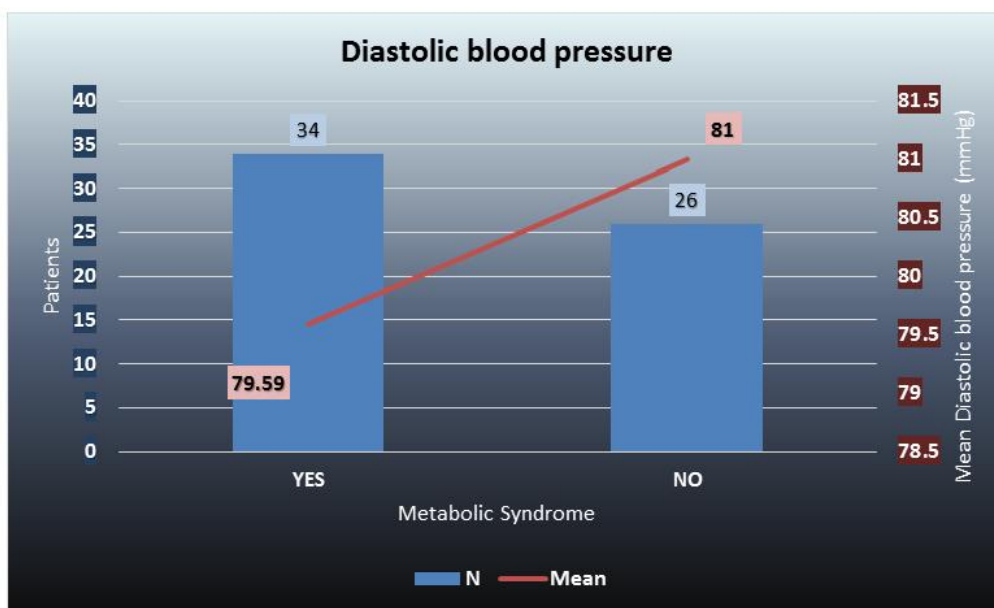**Graph-6: Metabolic Syndrome with heart failure**
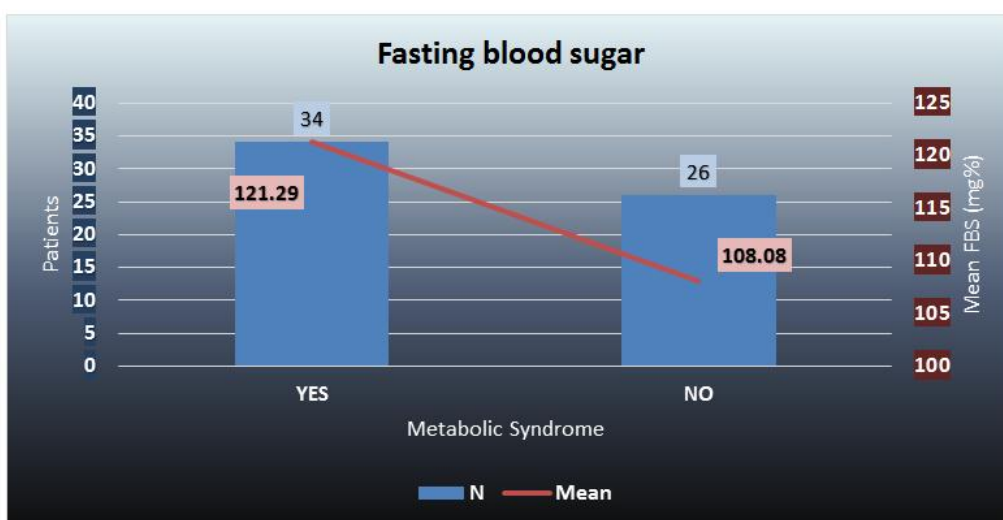
Graph-8: Metabolic Syndrome with arrhythmia

Graph-9: Mean age of patients with and without metabolic syndrome
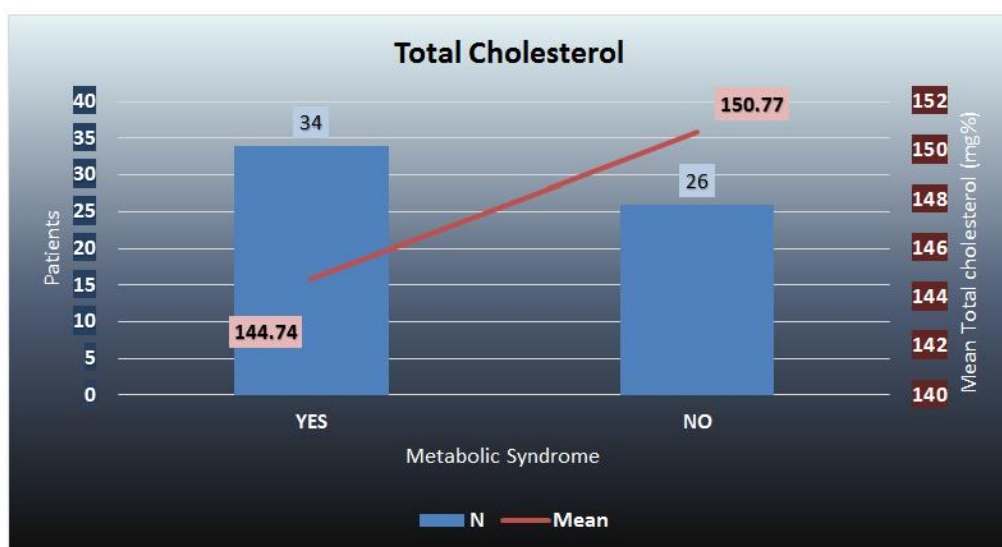

Graph-10: Mean systolic blood pressure of patients with and without metabolic syndrome

Graph-11: Mean diastolic blood pressure of patients with and without metabolic syndrome

Graph-12: Mean fasting blood sugar of patients with and without metabolic syndrome

Graph-13: Mean total cholesterol patients with and without metabolic syndrome.
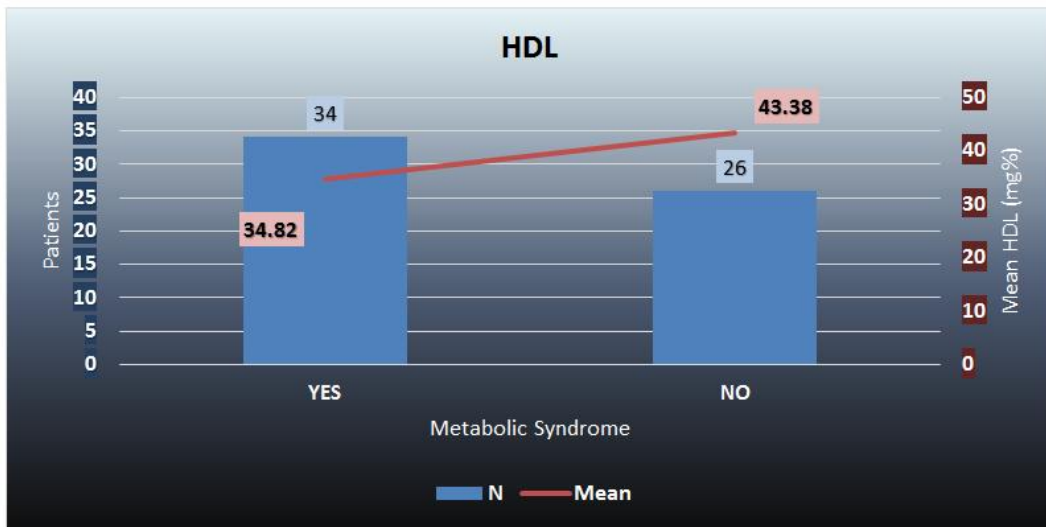
Graph-14: Mean HDL cholesterol levels in patients with and without metabolic syndrome
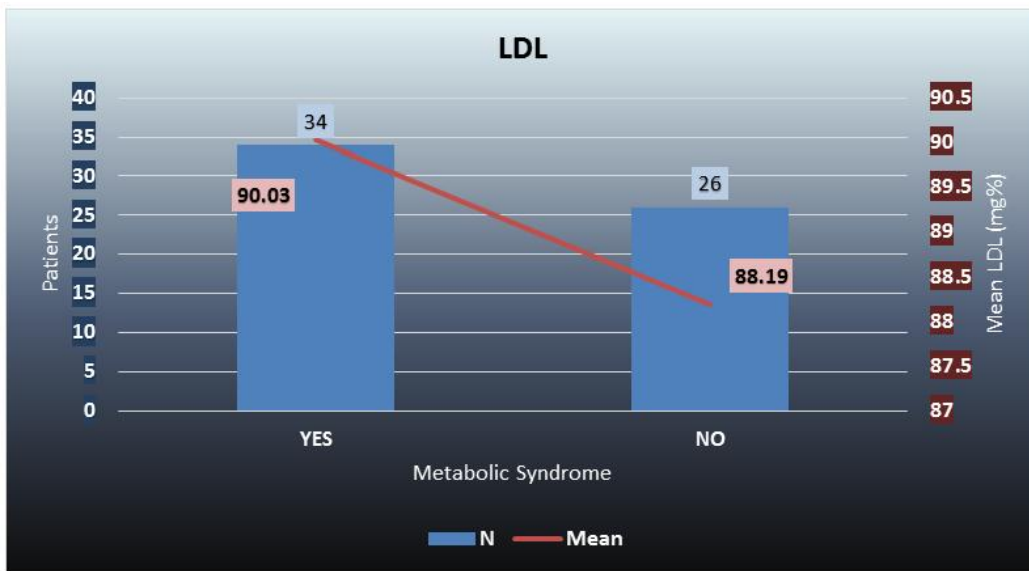
Graph-15: Mean LDL cholesterol levels in patients with and without metabolic syndrome
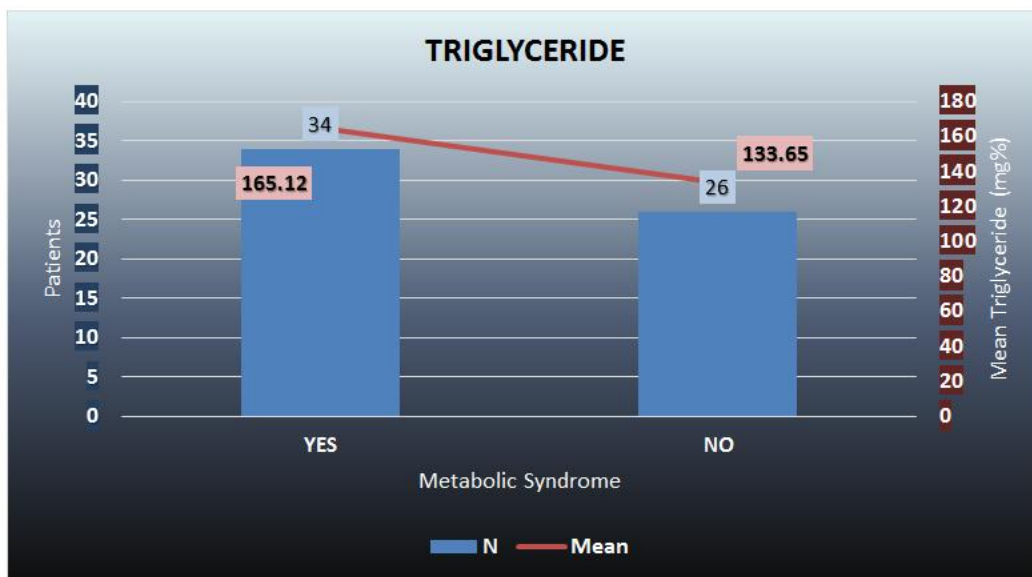
Graph-16: Mean triglyceride levels in patients with and without metabolic syndrome

Graph-17: Mean hospital stay in patients with and without metabolic syndrome

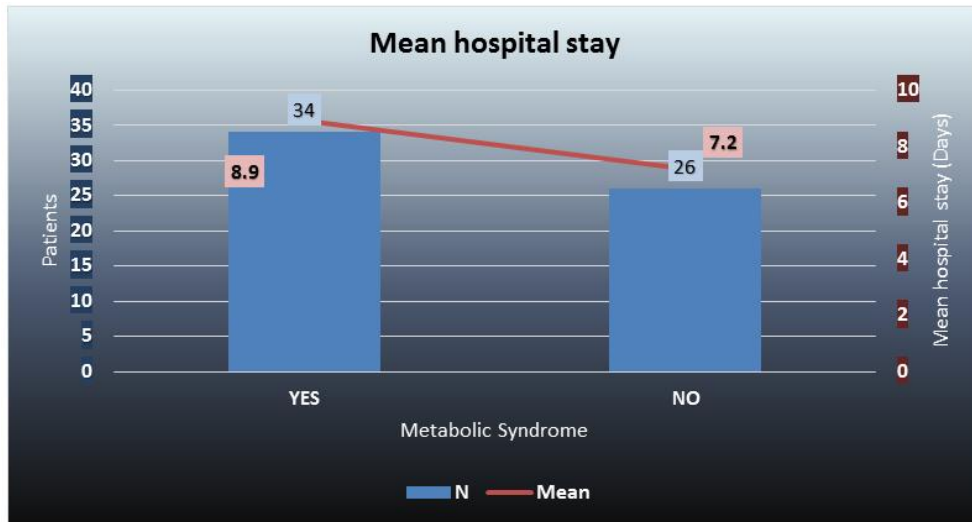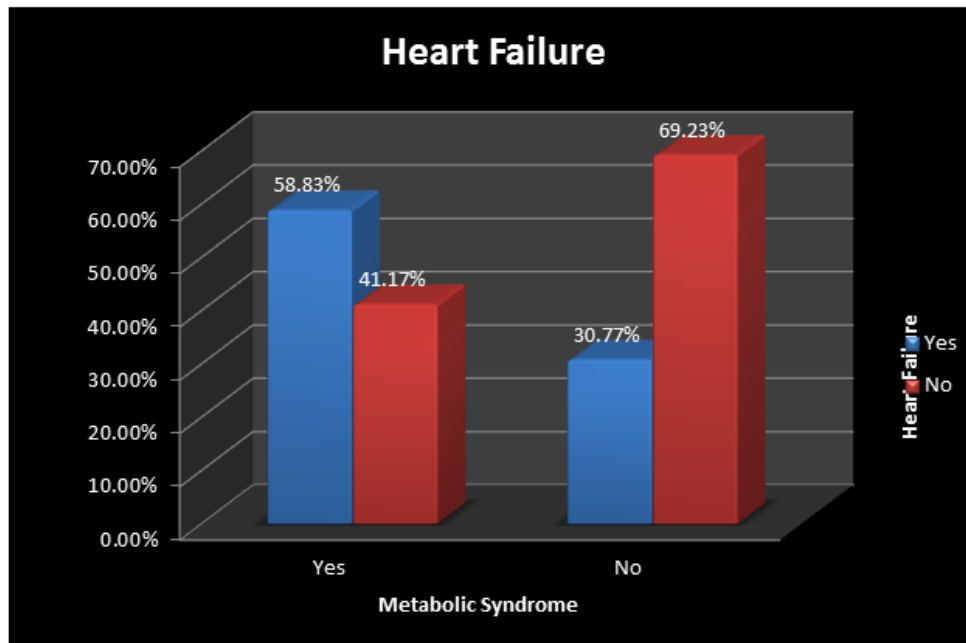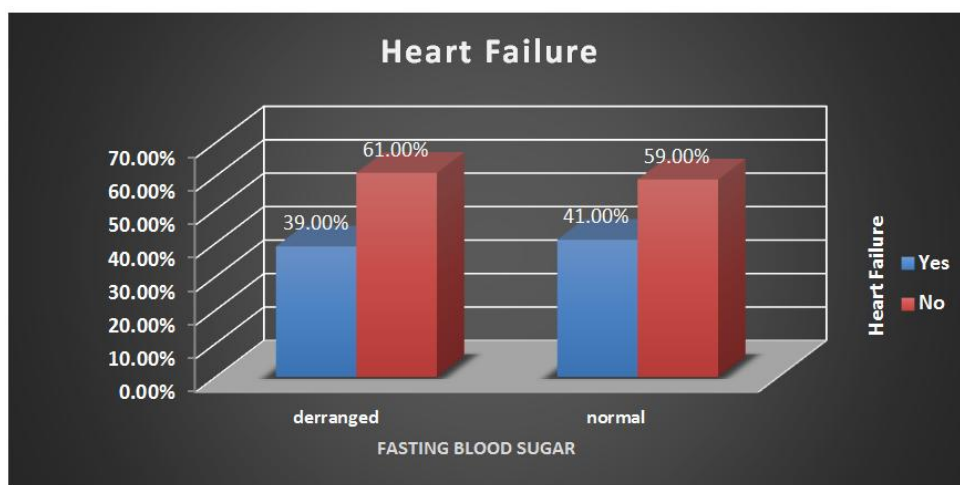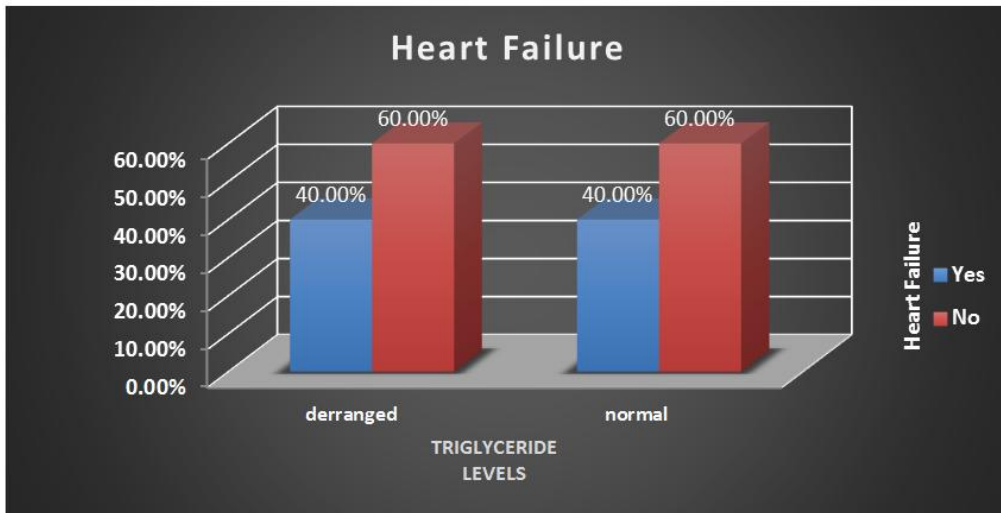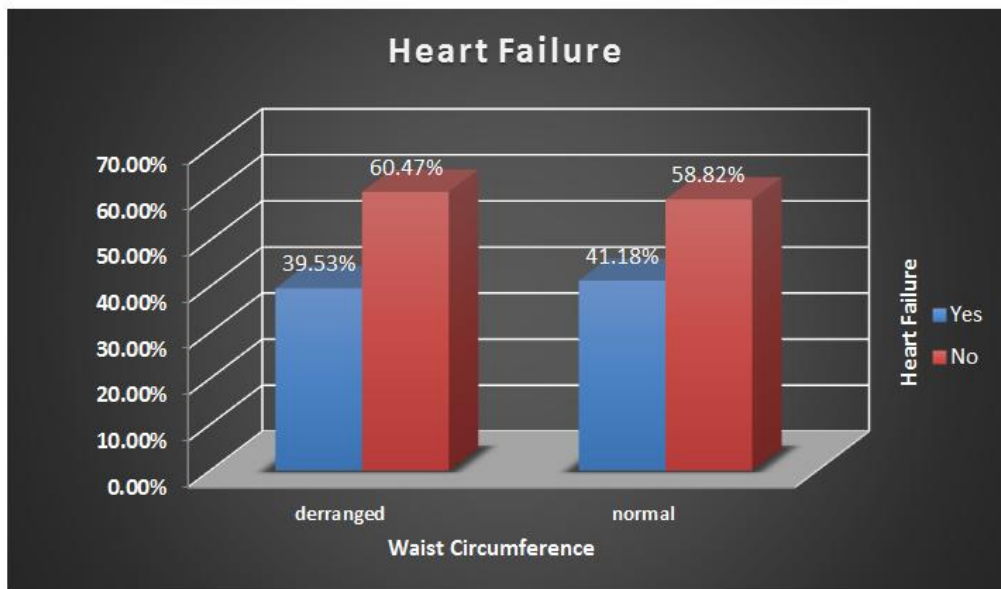**Graph-18: Heart failure with metabolic syndrome**

Graph-19: Heart failure with fasting blood sugar

Graph-20: Heart failure with triglyceride

Graph-21: Heart failure with waist circumference

DISCUSSION

The metabolic syndrome consists of constellation of metabolic derangements that leads to increase risk of cardiovascular disease.

The present study consisted of total 60 patients of Premature (Young) Acute Coronary syndrome who came seeking medical attention at Sri Aurobindo medical college and Post Graduate Institute, Hospital. After taking detailed case history patients were subjected to clinical examination and biochemical tests. Informed written consent was taken from all the patients and all the inclusion and exclusion criteria were followed and these patients constituted our study population.

In our study of 60 patients the age group of the cases ranged from 24 to 45 years and most patients were in the age group of 40-45 years and the mean age

group of this study was 39.09 years similarly Aggarwal *et al*., [48] found the average age of the study population to be 36.3 ± 4.1years, and Haralampos J. Milionis *et al*., [45] showed the mean age of 41.2 ± 3.6years.

In our study among 60 patients, 13(21.7%) had STEMI, 40(66.6%) had NSTEMI, and 7(11.7%) had UA while Virendra Dhakhada *et al*., [38] had 62%, 21%, and 17% of total patient respectively. Jassim Al Suwaid *et al*., [47] had 39% patient with STEMI, 33% had NSTEMI, and 28% UA. Rafid Fayadh Al-Aqeedi *et al*., [39] showed (54% STEMI vs. 46% NSTEMI), Marcos R. Esteban *et al*., [49] had 59.3% patients with STEMI, with 23.6% NSTEMI, and 17.1% with UA, Haralampos J. Milionis *et al*., [45] had 60% pateints with STEMI and 40% with NSTEMI. Gaurav Jain *et al*., [46] had 67% of patient with STEMI and 33% with NSTEMI.

In our study, 34 out of 60 patients (56.7%) had Metabolic Syndrome; similarities were noted by Virendra Dhakhada *et al.*, (59%) [38], Rafid Fayadh Al-Aqeedi *et al.*, (69.4%) [39], and Gaurav Jain *et al.*, (66%) [46] patients fulfilled the criteria of metabolic syndrome. While Pandey *et al.*, [43] noted metabolic syndrome in only 26.19%, difference can be attributed to different diagnostic criteria used.

In our study, the most common age group was found to be 41-45years. Similarity was noted in Vinod Kumar Balakrishnan *et al.*, [50] where 51.2% study population was of age group 36years or more. The mean age group of patient with metabolic syndrome was lower (37.41 years) than those without metabolic syndrome (40.77 years) and was in congruence with Jassim Al Suwaidi *et al.*, (55 vs. 58 years) [42], while Virendra Dhakhada *et al.*, (56.76 vs. 57.61 years) [38], Prasad *et al.*, (51.6vs. 41.5 years) [37], and Rafid Fayadh Al-Aqeedi *et al.*, (50.6 vs. 47.9 years) [39] showed significantly higher rates of metabolic syndrome in older age groups.

In our study, 61% of STEMI had metabolic syndrome, 52.5% of NSTEMI had metabolic syndrome, 71% of UA had metabolic syndrome. Similar findings were noted by Virendra Dhakhada *et al.*, [38] where 56% of STEMI, 71% of NSTEMI, and 52.9% of UA patients had metabolic syndrome, and Jassim Al Suwaidi *et al.*, [42] found 61%, 43%, and 43% of STEMI, NSTEMI, and UA to have metabolic syndrome, respectively.

Our study comprised of 80% males and 20% females. Amongst these 75% of the female patients had metabolic syndrome and 52% male patients had metabolic syndrome. Similar female preponderance was noted study done by Aggarwal *et al.*, [48] (46% vs. 24.3%), Prasad *et al.*, [37] whose study showed significantly high predilection among females with 52.2% than in males at 34.2% and moreover, it extends the observations of Jassim Al Suwaidi *et al.*, [42] (70% vs. 40%), Gaurav Jain *et al.*, (82.4% vs. 57.6%) [46], and Zeller and colleagues [44]. While Pandey *et al.*, [43] showed male preponderance (21% vs. 25%).

As the rising prevalence of obesity among young reflects feature of metabolic syndrome and Analysis of data from the Framingham Heart Study and Bogalusa Heart Study also suggested that increase in central fat antedates the development of coronary heart disease, atherosclerosis and related disorders [41] hence our study took anthropometric parameters into consideration such as weight, height, BMI, and waist circumference.

In our study the average weight of the patients with metabolic syndrome was found to be higher (79.35 kg) as compared to patients without metabolic syndrome (75.42Kg) and Rafid Fayadh Al-Aqeedi *et al.*, [39] had similar observations.

The average height of the patients with metabolic syndrome was found to be significantly lower (161.62cm) as compared to patients without metabolic syndrome (168.15cm) (P value=.004) in congruence with Jassim Al Suwaidi *et al.*, [42].

The mean BMI of the patient with metabolic syndrome was 30.71 kg/m^2 and was higher than the patients who do not have metabolic syndrome 26.26 kg/m^2. Similar findings were noted in Rafid Fayadh Al-Aqeedi *et al.*, [39] and Jassim Al Suwaidi *et al.*, [42] (37.5 vs. 24.9), and (29 vs. 26 kg/m2) respectively.

The mean waist circumference was 95.53cm and 85.31cm among patients with and without metabolic syndrome, respectively. Similar findings were noted in Zeller and colleagues [44] where the mean waist circumference was 106cm in patient with metabolic syndrome and 94cm in patients who do not have metabolic syndrome and was statistically significant.

The major risk factors of acute coronary syndrome were correlated in our study such as family history, diabetes, hypertension, alcohol consumption, smoking and tobacco chewing.

Among the total of 60 patients 35 patients of young ACS had history of alcohol consumption out of which 24 patients had metabolic syndrome. In our study 70% of patient with metabolic had history of alcohol consumption and was statistically significant contrary to study conducted by Virendra Dhakhada, *et al.*, [38] where only 8.4% of patients with metabolic had history of alcohol consumption.

In our study population 29 patients of young ACS were smokers and out of which 22(79.8%) patients had metabolic syndrome. The prevalence of smoking among metabolic syndrome and patients without metabolic syndrome were 64.7% and 26.9%, respectively and was statistically significant contrary to Virendra Dhakhada *et al.*, (50.8% vs. 2.4%) [38], while Zeller and colleagues (23% vs. 38%) [44], and Jassim Al Suwaidi *et al.*, (32% vs. 43%) [42] Showed lower prevalence of smoking among metabolic syndrome and not metabolic syndrome patients.

Among the total 60 cases of our study only 10 patients were tobacco chewers and among them 6 had metabolic syndrome. 17.6% and 15.3% of patients with metabolic syndrome and non-metabolic syndrome were tobacco chewers, but was not statistically significant agreeing with Virendra Dhakhada *et al.*, [38] (32.2% vs. 41.4%).

Total 12 patients of our study had previously diagnosed diabetes Mellitus and among which 7 were found to have metabolic syndrome. 20.5% of patients with metabolic syndrome had past history of diabetes mellitus while 19.2% of patients without metabolic syndrome had history of diabetes mellitus. Gaurav Jain *et al*., [46] noted history of diabetes mellitus in 83% of the patient with metabolic syndrome and 38.2% without metabolic syndrome, and Zeller and colleagues [44] noted (48% vs. 7%).

Our study found to have waist circumference, FBS and low HDL was significantly associated with metabolic syndrome. While Virendra Dhakhada *et al*., [38]. MetS, difference in waist circumference, high BP, TG and FBS were statistically significant with $p < 0.05$.

CONCLUSION

The metabolic syndrome consists of constellation of metabolic derangements that leads to increase risk of cardiovascular disease. The prevalence of metabolic syndrome was high in patients of Acute coronary syndrome. Female preponderance for metabolic syndrome was noted in our study.

Alcohol and smoking were significantly associated with presence of metabolic syndrome.

Average lower age, lower height, higher BMI, and Low HDL were significantly associated with metabolic syndrome.

Most common finding among patients with metabolic syndrome was deranged waist circumference followed by deranged HDL, FBS, Systolic blood pressure triglyceride and Diastolic blood pressure.

Metabolic syndrome was significantly associated with Heart failure and among its components, low HDL was found to be in a greater number of patients with heart failure and was statistically significant.

However, the study had several limitations. First, this is a single-center study. The study population was small. Moreover, unfortunately, we could not seek to examine the long-term clinical outcomes of all patients. In our study, the assessment of vessels lesions was not done in all patients.

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