Prevalence of Metabolic Syndrome and its Component in Patients with Acute Coronary Syndrome.

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ABSTRACT

Introduction: The Metabolic syndrome is a cluster of risk factors associated with risk of coronary artery disease causing morbidity and mortality in both developing and developed countries. The aim of this paper was to evaluate the prevalence of Metabolic Syndrome and to evaluate its cardiovascular risk potential using the National Cholesterol Education Program's Adult Treatment Panel III Criteria.

Methods: It was a hospital based case control study carried out in Cardiac Care Unit in Bir Hospital and Shahid Ganga Lal Heart Center in Kathmandu, Nepal, from 16th July 2005 to 10th August 2006. Total 209 patients with Coronary Artery Disease (Acute Coronary Syndrome) were enrolled. Patients having coronary by-pass surgery in past, age less than 18 years and other co-morbid diseases were excluded. The cardiovascular risk factors that define the metabolic syndrome and their correlation with the cardiovascular risk were evaluated by descriptive and interferential statistical methods. All analysis was carried out using SPSS 19. A p value <0.05 was considered as significant.

Results: A total of 209 patients of coronary artery disease were studied with a mean age of 57.87±12.45 years (range 27-88 years). Metabolic Syndrome was present in 120 (57.4%) patients. Out of 120, male and female were 78 (65.0%) and 42 (35%) respectively. Significant difference (p<0.05) between male with metabolic syndrome and female with metabolic syndrome were found in smoking (p=0.004), hypertension (p=0.047), tobacco use (p=0.007), triglyceride (p=0.014) and fasting blood glucose (p=0.05).

Metabolic Syndrome with five, four and three components was documented in 2.5%, 35% and 62.5% patients respectively. Only 31 (25.8%) patients with metabolic syndrome had diabetes mellitus, remaining 89 (74.2%) were non diabetic. Significant difference (p<0.05) between these two groups (metabolic syndrome and non-metabolic syndrome) were found in hypertension (p<0.001), diabetes mellitus (p=0.004), total cholesterol (p=0.043) and fasting glucose (p=0.001).

Conclusions: Metabolic syndrome is most common and important risk factor in patients of coronary artery disease. Other risk factors like smoking, obesity, dyslipidemia, hypertension and diabetes were also frequently found. Public awareness to control the risk factors can reduce the prevalence of coronary artery disease in our country.

Keywords: metabolic syndrome, acute coronary syndrome,

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INTRODUCTION

The metabolic syndrome is one of the major public health issues of this century. It is a constellation of physical conditions and metabolic abnormalities, commonly occurring together. If the current trend continues, these conditions will increase the financial burden in developed and developing countries.

The prevalence of Metabolic Syndrome (MS) and cardiovascular disease (CVD) among South Asians is increasing. This trend is not only seen in South Asians residing on the Indian subcontinent (eg, India, Pakistan, Bangladesh, Nepal), but is also observed in countries with large numbers of South Asian immigrants [1]. It is estimated that 20% –25% of South Asians have developed MS and many more may be prone to it. Urbanization, economic growth, irregular timing of meals and dietary westernization has been suggested as potential culprits implicated in the development of this disorder [2]. In the year 2005, 58 million people died from CVD accounting for 30% of all deaths worldwide; more than half these deaths were in developing countries [3]. If the risk factors associated with CVD go unchecked, then by 2030, when the world population is expected to reach 8.2 billion, 33 percent (24.2 million) of all deaths will be due to CVD [4].

The aim of the present study was to determine the prevalence of Metabolic Syndrome (MS) using the National Cholesterol Education Program - Adult Treatment Panel III (NCEP-ATP III) criteria[5] the frequency and combination of its definitive components in patients with Acute Coronary Syndrome (ACS) in Nepal.

METHODS

We performed a hospital–based cross sectional prospective study of consecutive patients admitted in Cardiac Care Unit with diagnosis of acute coronary syndrome at Bir Hospital and Shahid Ganga Lal Heart Center in Kathmandu, Nepal, from 16th July 2005 to 10th August 2006. Total 209 patients with coronary artery disease (Acute coronary syndrome) were enrolled. Patients having coronary by-pass surgery in past, age less than 18 years and other co-morbid diseases were excluded. All patients were informed about the study and a written consent was obtained from them. Acute coronary syndrome (ACS) was diagnosed on the basis of ECG changes and rises in cardiac enzymes and further classified into ST elevation Myocardial Infarction (STEMI), Non-ST elevation Myocardial Infarction (NSTEMI) and unstable angina.

Demographic data and presence of known risk factors like hypertension, diabetes mellitus, smoking and dyslipidemia were obtained, along with level of physical activity of at least 30 min daily or 5 days a week. Intake of any antihypertensive drugs, hypoglycemics and lipid lowering drugs were documented. Subjects were assessed for the five components of metabolic syndrome. Fasting blood samples were drawn for glucose and lipid profile in first 24 hours after acute coronary insult. Blood pressure was measured by using a standard mercury sphygmomanometer after the subject's pain and anxiety were relieved and the mean value of two measurements taken at least 15 minutes apart was used in the analysis.

Anthropometrics: Height was measured with a stadiometer to the nearest cm; Weight was measured in light clothing without shoes. Waist circumference was measured at narrowest diameter between costal margins and iliac crest or after locating the upper hip bone and top of the right iliac crest, placing the measuring tape in horizontal plane around the abdomen at the level of iliac crest. The body mass index was calculated as the ratio between the weight and the square of the height, according to the international criteria.

Metabolic Syndrome Definition: We applied NCEP-ATP III criteria 5 to define Metabolic Syndrome (MS). Metabolic syndrome was defined by the presence of 3 or more out of 5 components:

1. Central (abdominal) Obesity {Elevated Waist Circumference (WC) Male: ≥ 90 cm/Female: ≥ 80 cm};

2. High Triglyceride (TG) ≥ 150 mg/dL or on drugs for elevated TG;

3. Low HDL-(High density lipoprotein- Cholesterol) [≤ 40 mg/dL (male), ≤ 50 mg/dL (female)] Or on drugs for reduced HDL-C;

4. Elevate Fasting blood glucose (FBG) ≥ 100 mg/dL or on drugs for high sugar;

5. Elevated blood pressure (Systolic blood pressure/diastolic blood pressure > 130 mmHg/ > 85 mm Hg) or on drugs for hypertension.

Statistical Analysis: The data was collected on a pre-designed proforma and variables were entered on SPSS version 19. Frequencies and percentages were computed for qualitative variables and variables compared by Chi square test. Mean and standard deviation were calculated for quantitative variables and mean were compared between two groups (metabolic syndrome and normal metabolic status) by

using independent sample t-test. P-value of 0.05 was considered as significant.

RESULTS

The clinical demographic baseline characteristics of the study population are shown in **Table 1**. A total of 209 patients of ACS were studied with a mean age of 57.87±12.45 years (range 27 to 88 years). Maximum number of patients, 88 (42.1%), were seen in the age group >61 years. STEMI was diagnosed in 102 (48.8%) persons, NSTEMI was present in 31 (14.8%) while unstable angina was seen in 76 (36.4%). Frequency of components of metabolic syndrome are shown in **table 2**, results show prevalence of high FBG and high TG were more.

Table 1: Demographic baseline characteristic of patients with acute coronary syndrome (n=209)

VARIABLES	VALUES	
Ages	57.87 ± 12.45	
Sex	Male 142 (67.9 %)	
	Female 67 (32.1 %)	
Diabetes	40 (19.1 %)	
Hypertension	74 (35.4 %)	
Smokers	163 (78.0 %)	
Ex-smoker	1 (0.5 %)	
Tobacco	29 (13.9 %)	
Family H/O CAD	24 (11.5 %)	
Age groups	**< 40 years**	**16 (7.7%)**
	41-50 years	**50 (23.9%)**
	51-60 years	**55 (26.3 %)**
	>60 years	**88 (42.1%)**
Types Of Myocardial Infraction	**STEMI**	**102 (48.8%)**
	NSTEMI	**31 (14.8%)**
	UA	**76(36.4%)**

FBG (mg/dL)	119.19 ± 42.07
TC (mg/dL)	189.61 ± 51.74
HDL-C (mg/dL)	50.03 ±19.53
LDL-C (mg/dL)	105.29 ± 43.49
TG (mg/dL)	199.81 ± 74.35
BMI 2529.9 (kg/m2)	77 (36.8%)
BMI > 30 (kg/m2)	14 (6.7%)
Metabolic Syndrome	120 (57.4%)
Physical Activity	83 (39.7%)

Table 2: Frequency of Components of Metabolic Syndrome (n-120)

Component of MS	No. (%)
1. WAIST CIRCUMFERENCE	
a. Male ≥ 90 cm	49 (62.8)
b. Female ≥ 80 cm	32 (76.8)
2. TG> 150 mg/dL or on drugs for elevated TG	98 (81.7)
3. REDUCED HDL-C	
a. Male <40mg/dL	31 (39.7)
b. Female <50mg/dL	29 (69.0)
4. HYPERTENSION	69 (57.5)
5. Elevated Fasting Blood Glucose> 100 mg/dl or on drugs for high sugar	100 (83.3)

According to NCEP-ATP III criteria, descriptive statistics for the general characteristics of 209 participants (89 in non-MS group and 120 patients in MS group) are shown in **Table 3**. There is significant differences ($p < 0.05$) between these two groups were found in hypertension 57.5% (p<0.001), triglycerides 219.79 ± 73.84 (p<0.001), diabetes mellitus 25.8% (p=0.004), fasting blood glucose 129.55 ± 43.69 (p-0.001), total cholesterol 195.84 ± 57.73 (p-0.043).

Table 3: Baseline characteristics of the patients with and without MS markers.

S.N.	RISK FACTORS	MS (N=120)	NMS (N=89)	P VALUE
1	Male/ Female	78 (65.0%)/ 42 (35.0%)	65 (73.0%)/ 24 (27.0%)	**0.219**
2	Smoking	90 (75.0%)	73 (82.0%)	**0.228**
3	Hypertension	69 (57.5%)	5 (5.6%)	**< 0.001***
4	Tobacco	12 (10%)	17 (19.1%)	**0.06**
5	DM	31 (25.8%)	9 (10.1%)	**0.004***
6	CAD history	13 (10.8%)	11 (12.4%)	**0.734**

7	Physicallyinactive	73 (60.8%)	53 (59.6%)	**0.852**
8	SBP	127.93 ± 23.19	122.83±23.16	**0.118**
9	DBP	82.79 ± 12.27	80.38 ± 15.20	**0.206**
10	TC (mg/dL)	195.84 ± 57.73	181.21 ±41.16	**0.043***
11	LDL-C (mg/dL)	106.72 ± 46.00	103.36 ±40.04	**0.582**
12	HDL-C (mg/dL)	51.88 ± 24.41	47.54 ±16.47	**0.112**
13	TG (mg/dL)	219.78 ± 73.84	172.89 ±66.47	**< 0.001***
14	WC (cm)	87.58 ± 14.37	83.66 ± 14.03	**0.051**
15	BMI (kg/m^2)	24.50 ± 3.39	24.20 ± 4.58	**0.589**
16	FBG (mg/dL)	129.55± 43.69	105.21 ±35.48	**< 0.001***

Figure 1 shows, Metabolic Syndrome with five, four and three components was documented in 2.5%, 35% and 62.5% patients respectively.

Table 4 shows out of 120 patients with MS, male and female were 78 (65.0%) and 42 (35%) respectively. significant difference (p<0.05) between male with metabolic syndrome and female with metabolic syndrome were found in smoking 83.3% (p=0.004), hypertension (64.1%) (p=0.047), tobacco use 15.14% (p=0.007), triglyceride 231.82 ± 73.69 (p=0.014) and fasting blood glucose 135.27 ± 48.22 (p=0.05).

Only 31 (25.8%) patients with MS had diabetes mellitus, remaining 89 (74.2%) were non diabetic. Chief complaints of MS patients were chest pain (n=111, 92.5%) and chest discomfort (n=5, 4.2%). Central chest pain (43.8%) was most frequent by retrosternal chest pain (42.9%) in the chest pain group (including chest pain as secondary complaints). Out of total chest pain (n-111) non radiating type was present in 74 (61.7%) cases. CPK-MB was tested in 120 MS and 89 NMS patients with average of 65.49 ± 84.141 and 88.66 ± 91.99 respectively.
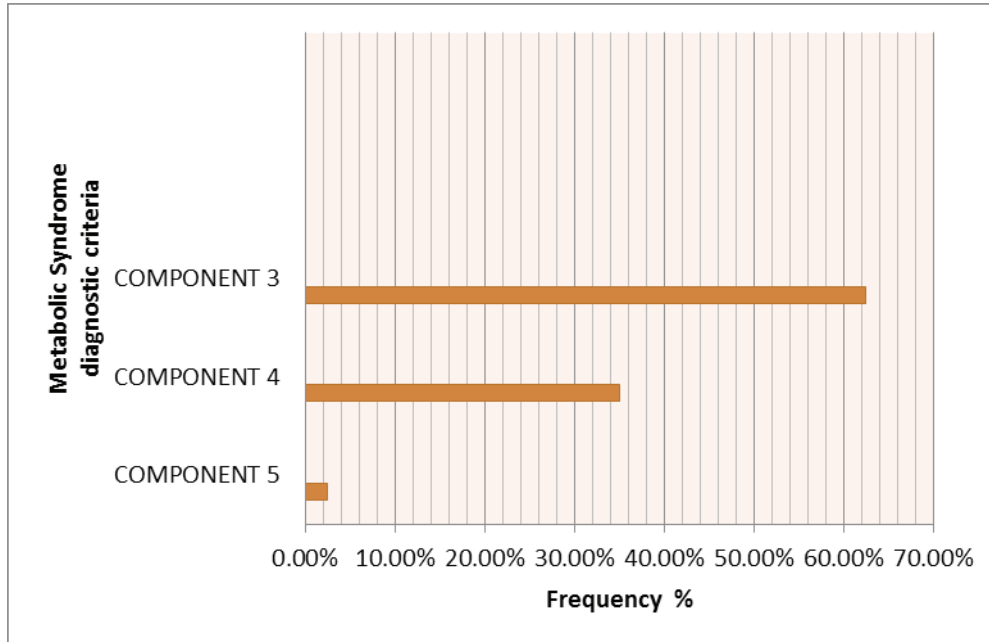
Figure 1: Frequency of metabolic components

Table 4: Baseline characteristics of the patients with MS markers. (n-120)

S.N.	Risk factors	Male (n-78)	Female(n-42)	p-value
1	Smoking	65 (83.3%)	25 (59.5%)	0.004*
2	Hypertension	50 (64.1%)	25 (59.5%)	0.047*

3	Tobacco	12 (15.4%)	0 (0.0%)	0.007*
4	DM	22 (28.2%)	9 (21.4%)	0.423
5	CAD history	8 (10.3%)	5 (11.9%)	0.784
6	Physically inactive	47 (60.3%)	26 (61.9%)	0.852
7	SBP	130.18±19.67	123.74±28.40	0.147
8	DBP	83.74±11.33	81.02±13.82	0.248
9	TC (mg/dL)	203.18±60.99	182.21±48.96	0.057
10	LDL-C (mg/dL)	108.41±46.62	103.57±45.23	0.585
11	HDL-C (mg/dL)	52.49±22.53	50.76±19.37	0.676
12	TG (mg/dL)	231.82±73.69	197.40±69.54	0.014*
13	WC (cm)	88.97±14.40	84.98±14.12	0.147
14	BMI (kg/m^2)	24.32±2.89	24.82±4.19	0.0442
15	FBG (mg/dL)	135.27±48.22	118.93±31.56	0.050*

DISCUSSSION

In our study the prevalence of MS in patients with ACS was higher using NCEP-ATP III, as was also observed in other studies [6, 7, 8]. These findings suggest that MS is very common among the patients with ACS. In this study, MS was detected more in male than that of female which is similar to Progetto CUORE study 9. The prevalence of MS was found more in age group >61 years in this study, as was observed similar in other studies [10, 11].

Our study, patients with ACS, confirmed the high prevalence of MS in patients with acute STEMI, which was same in study done in Korea [12]. According to the findings of the PROCAM study, in 40–65-year-old men with DM, there is an 8-fold risk of developing MI within 4 years in those with DM and AH and 19-fold risk in those with DM, AH, and dyslipidemia [13].

According to the findings of our study three, four and five components were detected in 62.5%, 35%, and 2.5% respectively. Literature quotes that more than one-half of patients with IHD and MS have three MS components, more than one-third of such patients have four MS components, and around 10–15% – five MS components [14, 15, 16].

In this study MS, regarding prevalence of sex, the results showed increased prevalence of MS in male than female but in many other studies showed predominately in female [17, 18]. Risk factors like smoking, tobacco use, HTN, high TG and high FBG was found significantly high in male with MS as compared to female with MS. On the other hand, the men presented a greater frequency of smoking, an important cardiovascular risk factor that is not taken into account in the diagnosis of MS.

Regarding the prevalence of MS risk factors, in this study high FBG (83.3%), high TG (81.7%), HTN (57.5%), high WC in female (76.2%) and low HDL-C in female (69.0%), while in SEPHAR and NATPOL PLUS study AO, low HDL-C, and elevated blood glucose levels were less common [19]. Anderson et al. found that the most common components in patients with IHD were AH, AO, and low HDL-C, while elevated triglyceride concentration and DM were less common [20]; while in (SMART) study group, elevated blood pressure was the more prevalent risk factor about (61%) [17], while in Indian study[18] and, in (CADISS) study[21] low HDL was the most prevalent risk factor of MS.

CONCLUSIONS

Our study has identified the high prevalence of MS among patients with ACS and suggests that among MS components, hypertension, high FBG, high TG, diabetes mellitus has the strongest relationship with the increased incidence of CAD. Risk factors like smoking, tobacco use, high carbohydrate metabolism and hypertension found in high prevalence in male. The risk of cardiovascular events rises proportionally with the number of metabolic components.

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