ORIGINAL ARTICLE

Metabolic Syndrome in Patients with Ischemic Heart Disease

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ABSTRACT

Objective: To determine the frequency of metabolic syndrome in patients with Ischemic Heart Disease (IHD).
Study Design: Cross-sectional, descriptive study.
Place and Duration of Study: Cardiology Department of Punjab Institute of Cardiology, Lahore, from June 2006 to June 2007.
Methodology: A total of 100 subjects with ischemic heart disease, fulfilling the inclusion criteria, were enrolled in the study. Demographic data (age and gender) and the 5 component conditions of the metabolic syndrome were noted. Subjects were physically assessed for the abdominal obesity, based on waist circumference. Fasting blood samples for glucose and lipid profile in first 24 hours after acute coronary insult were drawn and tested in central laboratory. Variables were processed for descriptive statistics.
Results: In this study population, 68% were male and 32% were female with mean age of 52 ±13.6 years in men and 56 ± 12.5 years in women. Frequency of metabolic syndrome was 32% in men and 28% in women. It increased with age. The highest rate of metabolic syndrome was in men diagnosed as STEMI (odds ratio: 3.39, 95% CI=1.36-8.41).
Conclusion: Frequency of metabolic syndrome was high among the patients with IHD. It supports the potential for preventive efforts in persons with high-risk of IHD.

Key words: *Blood pressure. Metabolic syndrome. Ischemic heart disease. Obesity.*

INTRODUCTION

Metabolic Syndrome (MS) is a cluster of clinical characteristics that is associated with enhanced coronary risk.[1] According to National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria, metabolic syndrome is associated with a greater risk of atherosclerotic disease than any of its individual components.[1] It has been studied that individuals with MS are at increased risk for Coronary Artery Disease (CAD).[2] Insulin resistance is a central pathophysiological process associated with MS.[3] Presence of MS increases the risk of Coronary Artery Disease (CAD) by 7.3 times in male and 10.2 times in female patients.[4] NCEP ATP III identified CAD as the primary clinical outcome of the MS.[5] According to NCEP ATP III, underlying risk factors for CAD are obesity (especially abdominal obesity), physical inactivity and atherogenic diet other than the major risk factors, which are cigarette smoking, hypertension, elevated Low Density Lipoproteins (LDL) cholesterol, low High Density Lipoproteins (HDL) cholesterol and family history of premature Coronary Artery Disease (CAD). Other risk factors include elevated triglycerides, chylomicrons, insulin resistance, glucose intolerance, pro-inflammatory state and pro-thrombotic state.[6,7] Majority of these factors can be identified and modified.

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The aim of this study was to determine the frequency of MS in ischemic heart disease patients.

METHODOLOGY

This descriptive study was conducted at the Department of Cardiology, Punjab Institute of Cardiology, Lahore, from June 2006 to June 2007.

Subjects fulfilling the inclusion criteria of those with previous history of myocardial infarction, angina pectoris and/or electrocardiographic changes of ischemic heart disease were enrolled in the study. Patients with stroke, chronic kidney disease and chronic obstructive pulmonary disease were excluded from the study. Informed consent was obtained from the subjects. Demographic data (age and gender), history of present illness and previous known risk factors were obtained. Physical examination including blood pressure was conducted. Subjects were assessed for the 5-component conditions of the metabolic syndrome. Smoking habits and a physician diagnosis of high blood pressure were queried. Current use of antihypertensive medications was documented by using pills and prescriptions brought to the clinic for that purpose. Height and weight were measured with the participant wearing light clothing and no shoes; body mass index was calculated as weight (kg)/height (m^2). Blood pressure was measured by using a standard mercury sphygmomanometer after the subject had been seated for at least 5 minutes. The mean value of two measurements taken at least one minute apart was used in the analysis. Fifth-phase Korotkoff sound was used for diastolic blood pressure. Abdominal obesity

based on waist circumference was measured at narrowest point between umbilicus and ribcage by measuring tape with same observer. Fasting blood samples were drawn for glucose and lipid profile in first 24 hours after acute coronary insult. Metabolic syndrome was defined by the presence of 3 or more out of 5 components: central obesity (waist circumference >102/88 cm (men/women); fasting plasma glucose > or =110 mg/dl; triglycerides > or =150 mg/dl; high density lipoprotein cholesterol <40/50 mg/dl (men/women); systolic/diastolic blood pressure > or =140/90 mmHg. IHD was diagnosed by the criteria of previous myocardial infarction, angina pectoris and/or ischemic changes of electrocardiogram.

The collected information was entered on SPSS version 13.0. Frequencies and percentages were computed for qualitative variables. Gender differences for age, weight, height, waist circumference, blood pressure, fasting serum levels for sugar, triglycerides, total cholesterol, LDL and HDL were compared by the t-test. Differences between ischemic heart disease patients with and without MS regarding number of metabolic syndrome risk factors were assessed using the chi-square test. Fisher's exact test was used where the cell count was less than 5. P-value ≤ 0.05 was considered as significant for all analysis.

RESULTS

A total of 100 subjects with ischemic heart disease were enrolled by convenient sampling. Among those, 68% were male and 32% were female with median age of 60 years. Basic characteristics of this population among gender are presented in Table I. Frequency of metabolic syndrome was 32% for men and 28% for women. Number of components of syndrome X among ischemic heart disease patients are given in Table II. Frequency of metabolic syndrome and IHD among men and women increased with age. The highest rate of metabolic syndrome was seen in men diagnosed with STEMI. Frequency of different components of metabolic syndrome is given in Table III. Most common was the low HDL in females followed by fasting blood sugar and triglycerides in both genders.

Table I: Gender-wise distribution of variables.

Variables	Male (n=68)	Female (n=32)	p-value
Age (mean±SD)	52±18.6	56±17.4	0.18
FBS (mg/dl)	127.3±49	149±93.8	0.001
SBP (mmHg)	113±17.2	120±17.5	0.35
DBP (mmHg)	72±10.2	76±10.7	0.40
Triglyceride	144.5±59.3	177.1±74.9	0.23
HDL	40.2±7.9	38.7±6.6	0.24
BMI	25.7±5.5	32.2±9.3	0.001
Waist circumference	94.3±12.7	103.5±15	0.22
STEMI (%)	50	16	0.02
Non-STEMI (%)	4	6	0.11
ST-T changes (%)	14	10	0.18

SBP; Systolic Blood Pressure, DBP; Diastolic Blood Pressure, FBS; Fasting Blood Sugar, BMI; Body Mass Index, STEMI: ST Elevation Myocardial Infarction.

Table II: Number of components among IHD patients with and without syndrome X.

Number of components	IHD with syndrome X (n=30)	IHD without syndrome X (n=70)
0	-	32
1	-	18
2	-	20
3	10	-
4	15	-
5	5	-

Table III: Frequency of components of metabolic syndrome.

Variables	Numbers (out of 100)
SBP≥ 140 mmHg	16
DBP≥ 90 mmHg	16
FBS≥ 110 mg/dl	56
TG≥ 150 mg/dl	56
BMI≥ 28	42
WC	45
HDL< 40 mg/dl	79

SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, FBS: Fasting Blood Sugar, TG: Triglyceride, BMI: Body Mass Index, WC: waist circumference

DISCUSSION

This analysis examined prevalence of metabolic syndrome according to the criteria from the NCEP and diabetic status based on 1997 American Diabetes Association criteria using NHANES III. The latter is the most recent large clinical survey of a representative sample of the U.S. population, which collected all necessary information to characterize individuals by metabolic status, in IHD patients. The prevalence of metabolic syndrome increases with increasing glucose intolerance. The prevalence of IHD markedly increases with the presence of metabolic syndrome.

The frequency of IHD among all participants with diabetes was increased compared with the frequency among those with metabolic syndrome without diabetes.[7,8] However, individuals with diabetes but without metabolic syndrome had about the same frequency of IHD as those with neither. One possible reason for the excess frequency of IHD associated with metabolic syndrome is the direct effect of insulin resistance on the heart and arteries.[8,9] It is more likely that the bulk of the increased frequency is mediated by known cardiovascular risk factors. Indeed, all 5 metabolic syndrome criteria are established cardiovascular risk factors. The presence of multiple risk factors confers an increased risk.[10-12] However, it is unclear whether the metabolic syndrome confers elevated risk beyond the sum of its parts. Multivariate analyses have suggested that the risk from metabolic syndrome is derived from its individual components, especially HDL cholesterol and blood pressure. However, modeling metabolic syndrome as the sole predictor of IHD yields more than a two-fold increased risk compared with not having metabolic syndrome and is a convenient way to encapsulate a number of proven risk factors.

Gender remained significantly associated with IHD/ECG when forced into a model that included age and the 3 components of the metabolic syndrome identified by factor analysis. Thus, gender and the metabolic syndrome had independent associations with prevalent IHD, which means that gender differences in IHD were not explained by the metabolic syndrome.[13-15] The Rancho Bernardo study results are concordant with the Whitehall study, which found significant associations between systolic pressure, blood glucose, and body mass index with the prevalence of ischemic ECG.[15,16] Previous results from Rancho Bernardo and the Pima Indians also confirmed an association of IHD/ECG with non-insulin dependent diabetes mellitus.[12,13] Other studies have not consistently supported serum insulin as an independent risk factor for ischemic ECG.[17-21] In those studies, associations with IHD/ECG were found in high-risk groups who had non-insulin dependent Diabetes mellitus or hypertension.[22]

There were some limitations in the present analysis. It was a single centre cross-sectional study. The sample size was small, which may have underestimated the frequency of metabolic syndrome. Employing a control group would have provided an idea of the risk conferred.

CONCLUSION

Among patients with IHD, frequency of metabolic syndrome was very high, particularly in females. This supports the potential for prevention efforts in persons with high-risk. Majority of patients had high fasting blood sugar levels and higher levels of triglycerides. Females demonstrated lower levels of High-Density Lipoprotein (HDL) compared to males, while blood pressure reading was observed to be the same in either gender.

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