ABSTRACT

OBJECTIVES: To determine the frequency of metabolic syndrome in acute ischemic cardiac patients and its impact on hospital outcomes.

STUDY DESIGN: Descriptive case series study.

Place and Duration: Coronary Care Unit (CCU), Fauji Foundation Hospital, Rawalpindi over a period of nine months i.e. from 18th Feb 2011 to 18th Nov 2011.

METHODOLOGY: A total of 188 patients were admitted with first ever episode of acute ST elevated myocardial infarction (diagnosed on the basis of WHO Criteria for diagnosis of acute MI). Outcomes measured were frequency of metabolic syndrome, median duration of hospital stay, the development of clinical heart failure (classified as per Killip classification) and in-hospital case mortality.

RESULTS: Among the 188 patients, 76% fulfilled the National Cholesterol Education Program ATP III criteria for metabolic syndrome. The median duration of hospital stay was five days. Increased incidence of heart failure and increased mortality was observed among patient with metabolic syndrome.

CONCLUSIONS: The frequency of metabolic syndrome in acute ischemic cardiac patients was high and was found to be associated with adverse hospital outcomes, with a higher risk of development of heart failure and mortality.

KEY WORDS: Metabolic syndrome, coronary artery disease, acute myocardial infarction, hospital outcomes, insulin resistance, syndrome X.

INTRODUCTION

The metabolic syndrome or the Insulin resistance syndrome is a major public health challenge worldwide. It is a constellation of physical conditions and metabolic abnormalities that predispose an individual to development of type 2 diabetes mellitus (DM) and coronary heart diseases (CHD). A rapid increase in both type 2 DM and CHD is being observed in developing countries, particularly in South Asia. There is a high incidence of insulin resistance and proatherogenic factors witnessed in South Asians which are important contributory factors for type 2 DM and CHD. The main culprits are rapid nutritional, lifestyle and socioeconomic transitions, consequent to increasing affluence, urbanization, mechanization, and rural to urban migration that have been implicated as the potential culprits in the development of this disorder.

Other predisposing factors of the metabolic syndrome include stresses of modern day living, genetic susceptibility and obesity in early life. If the current trend continues, premature deaths and disabilities resulting from these conditions will increase the financial burden in both the developed and the developing countries likewise.

As per the modified NCEP ATP III criteria for the diagnosis of metabolic syndrome, patients fulfilling three out of the following five criteria were considered to have metabolic syndrome: Waist circumference of > 90cm (Males), > 80cm (Females), Fasting blood glucose >100mg/dL (6.1mmol/L) or use of specific medications or previously diagnosed diabetes mellitus type 2, Systolic B.P >130mmHg or Diastolic B.P > 85mmHg or use of specific medication, Fasting triglycerides >150mg/dL (1.7mmol/L) or use of specific medication, HDL-Cholesterol males: <40mg/dL (1.03mmol/L) and females: <50mg/dL (1.29mmol/L) or use of specific medication. The objective of study is to determine frequency of the metabolic syndrome in our population and its clinical impact which would be helpful in formulation strategies to curb associated risk factors, type 2 diabetes mellitus and coronary heart disease and improve health outcomes especially in our part of the world where this menace exists in high prevalence.

METHODOLOGY

This descriptive case series study was conducted in the Coronary Care Unit (CCU) at Fauji Foundation Hospital Rawalpindi over a period of nine months i.e. from 18th Feb 2011 till 18th Nov 2011. 188 patients were inducted in this study. Non-probability consecutive sampling was done. Both male and female patients presenting for the first time with acute ST elevated myocardial infarction at the coronary care unit were included. Patients who were known to have the following ailments were excluded from the study: Chronic Renal Failure (CKD Stage > 3), Chronic Liver Disease (Child Pugh Score > B).
History of Ischemic or Hemorrhagic Stroke, History of Previous Myocardial Infarction, Previously known valvular heart disease, Non ST elevated MI / Unstable Angina. Study was conducted after approval from hospital ethical committee. Patients with a suspicion of acute coronary syndrome were admitted to the coronary care unit. A final diagnosis of acute ST elevated myocardial infarction on the basis of serum biochemical markers (CK-MB>25IU/L or Trop-T>0.01ng/ml) and characteristic electrocardiographic and clinical symptoms as defined by World Health Organization for diagnosis of acute MI. Patients fulfilling the inclusion criteria were inducted in this study after informed consent. Upon interview, detailed information on demographics, cardiovascular risk factors and relevant medical history including family history of coronary artery disease, use of long-term drugs especially aspirin, ACE inhibitors, β-blockers, and statins as well as socioeconomic history were also collected. Baseline electrocardiogram and laboratory investigations were already sent at the time of admission. Echocardiogram was performed upon all participants upon the third day to assess left ventricular function. All patients were subsequently clinically examined on the day of admission and were stratified into four groups of clinical heart failure as per Killip's classification. The duration of hospitalization was also recorded in median number of days, and so was the in-hospital case mortality.

The data was analyzed using Statistical Package for Social Science SPSS for Microsoft Windows® (version 16.0). Continuous quantitative variables such as age, blood pressure, waistline etc were expressed as mean ± SD (standard deviation) whereas categorical qualitative variables like gender, case mortality, clinical heart failure were expressed as frequency in percentage.

RESULTS

Over a period of 09 months, a total of 188 consecutive patients with a confirmed diagnosis of acute ST elevated myocardial infarction (STEMI) based on the WHO criteria were enrolled in this study. Amongst these patients, 143 (76%) were diagnosed to have metabolic syndrome whereas the remaining 45 (24%) subjects did not fulfill the criteria for metabolic syndrome as shown in figure - 1. The mean age of metabolic syndrome patients was found to be 62.9 ± 8.9 years, female being older than male (63.9 ± 8.7 and 59.8 ± 9.1 years respectively). Majority of the metabolic syndrome patients were smokers (68.1%) in contrast to the non-metabolic syndrome counterparts (31.9%) as shown in Table - 1. The frequency of individual components of metabolic syndrome in the STEMI population is displayed in figure - 2. Majority of the STEMI patients with metabolic syndrome were female (88.5%) as compared to males (53.0%). Obesity was predominantly observed amongst patients with metabolic syndrome (87.4%), amongst which majority was of females (females: 88.9% vs males: 82.8%). It was also observed that 45.5% of the STEMI patients with metabolic syndrome had at least four components of metabolic syndrome in them, whereas 35% had only three components while 19.5% had all five components of the metabolic syndrome present in them. Amongst these patients, most common component was hypertension (89.5%) more frequently present in male than in female (94.2% vs 87.9%). Majority of the male and female also had abdominal obesity (82.8% and 90.7%). Hypertriglycemia was observed in 60.1% of patients with metabolic syndrome, and it was more common among male (62.8%) as compared to female (59.2%). Reduced HDL-cholesterol level was significantly more common in female (90.7%) than in male (17.1%). Similarly, hyperglycemia was more frequently observed in male (82.8%) than in female (72.2%). The incidence of clinical heart failure was much higher among metabolic syndrome patients as compared to non-metabolic syndrome cases as shown in figure 3. Amongst 143 metabolic syndrome patients, 58% developed Killip – I heart failure, followed by 31.5% developed Killip – II, 6.3% Killip – III and 4.2% were found to have Killip – IV (cardiogenic Shock) heart failure. The highest incidence of mortality was found in metabolic syndrome patients with Killip – IV heart failure (60%) as shown in Table 2. Majority of the patients with hypertension (89.5%) developed heart failure. The frequency of individual metabolic syndrome components in clinical heart failure was demonstrated in figure - 4. The hospital stay amongst patients with metabolic syndrome was five days whereas it was found to be an average four days amongst non-metabolic cases. The overall mortality in both metabolic and non-metabolic syndrome patients was 5.3% amongst whom 100% mortality was observed in cases with Killip class-IV, 20% in Killip class-III and only 3.5% in Killip class-II cardiac failure as shown in Table - II. None of the patients in Killip class-I experienced in-hospital mortality. All the expired patients suffered from metabolic syndrome and majority of them had more than three components of metabolic syndrome, 66.7% of the deceased patients had all five metabolic syndrome components. In the entire sample of 188 patients, 63.3% patients were found to have acute anterior wall STEMI, amongst which 76.4% had metabolic syndrome. This was followed by inferior wall STEMI (30.9%), of which 75.8% had metabolic syndrome. The incidence of anteroseptal, lateral, anterolateral and posterior wall STEMI was minimal (2.7%, 2.1%, 0.5% and 0.5% respectively). 66.4% of the metabolic syndrome patients were found to have a low left ventricular ejection fraction (LVEF<45%), predominantly observed among females (females: 74.7% vs males: 25.2%).
DISCUSSION

Over the past two decades, there has been a striking increase in the number of people with metabolic syndrome especially in south east asia largely attributable to mass transition to cities and adaptation of modern lifestyle along with psychological stresses, genetic predisposition, adverse perinatal environment, and childhood "catch up" obesity. Metabolic syndrome has become effective and simple clinical tool for identifying high-risk subjects predisposed to Cardiovascular disease and Diabetes mellitus. This study was based on acute ischemic cardiac patients who were admitted with first ever episode of STEMI, and also found high prevalence of metabolic syndrome.
Our study has revealed that more than two-thirds of the patients diagnosed with acute STEMI had metabolic syndrome (76.1%) and it was significantly more common in female than male (females: 88.5% vs male: 53.0%). Other studies had also revealed similar results.6,7 In several studies, it has also been observed that metabolic syndrome is associated with a higher incidence of severe heart failure following an acute MI.6,8,9

This study has also revealed that majority of the STEMI patients with metabolic syndrome (76%) developed clinical heart failure post MI as against the non-metabolic syndrome cases. Moreover, during the course of hospitalization, it was observed that overt heart failure or severe heart failure developed more frequently in patients with metabolic syndrome as compared to those without metabolic syndrome. Other adverse outcome events occurred in a similar fashion in both groups. Various large observational studies have revealed that the development of heart failure after acute coronary syndrome is a major determinant of hospital outcome. This study also highlights the risk of developing heart failure is related to the components of metabolic syndrome, hypertension (89.5%), followed closely by central obesity (87.4%) and diabetes mellitus (74.8%).10,11,12

In this current study, the in-hospital mortality was observed only among patients with metabolic syndrome whereas none of the non-metabolic cases expired during their hospital stay. The incidence of mortality was directly linked to the higher Killip class of clinical heart failure, found to be 100% amongst patients who developed Killip class IV heart failure post MI. One of the reasons for such high mortality in metabolic syndrome cases is that its components such as central obesity, insulin resistance, dyslipidemia, and hypertension are all risk factors for endothelial dysfunction, which is an important factor in the pathogenesis of atherosclerosis and acute coronary syndromes.14 Similarly, other studies had also demonstrated a higher incidence of mortality amongst metabolic syndrome cases as well.15,16

The association between metabolic syndrome and adverse clinical events indicates the clinical significance of this syndrome and particularly the high occurrence among patients presenting with acute myocardial infarction. Patients with metabolic syndrome should be identified early and started on life style modification and lipid lowering drugs to prevent cardiac complications.17,18

This study has some limitations. The data has been collected from a population presenting with acute cardiac problem in hospital setting so caution must be exercised to extrapolate these results to the general population.

CONCLUSIONS

The frequency of metabolic syndrome in acute ischemic cardiac patients was high and was found to be associated with adverse hospital outcomes, with a higher risk of development of heart failure and mortality.

RECOMMENDATION

- Effective preventive programs to deal with this emerging medical problem should be properly planned and executed.
- Nevertheless, further research is required to explore this vital issue in detail and to develop and test the interventions.

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Jahanzeb Maqsood: Conceived Idea, Design Research Study and Manuscript Writing
Adnan Ghafar: Data Collection and Data Interpretation
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