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SHORT COMMUNICATION

MYOCARDIAL INFARCTION IN PREDIABETIC PATIENTS : ROLE OF BLOOD PRESSURE DYSHOMEOSTASIS

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Abstract : Male gender and fasting sugar level at pre diabetic range are two of the recognized risk factors associated with coronary artery disease. Recently it was found that although males are at increased incidence of myocardial infarction (MI), the severity of disease is same for both genders among pre-diabetic myocardial infarction cases. In this study, we have retrospectively analyzed various biochemical and physiological parameters and cardiac markers of patients admitted for the first instance of myocardial infarction. We found an evidence of impairment in blood pressure homeostasis in female patients which could be one of the factors responsible for the equal degree of severity in myocardial infarction among females compared to males, despite lower incidence of MI in them.

Key words : pre-diabetes, blood pressure, myocardial infarction, male-female difference

INTRODUCTION

Ischemic heart disease is the leading cause of death worldwide (1). Various epidemiological studies have shown that pre-diabetes confers an increased risk of cardiovascular disease (CVD) (2). The pre-diabetic patient load in India was around 85.6 million in 2003 and it is expected to rise up to 132 million by the year 2025 (3). Recently we found that prevalence of MI among pre diabetics is increased in India (4) and the severity of the disease is equal in both genders (5). However, the reason why female patients should suffer from similar degree of severity is not clear.

Though chronic hypertension is a known risk factor for MI, its role in MI in pre-diabetes has not been assessed. Hence, we collected the data of MI patients admitted to Pondicherry Institute of Medical Sciences (PIMS) from the year 2006 to 2008 and retrospectively analyzed the association of biochemical and physiological parameters and cardiac markers in prediabetic MI patients and attempted to understand the importance of blood pressure dyshomeostasis as an

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underlying mechanism in the genesis of this special category of myocardial infarction.

MATERIALS AND METHODS

The present study was conducted at Pondicherry Institute of Medical Sciences, Puducherry, India. Case history of patients of MI admitted to PIMS hospital over a period of three years was obtained from cardiology clinic. As per their case sheet data, myocardial infarction was confirmed based on the clinical features, ECG findings and cardiac marker enzymes. The physiological parameters at the time of admission such as age, heart rate, systolic and diastolic blood pressures and respiratory rate were noted down from the case records. Data of all the patients with their fasting blood glucose in the pre diabetic range (≥ 100 mg/dl (5.6 mM/L) but ≤ 126 mg/dl (7.0 mM/L)) were segregated for analysis.

All biochemical parameters were estimated in the clinical biochemistry lab using commercial kits adapted to autoanalyser. Glucose was estimated by glucose oxidase peroxidase method (Enzopak; Reckon Diagnostics, India). Troponin I was assessed by rapid sensitive immunochemistry method (Biomed, India). Cardiac enzymes used as markers of MI such as total CK, CK-MB and LDH were assessed by kits from Enzopak (Reckon Diagnostics, India). Lipid profile parameters such as total cholesterol, triglyceride and HDL cholesterol were analysed by using kits from Siemens (Siemens; Siemens Health care Diagnostics Inc. USA). Sodium, potassium and chloride were assessed in a semi automated electrolyte analyzer (Ilyte, India). Total cell count, hemoglobin and packed cell volume were analyzed using commercial kits (Transasia, India) adapted to automated coulter (Sysmex XT 1800i, USA). Bleeding time and clotting time were done by capillary method and ESR was evaluated by Wintrobe's method. RBC, platelet count, MCV, MCH and MCHC were determined from peripheral smear. PT-INR was evaluated using commercial kits (Tulip diagnostics, India).

Statistical analysis of data was done by using Student's *t* test. The P values less than 0.05 was considered to be statistically significant.

RESULTS

Thirty four MI cases with fasting blood glucose in pre diabetic range were collected out of which twenty five cases were males and nine were females. Seven of them had a family history of diabetes mellitus (5 males and 2 females) and thirteen (9 males and 4 females) of them had a family history of hypertension.

The severity of myocardial dysfunction as assessed by the ejection fraction in ECHO, CK and CK-MB levels was not statistically

TABLE I: Difference in age and cardiovascular parameters in male and female pre diabetic MI patients.

	Pre-diabetic males (n=25)	*Pre-diabetic males (n=9)*
Age (Years)	57.08±14.17	55.12±10.42
HR (per min)	87.12±16.97	86.44±14.55
SBP (mm Hg)	122.58±18.43	141.11±29.34*
DBP (mm Hg)	79.41±13.23	90.00±12.24*
EF (%)	40.76±12.88	36.00±17.08

Data presented as mean±SD; *P<0.05.

different between the male and female patients (Table II). Cardiac troponin I was positive in 12 males and 3 females. However, the systolic and diastolic blood pressure of the female MI patients was significantly higher ($P<0.05$) when compared to male patients (Table I).

TABLE II : Difference in the biochemical parameters of male and female pre diabetic MI patients.

	Pre-diabetic males (n=25)	*Pre-diabetic males (n=9)*
Troponin I positive (> 1 ng/mL)	12/25 (48.00%)	3/9 (33.33%)
CK (U/L)	797.62±612.12	1352.60±628.97
CKMB (U/L)	155.64±170.27	214.14±153.25
LDH (U/L)	280.33±20.74	523.00±461.51
TC (mg/dL)	162.44±26.13	173.00±73.37
TG (mg/dL)	162.44±77.37	138.75±14.52
HDL (mg/dL)	33.77±2.33	33.75±8.61
LDL (mg/dL)	96.22±15.84	102.50±48.17
VLDL (mg/dL)	29.87±14.26	27.75±2.87
Na^+ (mM/L)	137.04±6.22	135.50±4.10
K^+ (mM/L)	4.23±0.52	4.61±1.00
Cl^- (mM/L)	95.20±28.40	99.16±8.58

Data presented as Mean±SD.

TABLE III : Difference in the Hematological parameters of male and female pre diabetic MI patients.

	Pre-diabetic males (n=25)	*Pre-diabetic males (n=9)*
Hb (g/dL)	13.11±2.37	12.98±1.95
PCV (%)	39.89±4.14	29.00±17.83*
BT (minute)	2.11±0.47	2.10±0.17
CT (minute)	3.72±0.46	4.33±0.57
PT-INR	1.06±0.09	1.08±0.13

Data presented as Mean±SD.

DISCUSSION

Recently we have reported the significant prevalence of MI in pre-diabetes (5). Though, in general MI is more common in males, especially in male diabetic patients, findings of our recently reports works suggested the prevalence of MI in both the genders (5). However, the underlying mechanisms that facilitate the causation of MI in pre-diabetics have not been properly studied.

It has been documented that coronary artery diseases and hypertension are directly associated with the degree of stress (6). Also the common pathophysiological basis of these diseases is recently contributed to impairment in the autonomic balance (7). Hence, the autonomic imbalance associated with the impaired blood pressure levels in the female patients would have made them prone for MI. However, the physiological mechanisms that could contribute to the genesis of hypertension in prediabetic female patients in the absence of significant hypertension in male pre-diabetics should be investigated.

Females during their reproductive age are protected from cardiac diseases due to the action of estrogen (8). All the female patients in our study group were either in the perimenopausal or postmenopausal group. Thus, lack of estrogen could be another mechanism for increased severity of ischemia in these patients. In our previous study, we found that non diabetic individual (normoglycemia as well as pre-diabetes) in this region form a major fraction of the population in terms of risk-group for myocardial infarction when compared to the diabetic population (4). Based on the results of the present study, we propose that ladies above the age of forty with fasting plasma glucose in the pre-diabetic range and higher systolic and/or diastolic blood pressure should undergo regular health check

up and be included in high risk category for future cardiovascular disease. Further, research works should be conducted to correlate the association between hypertension and markers of MI in pre-diabetic patients.

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