Original Article

Correlation of Serum Magnesium With hsCRP in Diabetic Patients With Ischemic Heart Disease: A Causative Factor for Progression Of Ischemic Heart Disease in Diabetic

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Objective: To find out the correlation of serum magnesium with hsCRP in diabetic patients with ischemic heart disease.

Methods: This study was carried out at Sheikh Zayed Hospital, Lahore from August 2016 to October 2016. A total of 200 cases were included in the study after satisfying the exclusion and inclusion criteria. Subjects were divided into groups as A (patients of Diabetes Mellitus type 2), group B (patients of first MI), group C (patients of first MI with Diabetes Mellitus type 2) and group D (controls). Each group contained 50 subjects.

Results: Level of serum magnesium was significant decreased and level of hsCRP was significantly raised in both individuals with diabetes mellitus and ischemic heart disease compared to controls.

Conclusions: It is concluded that low level of serum magnesium and increased level of hsCRP in patients with diabetes may increased the risk of ischemic heart disease.

Keywords: serum magnesium, hsCRP, diabetes and IHD

Introduction

The American Heart Association believes diabetes to be one of the 7th main threatable factors for cardiovascular disease. About 68% diabetic with age 65 or more may die from heart problems; and 16 percent die due to stroke. Diabetic adults are 2-4 times may die due to heart problem compared to non diabetic adults.[1]

Risk of cardiovascular disease is in diabetic individuals is mainly due to a multifaceted combination of many non- traditional (insulin resistance, microalbuminuria, hematological parameters, inflammation, genetic factors, vitamins and minerals) and traditional risk factors (dyslipidaemia, high blood pressure, abdominal obesity, lack of physical exercise) may have a significant role in the start of and development of atherosclerosis progress from role of endothelium tooccurrence.[2,3] Number of risk factors are common in both diabetics and cardiovascular disease, and this showed that both diseases come separately from "common soil".[4,5]

Among the nontraditional risk factors, hs-CRP, a predictor for systemic inflammation, is related with risk of cardiovascular disease with a value of 310 mg/L[6] with a value more than of LDL-Chol.[7] Additionally CRP with the value of 0.12 mg/dl was indirectly related with age, BMI, waist circum-ference, insulin resistance and positive family history.[8] It is stated that serum hs-CRP is significantly related with left ventricular diastolic role and hypertrophy in hypertensive patients.[3,9]

Magnesium helps to maintain the function of nerve and muscle keeps steady heart rhythm and keeps healthy immune system. It have a role in the regulation of blood glucose levels, keep blood pressure normal blood and also take part in synthesis of protein.[10] Intracellular magnesium homeostasis may have a link with hypertension, cardiovascular disease, insulin resistance and diabetes.[11] It has been stated that people with impaired blood pressure and abdominal obesity has endothelial dysfunction due to low level of magnesium and high level of CRP in process going on in cells.[12,13]

A cross sectional study was designed to emphasize the significance of traditional (dyslipidemia, hypertension) and non-traditional associated factors (serum hs CRP serum magnesium) for cardiovascular problem in the individual with type-2 diabetes mellitus and converse their role in the pathogenesis of the morbidity and mortality of myocardial infarction in linked individuals.

Methods

Patients with Diabetes Mellitus type 2 and patients with first MI were taken from the diabetic clinic of

Sheikh Zayed hospital, Lahore and from Punjab institute of cardiology, Lahore. Patients with liver/renal disease, cardiomyopathy, with hemolytic disease or with family history of dyslipidemia were excluded from the study. The diagnosis of Myocardial Infarction was confirmed by ECG findings, clinical workup and cardiac enzymes. Study was included 200 subjects (130 males and 70 females). Subjects were divided into groups as A (patients of Diabetes Mellitus type 2), group B (patients of first MI), group C (patients of first MI with Diabetes Mellitus type 2) and group D (controls). Each group contained 50 subjects. Fifty healthy individuals with normal glucose level, with no history of IHD, age and sex matched with selected patients were taken as controls. The levels of fasting blood sugar, hs-CRP, HbA1c, Mg and lipid profile of all groups were estimated by standard kits. Letter of consent was taken from each patients. Study was endorsed by Ethical team of Institute.

Result was entered in SPPSS 20. Variables were expressed as mean±SD. Variables were compared by student 't' test. Correlation of variables was carried by Pearson correlation coefficient. P<0.05 is taken as significant.

Levels of, Age, BSF, hs-CRP, HbA1c and Mg in all four groups is tabulated as group 1. Study observed that mean age of group A, B, C and D was 53, 57, 55 and 57 years respectively. Level of fasting blood sugar was significantly increased (P<0.001) in A group and C contrast to group B and D. Level of serum hs CRP was significantly increased (P<0.001) in group B and C compared to A group A and group D. Level of serum blood HbA1c was significantly increased (P<0.05) in group A and C compared to group B and D. Level of serum magnesium was non significantly increased in group A, B and C compared to group D. Correlation of Mg with age, BSF and lipid profile in all four groups is tabulated as table 2. A significant (P<0.05) negative correlation between serum magnesium and fasting blood sugar was observed in group A. On the other hand a significant (P<0.001) negative correlation between serum magnesium and fasting blood sugar was observed in group C. Between serum magnesium and hs CRP, highly significant (P<0.001) negative correlation was observed in group A. A highly significant (P<0.001) negative correlation was observed between serum magnesium and HbA1c in group A. however a significant (P<0.05) negative correlation was observed between serum magnesium and HbA1c in group C.

Results

Table-1: Levels of, Age, BSF, hs-CRP, HbA1c and Mg in all four groups. Variables are expressed as mean ± SD. No of cases in parenthesis.

	DM2 Group A (50)	1st MI Group B (50)	Dm2 +1st MI Group C (50)	Control Group D (50)
Age (years)	53.22±10.98	57.00±9.90	55.22±8.69	57.60±1.02
Blood pressure (mmHg)	160/90±99/55	170/100±90/60	160/105±100/75	130/75±75.40
BSF (mg/dl)	202.26±57.64**	98.74±17.49	200.10±53.20	75.84±0.32
Hs-CRP (mg/L)	5.96±1.38	21.48±5.28**	26.86±5.69	1.88±0.48
HbA1c (%)	8.92±1.60*	5.72±0.61	10.25±1.69	5.58±0.35
Magnesium (mg/dl	1.67±0.20	1.87±0.25	1.54±0.19	2.30±0.23

*P<0.05 = significant difference **P<0.001= Highly significant difference

Table-2: Correlation of Mg with age, BSF and lipid profile in all four group sv. No of cases in parenthesis

Correlation	DM2 Group A (50)	1st MI Group B (50)	Dm2 +1st MI Group C (50)	Control Group D (50)
Magnesium with BSF	-.0.335*	0.080	-.415**	-.192
hs-CRP with magnesium	.-0.335*	-0.024	-0.51	-0.104
HbA1c with magnesium	-0.367**	-0.013	-0.283*	0.078

*P<0.05 = significant difference, **P<0.001= Highly significant difference

patients with diabetes and MI was in a range of 53-57 years. According to a study comorbid conditions associated with diabetes mellitus and ventricular function at the duration myocardial infarction are important providers to poorer results in diabetic patients.[14]

Level of fasting blood sugar and Hb A1c was significantly increased in diabetic patients and patient with the problems of diabetes and MI compared to MI patients and controls. It is found that lack of physical exercises, modification of life style and diet may have a role in glycemic control in diabetic patients. Constant hyperglycemia is a threat to the cardiovascular system and therefore diabetics are more at risk of cardiovascular problems like diastolic dysfunction and left ventricular systolic dysfunction compared to non-diabetics.[15] A study stated that in spite of good treatment, 65% of diabetic patients develop cardiovascular diseases.[16]

Level of serum hsCRP was significantly increased in MI patients and patients with the diabetes and MI compared to diabetic and control groups. According to a study an independent link is observed between death due to cardiovascular disease and increased level of hsCRP in diabetic patients, propose that inflammation also plays a significant role in development of severe atherosclerotic coronary problem[17]. The possible mechanisms by which hsCRP increase the process of atherosclerosis is to increase the entrance of particles of LDL into macrophages.[18] Another study found in diabetic patient increased level of hsCRP and inflammations are linked with insulin resistance, which may increase the risk of cardiovascular disease in diabetics.[19]

Level of serum magnesium was insignificantly increased in diabetic patients, MI patients and patients with both problems of MI and diabetes compared to control group. We also observed a significant negative correlation between serum magnesium and fasting blood sugar/Hb A1c was observed in diabetic subject and patients with both MI and diabetes. Our study is inline with a study and stated that reduced level of serum magnesium is observed in diabetic patients and this link may be a 'vicious cycle' with increased insulin resistance contributing to depletion of serum magnesium and in turn further increased insulin resistance.[20] Another study reported that hypomagnesimia is related with hypertension, dyslipidemia, inflammation, impaired endothelial function which may result cardiovascular problems.[21] We observed significant negative correlation in diabetic patients, MI patients and patients with both problems of MI and diabetes. It has been demonstrated that hypomagnesimia increased the rate of atherogenesis by encouraging inflammation and increasing the level of LDL-C and oxidative alteration. Furthermore, increased inflammatory cell recruitment and a secretion of growth factors that cause the migration and proliferation of cell after low dietary magnesium.[24]

Conclusions

It is concluded that low level of serum magnesium and increased level of hsCRP in patients with diabetes may increased the risk of ischemic heart disease.

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