ORIGINAL ARTICLE

Complications of Diabetes Type 2: Role of Serum hs-CRP and Serum Magnesium

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ABSTRACT

Back ground: Poor glycemic control and inflammation are the main component of the pathogenesis of diabetes and its complications.
Aims: To find out the correlation of serum magnesium and h-C reactive protein in relation with the complications of diabetes.
Methods: About 75 subjects out of them 35 males (group 1) and 35 females patients (group 11) and 50 control with no history of any disease were selected. A questionnaire with information on variables (sex, age) and characteristics of diabetes (type of diabetes mellitus, duration of disease, mode of treatment and any complication) during consultation. Level of fasting blood glucose, serum HbA1c, hs-CRP and magnesium were estimated by standard kit methods.
Results: Level of fasting blood sugar, hs-CRP, HbA1c is significantly increased in patients in contrast to controls and this shows a significant difference. However, the amount of serum magnesium was decreased significantly in diabetic patients in contrast to controls.
A direct correlation was seen between hs-CRP, fasting blood sugar and Hb A1c in both male and female diabetic patients. The correlation between serum magnesium and hs-CRP was negative in patients. The correlation between HbA1c and serum magnesium was also negative in both patients.
Conclusion: The correlation between hs-CRP and serum magnesium was negative in patients which may be related with poor glycemic control, which may increase the risk of complications of diabetes. However, more studies are needed on relationship of serum magnesium with serum hs-CRP to confirm their role in the prevention of complications of diabetes.
Keywords: hs-CRP, magnesium, complications of diabetes type 2.

INTRODUCTION

Diabetes is the most demanding health problems of this century. Diabetes mellitus or type 2 diabetes is a group of metabolic disorders with hyperglycemia[1]. Hyperglycemia is the reason of typical symptoms and long-standing complications[2].

A long term link of inflammation oxidative stress and β-cell dysfunction may result result hyperglycemia. Inflammation plays a significant role in the pathogenesis of type 2 DM may link the disease of diabetes with the conditions associated with inflammatory components[3].

High sensitivity C-reactive protein also called hsCRP synthesized in the organ of liver due to inflammatory stimuli. The increased level of serum hsCRP may increase inflammation in the arterial wall[4]. Long term inflammation is mainly responsible for insulin resistance, type 2 DM and metabolic syndrome. Disorders related with metabolic pathways include endothelial dysfunction, adiposity, impaired glucose tolerance and hypertension, which usually come together. Insulin resistance is associated with the hazard of developing cardiovascular diseases may be a cause of morbidity lead to mortality in patients with type 2 diabetes[5,6].

Complications of hyperglycemis is related with the buildup of glycation adducts in proteins. The main issue is control of blood glucose level. Checking of blood glucose level is including the estimation of blood glucose and of glycated hemoglobin (HbA_1c). Blood glucose estimation shows temporary glycemic control, whereas serum HbA_1c reveals control of blood glucsoe over the last three months[1].

DM2 is usually related with impaired level of Mg[7,8]. Deficiency of Mg is related with the long duration of the disease and with the presence of micro- and macrovascular chronic complication A long term deficit of magnesium is associated with inadequately controlled glycemic profiles. Mg plays an important role in regulating function of insulin, insulin-mediated uptake of glucose and vascular tone. Decreased level of intracellular Mg result in an impaired tyrosine-kinase activity, impairment in function of insulin action and may cause severe insulin resistance in diabetic patients[9].

Reduced glycemic control and inflammation are the major constituents of the pathogenesis of diabetic complications. There is a need to prevent the long-term complications in diabetes mellitus. Study was therefore designed to find out the correlation of serum magnesium hs-CRP in relation with the problems of diabetes.

METHODS

Subjects and study design: This study was a cross sectional study carried out at Sheikh Zayed Hospital Lahore between March 2009 to June 2010. About 75 subjects out of them 35 male and 35 female patients and 50 normal subject were taken as controls. The patients with juvinile mellitus, with liver or gastrointestinal diseases,

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using corticosteroids, amiodarone, methotrexate, hemolytic anemia or infectious disease like tuberculosis not included in the study.

Ethical deliberation: Informed written consent of all subjects included in the study was taken with description of reason of including subjects in the study.

Data collection: A questionnaire with information on variables (sex, age) and characteristics of diabetes (type of diabetes mellitus, duration of disease, mode of treatment and any complication) during consultation.

Analysis of blood sample: Fasting blood sugar was estimated by glucose oxidase-peroxidase method. Glycated hemoglobin (HbA_1c) level and serum C-reactive proteins were estimated by standard kit method.

Statistical analysis: The data was entered and scrutinize by SPSS 20. Results are expressed as mean ± SD. *P* value of < 0.05 was taken as significant. Pearson linear correlation was applied to find out the relation correlation between variables.

Table 1: Comparison of BSF, hs-CRP, HbA1c, Magnesium levels in Male group and their controls Variables are give as Mean± SD is given.

	Diabetic pts (35)	Control (25)
Age (yrs)	57.19±11.36	57.45±10.30
BSF (mg/dl)	198.94±52.60**	75.64±10.31
hs-CRP (mg/L)	5.62±1.25**	1.90±0.47
HbA1c (%)	9.21±1.55**	5.60±0.36
Magnesium(mg/dl)	1.68±0.22*	2.31±0.21

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

Table 2: Age, BSF, hs-CRP, HbA1c levels in Female groups and their controls Variables are expressed as Mean± SD is given. Number of cases in parenthesis.

	Diabetic pts (35)	Control (25)
Age (yrs)	51.35±10.44	57.88±12.64
BSF (mg/dl)	203.82±60.56**	76.24±10.64
hs-CRP (mg/L)	6.11±1.43**	1.84±0.49
HbA1c (%)	8.79±1.62*	5.55±0.33
Magnesium (mg/dl)	1.66±0.20*	2.28±0.28

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

Table 3: Coefficient Of Correlation among hs-CRP, HbA1c and Magnesium in male group is Given. Figure In parentheses indicates the number of cases in each group.

Correlation	Diabetic male (35)	Diabetic Control (25)
hs-CRP with HbA1c	.445	-.188
hs-CRP with FBS	0.434	-0.051
hs-CRP with Magnesium	-.245	.001
HbA1c with Magnesium	-.300	-.021

*p< 0.05 ** p< 0.01

Table 4: Coefficient Of Correlation among hs-CRP, HbA1c and Magnesium in female group is Given Number of cases In parentheses

Correlation	Diabetic patients (35)	Control (25)
hs-CRP with BSF	0.461**	0.193
hs-CRP with HbA1c	.465**	-.020
hs-CRP with Magnesium	-.372*	-.267
HbA1c with Magnesium	-4.13*	.233

*p< 0.05 ** p<0 .01

RESULTS

Variations of BSF, hs-CRP, HbA1c, Magnesium levels in Male group and their controls are tabulated as table 1. It is observed that mean age of patients and control was 57 years. Level of fasting blood sugar, hs-CRP, HbA1c is significantly increased in male patients in contrast to normal subjects or controls and shows a significant difference (P<0.001). However, the concentration of serum magnesium was significantly decreased (P<0.05) in diabetic patients in contrast to controls.

Comparison of BSF, hs-CRP, HbA1c, Magnesium levels in female group and their controls is tabulated as table 2. It is observed that mean age of patients and control was 51 and 57 years respectively. Level of fasting blood sugar, hs-CRP, HbA1c is increased significantly in male patients in contrast to controls and this shows a significant difference (P<0.05, P< 0.001). However, the level of serum magnesium was decreased significantly (P<0.05) in diabetic patients as compared to their controls.

A positive correlation was seen between Hb A1c and hs-CRP in male diabetic patients. However the correlation between hs-CRP and Hb A1c is negative in control subjects. In diabetic male the correlation between hs-CRP and FBS is positive while in control it was negative. The correlation between hs-CRP and serum magnesium was negative in male patients and in controls it was positive. The correlation between HbA1c and serum magnesium was negative in both patients and controls (Table 3).

In diabetic female the positive correlation between hs-CRP and FBS is seen in both diabetic and controls but in diabetic patients this correlation is significant (P<0.001). While in control it was weak positive. The correlation between hs-CRP and Hb A1c was significantly positive in female diabetics. However in female diabetics, it was weak negative. The correlation between HbA1c and serum magnesium was negative in both patients and controls, but in female diabetics, it was significant (Table 4).

DISCUSSION

Hs-CRP is an indicator mild inflammation and increased values are observed in diabetic patients. Magnesium homeostasis is related with insulin resistance, type 2 diabetes mellitus[10].

According to our study the concentrations of fasting blood sugar, hs-CRP, HbA1c are significantly increased in both gender as compared to their controls. However, the concentration of magnesium was decreased significantly. Many studies are in line with present study. It is suggested[11] participation of mild inflammation in the pathogenesis of type 2 diabetes. A study[12] suggested that increased concentrations of CRP are related with insulin resistance, obesity and impaired glucose tolerance, reported that inflammation is associated with back ground of type 2 diabetes.

It is proposed that increased level of CRP increase the synthesis of E-Selectin, VCAM-1 and ICAM-1, which may cause altered reactivity of vascular region, decreased release of insulin and enhanced insulin resistance. It is therefore confirm a positive link of type 2 diabetes with CRP, that may reflect endothelial dysfunction[13].

Another study stated that role of inflammation inducing type 2 diabetes is unclear. Though, adipose tissue can produce and discharge the cytokines like tumor necrosis factor-alpha (TNF-α), interlelukin-6 and interleukin-1 (markers of inflammation). These Pro-inflammatory cytokines along with acute phase reactants are engaged with number of metabolic pathways related with insulin resistance, reactive oxygen species, and adipocyte function. Therefore study concluded that inflammation and innate immunity are main factors in the pathogenesis of diabetes. The study showed that mild inflammation leads and forecasts, the development of diabetes type 2[14].

We observed a low level of magnesium in diabetic patients. It is stated low level of magnesium may increase complication of diabetes[15]. Other studies found that deficiency of magnesium may be increased the risk of diabetes or impair glucose tolerance. It is reported that low concentration of serum mangnesium has been related to impair glycemic control[16,17].

It is proposed that that hypomagnesaemia inhibits receptors of prostacyclin results in an imbalance between the effect of thromboxane and prostacyclin and thromboxane that may lead to microvascular complications[18]. Decrease level of magnesium also increased thromboxane excretion and increased the aldosterone effect of angiotensin-II. This results a decrease function of insulin and increase insulin resistance and vascular disease[19].

We observed a direct correlation was seen between serum hs-CRP, fasting blood sugar and Hb A1c in diabetic patients. However the relation between serum hs-CRP and magnesium was negative. The correlation between HbA1c and serum magnesium was also negative in patients. According to a study the positive relation of decrease level of serum magnesium levels and increased CRP levels may be related with endothelial dysfunction or oxidative stress. As deficiency of Magnesium stop endothelial growth and increase the production of inflammatory markers and of nitric oxide, thus may change microvascular functions[20]. Additionally it is found that increased level of hs-CRP and decreased values of serum magnesium are directly related impaired lipid profile, these alteration may be linked with increased rate of the complications and therefore may be a marker of complications in type 2 diabetes[21].

CONCLUSION

The correlation between hs-CRP and serum magnesium was negative in patients which may be related with poor glycemic control, which may increase the risk of complications of diabetes. However, more studies are needed on relationship of serum magnesium with serum hs-CRP to confirm their role in the prevention of complications of diabetes.

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