ORIGINAL RESEARCH

Malondialdehyde, Cystatin C and serum creatinine in patients with diabetes mellitus- A clinical study

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ABSTRACT

Background: Hyperglycemia or abnormally high blood sugar is a hallmark of a set of metabolic diseases commonly referred to as diabetes mellitus (DM). The present study was conducted to assess MDA, creatinine and Cystatin C level in patients with diabetes mellitus. **Materials & Methods:** 53 diabetic patients of both genders were put in group I and group II had 53 healthy subjects. The level of malondialdehyde (MDA), Cystatin C and creatinine levels were measured in both groups. **Results:** Group I had 30 males and 23 females and group II had 26 males and 27 females. Cystatin C level was 0.81 mg/L in group I and 0.89 mg/L in group II. MDA level was 4.08 µM in group I and was 1.34 µM in group II. Creatinine level was 0.97 mg/L in group I and 0.82 mg/L in group II. The difference was significant (P< 0.05). **Conclusion:** Compared to healthy persons, patients with diabetes mellitus had higher levels of MDA.

Key words: Cystatin C, Creatinine, malondialdehyde

INTRODUCTION

Hyperglycemia or abnormally high blood sugar is a hallmark of a set of metabolic diseases commonly referred to as diabetes mellitus (DM). This condition is caused by the body's incapacity to either create enough insulin or use it to its maximum potential.[1] Diabetes mellitus is characterized by hyperglycemia and insufficient endogenous insulin synthesis and activity.[2] The initial sign of type II diabetes is insulin resistance, which develops into glucose intolerance as the body's ability to regulate glucose hemostasis fails. Diabetes type II is a multifactorial disease.[3]

One important factor in the modification of low-density lipoprotein (LDL) is malondialdehyde (MDA), a result of the peroxidation of arachidonic, eicosapentaenoic, and docosahexaenoic acids.[4] Oxidized-LDL (ox-LDL) is created when lysine residues in LDL's apoB-100 combine with aldehydes such as MDA. The 13-kDa basic protein known as cystatin C (CysC) is a member of the cystatin superfamily of cysteine proteinase inhibitors.[5] It is unique among cystatins in that it seems to be synthesized by all human nucleated cells. Age, sex, diet, nutritional state, and inflammatory processes have little effect on its steady rate of production. Numerous studies have demonstrated that serum CysC is a better indicator of renal function in diabetics than serum creatinine, albeit this hasn't always been the case.[6] The present study was conducted to assess MDA, creatinine and Cystatin C level in patients with diabetes mellitus.

MATERIALS & METHODS

The present study comprised of 53 diabetic patients of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. Group I comprised of patients with diabetes mellitus type II and group II had healthy subjects (control). Random blood glucose levels during fasting were estimated. The level of glycated hemoglobin was also measured. The Hitachi 7600-110 automatic analyzer was used to measure the serum creatinine levels using automatic picric colorimetry. Malondialdehyde (MDA) was examined using a modified approach to measure the degree of lipid peroxidation. Using rabbit polyclonal antihuman CysC antiserum and latex particle-enhanced turbidimetric immunoassays (PET), Cystatin C was tested on a Hitachi 7600 automated analyzer. The results thus obtained were subjected to

statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
Male	30	26
Female	23	27

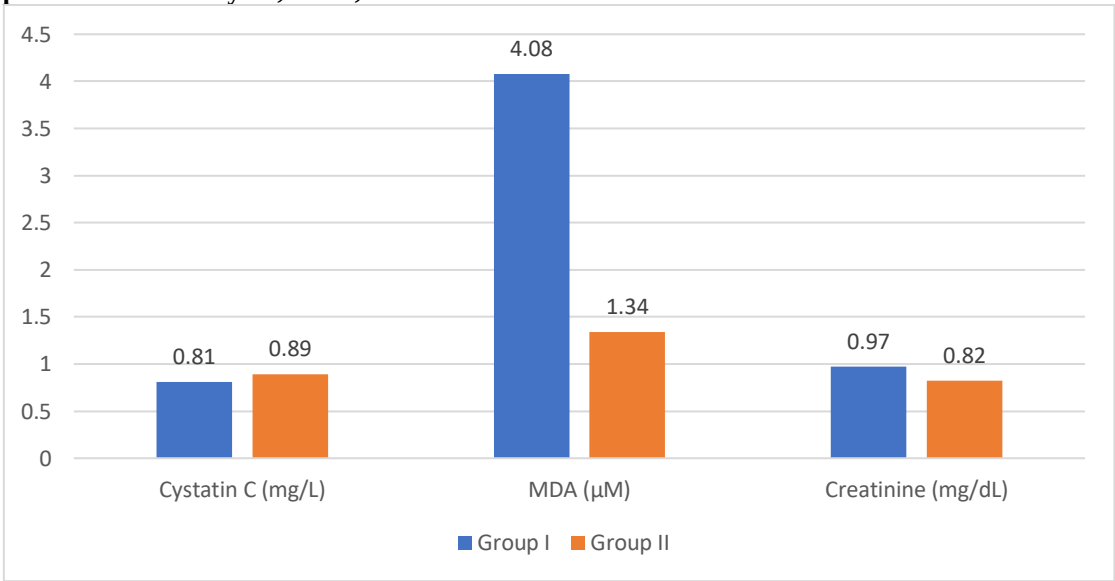
Table I shows that group I had 30 males and 23 females and group II had 26 males and 27 females.

Table II Evaluation of Cys C, MDA, creatinine level

Parameters	Group I	Group II	P value
Cystatin C (mg/L)	0.81	0.89	0.95
MDA (µM)	4.08	1.34	0.01
Creatinine (mg/dL)	0.97	0.82	0.05

Table II, graph I shows that cystatin C level was 0.81 mg/L in group I and 0.89 mg/L in group II. MDA level was 4.08 µM in group I and was 1.34 µM in group II. Creatinine level was 0.97 mg/L in group I and 0.82 mg/L in group II. The difference was significant (P< 0.05).

Graph IEvaluation of Cys C, MDA, creatinine level



DISCUSSION

Since diabetes is a chronic illness, many risk-reduction strategies are necessary. A metabolic disorder characterized by hyperglycemia caused by impairment of insulin action, production, or both, type 2 diabetes mellitus (T2DM) is on the rise.[7] In comparison to 145 million people in rural areas, 347 million people in metropolitan areas are expected to have diabetes by 2035. Without effective management and preventative actions, the prevalence and consequences of diabetes mellitus will increase globally.[8] The long-term damage, malfunction, and alterations in the organ systems associated with consequences from type 2 diabetes are caused by blood vessel injury, which is marked by an increased risk of macrovascular and microvascular problems.[9]The present study was conducted to conducted to assess MDA, creatinine and Cystatin C level in patients with diabetes mellitus.

We found that group I had 30 males and 23 females and group II had 26 males and 27 females.Lee et al[10]estimated GFR and staged the severity of diabetic nephropathy using blood creatinine and cystatin C (CysC). There were 0.87 and 0.91 mg/L of CysC and serum creatinine, respectively. The correlation values between CysC-GFR and the creatinine-based GFR evaluations were 0.589, 0.569, and 0.479, respectively. Compared to micro- and macro-albuminurics, normoalbuminurics had significantly higher serum CysC levels (1.05). There were significant differences between the groups' estimates of GFR on CysC-GFR and CLcr. CysC-GFR (mL/min) was statistically lower in macroalbuminurics than in normoalbuminurics. The logistic regression analysis's findings showed that retinopathy, A1C, CysC, diabetes duration, and CysC-GFR all had predictive significance. Serum CysC seems to be a more trustworthy serum marker than serum creatinine when assessing a prognosis.

We found that cystatin C level was 0.81 mg/L in group I and 0.89 mg/L in group II. MDA level was 4.08 µM in group I and was 1.34 µM in group II.

Creatinine level was 0.97 mg/L in group I and 0.82 mg/L in group II. In their research, Moon et al[11] monitored 2,676 non-diabetic participants with stable, normal renal function (estimated glomerular filtration rate >60 mL/min/1.73 m2) for almost 4.5 years. Glycated hemoglobin (HbA1c) ≥6.5%, fasting plasma glucose (FPG) ≥7.0 mmol/L, or individuals on antidiabetic medications were considered to have new onset diabetes. The difference between baseline and follow-up creatinine was referred to as variation of serum creatinine (ΔCre). Body composition was investigated using the bioelectric impedance analysis method in the subgroup analysis. During the follow-up period, 14 patients received a new-onset diabetes diagnosis. The groups with new-onset diabetes and those without diabetes did not differ in their baseline serum creatinine levels. After controlling for age, sex, body mass index, systolic blood pressure, FPG, HbA1c, triglyceride, high density lipoprotein cholesterol, and γ-glutamyl transpeptidase, negative ΔCre (ΔCre<0) was linked to an increased risk of type 2 diabetes (odds ratio, 1.885; 95% confidence interval, 1.127 to 3.153). In a body composition analysis, the serum creatinine level showed a negative association with the percentage of body fat and a positive correlation with muscle mass.

Hjelmesæth J et al[12]performed cross-sectional study of 1,017 consecutive morbidly obese patients with an estimated glomerular filtration rate >60 ml/min/1.73 m^2. Logistic regression (univariate and multiple) was used to assess the association between serum creatinine and prevalent type 2 diabetes, including statistically testing for the possibility of non-linearity in the relationship by implementation of Generalized Additive Models (GAM) and piecewise linear regression. Possible confounding variables such as age, family history of diabetes, waist-to-hip ratio, hypertension, current smoking, serum magnesium, albuminuria and insulin resistance (log HOMA-IR) were adjusted for in three separate multiple logistic regression models.The unadjusted GAM analysis suggested a piecewise linear relationship between serum creatinine and diabetes. Each 1 μmol/l increase in serum creatinine was associated with 6% (95% CI; 3%-8%) and 7% (95% CI; 2%-13%) lower odds of diabetes below serum creatinine levels of 69 and 72 μmol/l in women and men, respectively. Above these breakpoints the serum creatinine concentrations did not reduce the odds further. Adjustments for non-modifiable and modifiable risk factors left the piecewise effect for both women and men largely unchanged. In the fully adjusted model, which includes serum magnesium, albuminuria and log HOMA-IR, the piecewise effect for men was statistically non-significant, but it remained present for women. Patients with creatinine levels below median had approximately 50% (women) and 75% (men) increased odds of diabetes.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that compared to healthy persons, patients with diabetes mellitus had higher levels of MDA.

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