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Assessment of Serum Creatinine and Cystatin C as a Significance of Nephropathy in Diabetic Patients

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Abstract

Introduction: To assess serum creatinine and cystatin C as a significance of nephropathy in diabetic patients. **Subjects and Methods:** Eighty diabetes patients and eighty healthy controls were selected and divided into 2 groups. The level of lipid peroxidation was determined by examination of malondialdehyde (MDA) using a modified method. Cystatin C and serum creatinine levels were measured. **Results:** Group I had 45 males and 35 females and group II had 40 males and 40 females. The mean MDA level in group I was 4.06 µM and in group II was 1.32 µM. Creatinine level was 0.95 mg/L in group I and 0.84 mg/L n group II and mean cystatin was 0.82 mg/L in group I and 0.89 mg/L in group II. The difference was significant (P< 0.05). **Conclusion:** There was increased level of MDA in diabetic as compared to non- diabetics.

Key Words: Diabetics, Malondialdehyde, Lipid Peroxidation

INTRODUCTION

Type II diabetes mellitus is common and an important cause of morbidity and mortality. Its incidence is expected to increase by two to three times over the next 30 to 40 years due largely to changes in diet and physical activity levels.[1] Other factors such as smoking and renal disease have also been shown to increase the risk of type 2 diabetes mellitus. Recent studies suggest that cystatin C is not only a sensitive marker of renal dysfunction but it is also associated with insulin resistance, obesity, and hypertension. These conditions are known to be related to the development of type 2 diabetes.[2]

Cystatin C (CysC) is a 13-kDa, non-glycosylated basic protein belonging to the cystatin super-family of cysteine proteinase inhibitors. Unique among cystatins, it seems to be produced by all human nucleated cells. It is produced at a stable rate, which is unaffected by inflammatory processes, sex, age, diet, and nutritional status.[3]

Serum cystatin C was found superior to serum creatinine as a GFR marker in patients with early and moderately decreased renal function.[4] In keeping with this, serum cystatin C showed better performance compared with serum creatinine in studies evaluating patients with diabetes.[5] It is also possible that the relationship of serum cystatin C to the incidence of diabetes is the result of other disease processes. In persons without kidney disease, the association of serum cystatin C with incident diabetes was significant after controlling for age, sex, BMI, and smoking status.[6] However, the association did not remain significant after further adjustment for glycosylated hemoglobin. Recent studies suggest that cystatin C is associated with insulin resistance, obesity and hypertension, conditions closely related to diabetes.[7,8] We performed this study to assess serum creatinine and cystatin C as a significance of nephropathy in diabetic patients.

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MATERIALS AND METHODS

After considering the utility of the study and obtaining approval from ethical review committee, we selected eighty diabetes patients of both genders. Patients' consent was obtained before starting the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups. Group I comprised of diabetics (80) and group II had healthy subjects (80). The level of lipid peroxidation was determined by examination of malondialdehyde (MDA) using a modified method. Cystatin C was measured on Hitachi 7600 automatic analyzer by latex particle-enhanced turbidimetric immunoassays (PET) using rabbit polyclonal antihuman CysC antiserum. Serum creatinine levels were measured by automatic picric colorimetry on Hitachi 7600-110 automatic analyzer. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Table 1: Patients distribution

Groups	Group I	Group II
Status	Diabetes	Control
M:F	45:35	40:40

Group I had 45 males and 35 females and group II had 40 males and 40 females [Table 1].

Table 2: Comparison of MDA, creatinine and Cys C level

Parameters	Group I	Group II	P value
MDA (µM)	4.06	1.32	0.01
Creatinine (mg/dL)	0.95	0.84	0.95
Cystatin C (mg/L)	0.82	0.89	0.98

The mean MDA level in group I was 4.06 µM and in group II was 1.32 µM. Creatinine level was 0.95 mg/L in group I and 0.84 mg/L n group II and mean cystatin was 0.82 mg/L in group I and

0.89 mg/L in group II. The difference was significant (P< 0.05) [Table 2].

DISCUSSION

Diabetes as a chronic disease that requires multifactorial risk reduction strategies.[9] The increasing incidence of type 2 diabetes mellitus (T2DM) is a metabolic disease characterized by hyperglycemia due to damage to insulin secretion, insulin action and / or both.[10] Estimates of DM patients in 2035 show that there are 347 million people living in urban areas and around 145 million people living in rural areas.[11,12] Without effective management and prevention programs, the prevalence and complications of DM will continue to increase in the world.[13,14] DM complications are associated with long-term damage, dysfunction and disturbances in the organ systems which are initiated by blood vessel damage which is characterized by an increased risk of macrovascular and microvascular complications.[14,15] We performed this study to assess serum creatinine and cystatin C as a significance of nephropathy in diabetic patients.

Our study had diabetics in group I and control in group II. Group I had 45 males and 35 females and group II had 40 males and 40 females. Sahakyan et al,[16] determined association of serum cystatin C with the incidence of type 2 diabetes mellitus. The 15-year cumulative incidence of diabetes was estimated to be 9.6%. After controlling for age, sex, body mass index, smoking status, glycosylated hemoglobin, proteinuria, chronic kidney disease status, and hypertension status, serum cystatin C at baseline was associated with the 15-year cumulative incidence of type 2 diabetes (Odds Ratio per log of cystatin C unit 2.19, and 95% Confidence Interval 1.02, 4.68).

Our result showed that the mean MDA level in group I was 4.06 µM and in group II was 1.32 µM. Creatinine level was 0.95 mg/L in group I and 0.84 mg/L n group II and mean cystatin was 0.82 mg/L in group I and 0.89 mg/L in group II. Christensson et al,[17] determined whether serum cystatin C is more accurate than serum creatinine in the detection of diabetic nephropathy. Forty-one patients with type 1 and 82 patients with type 2 diabetes were evaluated with serum creatinine, serum cystatin C, and (51) Cr-EDTA clearance. Cystatin C was measured by a particle-enhanced turbidimetric method and creatinine by an enzymatic method. Estimations without age adjustment showed significantly closer correlation for cystatin C versus (51) Cr-EDTA clearance as compared with creatinine. However, when using age-adjusted values, the correlation for cystatin C and creatinine, respectively, versus (51) Cr-EDTA clearance did not differ. When comparing the diagnostic utilities for serum cystatin C versus serum creatinine in manifest renal impairment (GFR < 60 mL min (-1) 1.73 m (-2) or z-scores <-1.28 SD), there were no significant differences between the two markers whether age adjusted or not. However, for diagnosing mild nephropathy (GFR < 80 mL min (-1) 1.73 m (-2) or z-score -0.84 SD), serum cystatin C is significantly more useful.

Lee et al,[18] staged the level of diabetic nephropathy and estimated GFR based on serum creatinine and cystatin C (CysC). Serum creatinine and CysC levels were 0.91 mg/dL and 0.87 mg/L, respectively. Correlation coefficients between CysC-GFR and each of the creatinine-based GFR measurements were 0.589, 0.569, and 0.479. Serum CysC was significantly over in normoalbuminurics than in micro-albuminurics and macro-albuminurics and 1.05). Of the estimations of GFR, significant differences among the groups were found on CysC-GFR and CLcr. CysC-GFR (mL/min) was statistically lower in macroalbuminurics than in normoalbuminurics. The logistic regression analyses showed that retinopathy, A1C, CysC, diabetic duration, and CysC-GFR were indicators to predict the development of microalbuminuria. Serum CysC seems to be more accurate serum marker than serum creatinine in evaluating a prognostic stage of type 2 diabetic nephropathy.

Ogawa et al,[19] found that the serum CysC levels increased with the progression of nephropathy, and significantly higher in overt nephropathy, but not significant in early nephropathy. Serum CysC levels were well-correlated with H-CRP levels in the patients without nephropathy. These results indicate that serum CysC would be practical for the evaluation of renal function in diabetic patients with overt nephropathy but not early nephropathy and might be related with a risk for cardiovascular events in patients without nephropathy.

CONCLUSION

There was increased level of MDA in diabetic as compared to non- diabetics.

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