

## Original Research

### Assessment of Malondialdehyde, Cystatin C and serum creatinine in diabetes mellitus patients

B Gowri Shankar<sup>1</sup>, Ch Samasiva Rao<sup>2</sup>

<sup>1</sup>Professor General Medicine, NRI medical college & General Hospital, Guntur, A.P.,

<sup>2</sup>Associate professor, General Medicine, NRI Medical college & General Hospital, Guntur, A.P.

#### ABSTRACT

**Background:** Hyperglycemia and inadequate endogenous insulin production and function are two features of diabetes mellitus. The present study was conducted to assess MDA, creatinine and Cystatin C level in patients with diabetes mellitus.

**Materials & Methods:** 80 diabetic patients of both genders were put in group I and group II had 80 healthy subjects. The level of malondialdehyde (MDA), Cystatin C and creatinine levels were measured in both groups.

**Results:** Group I had 45 males and 35 females and group II had 40 males and 40 females. Cystatin C level was 0.82 mg/L in group I and 0.87 mg/L in group II. MDA level was 4.01  $\mu$ M in group I and was 1.36  $\mu$ M in group II. Creatinine level was 0.94 mg/L in group I and 0.85 mg/L in group II. The difference was significant ( $P < 0.05$ ).

**Conclusion:** There was elevated level of MDA in patients with diabetes mellitus in contrast to normal healthy subjects.

**Key words:** malondialdehyde, Cystatin C, Creatinine.

Received: 4 January, 2019

Accepted: 27 January, 2019

**Corresponding author:** Dr. Ch Samasiva Rao, Associate professor, General Medicine, NRI Medical college & General Hospital, Guntur, A.P., India

**This article may be cited as:** Shankar BG, Rao CS. Assessment of Malondialdehyde, Cystatin C and serum creatinine in diabetes mellitus patients. *J Adv Med Dent Sci Res* 2019; 7(2): 242-244.

#### Introduction

A group of metabolic illnesses collectively known as diabetes mellitus (DM) are characterized by unusually high blood sugar levels (hyperglycaemia), which result from the body's inability to produce enough insulin or to utilize it to its fullest capacity.<sup>1</sup> Hyperglycemia and inadequate endogenous insulin production and function are two features of diabetes mellitus.<sup>2</sup> Insulin resistance is the first symptom of type II diabetes, which progresses over time to failure of the body to maintain glucose hemostasis, which leads in glucose intolerance. Type II diabetes is a multicausal illness.<sup>3</sup>

Malondialdehyde (MDA), a by product of the peroxidation of arachidonic, eicosapentaenoic, and docosahexaenoic acids, is a key player in the alteration of low-density lipoprotein (LDL). lysine residues in the apoB-100 of LDL interact with aldehydes like MDA to form oxidized-LDL (ox-LDL).<sup>4</sup> The cystatin superfamily of cysteine proteinase inhibitors includes the 13-kDa basic

protein known as cystatin C (CysC). It stands out among cystatins in that all human nucleated cells appear to synthesize it. Its rate of production is constant and unaffected by inflammatory processes, sex, age, diet, or nutritional status.<sup>5</sup> Although this has not always been the case, numerous studies have shown that serum CysC is preferable to serum creatinine as a measure of renal function in people with diabetes.<sup>6</sup> 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 80 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). The level of fasting, random blood glucose was estimated. Glycated hemoglobin level was also

determined. Serum creatinine levels were measured by automatic picric colorimetry on Hitachi 7600-110 automatic analyzer. 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. 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
Status	Type II diabetes mellitus	Control
M:F	45:35	40:40

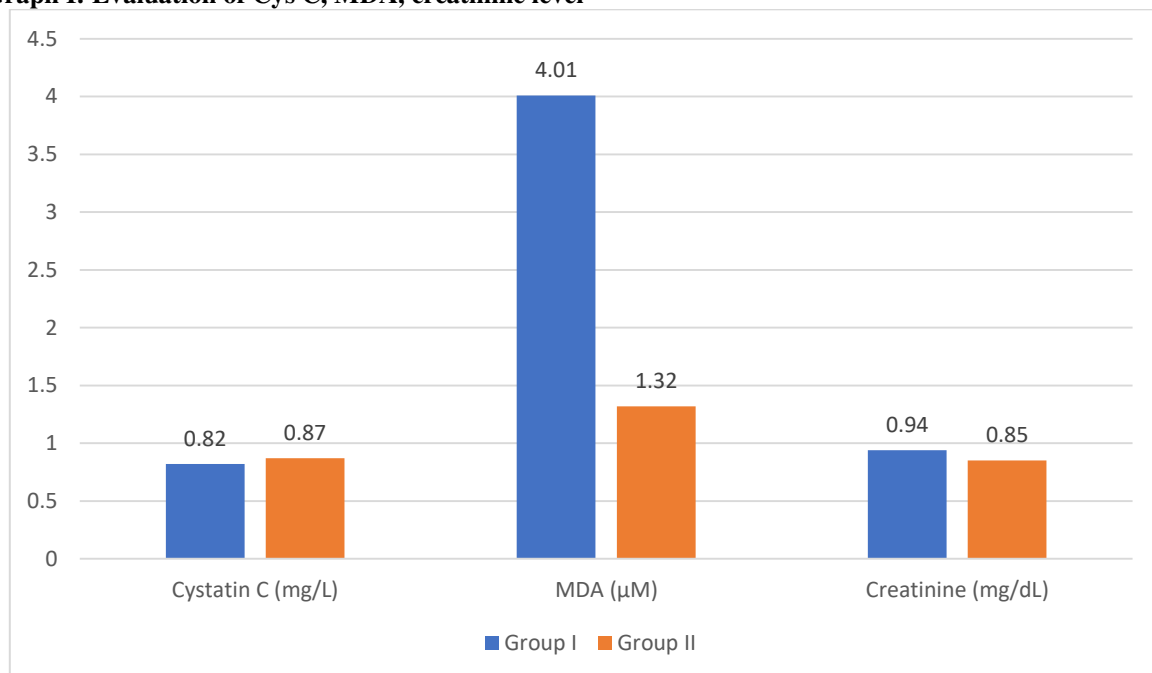
Table I shows that group I had 45 males and 35 females and group II had 40 males and 40 females.

**Table II: Evaluation of Cys C, MDA, creatinine level**

Parameters	Group I	Group II	P value
Cystatin C (mg/L)	0.82	0.87	0.91
MDA ( $\mu$ M)	4.01	1.32	0.82
Creatinine (mg/dL)	0.94	0.85	0.03

Table II, graph I shows that cystatin C level was 0.82 mg/L in group I and 0.87 mg/L in group II. MDA level was 4.01  $\mu$ M in group I and was 1.36  $\mu$ M in group II. Creatinine level was 0.94 mg/L in group I and 0.85 mg/L in group II. The difference was significant ( $P < 0.05$ ).

**Graph I: Evaluation of Cys C, MDA, creatinine level**



## Discussion

Diabetes is a chronic condition that calls for numerous risk-reduction measures. Type 2 diabetes mellitus (T2DM), which is becoming more common, is a metabolic condition marked by hyperglycemia brought on by impairment to insulin production, insulin action, or both.<sup>7</sup> According to projections, there would be 347 million urban residents with diabetes in 2035, compared to 145 million rural residents.<sup>8</sup> The prevalence and complications of DM

will spread over the world without proper management and preventative measures.<sup>9</sup> Blood vessel injury, which is characterized by an elevated risk of macrovascular and microvascular complications, is the initiator of the long-term harm, dysfunction, and changes in the organ systems that are linked with 2 DM complications.<sup>10,11</sup> The present study was conducted to assess MDA, creatinine and Cystatin C level in patients with diabetes mellitus.

We found that group I had 45 males and 35 females and group II had 40 males and 40 females. Lee et al<sup>12</sup> used blood creatinine and cystatin C (CysC) to stage the severity of diabetic nephropathy and estimate GFR. CysC and serum creatinine levels were 0.87 and 0.91 mg/L, respectively. CysC-GFR and the creatinine-based GFR assessments had correlation values of 0.589, 0.569, and 0.479, respectively. Serum CysC in normoalbuminurics was substantially higher than in micro- and macro-albuminurics and 1.05). On CysC-GFR and CLcr, there were substantial discrepancies between the groups' estimates of GFR. In comparison to normoalbuminurics, macroalbuminurics had statistically decreased CysC-GFR (mL/min). The results of the logistic regression analysis demonstrated the predictive value of retinopathy, A1C, CysC, diabetes duration, and CysC-GFR. When analyzing a prognosis, serum CysC appears to be a more reliable serum marker than serum creatinine.

We observed that cystatin C level was 0.82 mg/L in group I and 0.87 mg/L in group II. MDA level was 4.01  $\mu$ M in group I and was 1.36  $\mu$ M in group II. Creatinine level was 0.94 mg/L in group I and 0.85 mg/L in group II. Agrawal et al<sup>13</sup> determined overall antioxidant level in type 2 diabetes mellitus in relation to oxidative stress. 110 Type 2 diabetics between the ages of 30 and 60 were matched with an equal number of age- and sex-matched healthy controls. Diabetes patients had fasting plasma sugar levels of 172.43 43.02 mg/dl as opposed to 89.52 10.21 mg/dl in healthy controls. Diabetes patients had postprandial plasma sugar values of 247.26 46.16 mg/dl, while controls had readings of 115.34 42.18 mg/dl. MDA levels are significantly higher in diabetic patients (4.010.78M) compared to controls (1.991.22M).

Moon et al<sup>14</sup> in their study a total of 2,676 nondiabetic subjects with stable and normal renal function (estimated glomerular filtration rate >60 mL/min/1.73 m<sup>2</sup>) were followed up for approximately 4.5 years. New onset diabetes was defined as fasting plasma glucose (FPG)  $\geq$ 7.0 mmol/L, glycosylated hemoglobin (HbA1c)  $\geq$ 6.5%, or subjects taking antidiabetic agents. Variation of serum creatinine ( $\Delta$ Cre) was defined as a difference between follow-up and baseline creatinine. In subgroup analysis, body composition was examined by bioelectric impedance analysis method. A total of 106 subjects were diagnosed with new-onset diabetes during the follow-up period. Baseline serum creatinine was not different between the new-onset diabetes and no diabetes groups. Negative  $\Delta$ Cre ( $\Delta$ Cre<0) showed an association with increased risk of type 2 diabetes after adjusting for age, sex, body mass index, systolic blood pressure, FPG, HbA1c, triglyceride, high density lipoprotein cholesterol, and  $\gamma$ -glutamyl transpeptidase (odds ratio, 1.885; 95% confidence interval, 1.127 to 3.153). Serum creatinine level demonstrated positive correlation

with muscle mass and negative correlation with percentage of body fat in body composition analysis.

## Conclusion

Authors found that there was elevated level of MDA in patients with diabetes mellitus in contrast to normal healthy subjects.

## References

1. Ford ES, Mokdad AH, Giles WH, Brown DW. The Metabolic Syndrome and Antioxidant Concentrations: Findings from the Third National Health and Nutrition Examination Survey (NHANES 3). *Diabetes* 2003;52:2346-52.
2. Carr AC, Zhu BZ, Frei B. Potential antiatherogenic mechanisms of ascorbate (vitamin C) and alpha tocopherol (vitamin E). *Circ Res* 2000;87:349-54.
3. Halliwell B, Cross CE, Gutteridge JMC. Free radicals, antioxidants and human disease: where are we now? *J Lab Med* 1992;119:598.
4. Kumar N, Chandhoik N, Dhillon BS, Kumar P. Role of oxidative stress while controlling iron deficiency anemia during pregnancy-Indian scenario. *Indian J Clinical Biochemistry*. 2009;24(1):5-14.
5. Laight DW, Carrier MJ, Anggard EE. Antioxidants, diabetes and endothelial dysfunction. *Cardiovasc Res* 2000;47:457-64.
6. Hjelmæsæth J, Røislien J, Nordstrand N, Hofsvø D, Hager H, Hartmann A. Low serum creatinine is associated with type 2 diabetes in morbidly obese women and men: a cross-sectional study. *BMC EndocrDisord*. 2010;10:6.
7. Dogun ES, Ajala MO. Ascorbic Acid and Alpha Tocopherol Antioxidant Status of Type 2 Diabetes Mellitus Patients seen in Lagos. *Niger Postgrad Med J* 2005;12:155-7.
8. Nyenwe EA, Odia OJ, Ihekweba AE, Ojule A, Babatunde S. Type 2 diabetes in adult Nigerians: A study of its prevalence and risk factors in Port Harcourt, Nigeria. *Diabetes Res Clin Pract*2003;62:177-85.
9. Kashima S, Inoue K, Matsumoto M, Akimoto K. Low serum creatinine is a type 2 diabetes risk factor in men and women: the Yupo Health CheckupCenter cohort study. *Diabetes Metab*. 2017;43:460-4.
10. MemsoullariR, Tays S, Bakan E, Capoglu I. Antioxidant status and lipid peroxidation in type 2 diabetic mellitus. *Cell Biochemistry and Function* 2003;21:291.
11. Moussa SA, Youssef AA. Oxidative stress in diabetes mellitus. *Rom J Biophys*2008;18:225-36.
12. Lee BW, Ihm SH, Choi MG, Yoo HJ. The comparison of cystatin C and creatinine as an accurate serum marker in the prediction of type 2 diabetic nephropathy. *Diabetes research and clinical practice*. 2007 Dec 1;78(3):428-34.
13. Agrawal UK, Agrawal SK, Agrawal V. Evaluation of Total Antioxidant Status in Relation to Oxidative Stress in Type 2 Diabetes Mellitus. *J Adv Med Dent Scie Res* 2017;5(1):172-174.
14. Moon JS, Lee JE, Yoon JS. Variation in serum creatinine level is correlated to risk of type 2 diabetes. *Endocrinol Metab (Seoul)*. 2013;28:207-13