

Lipid profile, serum malondialdehyde, superoxide dismutase in chronic kidney diseases and Type 2 diabetes mellitus

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Abstract

The present study was carried out in patients with chronic kidney diseases (CKD) and type 2 diabetes mellitus to evaluate the status of lipid profile, malondialdehyde and superoxide dismutase in total 50 patients of CKD and 50 patients of type 2 diabetes mellitus and 40 healthy individuals were included as control in this study. After 12 hrs, fasting 5 ml. venous blood sample was collected, allowed to clot for half an hour and serum was separated. Lipid profile was measured by using commercially available kit of metro lab auto analyzer. Serum MDA was measured by Wilbur et al method, serum SOD levels were measured by Marklund and Marklund method. The values are expressed as mean \pm SD and P value of less than 0.05 was considered as significant. The levels of total cholesterol, LDL cholesterol were decreased where as Triglycerides (TG), VLDL Cholesterol were elevated in CKD patients as compared to control group, though the values were not statistically significant ($P > 0.05$). In type 2 diabetic patients HDL cholesterol significantly decreased ($P < 0.05$) while other parameters of lipid profile were significantly increased ($P < 0.05$) as compared to control group. Serum MDA and SOD were significantly higher ($P < 0.05$) in CKD and type 2 diabetic patients, but not statistically significant as compare to control. In conclusion study shows significant lipoprotein abnormalities in CKD and type 2 diabetes mellitus patients when compared to control. High levels of MDA in CKD and diabetic patients indicating to an increased oxidative stress, the increasing SOD level trying to fight against oxidative stress.

Key words-Chronic Kidney Disease (CKD), Malondialdehyde, Superoxide Dismutase

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Introduction

Dyslipidemia contributes to the rate of progression of atherosclerosis and chronic kidney diseases. Also chronic kidney disease lead to the development of secondary abnormalities in lipid metabolism that contribute to increased cardio vascular morbidity and mortality [1]. Chronic kidney disease reflects most quantitative abnormalities in predialysis patients and the incidence of Cardio vascular Diseases (CVD) becomes substantially elevated when CKD progresses [2]. Abnormal lipid and lipoprotein concentration in patients with chronic kidney diseases may be cause of their high risk of atherosclerosis. Reactive oxygen species (ROS) are constantly formed in the human body under physiological as well as under pathological conditions. The action of these free radical is antagonized by the enzymatic and non enzymatic antioxidant defense system [3]. The causation of renal damage may be related to oxidative stress encountered at the level of the renal tissue. Diabetic patients with

accompanied dislipidemia are soft targets of cardio vascular deaths. Patients with type 2 diabetes often exhibit atherogenic lipid profile, which greatly increased their risk of CVD compared with people without diabetes. An early intervention to normalize circulating lipids has been shown to reduce cardiovascular complications and mortality [4]. Oxidative stress thought to be increased in system where the rate of free radical production is increased and the antioxidant mechanism are impaired [5]. The present study was undertaken to explore the altered lipid, lipoprotein, serum MDA and SOD in patients with CKD and type 2 diabetes mellitus.

Material and Methods

The present study was carried out in the department of Biochemistry of Padmashree Dr. Vitthalrao Vikhe Patil Foundation's Medical College, Ahmednagar. The study was conducted on successive patients after informed consent was obtained from them. The study was approved by

ethical committee of institution. A total of 50 patients of chronic kidney disease (32 male and 18 females of age 20 to 55 yrs.) who were attending at hospital. The diagnosis was made by nephrologists. Similarly 50 patients of type 2 diabetes mellitus (35 male and 15 female of age group 35-65 yrs.), who were already diagnosed to have type 2 diabetes mellitus based on the criteria of the expert committee on the diagnosis and classification of diabetes mellitus [6]. 40 age and sex matched (28 males & 12 females) healthy individuals served as controls who attended for routine health check up at the hospital. None of the healthy control was taking any medicine or dietary supplement; they were selected after detailed physical examination and laboratory tests.

Sample collection: After 12 hrs fasting 5 ml. venous blood sample was collected in plain tubes, the samples were allowed to clot for half an hour following which a samples were centrifuged for 15 minutes at 2000 rpm. and serum was stored immediately at -80°C until analysis. Serums total cholesterol, HDL cholesterol were measured using commercially available kit of metro lab auto analyzer. LDL cholesterol and VLDL cholesterol concentration was calculated using Friedwald formula [7]. Serum malondialdehyde (MDA) was measured by Wilbur et al method. [8]. Superoxide dismutase (SOD) levels were measured by Marklund and Marklund [9].

Table 1. Lipid profile in CKD, Type 2 diabetes and their control

Parameters in Mg %	Control	CKD	Type 2 diabetes mellitus
Total cholesterol	175.00 \pm 45.3	170.30 \pm 35.45#	220 \pm 60.31*
TG	125.00 \pm 40.12	175.94 \pm 60.29#	305 \pm 72*
HDL cholesterol	35.33 \pm 8.51	30.6 \pm 17.45#	24.74 \pm 13*
LDL cholesterol.	125.12 \pm 33.81	119.89 \pm 30.97#	169.22 \pm 79*
VLDL cholesterol	18.09 \pm 1.18	30.7 \pm 12.17#	126.52 \pm 40*

Values are expressed as mean \pm SD

indicates non significant ($P > 0.05$)

* indicates highly significant ($P < 0.05$)

Table 2. Serum MDA and Superoxide dismutase levels in CKD, type 2 diabetes mellitus and their control.

Parameters	Control	CKD	Type 2 diabetes mellitus
Serum MDA (nmol /ml)	6.13 \pm 2.3	15.7 \pm 3.202*	13.29 \pm 0.72*
Serum SOD (units /ml)	3.50 \pm 1.35	7.60 \pm 1.45*	3.85 \pm 0.92#

Values are expressed as mean \pm SD

indicates non significant ($P > 0.05$)

* indicates highly significant ($P < 0.05$)

Discussion

Several studies shows that lipid abnormalities principally present in chronic kidney disease is hypertriglyceridemia. In present study we found hypertriglyceridemia in CKD as compare to control. The elevated triglyceride levels

Statistical Analysis

All values were expressed as the mean obtained from the number of experiments (n) data from all the tables of normal, CKD and diabetic patients were compared by ANOVA followed by students 't' test. P values of <0.05 were considered to be significant.

Results

Table no 1 shows levels of Total cholesterol, HDL cholesterol and LDL cholesterol were decreased were as triglycerides & VLDL cholesterol elevated in CKD patients as compared to control group. The values however were not statistically significant. ($P > 0.05$). In type 2 diabetic patients Total cholesterol, Triglycerides. VLDL cholesterol, LDL cholesterol, levels were significantly higher than control where as HDL cholesterol levels were significantly low ($P < 0.05$) compared with control group. Table 2 shows serum MDA concentration and SOD were significantly higher in CKD patients ($P < 0.05$) as compared to control where as in type 2 diabetic patients serum MDA level was significantly higher and SOD level was found to be elevated but not statistically differ with control subjects.

may be due to impaired activity of lipoprotein lipase [10]. Hyperlipoproteinemia is common in the western population in CKD patients, however Indian literature shows variable findings, Sharma et al [11] and others demonstrated the absence of significant hyper lipoproteinemia in CKD while Alam et al [12] and Rao et al [13] found that

significant abnormalities of lipoproteins in CKD. The present study confirms the presence of significant lipoprotein abnormalities in chronic kidney disease as compared to control group. In Indian studies there is no evidence of hypercholesterolemia in earlier stage but in end stage renal disease cholesterol is either normal or reduced whereas western studies have reported hypercholesterolemia to be present predominantly in CKD this could be due to difference in dietary habits [14]. We did not find hypercholesterolemia in CKD. VLDL cholesterol levels were significantly high in CKD when compared with control in this study. Increased in VLDL cholesterol in CKD may be due to their reduced clearance as well as insulin resistance driven over production of VLDL [15]. LDL cholesterol is usually normal or slightly reduced in CKD and exhibit important disturbances in density distribution of LDL sub fractions that is characterized by pre dominance of small dense LDL particles which are susceptible factors for atherogenesis [16]. In the present study we found slightly reduced LDL cholesterol in CKD as compared to control. HDL cholesterol levels were low in CKD as compared to control this may be due to the activity of Lecithin Cholesterol Acyl Transferase is consistently diminished in CKD [17].

In 2 type diabetes mellitus we found that HDL cholesterol levels were significantly low and other parameters of lipoproteins were significantly high as compare to control group. The low levels of HDL cholesterol which exerts antiatherogenic and antioxidative effects when present in sufficient amounts is key feature for oxidative stress status [18]. Protein identified as key component of the VLDL assembly process leads to increase level of TG and reduce levels HDL cholesterol in addition the elevation of free fatty acid and glucose in diabetes mellitus can decrease activity of lipoprotein lipase a pivotal enzyme in the removal of these lipoproteins from circulation that control the TG rich lipoproteins and HDL proteins [19]. De Z et al has proposed that oxidative stress may be associated with the pathogenesis of diabetes and its complications [20]. The rise in serum MDA indicated that any oxidative stress incurred sufficiently could cause free radical mediated peroxidation of lipid component in cell membrane, thus MDA is a good indicator for evaluating oxidative stress in degenerative disease like CKD and diabetes mellitus. The present study shows that serum MDA was increased significantly in CKD and type 2 diabetic patients as compare to control subjects as shown in Table No.2. In the present study antioxidant enzyme activities particularly SOD in CKD and Type 2 diabetic patients showed elevated, but did not reach to the significant level when compared to control group. This indicated that oxidative stress induced by high level of glucose may increase super oxide radical production with diabetic patients this findings was in agreement with the other evidences [21, 22].

Conclusion

In conclusion the present study shows that significant lipoprotein abnormalities in chronic kidney diseases and Type 2 Diabetic patients when compared with control subjects. The increased level of serum MDA and superoxide dismutase clearly shows that CKD and diabetic patients were exposed to an increased oxidative stress via lipid peroxidation. The antioxidant enzyme play an important role in scavenging ROS produced under oxidative stress. The increased SOD levels trying to fight against oxidative stress. The increased activity of antioxidant enzyme SOD may be a compensatory mechanism in response to increased oxidative stress in these patients. These findings also provide a theoretical basis for the development of novel therapeutic strategies such as antioxidant supplementation. It is reasonable to suggest that apart from the standard suggestive care for these patients like use of conventional drugs, antioxidant supplementation should form part and parcel of the physician's prescription. However due to limited number of cases in our study, future study should be planned with more number of cases to substantiate the results and arrive at a definite conclusion

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