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CORRELATION BETWEEN OXIDATIVE STRESS AND ANTIOXIDANT IN DIABETIC NEPHROPATHY

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Abstract:
Background: Diabetic Nephropathy is consider as one of the major micro-vascular problems of diabetes mellitus and has become the most general single factor of end stage of kidney disease. It is defined traditionally by kidney morphological and modification like: glomerular hyper filtration, glomerular and kidney hypertrophy, increased urinary albumin excretion (> 300 mg/24 hours), increased GBM (Glomerular Basement Membrane) thickness and mesangial expansion and also accumulation of extracellular proteins comprising laminin, collagens and fibronectin worldwide. Oxidative stress (OS) has been characterized as the imbalance between reactive oxygen species (ROS) yielding and the possessive antioxidant defense system.
Objective of the study: Correlation between oxidative stress and antioxidant in diabetic nephropathy.
Materials and methods: The investigation was conducted on 100 DN subjects of both sex and aged 20 or more and 100 age and sex matched healthy control subjects. MDA, SOD and Catalase of each subject was measured.
Results: the present investigation shows that the MDA was elevated significantly and SOD and Catalase level was found to be significantly low in DN individuals as compared to controls. Conclusion: This study concluded that the MDA could be better marker for early recognition of DN.
Keywords: Diabetic nephropathy (DN), MDA, SOD, Catalase**,** Kidney disease

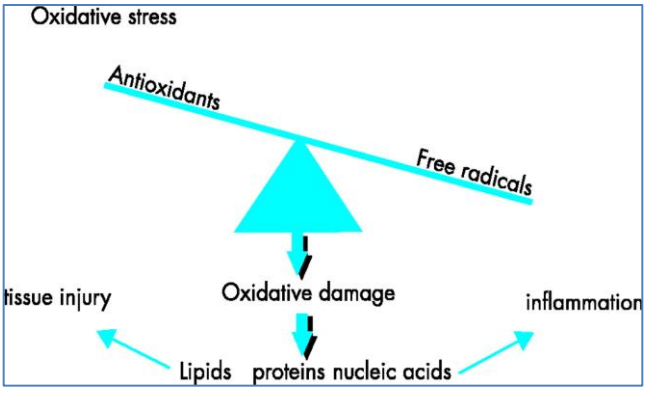
Introduction:

Diabetic Nephropathy (DN): DN is treated as one of the chief micro-vascular complications of diabetes mellitus and has become the most commonly single factor of end-stage of kidney disease. It is delineated commonly by renal morphological and function activity alterations like; glomerular and kidney hypertrophy, glomerular hyper-filtration, elevated glomerular basement membrane (GBM) thickness, elevated urinary albumin excretion (> 300 mg/ 24 hours), and mesangial expansion and also aggregation of extracellular proteins comprising laminin, collagens and fibronectin[1,2,3].

In 2015 the pervasiveness of diabetes was 8.8%, ages from 20 to 70 years affecting a people of about 440 million populations by the year 2035[4]. The main clinical features of diabetes are chronic tissue damage. For short-term elevation in hyperglycemia doesn't show in severe clinical problems. The duration and severity of hyperglycemia is the major causative factor in initiating organ damage[5].

About 2/3 of the patients with diabetic nephropathy develop ESRD or renal failure requiring either dialysis or renal transplantation. In the US the DN is the most general element of ESRD or chronic kidney failure and reports that for > 1/3 of subjects entered in long-term dialysis curicculums[6]. Patients with nephropathy frequently develop other complications, in particularly cardiovascular disease including hypertention and stroke, resulting in increased risk of early mortality[7,8]. In subjectswho have type 1 diabetes; forty years after onset of the disease, the mortality rate is 90% for those patients with nephropathy but only 30% for those patients without renal disease[8]. Hence, kidney problems of DM are crucial; glomerulosclerosis and vascular disease are the most essential factors of renal failure in the diabetic subjects.

Oxidative stress (OS): OS has been characterized as the imbalance between reactive oxygen species (ROS) yielding and the possessive antioxidant defense system. The oxidative stress developed by hyperglycemia increases ROS production, which causes the activation of different redox-sensitive cell signaling molecules and the production of cytotoxic materials. This is followed by cellular dysfunction and damage and ultimately results in diabetic micro-.and macro-vascular complications[9,10,11].



OS delineated by an elevation in production of products derived from lipid peroxidation and a decline in antioxidant capacity[12,13,14]. The most routine used marker of lipid oxidation is Malonaldehyde (MDA), which is developed naturally without any enzymatic action[15]. MDA is a kind of end product generated by lipid peroxidation and has been considered as a biomarker of increased oxidative stress during CKD[16]. Increased production of MDA level in the diabetic nephropathy, which is a suggestive feature of oxidative stress in long standing type 2 diabetes[17,18,19].

Antioxidants are intensifies that repress oxidation. Oxidation is a concoction response that can create free radicals, subsequently prompting chain responses that may harm the cells of creatures. Thus, it has been several stages of biological defenses developed, which can be classified as prevention, interception and repair[20].

The present investigation was undertaken to find out level of MDA and SOD & CAT in DN & compared with a group of healthy subjects.

Materials and methods:

The investigation was conducted on 100 DN subjects of both sex and aged 20 or more and 100 age and sex matched healthy control subjects. A 12 hours fasting blood sample was collected from each subject in plain, EDTA & fluoride vial. After collection sample was centrifuged and serum store at 4°c.

Plasma Malondialdehyde (MDA) was estimated by Jean CD (1983)[21] and Serum super oxide dismutase (SOD) was estimated by the method of Marklund & Marklund (1974)[22]. Serum catalase (CAT) was estimated by the method of Aebi (1984)[23]. Correlation analysis was done by using SPSS version 20. The mean (± SD) of test group (DN subjects) was compared with that of control group by Student's unpaired t test. A p value of less than 0.05 was considered as significant.

Results:

Table 1: Shows Statistical analyzes projected that the MDA of diabetic nephropathy patients found to be significantly elevated. This was observed that the average (Mean ± SD) MDA concentration that was found in the control group was 1.15 ± 0.27 and in the test group was 4.78 ± 0.68. The MDA level was found significantly higher in comparison to that in the (healthy subjects) control group, with a p value of < 0.001.

Table 2: Shows statistical analyzes projected that the SOD and CAT of diabetic nephropathy patients found to be significantly lower. This was observed that the average (mean ± SD) SOD and CAT concentration that was found in the control group was 6.16 ± 0.90 and 7.29 ± 0.77 and in the test group, it was 2.72 ± 0.42 and 3.11 ± 0.71. The SOD and CAT level was found to be significantly low in comparison to that in the healthy subjects (control group), with a p value of < 0.001.

Table 1: Comparison of MDA (Oxidative stress) of controls and test groups

PARAMETER	GROUP	MEAN ± SD	P-VALUE
MDA	Control group	1.15 ± 0.27	<0.001
	Test group	4.78 ± 0.68	

Table 2: Comparison of SOD and CAT of controls and test groups

PARAMETER	GROUP	MEAN ± SD	P-VALUE
SOD	Control group	6.16 ± 0.90	<0.001
	Test group	2.72 ± 0.42	
CAT	Control group	7.29 ± 0.77	<0.001
	Test group	3.11 ± 0.71	

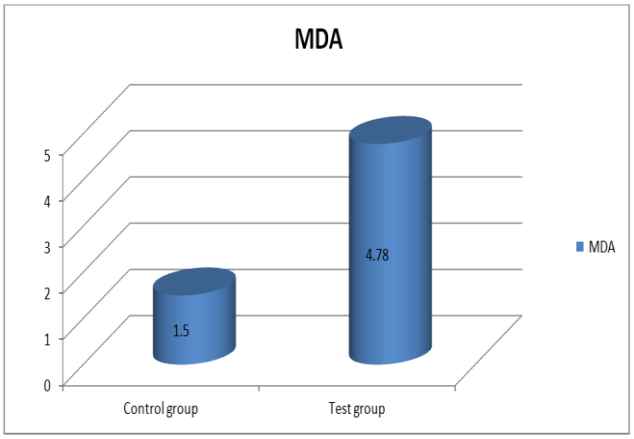


Figure 1: Comparison of MDA of controls and test groups, in the form of bar diagram.

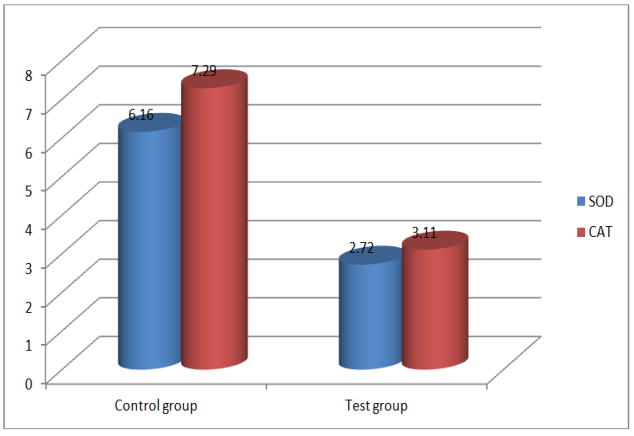


Figure 2: Comparison of SOD & CAT of controls and test groups, in the form of bar diagram.

Discussion and Conclusion

In the present study, the mean MDA concentration was found to be significantly higher and SOD and CAT level was found to be significantly low in the DN as compare to control group.

These findings were concordant with the results of the studies, which were previously done by Varma et al., (2014)[24] found increase level of MDA was observed in Diabetic nephropathy. They also found significantly decrease SOD, Catalase level.

Kafle et al., (2012)[25] concluded that the inflammatory markers and oxidative stress are raised with decline antioxidant defense levels in patients who have diabetic nephropathy because of hyperglycemia induced oxidative stress.

Our results are in conformity with these two previous reports. As the subjects included in the present study were otherwise healthy, the increased oxidative stress & abnormal antioxidant level are common in renal disease and diabetic patients. The role of oxidation mediated tissue damage in generation of diabetic nephropathy in humans is evidence by the higher level of MDA with lower blood level of CAT and SOD.

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