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# EVALUATION OF CATALASE, PARAOXONASE1 ACTIVITIES IN TYPE 2 DIABETES AND THEIR ROLE IN GLYCEMIC CONTROL

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## ABSTRACT

Patients with type II diabetes mellitus (NIDDM) are more prone to ischemic heart disease (IHD). Free radical damage is mostly responsible for causing all complications in diabetic patients. Conflicting reports are available regarding the antioxidant status in patients of NIDDM complicated with IHD. This study was undertaken to investigate the oxidative status in patients of NIDDM and to assess their relation with plasma glucose, catalase and paraoxanase activity.

**KEY WORDS:** type II diabetes mellitus (NIDDM), paraoxanase1I (PON1) , catalase (CAT)

## INTRODUCTION

Diabetes mellitus is a chronic disorder resulting from a number of factors in which an absolute or relative deficiency of insulin or its function occurs. It is projected that by the year 2025, India alone would have 57 million diabetics mainly of type 2 DM constituting 90% of the diabetic population.[1,2,3]

Oxygen free radicals contribute to the development of exacerabation of many mankinds most common illness, including heart attacks. The global burden of IHD is highlighted by the world health reports which estimates 58.6% of all deaths in 2014 were attributed to cardiovascular disease.[4]

Catalase is a common enzyme found in nearly all living organisms exposed to oxygen. It catalyzes the decomposition of hydrogen peroxide to water and oxygen.[5] it is a very

important enzyme in protecting the cell from oxidative damage by reactive oxygen species(ROS).

PON1 (paraoxonase-1) is an HDL (high density lipoprotein) – associated enzymes capable of hydrolysing diverse substrates from OP(organ phosphate) toxins to oxidized phospholipids. As such it has been linked with both the prevention of OP poisoning and inhibition of atherosclerosis intiated by oxidatively modified LDL9low density lipoprotein).[6]

Paraoxanase is a glycoprotein synthesized in the liver and secreted into the blood, where it associates with the HDL and has been implicated in the detoxification of organophosphate and possibly in the prevention of LDL lipid peroxidation .[7,8] by its paraoxonase activity and by preventing homocysteinylation of APO $B^{100}$.

Low serum paraoxonase activity has been associated with increased susceptibility to atherosclerosis which could be due to reduced capacity to detoxify lipid peroxides in diabetes. The aim of the study was to evaluate the catalase, PON1 activity in type 2 DM to know how they vary and how they are related to each other in diabetes.

## MATERIAL METHOD

The study was conducted over a period of 6 months. The study includes 80 subjects recruited in medicine department in Narayana Medical college and Hospital out of 80, 50 were patients with type 2 DM and 30 were normal healthy subjects matched to the age and sex.

5ml blood samples were collected after 12 hours of fasting for estimation of fasting blood glucose and 2 ml blood is collected in a plain tube for serum paroxonase estimation. This procedure is carried out both in case and controls.

FBS was estimated by glucose oxidase peroxidase method.[9]

Serum paraoxonase was estimated by spectrophotometric method[10] estimation of catalase activity in RBC by hemolysate method.[11]

## RESULTS

The data analysis was done using SPSS software. The results were expressed as mean ± standard deviation and range values.

The p value of 0.005 was considered for statistical significance.

The mean and standard deviation of all parameters of the study were calculated in patients and controls.

**Table I shows the comparision of fasting blood sugar (FBS) in cases and controls.**

| Parameters | Cases | Controls | P value |
|---|---|---|---|
| FBS | 160 ± 80 | 90.1 ± 14 | 0.001 |

**Table II shows the comparision of paroxonase 1 (PON1) in cases and controls.**

| Parameters | Cases | Controls | P value |
|---|---|---|---|
| PON1 | 36.8 ± 11.2 | 58.6 ± 7.4 | 0.0001 |

**Table III shows the comparision of catalase in cases and controls.**

| Parameters | Cases | Controls | P value |
|---|---|---|---|
| CAT | 63 ± 19.7 | 165 ±54 | 0.0001 |

**Table IV shows CAT /PON1 ratio in cases and controls.**

| Parameters | Cases | Controls | P value |
|---|---|---|---|
| CAT / PON1` | 2.72 ± 0.7 | 1.5 ± 0.36 | <0.01 |

## DISCUSSION

Hyperglycemia a hall mark of diabetic condition depletes natural antioxidants and facilitates the production of reactive oxygen species (ROS) which has the ability to react with all biological molecules like lipids, proteins, carbohydrates, DNA etc and exert cytotoxic effects on cellular components.[12]

High levels of glucose are associated with non enzymatic glycation of both extra and intracellular proteins. The occurrence of free radical induced lipid peroxidation causes considerable changes in cell membrane. [13] peroxidation of lipid membrane has been related to the pathogenesis of many degenerative diseases, such as atherosclerosis oxidative damage to DNA, ageing and DM[14] in our study the mean values of FBS in cases was 160 ± 80 controls 90.1 ± 14 it was evident that the serum glucose levels were increased in type 2 DM patients when compared to healthy controls. P value 0.001 which was significant. Similarly mean values of PON1 activity in cases and controls were 36.8 ± 11.2 and 58.6 ±7.4 respectively. It was evident that PON1 activity was decreased in cases when compared to controls and was significant (pvalue 0.0001)

Catalase is an antioxidant enzyme. It decomposes hydrogen peroxide. Which is a reactive oxygen species.

The activity of antioxidant enzymes in the course of diabetes depends on the glycemic control. In diabetes this antioxidant enzyme will be decreased because of poor glycemic control. The results of our study show that there was decrease in the activity of catalase in NIDDM.

Reduced CAT/ PON1 ratio can be used to assess poor glycemic control measurement of PON1 and CAT assess the oxidative stress in diabetes. Hence by using the above parameters we can access the oxidative stress and glycemic control in type 2 DM.

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