A Study on Oxidative stress and antioxidant status in diabetic nephropathy

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**ABSTRACT**

Diabetes mellitus is the most common metabolic disorder in the world. The metabolic dysregulation of diabetes mellitus affects multiple organs like Kidney, nerves, eyes and heart. Worldwide among all diabetics, 20-40% of the people are suffering from Diabetic Nephropathy. Oxidative stress is increased by hyperglycemia in which Reactive Oxygen Species has been implicated in the pathology of these complications. The aim of our present study is one such attempt to find the role of oxidative stress by estimating the levels of oxidants and antioxidant levels in diabetic nephropathy in the ethnic south Indian population. Thirty diagnosed cases of diabetic Nephropathy were taken as cases and 30 age and sex-matched Type2 Diabetes mellitus patients were included as controls in the study. For oxidant levels, Malondialdehyde (MDA) was estimated and for antioxidant levels, Superoxide Dismutase (SOD), Glutathione Peroxidase (GPx), Glutathione Reductase (GR) were measured. Statistically, a significant increase is observed in the levels of Malondialdehyde in cases when compared to controls. There is no statistically significant difference in the levels of Superoxide dismutase and Glutathione peroxidase between cases and controls. Whereas significant statistical difference is observed in the levels of Glutathione reductase in Diabetic Nephropathy cases when compared with controls.

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Table 1: Comparison of oxidative stress levels and antioxidant enzymes in Controls (Group I) and Cases (Group II)

| Parameters                  | Group I          | Group II         | pvalue |
|-----------------------------|------------------|------------------|--------|
|                             | Mean ± SD (n=30) | Mean ± SD (n=30) |        |
| 1 MDA                       | 3.71 ± 2.3       | 8.06 ± 6.19      | 0.0006 |
| 2 Superoxide dismutase      | 60 ± 13.5        | 58 ± 11          | 0.5318 |
| 3 Glutathione peroxidase    | 49 ± 13.4        | 45 ± 18.2        | 0.3364 |
| 4 Glutathione reductase     | 12 ± 2.60        | 10 ± 2.54        | 0.0038 |

The present study is conducted in the Department of Biochemistry and the Department of Nephrology of Saveetha medical college. Thirty diagnosed patients of Diabetic nephropathy patients were taken as cases. 30 age and sex-matched Type 2 Diabetes mellitus were taken as controls. Patients having hypertension, cardiovascular disorders, liver diseases, thyroid disorders and other renal disorders were excluded from the study. Informed consent was obtained from all cases and controls. Approval for this study is obtained from the Institutional Ethical committee.

5 ml of blood is collected from both cases and controls. Malondialdehyde (MDA), Superoxide Dismutase (SOD), Glutathione peroxidase (GPx), Glutathione Reductase (GR) levels were estimated by ELISA. Statistical significance is measured by unpaired t-test using SPSS package.

RESULTS AND DISCUSSION

Evaluation of oxidative stress is measured by estimating the levels of MDA and a statistically significant increase in the values was observed between cases and controls. (Table 1) There is no statistically significant decrease in the levels of antioxidants like Superoxide Dismutase (SOD) and Glutathione peroxidase (GPx) between cases and controls. Statistically, a significant decrease was observed in the levels of Glutathione Reductase (GR) between cases and controls.

Diabetes mellitus is the most common endocrine, metabolic disorder, affecting about 170 million people worldwide (Wild et al., 2004). An early stage of Diabetic nephropathy is commenced by hyperfiltration, which is followed by microalbuminuria and then macro-albuminuria, which progressively leads to a decline in renal function resulting in End-Stage Renal Disease (ESRD). In the present study, a statistically significant increase was observed in the levels of Malondialdehyde (MDA) in diabetic nephropathy patients when compared to Type-2 diabetes mellitus patients. This statistically significant increase suggests that Diabetic nephropathy cases have increased production of Reactive oxygen species and free radicals when compared with controls. Several other studies also show similar findings (Köksal et al., 2000).

CONCLUSIONS

Lipid peroxidation increases and Antioxidant status may decrease in diabetic nephropathy. Oxidative stress is implicated in the development of diabetic nephropathy in cases of Type-2 Diabetes mellitus. Antioxidants can be used as potential drugs in the treatment of diabetic nephropathy cases in the future, which requires further studies.

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