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# ASSOCIATION BETWEEN MICROALBUMINURIA AND OXIDATIVE STRESS IN DIABETIC NEPHROPATHY

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## ABSTRACT

**Objectives:** Diabetic Nephropathy (DN) is a leading cause of chronic kidney disease and end stage renal failure worldwide. This study aimed to evaluate the association between oxidants, antioxidants and microalbuminuria in Diabetic Nephropathy compared with Type II Diabetes Mellitus (DM). **Methods:** The study includes 60 Type II Diabetes Mellitus and 40 Diabetic Nephropathy Patients. Parameters performed HbA1c, urea, creatinine, total proteins, microalbuminuria, glutathione peroxidase and malondialdehyde (MDA). **Results:** The levels of HbA1c, urea, creatinine, microalbuminuria and malondialdehyde are significantly higher in DN compared with Type II DM. the levels of T.P and glutathione peroxidase are decreased in DN compared with Type II DM. **Conclusion:** Low levels of glutathione peroxidase and total proteins were observed in DN. HbA1c, urea, creatinine, microalbuminuria and malondialdehyde levels were elevated in DN compared with Type II DM.

**KEYWORDS:** Diabetic Nephropathy, glutathione peroxidase, microalbuminuria, malondialdehyde.

## INTRODUCTION

Diabetes Mellitus is a metabolic disorder characterized by hyperglycemia with disturbances in carbohydrate, fat and protein metabolism arising from a defect in insulin secretion or action of insulin. The long term complications of Diabetes fall in to two groups 1) Micro vascular complications that are Nephropathy, Neuropathy and Retinopathy. 2) Macro vascular complications related to atherosclerosis which occur in both Type I DM and Type II DM. [1]

Early stages of Diabetic Nephropathy, there are no clinical signs and symptoms of glomerular changes, the onset of Diabetic Nephropathy can be diagnosed only by screening the suspected patients for microalbuminuria. If Diabetic Nephropathy is diagnosed at the microalbuminuria stage, the further progress of nephropathy can be arrested with tight glycemic control, well controlled blood pressure and aggressive reno-protective therapy. [2]

Screening for a microalbuminuria is useful for the testing and the prevention of renal diseases in Diabetes Mellitus. It is said that microalbuminuria often advance to overt albuminuria <800 mg/day, progressive decline in renal function and final end stage renal function and finally end stage renal disease sets in. [3]

In Neuropathy and End stage renal disease occurs, it would have a severe effect on the health care deli vary system. Adequate and sustained treatments are necessary to prevent these serious complications in the Diabetic patients. [4]

Diabetic Nephropathy is characterized by excessive accumulation of extracellular matrix in the kidney, reactive oxygen species play a central role in the extracellular matrix synthesis and degradation in the glomeruli and tubulointerstitium leading to renal disease. Oxidative stress has been known to play an important role in the development and progression of Diabetic Nephropathy. Diabetic Nephropathy is

a leading cause of end stage renal failure. There is considerable evidence that hyperglycemia represents the main cause of complication of Diabetic Mellitus and oxidative stress resulting from increased generation of reactive oxygen species plays a crucial role in their pathogenesis. [5]

## MATERIALS AND METHODS

60 Type II Diabetic Mellitus (35 male and 25 female) and 40 Diabetic Nephropathy Patients (32 males and 08 females) with age ranges from 58 to 65 years were used for this study. The study was carried out at S.V.R.R.G.G Hospital, A.P, India. The samples collected from General Medicine and Surgery departments, 5ml of venous blood was collected from the patients and separated for the estimation of Glycosylated hemoglobin, urea, creatinine, total proteins, microalbuminuria, glutathione peroxidase, malondialdehyde.

HbA1c are estimated by Ion exchange high performance liquid chromatography.[6] Creatinine is estimated by Jaffe's method.[7] Microalbuminuria is estimated by immune turbidometry method.[8] Urea is estimated by Diacetyl Monoxime method.[9] Glutathione peroxidase activity was determined by spectrophotometer. [10] Malondialdehyde was determined by calorimetrically.[11] Total proteins are estimated by Biuret Method. [12]

## STATISTICAL ANALYSIS

Unpaired 'T' – test were used to compare two groups and the levels of significance was achieved if P< 0.05.

## RESULTS

**Table 1. Shows the status of mean ± SD and 'P' value of HbA1C, creatinine, microalbuminuria, total proteins, glutathione peroxidase and malondialdehyde in both Type II DM and Diabetic nephropathy.**

| Sl.no | Parameters | Type II DM | Diabetic Nephropathy | P - value |
|---|---|---|---|---|
| 1. | HbA1c % | 7.9±0.7 | 14.6±1.8 | <0.02 |
| 2. | Urea mg/dl | 30.2±4.2 | 50.6±10.2 | <0.04 |
| 3. | Creatinine mg/dl | 0.9±0.4 | 1.6 ±0.8 | <0.02 |
| 4. | Microalbuminuria mg/l | 20.2±3.94 | 178±68.2 | <0.01 |
| 5. | Total proteins gm/dl | 7.0±1.0 | 5.2±0.8 | <0.02 |
| 6. | Glutathione peroxidase u[c] | 11.02±0.62 | 6.25±1.22 | <0.04 |
| 7. | Malondialdehyde nmol/ml | 6.28±0.54 | 8.26±2.26 | >0.05 |

**Significant Findings** :- In Diabetic Nephropathy and Type II DM patients the 'P' value of HbA1c, Urea, Creatinine, Total Proteins, Microalbuminuria and Glutathione Peroxidase are significant. The 'P' is value <0.05. But the level of malondialdehyde is not significant 'P'value >0.05.

## DISCUSSION

Diabetes Mellitus is now a common endocrine disorder in India. The world wide prevalence of DM was approximately 2.8% in 2000 and is estimated to grow by 2030. The incidence of renal complication in Type II DM is very high and 5 to 15% end up in end stage renal disease. [13]

The earliest clinically detectable stage even in subclinical disease is when the patients excrete minimum amounts of albumin in urine. It has been proved that microalbuminuria is a strong predictor of Diabetic Nephropathy. [14 & 15]

In the present study Diabetic Nephropathy patients had more oxidative stress than Type II DM, where oxidative stress plays an important role in the pathogenesis of Diabetic complications. Diabetic Nephropathy seemed to occur as a result of an interaction between metabolic and hemodynamic factors, which activate common pathways that lead to renal damage. [16]

We noticed HbA1c levels are elevated in Diabetic Nephropathy, which would be due to excessive glycosylation of hemoglobin, Diabetes is also grossly reflected by profound changes in protein metabolism and negative nitrogen balance leads to more urea production. [17]

The Diabetic hyperglycemia induces elevation of the plasma levels of urea and creatinine, which are consider as significant markers of renal dysfunction, the decrease in the total protein may be due to microproteinuria. It is an important clinical marker of Diabetic Nephropathy may be due to increased protein catabolism. [18]

## CONCLUSION

We conclude that malondialdehyde levels are elevated and glutathione levels are decreased in Diabetic Nephropathy due to oxidative stress. HbA1c, Microalbuminuria levels are elevated in Diabetic Nephropathy due to prolonged hyperglycemia. Total proteins are decreased in Diabetic Nephropathy due to microproteinuria/may be due to increased protein catabolism. Urea & Creatinine are elevated in Diabetic Nephropathy due to renal dysfunction, which are considered as significant markers of renal dysfunction.

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