# Study of Microalbuminuria Level in Chronic Complications of type 2 Diabetes

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## ABSTRACT

**Introduction:** Microalbuminuria occurs when kidney leaks a minute amount of albumin in urine or when there is an abnormally increase in permeability for albumin in the renal glomerulus. It is a strong risk factor of cardiovascular disease and diabetic nephropathy. The aim of this study was to see the prevalence of Urinary Microalbumin (UMA) in type 2 diabetic patients with chronic complications in comparision to type 2 diabetic patients without any complication.

**Material and Methods:** The study includes 80 patients diagnosed with type 2 diabetes mellitus with complications such as hypertension, neuropathy and retinopathy and 20 patients with type 2 diabetes mellitus as control.

**Results:** In our study, microalbumin levels were found to be at a significantly higher levels in patients with complications, in comparison to patients without complications.

**Conclusion:** Our study shows that proper glycemic control will prevent from microalbuminuria and thereby to prevent the progress of diabetic nephropathy in patients with type 2 diabetes mellitus.


**Keywords:** Microalbuminuria, Hypertension, Diabetic Neuropathy, Diabetic Retinopathy.

## INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorder characterised by hyperglycemia resulting from defects in insulin secretion, insulin action or both.[1] According to world health organization (WHO), 180 million people world wide had diabetes in 2006 and this number is likely to be doubled by 2030.[2] DM is associated with long term dysfunction and damage to various organs, especially the eye, kidney, nerve, heart and blood vessels.[1] This risk of chronic complications increases with the duration of hyperglycemia. This excess risk is only partially explained by traditional risk factors such as obesity, smoking, dyslipidemia and hypertension. Diabetes is often considered as an independent risk factor for Cardiovascular disease.[3]

When urinary albumin excretion is 30-300mg/24 hours or 20-200µg/min is defined as microalbuminuria.[4] A high prevalence of urinary microalbumin (UMA) has been noted in early studies of individuals with poor glycemic control.[5] Increase in blood pressure in microalbuminuria than normoalbuminuric patients suggest that hypertension is associated with UMA.[3] Many studies show that amount of UMA present in a given person is proportional to the severity of systolic, diastolic and mean blood pressure elevation which is measured by either a clinical or 24 hours ambulatory blood pressure monitoring. Previous studies show that patient with UMA had increased blood pressure levels. UMA predicts progression to diabetic nephropathy and cardiovascular diseases.[6]

Diabetic periepheral neuropathy (DPN) has been defined as presence of symptoms and or signs of peripheral nerve dysfunction in diabetes after exclusion of other causes, which may range from hereditary, traumatic, compressive, metabolic toxins, nutritional, infection, immune mediated, neoplastic and secondary to other systemic illnesses.[7] Neuropathy, a common complication of diabetes mellitus is generally considered to be related to duration and severity of hyperglycemia. However it may also occur acutely even with hypoglycemia.[8-10] Changes in nerve structure occur in parallel with changes in blood vessels surrounding them, for eg. Capillary basement thickening, endothelial hyperplasia, contributing to diminished oxygen tension and hypoxia, and capillary narrowing involving small myelinated or non-myelinated C fibers.[11-14]

Diabetic retinopathy (DR) is defined as damage to microvascular system in the retina due to prolonged hyperglycemia. DR is primarily classified into non-proliferative DR and proliferative DR. Study has reported that higher prevalence of DR was associated with prolonged duration of diabetes. In CURES Eye study, 41.8% subjects had DR after 15 years duration of DM and severity was more with longer duration. In this study proteinuria was present in 29.2% subjects with DR, while correlation between DR and UMA was suggested from studies from North India.[15]

UMA is the marker of initial stage of diabetic nephropathy.[16] The aim of this study was to see the prevalence of UMA in type 2 diabetic patients with chronic complications in comparision to type 2 diabetic patients without any complication. High prevalence of UMA in subjects of this study shows that screening for UMA is essential for prevention of further complications like end stage renal disease and cardiovascular disease.

## MATERIAL AND METHODS

The study was done at Prasad institute of medical sciences, Lucknow and included 100 patients diagnosed with type 2 diabetes mellitus. Out of which 30 were type 2 DM with hypertension, 30 were type 2 DM with diabetic peripheral neuropathy (DPN), 20 were type 2 DM with retinopathy, and 20 patients with Type 2 DM without complication as control.

Complications was diagnosed by clinicians based on history and clinical examination and related investigations were done. Microalbuminuria levels were compared in patients with

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complications (subjects) of type 2 diabetes mellitus and patients without complications as controls. Study was done after ethical approval and informed consent from patients.

**Inclusion criteria**

- 80 Patients with type 2 diabetes complications like retinopathy, neuropathy and hypertension
- 20 patients with type 2 diabetes mellitus without complication.
- Patients whose serum creatinine levels are less than 1.4mg/dl.

**Exclusion criteria**

- Creatinine more than 1.4mg/dl
- Patients with chronic illness
- Pregnancy
- Diabetic nephropathy

**Sample collection**

Fasting blood samples were collected for estimation of blood glucose, creatinine and urine sample for microalbuminuria of subjects and control.

Biochemical evaluations include fasting blood sugar(FBS), post prandial blood sugar (PPBS), Serum creatinine and urine microalbumin were analysed.

Plasma glucose was measured by enzymatic method (glucose oxidase and peroxidase) and creatinine by Jaffe's method on the same day of collection. Sample obtained for measurement of urine microalbuminuria were stored at -20°C until assessment. Urine microalbumin level was measured based on immunoturbidimetric method.

## STATISTICAL ANALYSIS

The statistical analysis was done by SPSS 20 software and datas were expressed as the mean and standard deviation. The student's t-test was used for the analyzing of statistical significance ($p<0.05$). Significante values were represented as (*) less significant ($p<0.05$), (**) significant ($p<0.01$) and (***) highly significant ($p<0.001$).

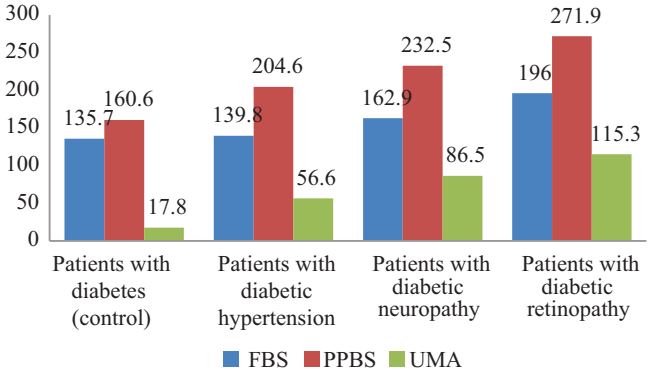


**Figure-1:** Mean values of biochemical parameter in diabetic complications with respect to control

## RESULTS

In our study, we tried to see the comparision between microalbuminuria levels in diabetic complications (Hypertension, Neuropathy, Retinopathy) and diabetic patients without any complication.

In our study UMA level in hypertensive patients were (56.6 ± 28.8) and in controls were (17.8 ± 15.9). UMA level in DPN patients were (86.5 ± 74.5) and in controls were (17.8 ± 15.9) and in diabetic retinopathy,UMA level were (115.3 ± 92.1) and in controls were (17.8 ± 15.9), (Figure 1 and Table 1).

FBS in control was (135.7 ± 35.9), in patients with hypertension was (139.8 ± 64.1), in patients with DPN was (162.9 ± 49.3) and in patients with DR was (196.0 ± 106.0). Similarly PPBS in control was (160.6 ± 16.4), in patients with hypertension was (204.6 ± 61.7), in patients with DPN was (232.5 ± 79.4) and in patients with DR was (271.9 ± 137.7), (Figure 1 and Table 1).

## DISCUSSION

Diabetes mellitus is a risk factor for many complications like hypertension, DPN and DR. In our study we evaluate urine microalbumin level in patients with chronic complications of DM and compared with subjects of type 2 DM without any complication. Since microalbumin level in urine is the risk factor for early stage of renal disease, we tried to assess the risk of diabetic nephropathy in patients with chronic complication with respect to patients without complication.[15]

Study done by Manavita MR et al. reported the incidence of 25.9% of microalbuminuria and 14.5% of macroalbuminuria in type 2 diabetic patients.[17] In a study done by Wu et al, high prevalence of microalbuminuria (39.8%) and macroalbuminuria (18.8%) was found in Asian people, while study done in a diabetes center in south india had reported that microalbuminuria was detected in 36.3% of type 2 DM.[16,17]

In a study done by Uneda et al. microalbuminuria was found more commonly in patients with diabetic retinopathy and neuropathy in comparision with patients without any diabetic complication.[18]

A statistical correlation was found between microalbuminuria and systolic blood pressure in a study done by S Ghos et al. similar finding were reported by Vijay et al.[19]

According to the study done by Padmaja K Rani et al. subjects with microalbuminuria had around 2 times risk to have diabetic retinopathy in comparision with subjects without microalbuminuria and this risk became 6 times in the presence of macroalbuminuria.[20]

## CONCLUSION

In this study we found urinary microalbumin level in study groups were significantly higher in comparision with control group. Therefore, proper glycemic control should be maintained in patients with chronic diabetic complications having high

| Parameter | Patients with diabetes (control) | Patients with hypertension (Subject) | Patients with diabetic peripheral neuropathy (Subject) | Patients with diabetic retinopathy (Subject) |
|---|---|---|---|---|
| FBS | 135.7 ± 35.9 | 139.8 ± 64.1 | 162.9 ± 49.3 | 196.0 ± 106.0 |
| PPBS | 160.6 ± 16.4 | 204.6 ± 61.7 | 232.5 ± 79.4 | 271.9 ± 137.7 |
| UMA | 17.8 ± 15.9 | 56.6 ± 28.8 | 86.5 ± 74.5 | 115.3 ± 92.1 |

**Table-1:** Mean values of biochemical parameter in diabetic complications with respect to control

microalbumin level in urine, so as to prevent progression to diabetic nephropathy.

## REFERENCES


1. ADA. Diagnosis and classification of diabetes mellitus (position statement) Diabetes care. 2007 (suppl):30:42-7
2. WHO.Diabetes facts 2006. Fact sheet 312.
3. Selvin E, Marinopoulos S, Berkenblit G, Rami T, Brancati FL, Powe R NR, et al. Meta-Analysis: Glycosylated Hemoglobin and Cardiovascular Disease in Diabetes Mellitus. Ann Intern Med. 2004;141:421-31.
4. Prasad K, Rajaseker. Study of microalbuminuria as a cardiovascular risk factor in type 2 diabetes mellitus. AJPCR. 2012;5:42-43.
5. Dinneen SF, Gerstein HC. The association of microalbuminuria and mortality in non-insulin-dependent diabetes mellitus. A systematic overview of the literature. Arch Intern Med. 1997;157:1413-18.
6. Garg J, Bakris G. Microalbuminuria: marker of vascular dysfunction, risk factor for cardiovascular disease. Vascular medicine. 2002;7:35-43.
7. S.K. Bhadada, R.K. Sahay, V.P. Jyotsna, J.K. Agrawal. Diabetic Neuropathy: Current Concepts: Journal Indian Academy of Clinical Medicine. 2001;2:31-36.
8. Apfel SC. Introduction to diabetic neuropathy. Am J Med. 1999;(Suppl)1S-8S[47].
9. Harati Y. Diabetes and the nervous system. Endo Metab C lin North Am. 1996;25:325-59.
10. Boulton AJM,Malik RA. Diabetic neuropathy. Med C lin North Am. 1998;82:909-29.
11. Giannini C, D YCK PJ. Basement membrane reduplication and pericyte degeneration precede development of diabetic polyneuropathy and are associated with its severity. Ann Neurol. 1995;37:498-504.
12. Britland ST, young RJ, Sharma AK, Clark BF. Relationship endoneurial capillary abnormalities to type and severity of diabetic polyneuropathy. Diabetes. 1990;39:909-913.
13. Timperley WR, ward JD, preston EE Duckworth T, O malley BC. A reassessment of vascular factors in relation to intravascular coagulation. Diabetologia. 1976;12:237-243.
14. Milik RA, Tesfaye S, Thompson SD et al. Endoneurial localisation of microvascular damage in human diabetic neuropathy. Diabetologia. 1993;36:454-459.
15. Rema M, pradeepa R. Diabetic retinopathy: An Indian perspective. Indian J Med Res. 2007;125:297-310.
16. Sigdel M, Rajbhandari N, Basnet S, Nagila A, Basnet P, Tamrakar BK. Microalbuminuria among type-2 diabetes mellitus patients in Pokhara, Nepal. Nepal Med Coll J. 2008;10:242-245.
17. Phoksunthorn T, Thatsnarong D. retinopathy and macroalbuminuria in type 2 diabetic patients. J Med Assoc Thai. 2007;90:684-687.
18. Bell D, Ketchum MB, Robinson C, Wagenknecht L, Williams DRPH. Microalbuminuria associated with diabetic neuropathy. Diabetes care. 1992;15:528-531.
19. Ghosh S, Lyaruu I, Yeates K. Prevalence and factors associated with microalbuminuria in type 2 diabetic patients at a diabetes clinic in northern Tanzania. African journal of diabetes medicine. 2012;20:12-15.
20. Rani et al. Albuminuria and diabetic retinopathy in type 2 diabetes mellitus Sankara Nethralaya diabetic retinopathy epidemiology and molecular genetic study (SN-DREAMS, report 12). Diabetology and metabolic syndrome. 2011;3:9-11.


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