Int J Pharm Bio Sci 2014 April ; 5 (2) : (B) 634 - 639

**Research Article** **Biochemistry**

**International Journal of Pharma and Bio Sciences** **ISSN 0975-6299**

# STUDY OF MICROALBUMIN IN TYPE 2 DIABETES MELLITUS WITH LESS THAN AND MORE THAN FIVE YEARS OF DURATION.

***DR. B. JYOTHIRMAYI**

*Assistant Professor Department of Biochemistry, SRM Medical College, Hospital & Research Centre.*

## ABSTRACT

Presence of microalbumin in type 2 diabetes mellitus patients is early sign of onset of microvascular complications which can damage various organs like heart, kidneys, eyes and nervous system. The principal aim of the study is to compare the microalbumin levels with duration of diabetes. The study was conducted in 30 diabetic subjects with less than 5 years of duration and more than 5 years of duration as controls and subjects respectively. .Microalbuminuria was considered to be positive when 24 hrs urine sample contains 30 to 300mg /g of creatinine. Biochemical analysis was done using commercially available kit for plasma glucose (GOD-POD method), lipid profile - cholestrol by enzymatic method, triglycerides by glycerol kinase method, HDL by enzymatic method, VLDL and LDL by Friedwalds calculated method and Serum creatinine by Jaffes method. Microalbumin was measured using commercially available kit by immunoturbidimetric method. The mean fasting blood sugar, cholesterol, triglycerides and microalbumin levels are high in subjects compared to controls ($p<0.001$). Systolic blood pressure was also high in subjects compared to controls.
The duration of diabetes also showed significant association with microalbumin levels ($p<0.001$).

**KEY WORDS:** **Type 2 diabetes mellitus, microalbuminuria, lipid profile, diabetic nephropathy.**

**DR. B. JYOTHIRMAYI**
**Assistant Professor Department of Biochemistry,**
**SRM Medical College, Hospital & Research Centre.**

# INTRODUCTION

Diabetic Nephropathy is the leading cause of end stage renal disease worldwide (1). One of the earliest markers of Diabetic Nephropathy is microalbuminuria (2). Microalbuminuria is considered to be a predictor of cardiovascular disease both among diabetic and non diabetic subjects (3, 4, 5). Studies on microalbumin levels are helpful to prevent early onset of nephropathy. Microalbuminuria, an early marker of diabetic nephropathy, is an independent risk factor for cardiovascular diseases. Microalbuminuria is defined as urinary albumin excretion rate of 30 to 300mg/d in a 24 hr urinary collection or urinary protein excretion rate of 30 to 300 mg/g of creatinine which predicts future development of overt nephropathy (6). Presence of microalbuminuria is the most important early signal heralding the onset of systemic vasculopathy and associated organ damage. Microalbuminuria also identifies patients who need more rigorous cardiovascular risk management, especially more intensive blood pressure control and strict attention to glycemic control and lipid levels (7). The causal risk factors for microalbuminuria are raised blood pressure and poor glycemic control resulting in hyperperfusion of glomrulus and glomerular filtration (8). Hyperglycemia, arterial hypertension and dyslipidemia causes disorders of the albumin excretion rate by damaging the podocytes and slit diaphragm protein scaffold with overproduction and extracellular release of oxygen radical species at the glomerular level (9). Male gender, old age, longer duration of diabetes, poor glycemic control and raised blood pressure are risk factors of microalbuminuria (10). Levels of HbA1C are also associated with microalbuminuria (11). Vijay etal reported duration of diabetes, systolic and diastolic blood pressure, age of the patient, serum creatinine are also associated with proteinuria (12). There are 3 major histological changes in glomeruli in diabetic nephropathy, includes: (1) Mesangial expansion (2) glomerular basement thickening and (3) glomerular sclerosis (13). Alterations in the molecular structure of components of glomerulus and its basement membrane have also been suggested as primary pathogenic mechanism (14). The pathophysiologic mechanism of diabetic nephropathy includes glycosylation of circulating and intrarenal proteins, hypertension and abnormal intra-renal hemodynamics. The earliest demonstrable abnormalities include intra renal hypertension, hyperfiltration increased GFR and microalbuminuria (15). A reduction in negative charge of basement membrane secondary to decrease in sialic acid and sulphated proteoglycans has been suggested as the basis for proteinuria. The repulsive electrostatic interaction with negatively charged plasma proteins, such as albumin is reduced and so increased filtration of albumin may occur (16). Another possible causative mechanism is that alteration in glomerular filtration barrier at the podocyte level will cause leakage of albumin. Arterial hypertension and abnormalities of blood lipid concentrations are important complications of diabetes mellitus (17).

# METHODS

### *Patients*

Study group comprised of 30 T2DM patients with less than 5 years of duration as controls and 30 T2DM patients with more than 5yrs of duration as subjects. Study was conducted at Government Medical College, Tirupati. Informed consent was obtained from subjects after and controls who has participated in the study. Serum creatinine concentration within the normal range i.e1.1 mg/dl in women and 1.2 mg/dl in men were selected for the study and patients with incomplete records, presence of urinary tract infection and presence of proteinuria were excluded from study. A fasting blood sample was drawn after an overnight fasting and analysis of plasma glucose, lipid profile and serum creatinine was done. 24hrs urine sample was collected to estimate urine microalbumin levels. Blood pressure was recorded in right upper arm in sitting posture. After five minutes of rest, patients blood

pressure was recorded and categorized as normotensives (120mm of Hg systolic and 80 mm of Hg of diastolic blood pressure) and hypertensives (>140mm of Hg systolic and >90 mm of Hg diastolic blood pressure). Biochemical analysis was done using commercially available kit for plasma glucose (GOD-POD) method, lipid profile - cholestrol by enzymatic method, triglcerides by glycerol kinase method, HDL by enzymatic method, VLDL and LDL by Friedwalds calculated method and Serum creatinine by Jaffes method. Microalbumin was measured using commercially available kit by immunoturbidimetric method (18). Data was expressed as mean±SD.Students 't' test (p value<0.05) was used to know the statistical significance.

## RESULTS

The study group comprised of 30T2DM patients with less than 5 yrs of duration as controls and 30T2DM with more than 5yrs of duration as subjects. Table 1 shows the biochemical characteristics of normo albuminuric and microalbuminuric patients. The subjects had a longer duration of diabetes compared with control group (p<0.001). Systolic blood pressure was significantly high in subjects when compared with the controls. Fasting plasma glucose was high in subjects compared with controls. Serum triglycerides and serum cholesterol were significantly high in subjects compared to controls. The level of microalbuminuria increased with increase in duration of diabetes (p<0.001). Systolic blood pressure, (p<0.001), fasting plasma glucose (p<0.01) and duration of diabetes (p<0.001) showed a significant association with microalbuminuria.

**Table 1**

***Shows comparison of biochemical characteristics of subjects and control group. Duration of diabetes, lipid profile and microalbuminuria were significantly higher in subjects when compared to control.***

| Microalbumin | Mean S.D | subjects | controls | p value |
|---|---|---|---|---|
| Microalbumin | Mean S.D | 39.4± 15.6 | 27.7 ±9.85 | <0.0001 |
| FBS | Mean S.D | 143 ±36 | 121 ±27.2 | <O.01 |
| TC | Mean S.D | 231 ±27.4 | 199 ±25.9 | <0.0001 |
| TGL | Mean S.D | 134 ±23.5 | 108 ±20.4 | <0.0001 |
| HDL | Mean S.D | 33.1 ±5.76 | 35.3 ±4.15 | 0.1 NS |
| LDL | Mean S.D | 137 ±35.5 | 125 ±30.8 | 0.1 NS |
| S.Creatinine | Mean S.D | 1.31 ±0.434 | 1.17 ±0.424 | 0.19 NS |
| Years of duration | Mean S.D | 8.43 ±2.87 | 2.23 ±1.39 | <o.0001 |
| S.B.P | Mean S.D | 144 ±15.3 | 128±13.1 | <0.0001 |
| D.B.P | Mean S.D | 88.2 ±9.73 | 81.1±7.66 | <0.002 |

***p<0.001 is considered as statistically significant***

## DISCUSSION

Diabetic nephropathy is characterized by proteinuria and is the leading cause of end stage renal disease (18A). Microalbuminuria is the first clinical detectable sign of involvement of the kidney. Microalbuminuria is considered to be an early stage of diabetic nephropathy (19). In our study there was a Significant association between duration of diabetes and microalbuminuria that was similar with the other studies (20, 21, 22, 22A). Poor glycemic control has been shown to be an independent risk factor for microalbuminuria. The association of glycemic control with microalbuminuria has been well established by various studies. A correlation of prevalence of microalbuminuria with the fasting blood sugar and with HbA1C levels were reported (23). In our study there was a rise in fasting blood sugar levels when compared to controls .our study shows an increase in systolic blood pressure in subjects compared to controls. Both systolic and diastolic blood pressure were found to be increased in accordance to microalbuminuria (23). Huraib etal reported correlation between the prevalence of microalbuminuria and hypertension in his studies (24). Svensson etal showed that high blood pressure increased the risk of developing signs of nephropathy (p=0.003). Hypertension in turn causes hypertensive nephropathy that can speed up progression of diabetic nephropathy (25). The microalbuminuria positive group (subjects) had more deranged lipid profile with higher serum total cholesterol and triglycerides compared to controls. Several studies have shown that there are significant lipid abnormalities including high VLDL, LDL and triglycerides and low levels of HDL. Mather etal also reported a statistical significance between the presence of microalbuminuria and serum triglycerides (26). Smulders etal. reported that diabetic dyslipidemia (high serum triglycerides and low HDL) is a predictor of rapid progression of microalbuminuria in patients with well controlled blood pressure (27).

## CONCLUSION

Since there is high prevalence of diabetes in Indians with over 20 million diabetics already and expected to increase further in coming years, this will increase further morbidity and cost effectiveness in management of diabetes. Several factors contribute to diabetic nephropathy; most important among those are hyperglycemia and hypertension in diabetic population. Patients with microalbuminuria can revert back to normal with intensive blood glucose and Blood pressure control strategies, such as glycated hemoglobin below 7%, B.P 115/70mm of Hg and a strict lipid profile control. Screening should be done regularly to prevent microalbuminuria and thereby diabetic nephropathy.

## REFERENCES

(1).CordonnierD,BayleF,BenhamouPY,etal.Future trends of management of renal failure in diabetics. kidney Int ;43:8-13. 1993

(2). Riju Mathew, Vinitha R, Vijay Kumar T. and etal Comparative évaluation of conventional and new Biomarkers of renal involvement in patients with type 2DM and HTN. International Journel of Pharma and Bioscience, 4(2) ; (B) 742-50, (2013)

(3).YudkinJS,ForrestRD,JhonsonCA,Microalbuminuria as predictor of vascular disease in non diabetic subjects.Lancet1988;(ii)530-(3).

(4). NosadiniR,TonoloG.Blood glucose and lipid control as risk factors in the progression of renal damage in type 2 diabetes Journal Nephrol ;16:S 42-7 2003;

(5).BrunoG,FerreroS,PaganoG,CavalloperinP etal. Progression to overt Nephropathy in type 2 diabetes. Diabetes care; 26: 2150-5. 2003

(6).AfkhamiArdekaniM,VahidiS. The prevalence of type 2 diabetes mellitus age of 30 years above in Yazd province( Iranian population).J Shahid Sadhaghi Univ meds in Health services: 9;22-7: 2001

(7). WeirMR.CME Microalbuminuria in type 2 diabetics; An important, overlooked cardiovascular risk factor. The journal of clinical Hypertension; 6:134-43: 2004

(8). AVarghese, R Deepa, M Reema and V Mohan. Prevalence of microalbuminuria in type2 diabetes mellitus at a diabetes centre in southern India. Postgraduate Medical Journal 2001 June; 77(908):399-402; 2001

(9). NosadiniR, TonoloG. Blood glucose and lipid control as risk factors in the progression of renal damage in type 2 diabetes. J Nephrol; 16: S 42-7. 2003

(10).JohnL,RaoPS,KanagasabapathyAS. Prevalence of diabetic nephropathy in non insulin dependent diabetes. Indian journal MedRes1991; 94:24-9.

(11).GuptaDK, VermaLK, KhoslaPK, etal. The prevalence of microalbuminuria in diabetes: a study from north India. Diabetes Res clinPract1991; 12:125-8.

(12).VijayV,SnehalathaC,RamachandranA,etal prévalence of proteinuriain non-insulin dépendent diabètes. JAssoc physicians India1994; 42:792-4.

(13).FiorettoP,SteffesMW,BrownDM etal., An overview of renal pathology in IDDM in relationship to altered glomerular hemodynamics, AMJ Kidney Diseases 1992 ; 20:549-58.

(14).Cohen Mp,Wuvy,Surma ML.Non collagen protein and proteoglycan in renal glomerular basement membrane. Biochem biophysics Acta1981; 678:322-8.

(15).Timothc.Evans,etal., Clinical diabetes, Diabetic Nephropathy vol18 No.1winter 2000.

(16).Cohen Mp, Wuvy, Surma ML. Non collagen protein and proteoglycan in renal glomerular basement membrane. Biochem biophysics Acta1981; 678:322

(17). NosadiniR, TonoloG. Blood glucose and lipid control as risk factors in the progression of renal damage in type 2 diabetes. J Nephrol 2003; 16: S 42-7.

(18) Gatling,W.,etal., Microalbuminuria an appraisal of assay techniques and urine collection procedures for measuring urinary albumin at low concentrations. MothrndrnV.R.(ed). The kidney and Hypertension in Diabetes mellitus. Martinus Nijhoff, Boston.1988 pp41-50..

(18A).Ahmedani MY, HydrieMZ and etal Prevalence of Microalbuminuria in type 2Diabetic patients in Karachi: Pakistan A Multi centre study. Journal of Pakistan Medical association September 2005: 55(9); 382-6

(19).Rai Jl. Recommendations for the management of special populations. Renal disease in diabetes, AMJ Hypertension 2003;16:46S- 9S.

(20).HuraibS, Abu-AishaH, SulimanRA, Askar etal. The pattern of diabetic Nephropathy among Saudi patients with NIDDM. Ann Saudi Med1995;15:120-4.

(21).VargheseA, DeepaR, RemaM, MohanV. Prevalence of Microalbuminuria in type 2DM at a diabetes centre in southern India.post grad Med J 2001; 77:399-402.

(22).MatherHM, ChaturvediN, KehelyAM. Comparison of prevalence and risk factors for microalbuminuria in south Asians and Europeans with type2 diabetes mellitus. Diabetes Ned1998; 15:672-7.

(22A). Sangeetha Dayanidhi, K.Ramadevi and I.Periyandavar. Prevalence of and predictors of microalbuminuria in patients with Type 2DM. IJPBS 2013 Oct; 4(4): (B) 676-681.

(23).VargheseA, DeepaR, RemaM, MohanV. Prevalence of Microalbuminuria in type 2DM at diabetes centre in southern India. Postgrad Med journal 2001; 77:399-402.

(24).HuriabS, Abu-Aishah, SulaimanRA, Askar etal., The pattern of diabetic Nephropathy among Saudi patients with NIDDM. Ann Saudi Med1995; 15:1

(25).SvenssonM,SundkvistG,ArnqvistHJ,BjorkE, BlohmeG,BolinderJ,etal. Signs of Nephropathy may occur early in young adults with diabetes despite modern diabetes management results from the

nationwide population based diabetes incidence. Study in Sweden (DISS). Diabetes Care2003; 26:2903-9.

(26).MatherHM, ChaturvediN, KehelyAM. Comparison of prevalence and risk factors for microalbuminuria in south Asians and Europeans with type2 diabetes mellitus. Diabetes Med1998; 15:672-7.

(27).SmuldersYM,RakicM,StehouwerCD,WeijersRN,SlaatsEH,etal. Determination of progression of microalbuminuria in patients with NIDDM. Diabetes care1997June; 20(6)999-1005