

# To Study Serum Uric Acid and Urine Microalbumin in Type-2 Diabetes Mellitus

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**Abstract** Type 2 diabetes mellitus is one of the major cause of the mortality and morbidity in the world. Type 2 diabetes mellitus is a chronic disease characterized by relative deficiency of insulin, resulting in glucose intolerance.

**Aims and objectives:** The present study was planned to understand more about hyperuricemia and microalbuminuria and its complications in type 2 diabetes mellitus patients.

**Material and methods:** In present study, 565 patients of type 2 diabetes mellitus and age and sex matched controls were included.

**Observation and results:** We found increased levels of serum uric acid and urine microalbumin in type 2 diabetic patients as compared to controls ( $p < 0.001$ ). We observed the positive correlation between serum uric acid and urine microalbumin ( $p < 0.001$ ).

**Conclusion:** The serum uric acid and urine microalbumin are not only early diagnostic markers for atherogenic cardiovascular disease and renal disease but also prognostic monitoring of the disease in type 2 diabetes mellitus patients.

**Key words:** - Blood sugar fasting and post-prandial, serum uric acid and urine microalbumin.

## I. INTRODUCTION

The prevalence of diabetes is rapidly rising all over the globe at an alarming rate. Over the past 30 years,<sup>[1]</sup> It has been estimated that the global burden of type 2 diabetes mellitus for 2010 would be 285 million people (2010) which is projected to increase to 438 million in 2030.<sup>[2]</sup> Diabetes mellitus is a chronic disease characterized by relative deficiency of insulin, resulting in glucose intolerance.<sup>[2]</sup> Hyperuricemia is a condition that is significantly associated with markers

of metabolic syndrome such as dyslipidemia, glucose intolerance, high blood pressure, and central obesity, which are accepted as risk factors for developing cardiovascular disease.<sup>[3]</sup> Urinary microalbumin assesses glomerular endothelial function and microvascular integrity. The higher the urinary microalbumin level, the higher the risk for development of kidney disease, particularly in type 2 diabetes mellitus and hypertension.<sup>[8]</sup>

## II. MATERIAL AND METHODS

The present study was carried out at the department of Biochemistry, Bharati Vidyapeeth Deemed University Medical College & Hospital, Sangli in period over six months. 565 of type 2 diabetes mellitus patients and healthy controls. The patients were selected from O.P.D. Subjects who have not willing to participate and patients associated with infections, arthritis, cardiac and renal failure were excluded from the present study. Patients information was filled in proforma contains patients name, age, sex, diet (veg/non-veg/mixed), habits, clinical history,

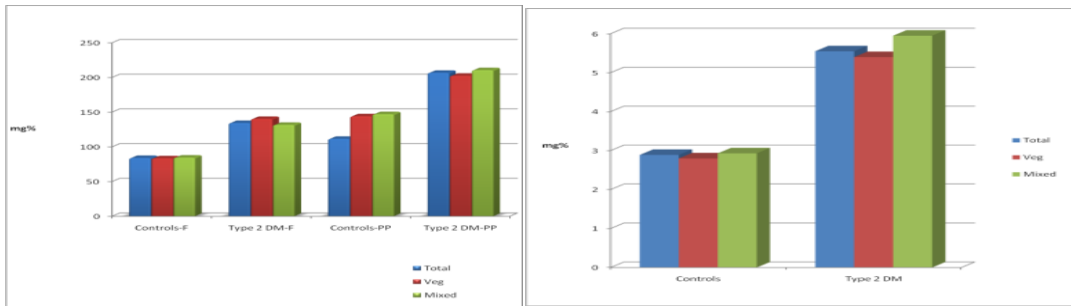
family history of diabetes etc. 4 ml blood for fasting blood sugar, serum uric acid in fasting condition and after 1 ½ hrs of lunch 2 ml blood for Post-prandial blood sugar. Urine sample also collected from patients and controls for estimation of urine sugar and urinary microalbumin. Estimation was done by Tulip corolyzer fully autoanalyzer for serum uric acid.<sup>[11]</sup> Urine microalbumin was done by turbidometry.<sup>[12]</sup> Data was stastically verified by using ANOVA software. As per clinical history; data analysis of duration of disease.

III. RESULTS

Table no-1

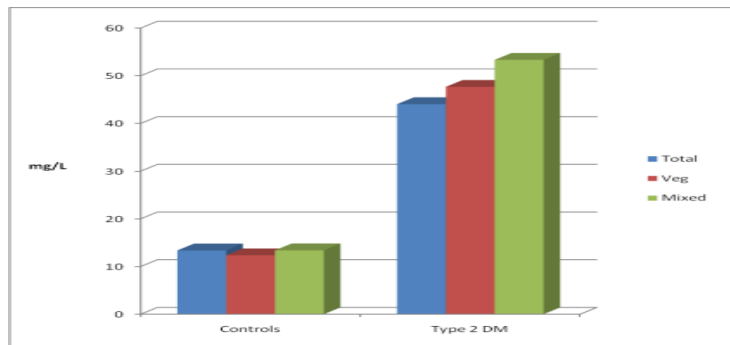
Test parameters	Healthy controls (n-565) Mean±SD		Type-2 DM patients (n-565) Mean±SD	
	Veg diet	Mixed diet	Veg diet	Mixed diet
BSL-F (mg%)	83.4±15.15	84.42±15.12*	131.64±59.22	140.20±53.58*
BSL-PP (mg%)	144± 15.4	147± 15.3*	202.32±61.33	210.43±45.14*
Uric acid (mg%)	2.8± 0.50	2.93± 0.48*	5.40± 1.82	5.95± 1.65**
Urine microalbumin (mg/L)	12.36±3.50	13.40±3.58*	47.68± 28.49	53.34±31.94**

Values are expressed in Mean±SD. Significance to be calculated in both groups. Statistically non- significant\* in controls but significant\*\* p(<0.001) in diabetic patients.



Graph :- Blood sugar (F & PP)

Serum uric acid

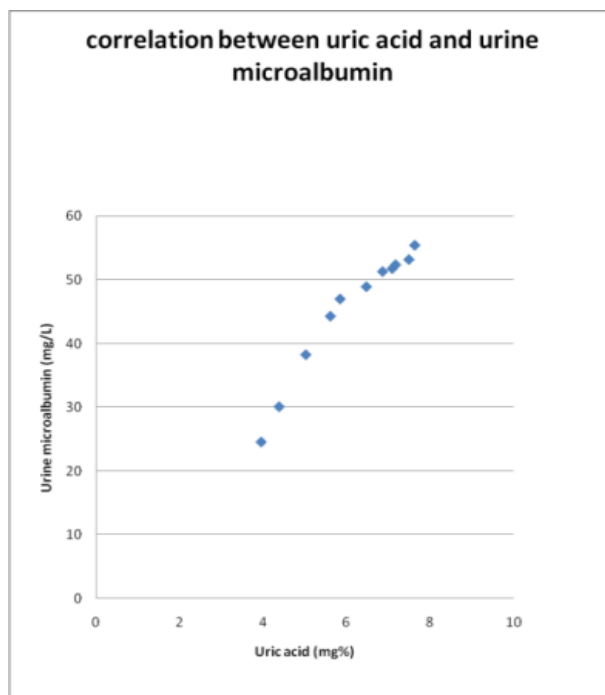


Urine microalbumin

**Table no-2 :Correlation between serum uric acid and urine microalbumin in diabetes patients**

Duration of T2DM	No.of T2DM	Uric acid (mg%) Mean±SD	Urine microalbumin (mg/L) Mean±SD
6 mnths	26	3.95 ± 1.77	24.58 ± 27.36
1 yrs	33	4.38 ± 1.40	30.11 ± 29.23
2 yrs	91	5.02 ± 1.57	38.26 ± 31.14
3 yrs	67	5.61 ± 1.71	44.29 ± 29.70
4 yrs	58	5.84 ± 1.82	46.99 ± 31.04
5 yrs	44	6.47 ± 1.84	48.91 ± 28.96
6 yrs	29	6.86 ± 1.57	51.29 ± 24.68
7 yrs	19	7.09 ± 1.80	51.76 ± 18.48
8 yrs	22	7.17 ± 2.10	52.35 ± 18.31
9 yrs	13	7.49 ± 2.04	53.17 ± 28.92
10 yrs	45	7.63 ± 2.27	55.41± 29.00
11 yrs	48	7.88± 1.49	56.37 ± 18.99
12 yrs above	51	8.06± 1.63	58.91± 28.58

Type-2 diabetes mellitus is a metabolic disorder. The hyperglycemia causes biochemical and structural alterations which lead to many complications due to organ dysfunction including micro and macro vascular diseases. [13] The extent and duration in diabetic patients may contribute to the severity of diabetic complications like hyperuricemia and albuminuria caused by renal and cardiovascular dysfunction. [14] With this view, we studied the levels of serum uric acid and urine microalbumin along with fasting and post-prandial blood sugar. Serum uric acid and urine microalbumin levels were markedly increased in type 2 diabetic patients with mixed diet (p<0.001). In controls group values of above parameters were found statistically non-significant in dietary status (veg and mixed diet) (Table No-1). All patients urine samples were positive for sugar, that is glycosuria was detected. Hyperglycemia with glycosuria is a characteristic feature of diabetes mellitus, due to relative or absolute deficiency of insulin secretory response which cause impaired carbohydrate metabolism. [15,16]. When



Values are expressed in Mean±SD. The r value is 0.98. Positive correlation between the uric acid and urine microalbumin. Data shows serum uric acid and urine microalbumin increased with duration of disease in type 2 diabetic patients.

#### IV. DISCUSSION

considered dietary status of patients, as well as of controls, we observed very less and non-significant rise in fasting and post-prandial blood sugar in all subjects taking mixed diet (veg and non-veg) against pure vegetarian group (Table-1). Our finding shows dietary status not much reflecting on blood sugar level. However non-significant raised levels in mixed dietary subjects may be explained as non-vegetarian component of mixed diet due to its palatability may cause increase in consumption of food lead to higher sugar level. Biologically uric acid plays an important role in worsening of insulin resistance by inhibiting the bioavailability of nitric oxide, which is essential for insulin-stimulated glucose uptake. [3,8,13] Hyperinsulinemia as a consequence of insulin resistance causes an increase in serum uric acid concentration by both reducing renal uric acid secretion and accumulating substrates for uric acid production. [27,28] The mean serum uric acid and urine microalbumin levels were elevated statistically highly significant in type 2 diabetic patients as compared to healthy controls.(p<0.001) (Table-2). Hyperuricemia is

caused by muscle wasting and weight loss in diabetes mellitus.<sup>[17]</sup> Chronic high glucose concentration causes tissue injury, in turn leads to increasing non-protein nitrogen substances.<sup>[3]</sup> This well known phenomenon may account for increased uric acid levels. Diabetic patients are at high risk of kidney disease due to hyperglycemia, hyperuricemia etc.<sup>[18]</sup> The presence of microalbuminuria is an indicator of the early stages of kidney disease in diabetic patients.<sup>[9,25,26]</sup> Increased glycaemic index associated with hyperuricemia lead to alteration in glomerular permeability. However renal function were deranged subclinically and urine microalbumin levels were increased in patients. The highly significant values seen were due to dysfunction of the rennin-angiotensin system in long term diabetes.<sup>[19]</sup> Type 2 diabetic patients often have a long

#### **Correlation between the serum uric acid and urine microalbumin in diabetic patients :-**

The positive correlation between the uric acid and urine microalbumin in diabetic patients with increased duration of diabetes mellitus. The long duration of disease may cause hyperuricemia and microalbuminuria which in turn lead to micro and macro vascular complication.<sup>[22,23]</sup> The uric acid and urine microalbumin are very good diagnostic markers for detection of kidney injury in initial stage of disease.<sup>[10]</sup> These results were supported by other studies as follows, same finding observed by CAi xiao-ling (2011)<sup>[9]</sup>, Chin-Hsino Tseng (2005)<sup>[23]</sup> and Saeed Behradmanesh et al (2012)<sup>[10]</sup>. The association of higher uric acid and microalbuminuria may have a role in endothelial dysfunction and act as a mediator of diabetic nephropathy in type 2 diabetic patients.<sup>[10,20]</sup> Hyperuricemia may have a pathogenic role in the development and progression of chronic renal failure.<sup>[10,18]</sup> Increased levels of uric acid is an injurious factor for kidneys.<sup>[24,27,28]</sup> In mixed diet contains meat, dairy

#### **V. CONCLUSION**

In our study the fasting and post-prandial blood sugar, serum uric acid and urine microalbumin were markedly increased in diabetic patients as compared to healthy controls. The positive correlation of serum uric acid and urine microalbumin were found in our study. It indicates that now a day micro and macro-vascular complication are major risk factors after long term duration of diabetes, and its higher risk in mixed diet diabetic patients. In conclusion the serum uric acid and urine microalbumin are not only early diagnostic markers for atherogenic cardiovascular disease and renal disease but also for prognostic monitoring of the disease in type 2 diabetes mellitus patients.

asymptomatic period of hyperglycemia and many other conditions causing microalbuminuria but hypertension and long term diabetes are main risk factors.<sup>[20,21]</sup> Hyperuricemia was found in patients with mixed diet may be due to non-vegetarian content from mixed food consists of lysed animal tissue and high protein concentration. Cause of increased urinary microalbumin in patients group with mixed diet, remain unexplained further studies with large sample size are essential in this area. The benefits of early serum uric acid and urine microalbumin testing can be linked to early detection and treatment of kidney disease ultimately resulting in improved health outcomes for diabetic patients.

products, refined vegetable oils, sugars, white flour products which contains animal fat, animal protein, refined sugars, processed and complexed carbohydrates and trans fatty acids which increases risk of type 2 diabetes. Refined grains and foods are made from white breads, cookies, pastries, pasta and rice have been linked not only to weight gain but to increased risk of insulin resistance (the precursor of type 2 diabetes) and the metabolic syndrome (a strong predictor) of both type 2 diabetes and cardiovascular disease.<sup>[15,16]</sup> In present study the levels of biochemical parameters serum uric acid, serum lipid profile and urine microalbumin were evaluated and these were correlated with duration of disease and effect of dietary status on these values were assessed with findings. We can suggest the above parameters can be used as not only marker for diabetic complications but also these are having prognostic importance.

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