

# Study of Association of Level of Serum Uric Acid in Type 2 Diabetes Mellitus

P Manimekalai<sup>1</sup>, Karthik Ramalingam<sup>2</sup>

<sup>1</sup>Associate Professor, Department of General Medicine, Sree Balaji Medical College and Hospital, Tamil Nadu, India, <sup>2</sup>Assistant Professor, Department of General Medicine, Sree Balaji Medical College and Hospital, Tamil Nadu, India

## Abstract

**Introduction:** Diabetes mellitus (DM) is a group of metabolic disorder in which there are high blood sugar levels over a prolonged period. The prevalence of type 2 DM (T2DM) is a chronic metabolic disease that is a significant public health problem worldwide. Elevated serum uric acid (UA) concentration has been found to be closely associated with metabolic and other related syndromes.

**Aim:** This study aims to study serum UA levels in T2DM patients.

**Materials and Methods:** A total of 50 Type II diabetic patients were included in this study. Duration of diabetes, RBS, hemoglobin A1C (HbA1c), and serum UA level were collected. Results were analyzed statistically and discussed below.

**Results:** The study included 50 cases of T2DM, out of which there were 28 males and 22 females. The majority of the study population fell under the age group between 51 and 60 years. Based on the duration of diabetes, 7 patients had <5 years, 28 patients had between 6 and 10 years, and 15 patients had >11 years. Mean HbA1c was  $7.1 \pm 1.1$ , RBS was  $168.24 \pm 28.26$ , and serum UA was  $8.62 \pm 2.44$ . Seventeen patients had serum UA level <7.3, and 33 patients had >7.4.

**Conclusion:** DM is a chronic disease linked to cardiovascular and renal complications, as well as a variety of microangiopathies, including metabolic syndrome. In our study, DM is strongly associated with hyperuricemia. To avoid renal complications, it is recommended to monitor UA levels in people with type 2 diabetes.

**Key words:** Hemoglobin A1C, Serum uric acid, Type 2 diabetes mellitus

## INTRODUCTION

Diabetes mellitus (DM) is a chronic disorder associated with cardiovascular complications, renal complications, and various microangiopathy types, including metabolic syndrome. The International Federation of Diabetes reported that around 415 million adults around all over the world have diabetes, and they estimated that the numbers are likely to reach about 642 million by 2040.<sup>[1]</sup>

Recent studies have demonstrated that serum uric acid (UA) levels are higher in subjects with pre-diabetes and early type 2 diabetes than in healthy controls.<sup>[2,3]</sup> Hyperuricemia

has also been added to the set of metabolic abnormalities associated with insulin resistance or hyperinsulinemia in metabolic syndrome.<sup>[4-6]</sup>

UA is the end product of human purine metabolism. Hyperuricemia is a condition in which the subject has increased serum UA levels. Studies have noted that an elevated level of UA predicts diabetes, obesity, hypertension, and metabolic syndrome. People who had higher UA levels are more likely to get type 2 diabetes. The diabetic patients with increased serum UA level appear to be at increased risk of developing diabetic complication. Hyperuricemia is an independent risk factor for kidney dysfunction in diabetic patients. Hyperuricemia is probably associated with glucose intolerance due to various mechanisms. However, most important is an association between insulin a renal resistance to absorption of urate.<sup>[7]</sup>

Since hyperuricemia requires long-term management, patients must be informed about their diagnosis and

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**Corresponding Author:** Dr Karthik Ramalingam, Department of General Medicine, Sree Balaji Medical College and Hospital, Tamil Nadu, India.

educated to achieve good patient compliance. The association between a chronic purine-rich diet, mainly of animal origin, and hyperuricemia or incident gout is well established.<sup>[8]</sup>

### Aim

This study aims to study serum UA levels in type 2 DM (T2DM) patients.

## MATERIALS AND METHODS

This prospective observational study was conducted in the department of general medicine in Type II diabetic patients. Patients diagnosed with type 2 diabetes were identified, and their hospital record in the department was studied. Selected sociodemographic, clinical, and laboratory data were elicited from the patients. A total of 50 patients were included in this study. Inclusion criteria include age above 18 years of both genders. Exclusion criteria include patients with renal failure and creatinine levels >1.5 mg/dl, renal stones, liver disease, and drugs affecting renal function. Results were analyzed statistically and discussed below.

## RESULTS

The study included 50 cases of T2DM, out of which there were 28 males and 22 females [Table 1].

The majority of the study population, about 21 patients, fell under the age group between 51 and 60 years, 2 patients had age below 40 years, 13 patients had an age between 41 and 50 years, and 14 patients had more than 61 years [Table 2].

Based on the duration of diabetes, 7 patients had <5 years, 28 patients had between 6 and 10 years, and 15 patients had >11 years [Table 3].

Mean hemoglobin A1C was  $7.1 \pm 1.1$ , RBS was  $168.24 \pm 28.26$ , and serum UA was  $8.62 \pm 2.44$  [Table 4].

Seventeen patients had serum UA level <7.3 in that 5 patients had a duration of diabetes of fewer than 5 years, 10 patients had between 6 and 10 years, and 2 patients had >11 years. Out of 33 patients had >7.4, 2 patients had a duration of diabetes <5 years, 18 patients had between 6 and 10 years, and 13 patients had >11 years [Table 5].

## DISCUSSION

Variations in UA levels have been increasingly associated with insulin resistance, hyperinsulinemia, and diabetes. Diabetic patients who are hyperuricemia appear to be

**Table 1: Gender distribution**

Gender	Frequency
Male	28
Female	22

**Table 2: Age distribution**

Age	Frequency	Percentage
<40	2	4.0
41–50	13	26.0
51–60	21	42.0
>61	14	28.0

**Table 3: Duration of diabetes**

Duration of diabetes	Frequency	Percentage
<5	7	14.0
6–10	28	56.0
>11	15	30.0

**Table 4: Diseases parameters**

Diseases parameters	Mean values
Hemoglobin A1C	$7.1 \pm 1.1$
RBS	$168.24 \pm 28.26$
Serum uric acid	$8.62 \pm 2.44$

**Table 5: Distribution of duration of diabetes and uric acid level**

Duration of diabetes	Serum uric acid		Total	P-value
	<7.3	>7.4		
<5				
Count	5	2	7	0.026
% within row	71.4	28.6	100.0	
6–10				
Count	10	18	28	100.0
% within row	35.7	64.3	100.0	
>11				
Count	2	13	15	100.0
% within row	13.3	86.7	100.0	
Total				
Count	17	33	50	100.0
% within row	34.0	66.0	100.0	

at increased risk for developing diabetic complications, predominantly renal and cardiovascular disease. In Type 2 diabetes, hyperuricemia seems to be associated with insulin resistance syndrome, impaired glucose tolerance, and an early onset of nephropathy. In contrast, hypouricemia is associated with non-adequate metabolic control, hyperfiltration, and late-onset of overt nephropathy. Although one of the major antioxidants in circulation, UA can induce oxidative stress in various cells, including vascular smooth muscle cells, thus mediating cardiovascular disease progression. The pathogenic mechanism involves

decreased nitric oxide (NO) bioavailability in vascular smooth muscle and endothelial cells and direct scavenging of NO by UA. A decrease in endothelial NO production by UA has also been associated with endothelial dysfunction and insulin resistance. UA has been implicated in hypertension development, and elevated UA levels have been reported mainly in newly diagnosed hypertension. Hyperuricemia is also closely linked to the various metabolic syndrome components and represents a possible link between UA levels and cardiovascular morbidity and mortality.

In this current study, males were predominant compared to females. Prabhuswamy *et al.* and Prashant *et al.* quoted dominant males in their research, similar to the present analysis.<sup>[9,10]</sup>

In this present study, the majority fell under the age group between 51 and 60 years. Li *et al.*,<sup>[11]</sup> in their study, reported that the mean age was  $65.57 \pm 11.70$  years. A survey by Ishizaka *et al.*<sup>[12]</sup> studied Japanese patients the mean age was  $56.6 \pm 10.4$  years.

However, in the study reported by Rao and Sahayo,<sup>[13]</sup> the UA levels were higher only for pre-diabetes and not for people with diabetes. The studies done by Shabana *et al.*<sup>[14]</sup> reported a decreased UA level. As per our study, it was concluded that hyperuricemia was positively associated with hyperglycemia.

Patients having higher UA have the ability for more insulin secretion than patients having lower UA.<sup>[15]</sup> In a study by Zoppini in type 2 diabetic patients, hyperuricemia was an independent and vital risk factor for the development of chronic renal disease.<sup>[16]</sup> A study by Tanaka showed that UA increase results in declining renal function in diabetic patients.<sup>[17]</sup> A study by Siu had reported that as UA levels were lowered in renal disease patients with hyperuricemia, there was associated decrease in kidney disease.<sup>[18]</sup>

## CONCLUSION

DM is a chronic disease linked to cardiovascular and renal complications and various microangiopathies, including metabolic syndrome. In our study, diabetes mellitus is strongly associated with hyperuricemia. To avoid renal

complications, it is recommended to monitor UA levels in people with type 2 diabetes.

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