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## **The correlation of serum uric acid levels with type II diabetic patients: A hospital based pilot study**

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**Abstract**---Aim: To correlate diabetes patients' blood uric acid levels with their duration of diabetes. Materials and methods: This study was conducted on 100 diabetic patients (30-50 years). Diabetic patients with no history of any other systemic complications and metabolic disorders like obesity and gout. Each diabetic patient was subjected to detailed general examination. A biochemical investigation for fasting serum uric acid levels estimated. Results: A positive correlation present between SUA and duration of type 2 diabetes is statistically significant. As the duration of diabetes increases, there is an increase in the serum uric acid concentration in type 2 diabetes patients ( $r = +0.630, p < 0.001$ ). Conclusion: Drugs that reduce the serum uric acid level may become effective in preventing the development and prognosis of insulin resistance, a major factor in type 2 diabetes. The significant positive correlation between serum uric acid and the duration of type 2 diabetes suggests the uric acid acts as an independent biochemical marker for type 2 diabetes prognosis.

**Keywords**---uric acid, diabetes mellitus, insulin sensitivity.

## **Introduction**

A clinical syndrome characterized by hyperglycemia is known as diabetes mellitus. It may lead to a number of complications, including macro and micro vascular illnesses. In the purine metabolism, uric acid (UA) is the end product. Blood glucose levels are associated with serum uric acid levels for a long time. [1]. By the year 2040, 642 million people worldwide will have diabetes, according to a report by the International Diabetes Federation. Diabetes will be the 7th leading cause of death as reported by the World Health Organization in 2030. This metabolic disorder characterized by hyperglycemia and deregulation of lipids and proteins is one of the major cause found in middle-aged and elderly people worldwide. Currently, India is considered as the diabetes capital of the world because it has the highest prevalence of type 2 diabetes resulting from progressive insulin secretion defects. According to the 2015 Diabetes Global Report, India has the second-highest number of diabetes cases in the world after China. [2]

As an end product of purine metabolism, serum uric acid, or more correctly, its monoamine uric acid, is thought to be metabolically inert in humans (except during gouty diathesis) however, it has recently been found to be related to insulin resistance. [3] Among all antioxidants, uric acid is the most abundant. Urate, a soluble form of uric acid, can scavenge superoxide radicals, hydroxyl radicals, and singlet oxygen in the blood and chelate transition metals. Recent research indicates that uric acid has powerful free radical scavenging capabilities and may have therapeutic properties.[4] The production of uric acid occurs during nucleotide and adenosine triphosphate metabolism, and it is the result of purine metabolism. [5] It has been found in large population-based studies that serum uric acid is associated with cardiovascular disease, obesity, heart failure, and atrial fibrillation.[6]

A number of studies have indicated that elevated serum uric acid is associated with increased risk of cardiovascular disease[7], systemic arterial hypertension[8], and chronic renal dysfunction[9]. Metabolic syndrome (a complex of risk factors related to insulin resistance) is also thought to be linked to raised serum uric acid levels [10]. The development of peripheral arterial disease is also associated with higher serum levels of uric acid.[11] Several studies suggest a relationship between SUA levels and atherosclerotic disease. Additionally, there is epidemiological evidence that hyperuricemia is linked to mortality in patients undergoing coronary angioplasty or presenting with an acute myocardial infarction. [12]. Thus, the purpose of this study is to investigate how uric acid levels change over a period of time in type 2 diabetics who do not have any other complications or morbidities.

## **Material and Method**

### **Study Place**

The present study conducted at Santosh Medical College , Ghaziabad

### Study Participants

100 type 2 diabetic patients which were randomly selected from the OPD of Department of Medicine .

### Inclusion criteria

1. Type 2 diabetics
2. The age group for 30-40 years
3. Duration of diabetes: 2-9 years
4. They were taking hypoglycemic drugs regularly or Irregularly .

### Exclusion criteria

1. past History of CVS, Respiratory, GIT, Renal & CNS disorders
2. History of endocrine & metabolic disorders like type 1DM, GOUT
3. obese
4. Smokers
5. Alcoholics
6. Any complications of type 2 diabetes
7. Pregnancy & lactation
8. Menstrual disorders

Personal, family & diet history from the patients recorded. General physical examination, height (cms), weight (kgs), BMI (Kg/m<sup>2</sup>), vitals and systemic examinations performed to rule out the exclusion criteria. Overweight, obese & hypertensive excluded from the study, which could affect uric acid and insulin resistance in type 2 diabetics. Specific instructions were given to the patients about 8 hour overnight fasting. Collection of the venous blood samples under aseptic precaution at Central Laboratory of the Hospital done. A biochemical investigation like Uricase method (Peroxidase) employed for the estimation of serum uric acid levels in the patients.

### Statistical analysis

Parameters expressed in terms of mean \_ standard deviation. Pearson correlation test used to know the association between SUA & duration of type 2 diabetes by software Jamovi 2.3.3 .

### Results

Table 1 show the descriptive analysis of serum uric acid with the duration of diabetes in year. Serum uric acid concentration in type 2 diabetic patients was 5.83\_ 1.15 (mean\_SD) stating that they were suffering from hyperuricemia

DESCRIPTIVES		
duration of diabetes		uric acid level
N	100	100
Mean	5.82	5.83
Std. error mean	0.173	0.115

95% CI mean lower bound	5.48	5.60
95% CI mean upper bound	6.16	6.05
Median	6.00	5.90
Mode	6.00	5.90
Standard deviation	1.73	1.15
Skewness	-0.288	0.0141
Std. error skewness	0.241	0.241
Kurtosis	-0.263	0.483
Std. error kurtosis	0.478	0.478

Table 2 shows a positive Pearson correlation of SUA with the duration of diabetes in years of type 2 diabetes. The result showed that a positive correlation present between SUA and duration of type2 diabetes is statistically significant. ( $r = 0.630$  ,  $p < 0.001$ )

DURATION OF DIABETES		
uric acid level	Pearson's r	0.630***
	p-value	< .001
	95% CI Upper	0.735
	95% CI Lower	0.494
	N	100

## Discussion

The current study was undertaken to investigate the relationship between the serum uric acid level with the duration of diabetes in the diabetic patient. Researchers have previously examined the relationship between serum uric acid level and diabetes mellitus in specific racial/ethnic groups or by gender, but their findings were inconsistent. In some studies, serum uric acid levels have been found to be associated with elevated levels of diabetes mellitus, whereas in others, no association has been found.[13] A study by Bansal et al. [14] assessed serum uric acid levels in 50 patients with ischemic thrombotic cerebrovascular disease and found that hyperuricemia was more common in those with abnormal angiograms. In addition, studies of carotid ultrasound [15] and angiography [16] found that hyperuricemia is straight-line related to carotid atherosclerosis.

A rise in serum uric acid levels can be attributed either to an increase in uric acid production or a decrease in its excretion. Ferris and Gorden[17] demonstrated that, in normal subjects, sympathetic nervous system stimulation via norepinephrine or angiotensin II infusion produced changes in serum uric acid levels and blood pressure, which resolved after the pressor agent was discontinued. In both normotensive and hypertensive humans, serum uric acid levels are inversely related to renal blood flow and directly to renal vascular resistance. [18] Several studies have demonstrated that high uric acid levels in men are independently associated with an increase in proximal tubular sodium reabsorption. This finding is similar to the fact that insulin promotes renal sodium absorption in metabolic syndrome and NIDDM, which may contribute to hypertension.[19]

Bandaru et al. conducted a study regarding the independent relation between serum uric acid levels and diabetes mellitus and reported that there was statistically a negative correlation between uric acid and FBS and a positive correlation with HbA1c [20]. This results are consistent with our study where we also found a negative correlation between serum uric acid and FBS in diabetic patients. According to Wang, Ji-Guang, et al [21], serum creatinine and uric acid are associated with mortality and cardiovascular disease among older Chinese patients with isolated systolic hypertension (systolic/diastolic blood pressure >160/95 mm Hg).

As in this study positive correlation was found in serum uric acid level with the duration of diabetes. Many other studies have reported similar results, including those done by Srivastava and Dixit, [22] Kumari and Sankaranarayana [23], which concluded that patients with Type 2 diabetes have higher serum uric acid levels than healthy controls. In a study done by Rao TMV & Vanukuri NK on type 2 diabetes patients in India, similar results were observed. However, in their study overweight, obesity & hypertension were not excluded, which create hyperuricemia as confounding factors. [24]

The treatment of hyperuricemia with hypouricemic drugs [25] has been concluded by Katsiki N. et al. in their review of diabetes and its complications [26]. Keenan T., et al have concluded that increased serum urate levels are not associated with type 2 diabetes, coronary heart disease, ischemic stroke or hypertension. A recent study has suggested that uric acid does not play a causal role in diabetes-related cardiovascular complications, contrary to the majority of published studies on the topic. [27] An analysis by Choi H. K., et al. confirms that, for men with a high cardiovascular risk profile with gout, there is an increased risk of developing type 2 diabetes over the long term, independent of other known risk factors. [28]

According to Johnson et al (2015), in a review on T2DM with complications, hyperuricaemia has been associated with hypertension as well as diabetes complications. However, our study in contrast shows that hypertensive diabetics (males as well as females) had a statistically significant decline in serum uric acid levels compared to non-hypertensive diabetics, particularly in terms of blood pressure. [29] A uric acid level can also be used as a marker of cardiovascular disease, which is the most common cause of death in people with diabetes mellitus. This study has several limitations, such as the small sample size and the absence of other biochemical variables associated with type 2 diabetes, such as serum triglycerides, cholesterol, blood glucose, blood urea, serum creatinine levels, insulin levels, leptin levels, and other inflammatory mediators such as C reactive protein.

## **Conclusion**

In patients with type 2 diabetes mellitus who have long-term hyperglycemia, there is a high risk of macro and microvascular complications, which can result in retinopathy, neuropathy, and cardiovascular complications. According to our study, there is a positive correlation between serum uric acid and duration of diabetes in type 2 diabetics. Since this study suggests that reducing the uric acid levels with medications can help prevent insulin resistance, which can lead to

type 2 diabetes mellitus or its complications, we conclude that reducing uric acid levels with medications can help the diabetic patients .so that it may not lead to other complication in diabetic patients.

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