



SERUM URIC ACID IN TYPE 2 DIABETES MELLITUS AND ITS ASSOCIATION WITH CARDIOVASCULAR RISK FACTORS

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ABSTRACT

BACKGROUND: Prevalence of Type 2 Diabetes mellitus is rapidly increasing and is already as epidemic in India. Diabetes mellitus is an important risk factor associated with increased incidence of cardiovascular disease (CVD) Prevalence of CVD has rapidly increased in past few years. The four major risk factors for CVD are hypertension, dyslipidemia, diabetes mellitus and cigarette smoking. The Morbidity and mortality due to noncommunicable diseases specially attributed to diabetes mellitus and coronary heart disease is rising rapidly in India, causing nearly 5.8 million deaths per year annually. Insulin resistance state is associated with diabetes mellitus and metabolic syndrome. **AIM** To study the effect of serum uric acid levels in type 2 diabetes mellitus and its association with cardiovascular risk factors. **OBJECTIVES** :To compare serum uric acid levels with other CVD risk factors (hypertension, dyslipidemia, obesity, smoking) among type 2 diabetic subjects. To compare duration of diabetes and serum uric acid levels **STUDY DESIGN:** Cross sectional, observational study. **PLACE OF STUDY:** Department of General Medicine, Kamineni institute of medical sciences, Narketpally. **DURATION OF STUDY** : October 2020 to September 2022

KEYWORDS : Uric acid, Type 2 diabetes mellitus, Hypertension, Obesity, Smoking, dyslipidemia, .

INTRODUCTION

Prevalence of Type 2 Diabetes mellitus is rapidly increasing and is already as epidemic in India. Diabetes mellitus is an important risk factor associated with increased incidence of cardiovascular disease (CVD)

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The Morbidity and mortality due to noncommunicable diseases specially attributed to diabetes mellitus and coronary heart disease is rising rapidly in India, causing nearly 5.8 million deaths per year annually. Insulin resistance state is associated with diabetes mellitus and metabolic syndrome.[1]

Many studies in the past have recommended regular screening of all type 2 diabetic subjects, to identify people with higher risk of subsequent atherosclerosis[2].

A strong association was also demonstrated between uric acid levels [3]and various other cardiovascular risk factors. (Hypertension, obesity, diabetes mellitus, smoking, dyslipidemia)

The positive association between serum uric acid and cardiovascular diseases [4] such as ischemic heart disease has been recognized since the early years and has been confirmed by numerous epidemiological studies since then. However, whether uric acid is an independent risk factor for cardiovascular mortality is still disputed as several studies have suggested that hyperuricemia is merely associated with cardiovascular diseases because of confounding factors such as obesity, dyslipidemia, hypertension, use of diuretics and insulin resistance.

Over recent years there has been debate [5] about the nature of the association between elevated serum uric acid levels and cardiovascular disease. Several studies have identified the value, in populations, of serum uric acid concentration in predicting the risk of cardiovascular events, such as

myocardial infarction. This has led the research towards the potential mechanisms through which uric acid could have direct or indirect effects on the cardiovascular system[6].

It has been difficult to identify the specific role of elevated serum uric acid because of its association with established cardiovascular risk factors such as hypertension, diabetes mellitus, hyperlipidemia and obesity.[7,8]

An attempt has been made here to study the level of serum uric acid in type 2 diabetes mellitus and the its correlation with cardiovascular risk factors like obesity, hypertension, smoking, dyslipidemia.

AIM:

To study the effect of serum uric acid levels in type 2 diabetes mellitus and its association with cardiovascular risk factors.

OBJECTIVES

To compare serum uric acid levels with other CVD risk factors (hypertension, dyslipidemia, obesity, smoking) among type 2 diabetic subjects.

To compare duration of diabetes and serum uric acid levels

Inclusion Criteria

- Patients with type 2 diabetes mellitus (irrespective of their glycemic status and duration of diabetes).
- Patient's age \geq 40 years.
- Both sexes were included.

Exclusion Criteria

- Patients with the following conditions were excluded from the study
- Age $<$ 40 yrs
- Renal failure.
- On long term diuretics and steroids.
- Chronic Alcohol consumers.
- On antimetabolite and chemotherapy drugs.
- Hepatic disorders.
- Renal transplant patients.
- Pregnancy and lactating mothers

METHODOLOGY:

140 patients with Type 2 Diabetes Mellitus will be taken as cases. These patients will be subjected to detailed Medical history, General and Systemic examination with prior consent of the patient after which they will be subjected appropriate and related tests, the results of which will be statistically analysed.

RESULTS

Table – 1: Age Group Wise Distribution In Patients With Type 2 Diabetes (n = 140)

Age Group (Years)	Cases	Percentage Age (%)
40 – 50	49	35
51 – 60	50	35.7
61 – 70	31	22.1
> 70	10	7.14
Total	140	100

Table 1 demonstrates that, maximum number of patients with type 2 diabetes were in 51-60 years age group

Table – 2: Gender Wise Distribution In Patients With Type 2 Diabetes

Gender	Cases (N=140)	Percentage Age (%)
Male	84	60
Female	56	40
Total	140	100

Demonstrates That Males (60%) Were More Compared To Females (40%) In this Study

Table – 3: Age Wise Distribution With Respect To Serum Uric Acid Levels (n = 140)

Age Group (years)	Hyperuricemia		Normo/Hypouricemia		Total	
	Number	Percentage	Number	Percentage	Number	%
40-50	19	36.53	30	34.09	49	35
51-60	22	42.3	28	31.81	50	35.7
61-70	11	21.15	20	22.72	31	22.1
>70	0	0	10	11.36	10	7.14
Total	52	100	88	100	140	100

Demonstrates that number of patients with hyperuricemia in type 2 diabetes is more in 51-60years age group (42.3%)

Table – 4: Genderwise Distribution With Respect To Serum Uric Acid Levels

Gender	Hyperuricemia		Normo/Hypouricemia		Total	
	Number	Percentage	Number	Percentage	Number	%
Male	42	80.76	42	21	84	60
Female	10	19.23	46	11	56	40
Total	52	100	88	32	140	10

Table – 5: Serum Uric Acid Levels In Type 2 Dm With Respect To Hypertension (n = 140)

Hypertension	Hyperuricemia		Normo/Hypouricemia		Total	
	Number	%	Number	%	Number	%
Present	31	59.61	5	5.68	36	25.71
Absent	21	40.38	83	94.31	104	74.29
Total	52	100	88	100	140	100

Table 5 Demonstrates that hyperuricemia is seen more in type 2 diabetes patients with pre-existing hypertension

Table – 6: Serum Uric Acid In Hypertensive Patients

Hypertension	No. Of Cases	Serumuricacid (Mean)	Serumuricacid (SD)	P Value
Yes	36	6.60	1.105	0.0001
No	104	4.79	1.18	

Table 6 demonstrates that there is significant correlation between hyperuricemia in patients with type 2 diabetes and coexisting hypertension

Table 7- Serum Uricacid Levels With Respect To Dyslipidemia (n = 140)

Dyslipidemia	Hyperuricemia		Normo/Hypouricemia		Total	
	Number	%	Number	%	Number	%
Present	29	55.7	23	26.13	52	37.1
Absent	23	44.2	65	73.86	88	62.8
Total	52	100	88	100	140	100

Table 7 demonstrates that more number of cases of hyperuricemia are seen in type 2 diabetes patients with coexisting dyslipidemia

Table- 8: Serum Uric Acid Values In Relation To Dyslipidemia

Dyslipidemia	No. Of Cases	Serum Uric Acid Value		P Value
		Mean	SD	
Present	52	6.33	1.24	0.0001
Absent	88	4.60	1.14	

Table 8 demonstrates that there is significant correlation between dyslipidemia and hyperuricemia in type 2 diabetes

Table – 9: Serum Uricacid Levels In Type 2 Dm With Respect To Bmi (n = 140)

BMI	Hyper Uricemia		Normo/Hypouri Cemia		Total	
	Number	%	Number	%	Number	%
> 25	48	92.30	40	45.45	88	62.85
< /=25	4	7.69	48	54.54	52	37.14
Total	52	100	88	100	140	100

Table 9 - demonstrates that hyperuricemia is more seen in patients with type 2 diabetes with a BMI > 25

Table 10 – Serum Uricacid Levels In Type 2 Dm With Respect To Smoking (n = 140)

Smoking History	Hyperuricemia		Normo/ Hypouricemia		Total	
	Number	%	Number	%	Number	%
Smoker	35	67.3	1	1.13	36	25.7
Nonsmoker	17	32.6	87	98.8	104	74.2
Total	52	100	88	100	140	100

Table 10 - demonstrates that hyperuricemia is more seen in type 2 diabetes patients with history of smoking

Table – 11: Serum Uricacid Levels In Type 2 Dm With Respect To Duration Of Diabetes (n = 140)

Duration n(YRS)	Hyperuricemia		Normo/Hypouricemia		Total	
	Number	%	Number	%	Number	%
0 – 5	14	26.92	31	35.22	45	32.14
6– 10	22	42.3	32	36.36	54	38.57
11– 15	16	30.76	25	28.4	41	29.28
Total	52	100	88	100	140	100

Table 11 demonstrates that number of cases with hyperuricemia in type 2 diabetes is more in the 6-10 years duration group

Table – 12: Duration Of Diabetes And Hyperuricemia

Duration Of Diabetes	No.Of Patients	Hyperuricemia	
		Mean	Sd
0-5	14	4.3	0.77
6-10	22	4.57	1.01
11-15	16	6.47	1.07

Table 12 demonstrates that there is significant correlation between hyperuricemia and duration of diabetes

Table – 13: Prevalence Of Hyperuricemia In Type 2 Diabetics (n = 140)

Cases	Number of cases	Percentage
Hyperuricemia	52	37.14 %
Normo/Hypouricemia	88	62.85%
Total	140	100%

Table 13 demonstrates that prevalence of hyperuricemia

among the studied type 2 diabetes patients is 37.14%

DISCUSSION

- An epidemiological link between elevated serum uric acid and an increased cardiovascular risk has been recognized for many years.
- In this study serum uric acid levels in diabetes was examined. Uric acid as a marker of CAD in combination with other risk factors which includes Metabolic Syndrome components was examined.
- Duration of the diabetes positively correlated with uric acid levels. Uric acid levels increase with increasing duration of diabetes and the association was statistically significant.
- In the present study males have higher uric acid level when compared to females.
- The mean uric acid levels in males and females were 5.45 ± 1.47 and 4.97 ± 1.28 respectively although the difference was not statistically significant.
- In the present study serum uric acid correlated well with body mass index (BMI). The mean uric acid in subjects with $BMI > 25$ was 6.40 ± 1.006 and 4.23 ± 0.73 in patients with $BMI < 25$. The difference was statistically significant.
- In the present study uric acid levels were significantly elevated in patients with dyslipidemia. The mean serum uric acid level in patients with elevated serum triglycerides was 6.37 ± 1.02 and in patients with normal lipid profile was 4.60 ± 1.14 . The difference was statistically significant.
- In the present study serum uric acids were significantly raised in patients with hypertension. The mean uric acid levels in diabetics with hypertension and non hypertensive were 6.6 ± 1.105 and 4.79 ± 1.18 respectively. The difference was statistically significant.
- In the present study serum uric acid positively correlated with duration of diabetes and cardiovascular risk factors like obesity (high BMI), hypertension, dyslipidemia and the results were statistically significant.
- Studies by Li L. X., et al [9] Nagahama K., et al [10] also have reported similar strong association between hyperuricemia and components of metabolic syndrome
- The prevalence of hyperuricemia among type 2 diabetes patients is 32% in Li L. X., et al [9] 29.34 % in Nagahama K., et al and 37.14% in the present studies, which are similar to our present study
- 25% of the patients with hyperuricemia were in the 40-50 years age group, 46.87% in 51-60 years age group, 28.12% in 61-70 years age group in Li L.X et al [9] group, whereas 36.53% of patients with hyperuricemia were in 40-50 years age group, 42.3% in 51-60 years age group, and 11% in 61-70 years age group in the present study.
- 54.28% of patients with hyperuricemia are had hypertension and 45.71% were non hypertensives in causevic A et al 24 study, and 59.61% had hypertension and 40.38% were non hypertensives in the present study
- 54.16% of patients with hyperuricemia had dyslipidemia in causevic A et al [11] study and 55.76% patients with coexisting dyslipidemia in the present group
- 77.27% of patients with hyperuricemia had $BMI > 25$ and 5% had $BMI \leq 25$ in pavani bandaru et al [12] study, whereas 92.30% had $BMI > 25$ and 4% had $BMI \leq 25$ in the present study group.
- 22.72% of cases with hyperuricemia among 0-5 years duration, 45.45% among 6-10 years duration and 31.81% among 11-15 years duration in pavani bandaru et al [12] study, and 26.92% of cases with hyperuricemia among 0-5 years duration, 42.3% of cases among 6-10 years and 30.76% among 11-15 years duration in the present study.
- Among people who had diabetes for 11 to 15 years, the mean uric acid level was 6.47 ± 1.07 .

CONCLUSION

- Serum uric acid levels were significantly elevated in diabetic population.

- The serum uric acid level was independent of age and smoking status (in males).
- Mean serum uric acid levels were high in males.
- Significant positive correlation between serum uric acid levels and Body Mass Index was noted.
- Elevated serum uric acid levels were significantly noted among those with
 1. $BMI > 25$,
 2. WHR abnormality,
 3. Dyslipidemia,
 4. Hypertension.
- Serum uric acid levels increased with increasing duration of diabetes.
- Serum uric acid levels in diabetic patients with CAD were significantly higher.
- Serum uric acid above 4 mg/dl in diabetic population is a marker or risk factor for CAD.
- Multiple factors are associated with increased uric acid levels. Routine annual estimation of uric acid among diabetics from the identification of diabetes will help the clinician to find out the adequacy of
 1. Control of glycemic status
 2. Control of dyslipidemia
 3. Development of hypertension
- Diabetic patients with raised serum uric acid levels should be carefully monitored for CAD as well as other vascular episodes.
- A meticulous control of blood sugar, hypertension, body mass index, dyslipidemia among diabetics bring down elevated uric acid level in diabetics

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