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## Prevalence of hyperuricemia in patients with type 2 diabetes mellitus in tertiary care centre

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### Abstract

**Introduction:** The incidence and prevalence of diabetes mellitus type 2 (T2DM) is increasing throughout the world. Diabetes is responsible for 6.7 million deaths in 2021- 1 in every 5 second. Patients with T2DM tend to have higher serum uric acid levels than normal population. Uric acid is associated with the onset of diabetes-related health complications including inflammation, oxidative stress, vascular endothelial injury. This study has been carried out to see prevalence of hyperuricemia in T2DM in our population. Identifying risk factors for progression of diabetic complications are also equally important for its early addressing or delaying progression of diabetic complication

**Method:** A hospital based cross-sectional study was done in which sixty five patients with T2DM were included from May 2021 to May 2022 who were admitted in ward or visited in general medicine OPD of Bir Hospital after ethical approval from the institutional review committee. The patients fulfilling inclusion criteria underwent anthropometric measurement and laboratory investigations. The data were entered and analyzed using statistical software IBM-SPSS version 25.

**Result:** The prevalence of hyperuricemia ( $>7$ mg/dl for male &  $>6$ mg/dl for female) was found to be 15.38% in patients with T2DM.

**Conclusion:** There was prevalence of hyperuricemia among diabetes cases in this study. This forms a basis for screening hyperuricemia among patients with T2DM. Further studies with larger number of patients with T2DM are needed to explore prevalence and the relationship of hyperuricemia to other clinical and laboratory parameters of T2DM.

**Keywords:** Diabetes Mellitus Type 2, Hyperuricemia, Prevalence

## INTRODUCTION

Diabetes was the ninth leading cause of death globally in 2019 with estimated 1.5 million deaths.<sup>1</sup> A recent population-based prevalence study of selected Non-communicable diseases (NCDs) in Nepal also showed that diabetes prevalence was 8.5%.<sup>2</sup> Serum Uric Acid (UA) was found correlated with further complications in patients with Type 2 Diabetes mellitus (T2DM) in many studies.<sup>3</sup> Hyperuricemia is closely related to the development of diabetes and its chronic complications such as diabetic retinopathy, diabetic nephropathy, and diabetic peripheral neuropathy through inflammation, oxidative stress, endothelial function damage, and other effects.<sup>2</sup>

The study could make a basis for routine screening of serum UA in T2DM cases and simultaneous management of hyperuricemia timely so further complications of diabetes halt and improve patient's quality of life.

The aim of this study was to find out the prevalence of hyperuricemia among patients admitted to the department of medicine in a tertiary care centre.

## METHOD

This descriptive cross-sectional study was conducted in the in-patient and out-patient Department of Medicine at the National Academy of Medical Sciences (NAMS), Kathmandu, Nepal. Sixty-five patients were included from May 2021 to May 2022. Ethical approval was obtained from the Institutional Review Committee of the same institution (Reference number: 267/2078/79).

Patients with type 2 diabetes mellitus above age of 18 years were included in the study after written informed consent; excluding those who were on antimetabolite and chemotherapy drugs, uricosuric drugs and urate lowering agents, pregnant ladies and lactating mothers. A structured performa was used for the data collection purpose.

Purposive sampling method was used. The sample size was calculated by following formula:

Sample size (n) =  $\{z^2 p (1-p)/d^2\}$  where,

n = required sample size

Z= Statistics for level of confidence (for 95% level of significance, Z= 1.96)

P= Prevalence of hyperuricemia in type 2 diabetes (estimated at 22% from the previous study)<sup>4</sup>

d= Desired precision (10%)

n =  $1.96^2 * 0.22 (1-0.22) / 0.1^2 = 65.92$ . Thus sample size of 65 patients was taken for the study.

Collected data was analysed using IBM SPSS Statistics version 25. The point estimate was calculated at a 95% CI. Chi-Square (X<sup>2</sup>) tests was used to find correlation between dependent and independent variables. P-value <0.005 was considered significant.

## RESULT

Total study participants were 65. Table 1 shows that among 65 study participants, maximum participants were of age  $\geq 60$  years 34(52.3%). There were more female participants 38(58.5%) than male 27(41.5%). Likewise, six patients have concomitant hypertension as comorbid condition (Table2).

**Table 1. Demographic Characteristics of the Patients with Type 2 Diabetes Mellitus (T2DM) (n=65)**

Characteristics	N (%)
<b>Age group (yrs)</b>	
<40	6 (9.2%)
40-49	11 (16.9%)
50-59	14 (21.5%)
$\geq 60$	34 (52.3%)
<b>Gender</b>	
Male	27 (41.5%)
Female	38 (58.5%)

Most of the study participants were obese, 33(50.77%). (Figure 1). This study showed prevalence of hyperuricemia ( $>7$ mg/dl for male and  $>6$ mg/dl) in 10 (15.38%) patients of type 2 diabetes mellitus. Among the study population, concomitant hypertension was found in 6 patients (9.2%). (Table 2).

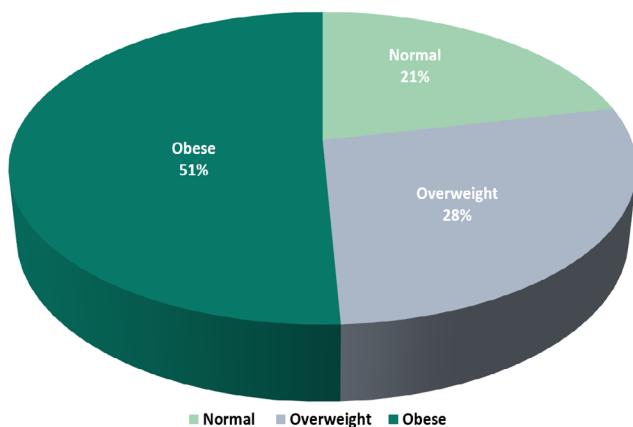
**Table 2. Prevalence of hyperuricemia in type 2 diabetes mellitus according to different variables (n=65)**

Characteristics	Normouricemia f (%)	Hyperuricemia f (%)	Total (n)	p value
<b>Sex</b>				
Male	20 (74.1%)	7 (25.9%)	27	0.047
Female	35 (92.1%)	3 (7.9%)	38	
<b>History of Hypertension</b>				
Yes	3(50.0%)	3(50.0%)	6	0.014
No	52 (90.9%)	7 (9.1%)	59	
<b>BMI (kg/m<sup>2</sup>)</b>				
Normal (18–22.9kg/ m <sup>2</sup> )	13 (92.9%)	1 (7.1%)	14	
Overweight (23– 24.9kg/m <sup>2</sup> )	16 (88.9%)	2 (11.1%)	18	0.398
Obese ( $\geq 25$ kg/ m <sup>2</sup> )	26 (78.8%)	7 (21.2%)	33	

CI difference: 95%, p<0.05

Uric acid range: Men: 2.5-7.0 mg/dL, Women: 1.5-6.0 mg/dL

WHO Asia-Pacific BMI cut-off values: Normal (BMI  $>18.5$ -22.9), Overweight (BMI  $> 23$ -24.9), Obese (BMI  $\geq 25$ )



**Figure 1. Distribution of T2DM Patients according to Body Mass Index (BMI)**

In Table 2, a higher proportion of males (25.9%, p-value: 0.047) depicted increased serum uric acid levels compared to females (7.9%) in this study. This research found a statistically significant association between serum UA and hypertension, indicated by a p-value of 0.014.

## DISCUSSION

Hyperuricemia was found to be prevalent in 15.38% patients with type 2 diabetes mellitus from this study which is similar to study in India (11.43%).<sup>5</sup> Likewise, it was found lower than the study done in Egypt(32%), Nigeria(25%) and Ethiopia(33.8%).<sup>6,7</sup>

The magnitude of high serum uric acid in males (25.9%, p-value: 0.047) was higher than females (7.9%) in this study. This finding was consistent with a study done in Southwest Ethiopia (male 22.3% versus female 11.5% respectively).<sup>8</sup> Possible mechanism for this finding explained due to oestrogen promoting UA excretion. In contrast, some studies have shown female predominance (71%) with hyperuricemia.<sup>9</sup> This is explained by increase health service seeking behaviour of female, older age of female patients in study group with loss of protective effects of oestrogen against hyperuricemia and most patients being obese. Another study showed frequency of hyperuricemia was comparable to both genders (59% vs 41%, p-value: 0.3).<sup>6</sup>

In this study, 6 out of 65 patients had concurrent hypertension along with diabetes. This study achieved statistical significance between serum UA and hypertension (p-value: 0.014). Serum UA levels were associated with risk of hypertension and further serum UA at level 6.1 mg/dl identify onset of hypertension in type 2 DM.<sup>10</sup>

Obesity has been found to contribute to hyperuricemia.<sup>11</sup> In this study, majority of patients were obese ( $\geq 25$  kg/ m<sup>2</sup>) with (50.8%). Although this study showed no association between hyperuricemia and with BMI (p-value: 0.398), the highest prevalence of hyperuricemia was determined among overweight patients (23– 24.9kg/m<sup>2</sup>) and obese patients ( $\geq 25$  kg/ m<sup>2</sup>) when compared to those patients with normal

BMI (18–22.9kg/ m<sup>2</sup>). In contrast to our findings, study conducted by Arersa et al revealed significant association between hyperuricemia and BMI (p-value: 0.000).<sup>4</sup>

This study is single-centered and the sample size is also small. Therefore, the results cannot be generalized in a larger population. Longitudinal studies tracking uric acid levels and diabetes progression over time are needed to have a more comprehensive understanding of the relationship between uric acid and diabetic progression

## CONCLUSION

The prevalence of hyperuricemia was found 15.38% among type 2 diabetic patients. Male patient had higher prevalence of hyperuricemia in patient with type 2 diabetes mellitus. More studies need to be conducted for more approval whether screening and addressing uric acid level is needed for preventing further diabetic progression and its complications.

## DECLARATIONS

### Acknowledgement

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### Conflict of Interest

None

### Funding

None

### Ethical Clearance

Ethical clearance was obtained from IRB of, Bir Hospital, National Academy of Medical Sciences.

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