

# Study of Serum Uric Acid Level in Men and Women with Type 2 Diabetes Mellitus Attending in A Tertiary Care Hospital at Dhaka

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## ABSTRACT

**Background:** Type 2 diabetes mellitus results from the body's ineffective use of insulin and it accounts for the vast majority of people with diabetes around the world. In other epidemiological studies, Serum Uric Acid (SUA) has been shown to be associated with hypertension and some chronic disease. However, limited studies have evaluated the SUA and glucose levels in diabetic individuals. Therefore, The present study is to evaluate the serum uric acid levels and prevalence of hyperuricemia in patients of Type-2 Diabetes Mellitus.

**Materials and methods:** A total of 100 patients (Male, n= 54, Female, n=46) with the different age, sex, dietary habits, predominant physical activities, socioeconomic status having fasting blood glucose level >126 mg/dl (7 mmol/l) and diagnosed patient of DM either on hypoglycemic drugs or insulin were included in the study group. Hyperuricemia is considered when the serum uric acid concentration is greater than 7.0 and 6.0 mg per deciliters for male and female respectively. Estimation of Fasting blood glucose level, Serum Uric acid level were done by Hexokinase methods and by uricase method respectively.

**Results:** Mean  $\pm$  SD of serum uric acid was significantly higher ( $p < 0.05$ ) in male Diabetic patients ( $6.25 \pm 2.30$ ) when compared to female Diabetic patients ( $5.12 \pm 1.90$ ). The prevalence of hyperuricemia in male (44%, n= 24) Diabetic patients is higher than the female (28%, n=13) Diabetic patients.

**Conclusion:** Uric acid is a last by product of purine metabolism and its increased levels have been associated with Type-2 Diabetes Mellitus. There was high prevalence of hyperuricemia among male type 2 diabetic patients. Regular health information about early diagnosis and treatment for hyperuricemia is essential to reduce its prevalence in type 2 diabetic patients.

## KEY WORDS

Blood glucose; Diabetes mellitus, Serum uric acid.

## INTRODUCTION

Type 2 diabetes range from autoimmune destruction of the cells of the pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action. This form of diabetes, which accounts for 90–95% of those with diabetes.<sup>1</sup>

Regarding sex distribution, the number of men with DM (215.2 million) is slightly higher than the women with DM (199.5 million) a difference that will also be preserved in 2040, 328.4 million versus 313.3 million.<sup>2</sup> In Bangladesh, According to the International Diabetes Federation, the prevalence will be 13% by 2030.<sup>3</sup>

Diagnosis is still based on the American Diabetic Association (ADA) guidelines of 1997 or World Health Organization (WHO) National diabetic group criteria of 2006, which is for a single raised glucose reading with symptoms -polyuria, polydipsia, polyphagia and weight loss.<sup>4</sup> Diabetes has a stronger association with central obesity than with generalized obesity. The chronic hyperglycemia of diabetes is associated with long term dysfunction, damage and failure of various organs especially the eyes, kidney, nerves, heart and blood vessels.<sup>5</sup>

Uric acid is the product of purines breakdown. Uric acid may cause vascular smooth cell proliferation, and reduce vascular nitric oxide production. It has been suggested that serum uric acid may cause endothelial dysfunction.<sup>6</sup>

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Excess serum accumulation can lead to various diseases, and most notably uric acid is causally involved in the pathogenesis of gouty arthritis.<sup>7</sup>

Under the steady-state conditions the production of uric acid is in balance with the uric acid disposal of enzymes involved in uric acid production are also responsible for oxidative stress.<sup>8</sup>

Hyperuricemia is a condition in which individuals have higher levels of uric acid concentration in the serum or when serum levels of uric acid concentration is greater than 7.0 and 6.0 mg/dl respectively for both male and female adults.<sup>9</sup>

Hyperuricaemia has been also added to the set of metabolic abnormalities which are associated with insulin resistance and/or hyperinsulinaemia.<sup>10</sup>

The present study is designed to evaluate serum uric acid levels and to see the prevalence of hyperuricemia in patients of type-2 Diabetes Mellitus.

#### MATERIALS AND METHODS

This cross sectional study was carried out in the Department of Biochemistry, Dhaka Medical College, Dhaka, from January 2017 to December 2017. In this study, 100 diagnosed Type 2 DM patients were taken in which 54 Type 2 DM male (Group A) and 46 Type 2 DM female (Group B) were selected from department of Endocrinology, DMCH. Ethical clearance for the study was taken from the ethical review committee, Dhaka Medical College. Sample was taken purposively. Fasting blood glucose level > 126 mg/dl and diagnosed patient of DM either on hypoglycemic drugs or insulin were included in the study. Hyperuricemia is considered when the serum uric acid concentration is greater than 7.0 and 6.0 mg per deciliters for male and female respectively. Data was collected by using a preformed data collection sheet. Baseline parameters—height, weight, Body Mass Index (BMI) of both sexes were measured and serum uric acid, Fasting Plasma Glucose (FPG) were estimated by enzymatic method. All the analytical measurements were done by using an auto-analyzer. All data were processed to compute mean and standard deviation. Difference of mean among two groups was compared by unpaired t test. All statistical analysis was done using the SPSS 22.0. Data was presented by table and graphs.

#### Inclusion criteria:

- i) Diagnosed type 2 diabetes mellitus patients of both sexes
- ii) Age: 30-70 years
- iii) Sex : Both male & female.

#### Exclusion criteria:

- (i) Patients having known H/O Gout
- (ii) Patient with H/O of malignancies
- (iii) Hypothyroidism.

#### RESULTS

In present study, 100 patients of Type 2 DM were considered, out of which 54 were males and 46 were females. Baseline parameters and biochemical parameters were estimated. Statistical analysis was done and results were presented by tables and figures.

Table I shows the distribution of cases according to baseline parameters and p value <0.05 was considered significant.

Table II shows mean distribution of uric acid according to sex and p value <0.05 was considered significant. Mean  $\pm$  SD of serum uric acid was significantly higher in male Type 2 DM patients when compared to female Type 2 DM patients.

Table III and Figure 1 shows hyperuricemia and sex distribution, where p value <0.05 was considered significant.

**Table I** Baseline characteristics of the study subjects (n=100)

	Male (n=54)	Female (n=46)	p value
Age (Years)	40.58 $\pm$ 7.30	38.96 $\pm$ 6.40	0.240
Height (cm)	155 $\pm$ 5.70	146 $\pm$ 4.50	0.000
Weight (Kg)	65 $\pm$ 9.10	57 $\pm$ 8.60	0.000
BMI (kg/m <sup>2</sup> )	24.90 $\pm$ 3.20	25.10 $\pm$ 3.60	0.769
FPG (mmol/l)	7.90 $\pm$ 2.40	8.21 $\pm$ 3.34	0.595

Unpaired student's 't' test was done to measure the level of significance. Level of significance p <0.05.

**Table II** Serum uric acid level of the study subjects (n=100)

	Male (n=54)	Female (n=46)	p value
SUA (mg/dl)	6.25 $\pm$ 2.30	5.12 $\pm$ 1.90	0.009

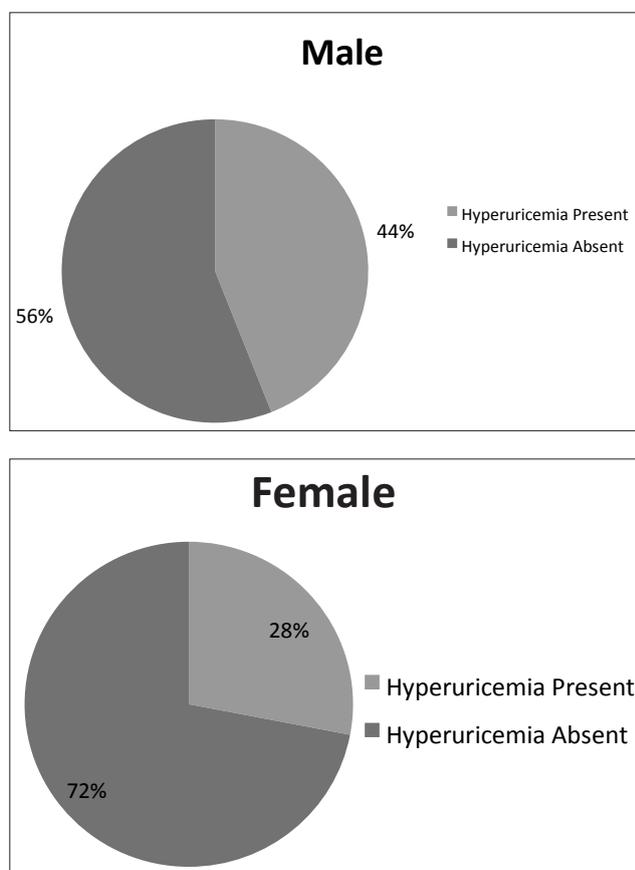
Unpaired student's 't' test was done to measure the level of significance.

Level of significance p <0.05.

**Table III** Gender variation of hyperuricemia among study subjects (n=100)

Gender	Hyperuricemia Present n (%)	Hyperuricemia Absent n (%)	p value
Male n (%)	24 (44)	30 (56)	0.022
Female n (%)	13 (28)	33 (72)	

Chi Square test was done to measure the level of significance. Level of significance p <0.05.



## DISCUSSION

Type 2 DM continues to have a great impact on public health. Although some determinants, such as age, gender, race, family history and heredity cannot be modified, they are risk markers. However controlling the more important modifiable factors like serum uric acid levels may reduce the incidence of the disease.

In our study a total of 100 patients with type 2 DM were included. Out of which 54 were males and 46 were females. The mean age of the male and female patients were  $40.58 \pm 7.30$  and  $38.96 \pm 6.40$  respectively. Mean serum uric acid levels was significantly higher ( $p=0.009$ ) in male ( $6.25 \pm 2.30$ ) compared to the females ( $5.12 \pm 1.90$ ). Total 37 patients were hyperuricemic where male patients with hyperuricemia, 24 (44%) was higher than the female 13 (28%).

A study by Li et al. was done in 1026 patients with type 2 diabetes with a mean age of  $65.57 \pm 11.70$  years. At the time of uric acid determination, the patients with higher uric acid were more likely to be male and they displayed lower levels of FPG. This is similar with our study.<sup>7</sup>

A cross-sectional study was conducted by Woyesa et al where a total of 319 study subjects were enrolled in this study. 67.0% ( $n=211$ ) of the study subjects were males and the remaining were females. The prevalence of hyperuricemia were 33.8% ( $n=106$ ) among type 2 diabetic patients in the study area. The serum uric acid

concentration was higher among male study subjects when compared to female (22.3% versus 11.5% respectively)<sup>9</sup>. These findings are accordance our study. Another study by Bandaru et al where they examined the association between serum uric acid levels and diabetes mellitus in participants from the third National Health and Nutrition Examination Survey ( $n = 18, 825$ , 52.5% women). Diabetes mellitus was defined as fasting glucose  $\geq 126$  mg/dL. They found that higher serum uric acid levels were inversely associated with diabetes mellitus after adjusting for age, sex, race/ethnicity, education, body mass index.<sup>11</sup>

Another cross-sectional study was carried out by Sidhu et al. in which 50 were Type 2 Diabetic patients. The mean age of the diabetic patients involved in this was  $54.6 \pm 10.05$  years. The mean uric acid level was found to be  $8.02 \pm 1.86$  mg/dl and the mean value of serum uric acid level was higher in diabetic patients.<sup>12</sup> This findings are similar with our study.

A cross-sectional study was carried by Arersa et al to assess the level of serum uric acid in type 2 diabetic patients attending their Jimma Medical Center chronic illness clinic. A total of 287 study participants with Type 2 DM were enrolled in the study. The mean  $\pm$  SD age of the study participants was  $51.79 \pm 14.36$  years. The majority of the study participants, 65.9% ( $n=189/287$ ) were male and the rest were female. About 42.8% of study participants had hyperuricemia. There was a high prevalence of hyperuricemia among males.<sup>13</sup> This is similar with us.

Taken into account the inconsistent findings in recent and previous studies, it is rather difficult to determine SUA levels as a risk factor for diabetes mellitus.

However, present study findings are worthy as a reference for future research.

## LIMITATIONS

Although optimal care had been taken by the researcher in every step of the study, there was limitation.

- Due to constrain of fund HOMA-IR for measurement of insulin resistance could not be done.

## CONCLUSIONS

It can be concluded as per this study that serum uric acid levels are elevated in Type 2 diabetes mellitus of both sexes. The prevalence of hyperuricemia was relatively high in male diabetic patients. Hyperuricemia has been found to be associated with Type 2 diabetes.

## RECOMMENDATIONS

- Further prospective study with large sample size should be carried out for better understanding of the relationship of elevated serum uric acid level with Type 2 Diabetes Mellitus.

- Monitoring of serum uric acid levels in persons having Type 2 diabetes can help in knowing the effects in these cases and can be used as an aid to other tests.
- Insulin resistance should be measured to find out etiological link between uric acid and type 2 DM.

#### DISCLOSURE

The authors declared that they have no competing interests.

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