

A Hospital Based Descriptive Cross-Sectional Study to Evaluate the Level of Serum Uric Acid in Type 2 Diabetes Mellitus Patients

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Abstract

Aim: To evaluate the level of serum uric acid in type 2 Diabetes mellitus patients in tertiary care hospital in Bihar region.

Methodology: This is a descriptive cross-sectional study included 100 subjects diagnosed with type 2 Diabetes mellitus, conducted in Department of medicine DMCH, Bihar. Venous blood sample was collected (fasting and postprandial samples). The test methodology for glucose levels was by colorimetric method of glucose oxidase-peroxidase. Serum sample was used to estimate serum uric acid by uricase trinder endpoint method.

Results: Case group had a mean age of 48.7 ± 12.45 years; of which, 28 (56%) were men and 22 (44%) were women. The control group had mean age of 45.6 ± 14.2 years with 26 men (52%) and 24 women (48%). The mean fasting plasma glucose level was higher in cases (185.74 ± 71.74 mg/dl) than in controls (90.34 ± 13.65 mg/dl). The mean postprandial plasma glucose level was also higher in cases (273.65 ± 92.63 mg/dl) than controls (127.54 ± 24.76 mg/dl). The mean uric acid level in cases was found to be 7.85 ± 2.82 mg/dl, whereas in controls, it was found to be 4.62 ± 1.45 mg/dl.

Conclusion: It can be concluded that Type-2 diabetes mellitus is related to rise in serum uric acid level. Further, more studies should be done to see whether lowering serum uric acid level decreases the glycemic level the diabetes mellitus patients which can help in improving the health of hyperuricemic subjects of Type 2 diabetes mellitus.

Keywords: Hyperuricemia, hyperinsulinemia, Uric acid.

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Introduction

Diabetes mellitus is a group of disorders characterized by chronic hyperglycemia associated with disturbance of carbohydrate, fat and protein metabolism due to absolute or relative deficiency of insulin secretion or its action. It is

associated with cardiovascular complications, renal complications and various types of micro-angiopathies. In India Diabetes mellitus prevalence ranges from 0.4 to 3.9% in rural areas and from 9.3 to 16.6% in urban areas. [1] The International Federation of Diabetes,

reported that around 415 million adults around all over the world are suffering from diabetes, and they estimated that the numbers are likely to reach around 642 million by 2040.[2]

Many studies have demonstrated that serum uric acid levels are higher in subjects with prediabetes and early type 2 diabetes than in healthy controls. [3] Uric acid is the most abundant of antioxidant in plasma.[4] Urate, the soluble form of uric acid in the blood, can scavenge superoxide radicals, hydroxyl radicals, and singlet oxygen and can chelate transition metals.[5] Uric acid is considered to be a potent scavenger of free radicals. Recent researchers have shown that uric acid has extreme scavenging capability and may have therapeutic influences.[6]

Uric acid is one of the major endogenous water-soluble antioxidants of the body. Increase in serum uric acid concentration along with blood glucose reflects the role of hyperglycemia in the genesis of oxidative stress in the diabetic patients.[7] Hyperuricemia has been also added to the set of metabolic abnormalities associated with insulin resistance or hyperinsulinemia in metabolic syndrome. [8, 9] So it can be said that uric acid as a biochemical parameter may be estimated to know its relation as an antioxidant in Type 2 diabetes.

Materials and Methods

This is a descriptive cross-sectional study included 100 subjects diagnosed with type 2 Diabetes mellitus, conducted in Department of medicine DMCH, Bihar.

This study included total 100 subjects, out of whom 50 were Type 2 diabetic patients as cases and 50 healthy individual controls.

Inclusion criteria

Patients age more than 18 years with diagnosis of type 2 Diabetes mellitus

Exclusion criteria

Patients with renal failure and creatinine levels >1.5 mg/dl, renal stones, liver disease, drugs affecting renal function and uric acid level. Patients with Type 1 diabetes mellitus were also excluded.

Methodology

Under aseptic precautions, venous blood sample was collected (fasting and postprandial samples). Diagnostic criteria for Type 2 diabetes mellitus were based on fasting blood sugar (FBS) ≥ 126 mg/dl and 2-h blood glucose levels ≥ 200 mg/dl. The test methodology for glucose levels was by colorimetric method of glucose oxidase-peroxidase. Serum sample was used to estimate serum uric acid by uricase-trinder endpoint method. (Reference range: Males - 3.6-8.4 mg/dl and females - 2.9- 7.5 mg/dl).

Results

In this study, 100 subjects were studied in which 50 were Type 2 Diabetic cases and 50 were apparently healthy controls. Case group had a mean age of 48.7 ± 12.45 years; of which, 28 (56%) were men and 22 (44%) were women. The control group had mean age of 45.6 ± 14.2 years with 26 men (52%) and 24 women (48%).

Table 1: Demographic details of both the groups

Groups	Men	Women	Mean age (in years)
Cases	28 (56%)	22 (44%)	48.7 ± 12.45
Controls	26 (52%)	24 (48%)	45.6 ± 14.2

The mean fasting plasma glucose level was higher in cases (185.74 ± 71.74 mg/dl) than in controls (90.34 ± 13.65 mg/dl). The mean postprandial plasma glucose level was also higher in cases (273.65 ± 92.63 mg/dl) than controls (127.54 ± 24.76 mg/dl). The mean uric acid level in cases was found to be 7.85 ± 2.82 mg/dl, whereas in controls, it was found to be 4.62 ± 1.45 mg/dl. The mean value of serum uric acid level was higher in cases than in controls and the difference is statistically significant (P-value < 0.05).

Table 2: Mean fasting blood glucose, PPBS, and uric acid level in cases and controls

Parameter		Cases (n=50)	Controls(n=50)	P-value
Blood sugar (mg/dl)	Fasting blood sugar	185.74 ± 71.74	90.34 ± 13.65	< 0.05
	Postprandial blood sugar	273.65 ± 92.63	127.54 ± 24.76	< 0.05
Uric acid levels (mg/dl)		7.85 ± 2.82	4.62 ± 1.45	< 0.05

Discussion

Incidence of diabetes mellitus type 2 has been increasing worldwide, making the disease of extreme importance. Several reports have suggested a possible association between serum levels of uric acid and higher incidence of diabetes mellitus type 2. On a biological basis, uric acid can negatively affect insulin resistance in animals due to its role in the inhibition of nitric oxide. Nitric oxide, on the other hand, is crucial in the glucose uptake mechanisms, thus its inhibition by uric acid will affect insulin role. [10]

Serum uric acid, an end product of purine metabolism, has been shown to be associated with an increased risk of hypertension [11, 12], cardiovascular disease [12], and chronic kidney disease [13] in previous epidemiological studies. Also, elevated levels of uric acid is a risk factor for peripheral arterial disease [14], insulin resistance, and components of the metabolic syndrome [15]. However, the putative association between serum uric acid levels and diabetes mellitus is not clear. Some studies reported that there is a positive association between high serum uric acid levels and diabetes [16-18], whereas other studies reported no association [19], or an inverse relationship [20].

This study showed that the serum uric acid levels in Type 2 diabetic cases were significantly higher as compared to healthy control persons visiting a tertiary care hospital in Bihar region. In our study, the mean fasting blood sugar level of patients with Diabetes mellitus type 2 is 185.74 ± 71.74. A study conducted by Talwar et al

had mean FBS to be 222 ±14.82 which is higher than the current study. [21] The post prandial blood sugars of the subjects had mean of 273.65 ± 92.63 mg/dl. The study by Talwar et al [21] had mean of 273.91 ±32.59 which is very similar to the current study.

Similar results were observed in various other studies such as done by Srivastava and Dixit,[22] Kumari and Sankaranarayana[23] which also reported higher serum uric acid levels in Type 2 diabetics than in normal controls. But the study done by Shabana et al [24] reported a decreased uric acid level.

To summarize the association of serum uric acid levels and diabetes mellitus type 2 risk, a meta-analysis was performed and concluded that with each 1mg/dl elevation of serum uric acid levels, there is a 17% elevation in diabetes mellitus type 2 risk. [25] In another meta-analysis on eight prospective observational studies, authors were able to conclude that in middle aged individuals and elderly, each 1 mg/dl elevation of serum uric acid was associated with a 6% elevation in diabetes mellitus type 2 risk. [26]

Current study observed effects of uric acid levels in type 2 Diabetes mellitus. So, to prevent renal and cardiovascular complications also, it is sensible to check serum uric acid levels in type 2 diabetes mellitus patients.

Conclusion

It can be concluded that Type-2 diabetes mellitus is related to rise in serum uric acid level. Further, more studies should be done to see whether lowering serum uric acid

level decreases the glycemic level the diabetes mellitus patients which can help in improving the health of hyperuricemic subjects of Type 2 diabetes mellitus.

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