A Study of Serum Uric Acid Levels in Type 2 Diabetes Mellitus Subjects: A Cross Sectional Study

Akshay Shirsath¹, Virendra C Patil², Makarand Mane³, Shilpa Patil⁴

ABSTRACT

Introduction: Diabetes mellitus is one of the major non-communicable diseases of which world is experiencing a serious epidemic these recent years. Uric acid serves as an early indicator of renal complications in diabetes mellitus patients.

Material and methods: This was an Observational, descriptive cross sectional study which was conducted during a period of 18 months (October 2016 and March 2018). This study was designed to check the levels of serum uric acid and its relation with creatinine, microalbuminuria, HbA1c, fasting and post prandial blood sugar levels in type 2 Diabetes subjects.

Results: Study included a total of 120 cases of type 2 Diabetes mellitus, out of which there were 69 males (57.5%) and 51 females (42.5%), with a mean age of 59.04 ±13.47 years.

Mean FBS was 186.10 ±77.53 mg/dl, with majority of the subjects having elevated FBS. Mean PPBS of 274.94 ±108.66 mg/dl and of HbA1c 8.15 ± 1.7 was observed. The uric acid of majority number of our study participant males (65.22%) had level of ≥ 7.4, with a mean of 9.53 ± 4.38. Mean blood urea and serum creatinine levels were 46.91 ± 15.13 and 1.44 ± 0.29 respectively. There was significant association seen between uric acid levels and urine albumin, serum creatinine, twenty four hour urinary albumin, FBS and PPBS levels and HbA1c levels.

Conclusion: Present study had about two-third subjects with type 2 Diabetes mellitus with elevated uric acid levels had microalbuminuria and elevated serum creatinine levels.

Keywords: Type 2 Diabetes, Microalbuminuria, Serum Uric Acid levels.

INTRODUCTION

Diabetes Mellitus is a chronic disorder that is associated with cardiovascular complications, renal complications and various types of microangiopathies including metabolic syndrome. 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 2040.¹

Recent studies have demonstrated that serum uric acid levels are higher in subjects with prediabetes and early type 2 diabetes than in healthy controls.²³ Hyperuricemia has been also added to the set of metabolic abnormalities associated with insulin resistance or hyperinsulinemia in metabolic syndrome.⁴⁵ This study was carried out to evaluate the level of serum uric acid in type 2 Diabetes mellitus patients and to correlate the parameters of diabetic nephropathy like microalbuminuria and serum creatinine levels with uric acid in type 2 Diabetes mellitus subjects.⁶

The current research aimed to study the levels of serum uric acid in type 2 Diabetes mellitus subjects and relation with microalbuminuria and serum creatinine levels.

MATERIAL AND METHODS

This was an Observational, descriptive cross sectional study. Present study included 120 subjects which were diagnosed type 2 Diabetes mellitus. This study was conducted at Krishna Hospital Medical Research Centre (KHMRC), Karad a tertiary care hospital and teaching institute, in the department of Medicine.

Study Period: This study was conducted over a period of 18 months (October 2016 and March 2018)

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

STATISTICAL ANALYSIS

Data will be analysed for mean, percentage, standard deviation, chi square test, multiple correlation and multivariate analysis, by using SPSS-10 (Statistical Package for the Social Sciences) for Windows (SPSS, Chicago, Inc).

RESULTS

The mean for age in the study subjects was 59.04 (±13.47) years predominated by age group of 61 – 70 years (31.67%), followed by 51 – 60 years (30%). There were 71-80 years (13.33%), 41-50 years (11.67%) 31-40 years was (7.5%) and <30 years (13.33%). There were 69 males (57.5%) and 51 females (42.5%) in the study.

The fasting blood sugars (FBS) of the subjects had mean of 186.10 ±77.53 mg/dl. Majority number of subjects had level of ≥ 7.4, with a mean of 9.53 ± 4.38. The mean for age in the study subjects was 59.04 (±13.47) years predominated by age group of 61 – 70 years (31.67%), followed by 51 – 60 years (30%). There were 71-80 years (13.33%), 41-50 years (11.67%) 31-40 years was (7.5%) and <30 years (3.33%). There were 69 males (57.5%) and 51 females (42.5%) in the study.


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Serum Uric Acid Levels in Type 2 Diabetes Mellitus Subjects

<table>
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<tr>
<th>Uric acid (mg/dl)</th>
<th>Serum creatinine (mg/dl)</th>
<th>Total</th>
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<tr>
<td>&lt;7.4</td>
<td>≥1.3</td>
<td>21</td>
</tr>
<tr>
<td>≥7.4</td>
<td>≥1.3</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
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\( \chi^2 = 11.58; \text{DF}=1; \text{p}<0.001 \)

<table>
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<th>Uric Acid (mg/dl)</th>
<th>HbA1c (%)</th>
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<td>&lt;6.5</td>
<td>≥6.5</td>
<td>18</td>
</tr>
<tr>
<td>≥7.4</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
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\( \chi^2 = 18.98; \text{DF}=1; \text{p}<0.001 \)

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<th>Twenty four hour urinary albumin (mg/dl)</th>
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<td>&lt;30</td>
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<td>30 – 300</td>
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<tr>
<td>&gt;300</td>
<td>20</td>
</tr>
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\( \chi^2 = 7.357; \text{DF}=2; \text{p}=0.025 \)

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<td>100 – 125</td>
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</tr>
<tr>
<td>&gt;125</td>
<td>8</td>
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<td>Total</td>
<td>23</td>
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\( \chi^2 = 7.03; \text{DF}=2; \text{p}=0.004 \)

<table>
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<tbody>
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<td>7</td>
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<tr>
<td>140 – 199</td>
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<tr>
<td>&lt;200</td>
<td>7</td>
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<tr>
<td>Total</td>
<td>36</td>
</tr>
</tbody>
</table>

\( \chi^2 = 6.79; \text{DF}=2; \text{p}=0.033 \)

**Table-1: Association between uric acid levels with Serum creatinine, HbA1c, FBBSL and PPBSL**

**Figure-1: Association between uric acid levels with serum creatinine, HbA1c and twenty hour urinary albumin**

(77.50%) had elevated fasting blood sugar levels (>126), some (11.67%) had fasting blood sugar levels of less than 100 mg/dl while few (10.83%) had between 100-125 mg/dl range. The postprandial blood sugars (PPBS) of the subjects had mean of 274.94 ± 108.66 mg/dl. Significant number of subjects (70.83%) had raised PPBS (>200 mg/dl), some (17.50%) had PPBS of 140–199 mg/dl while few (11.67%) had less than 140 mg/dl. The subjects in present study had mean HbA1c levels of 8.15 ± 1.7 major number of subjects (51.67%) had levels of more than 8.1, some (20%) had controlled sugars with levels of less than 6.5, while others had levels of 7.1-7.5 (11.67%), 7.6 - 8 (9.16%) and 6.5 - 7 (7.50%).

The uric acid of majority number of present study participant males (65.22%) had level of ≥7.4, rest (34.78%) had levels of 3 – 7.4. The uric acid of maximum number of our study participant females (80.39%) had level of ≥6.3, rest (19.61%) had levels of 2.1 – 6.3. Uric acid levels had a mean of 9.53 ± 4.38.

Mean blood urea and serum creatinine levels were 46.91 ± 15.13 and 1.44 ± 0.29 respectively. Blood urea of majority number of subjects (95.83%) had values of more than 26 mg/dl; few (4.17%) had values of 10–26 mg/dl. Maximum number of the study subjects (58.33%) had creatinine levels of 1.3 – 2, rest (41.67%) had levels of 0.6 – 1.3. Majority (81.67%) of the study participants had twenty four hour urinary albumin in the range of microalbuminuria (30-300 mg), some (10%) had macroalbuminuria (>300 mg) while few (8.33%) had levels of <30 mg. The mean twenty four hour urinary albumin in our participants was 129.26 ± 78.90 mg/dl. The significant number (41.67%) of our study subjects had urine albumin negative (nil / 0); 35% had 1+, 15.83% had 2+ and 7.50% had 3+ urine albumin.

In present study, significant association was seen between the serum creatinine and uric acid levels (p<0.001), we observed that with elevated serum creatinine levels of the subjects, there was also increase in uric acid levels (fig-1). Significant association was seen between twenty hour urinary albumin and uric acid levels (p = 0.025), with increase in uric acid levels, we observed that microalbuminuria was significant. Similarly, highly significant association was seen between HbA1c and uric acid levels in present study (p < 0.001). There was significant association seen between fasting blood sugar levels and uric acid levels in the study (p=0.004). High uric acid levels were seen more in subjects with raised fasting blood sugar level and similarly it was significant between PPBS levels and uric acid levels in present study. (p=0.033) (table-1).

**DISCUSSION**

Current study observed effects of uric acid levels in type 2 Diabetes mellitus and its correlation with creatinine and microalbuminuria. The age group wise distribution in the study observed mean age 59.04 years ±13.47 years. Majority subjects were from age group of 61–70 years (31.67%). The study by Saeed et al observed mean age 57 ± 8.3 years. There were (57.50%) males and (42.50%) females in present study. Prabhuswamy et al, Prashant et al quoted there were predominant males in their study similar to present study.

Mean fasting blood glucose was found to be 186.10 ± 77.53 mg/dl. Majority number of subjects (77.50%) had high fasting blood sugar levels. The study by Talwar et al had...
The post prandial blood sugars of the subjects had mean of 274.94 ±108.66 mg/dl. The study by Talwar et al had mean of 273.91 ±32.59 similar to the current study. The uric acid of majority number of present study participant females (80.39%) had level of ≥ 6.3, rest (19.61%) had levels of 2.1–6.3. Mean uric acid levels in a study by Talwar et al was seen to be 3.93 which is lower than the current study among females.

Blood urea of majority number of subjects (95.83%) had values of more than 26 mg/dl, few (4.17%) had values of 10 – 26 mg/dl. The study by Prabhuswamy et al had mean urea level of 22.28 which is lower than the current study. Majority of the study subjects (58.33%) had creatinine levels of 1.3 – 2, rest (41.67%) had levels of 0.6 – 1.3. The study by Prabhuswamy et al had mean creatinine level of 0.805 which is lower than the current study. Majority (41.67%) number of our study patients had urine albumin negative (nil / 0). Some (35%) had urine albumin level of 1, rest had levels of 2 (15.83%) and 3 (7.50%).

In current study twenty four hour urinary albumin levels were maximum in the range of 30-300 mg/dl levels (81.67%), (10%) had levels of >300 mg, while few (8.33%) had levels of <30 mg. The study by Suryawanshi et al saw increased microalbuminuria in diabetics as seen in the current study. The study by Wen CP et al had lower levels of microalbuminuria in contrast to the current study. There was highly significant association seen between Urine albumin and Uric acid levels of the study participants (p<0.001), with increasing levels of urine albumin along with increased uric acid levels. Similar findings were seen in a study by Prabhuswamy et al and Barkha Goyal et al. Significant association was seen between twenty four hour urinary albumin and Uric Acid levels (p = 0.032), with increasing uric acid levels of the subjects, increase in 24 Hr urinary albumin was observed. The study by Prabhuswamy et al findings were similar to the current study where they found correlation between the two. Microalbuminuria is a good predictor of diabetic nephropathy, the earlier it is detected better the chances of preventing further renal damage.

In present study, significant association was seen between the serum creatinine and uric acid levels (p = 0.001), we observed that with increasing serum creatinine levels of the subjects, there was also increase in Uric Acid levels. Many studies saw association with poor glycemic control and creatinine like study by Naveen et al and by Barkha Goyal et al. Uric acid levels also serve as an indicator of cardiac risk, which when raised in the cases of type 2 DM, further adds the cardiac risk which is already there due to diabetes.

The current study saw highly significant association between HbA1c and Uric acid levels (p<0.001). With increasing levels of uric acid observed in subjects with HbA1c levels of ≥ 6.5.

CONCLUSIONS

The present study is predominated by male gender and age group of more than 60 years. Uric acid levels were observed elevated in subjects with high blood sugar levels, as seen on glycemic index. The serum creatinine levels were elevated in subjects who were type 2 Diabetes mellitus with high uric acid levels. About two-third subjects with type 2 Diabetes mellitus with elevated uric acid levels had microalbuminuria. There was positive correlation of uric acid levels with HbA1c. The study population had an elevated uric acid levels with microalbuminuria in type 2 Diabetes mellitus. Hence it is sensible to check uric acid and urine albumin levels in subjects with type 2 Diabetes mellitus to prevent renal complications.

REFERENCES


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