Serum uric acid level and its correlation with HbA1c in type 2 Diabetes Mellitus

Authors

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Abstract

Diabetes Mellitus is a chronic disorder that is associated with cardiovascular complications, renal complications and various types of microangiopathies including metabolic syndrome. Haemoglobin A1C (Hba1c) is a measure of glycosylated haemoglobin over the period 3 months due to the usual lifespan of erythrocytes of 120 days and is used to monitor control of blood glucose levels in patients with DM. Serum Uric acid is the final oxidation product of purine metabolism in the circulation. A cross-sectional, observational study was conducted over a period of six months. 50 patients of more than 18 years of age diagnosed with type 2 Diabetes Mellitus were included in the study and 50 age and sex matched healthy controls were taken. In this study a negative correlation between serum uric acid and HbA1c was observed in patients with type 2 Diabetes Mellitus.

Keywords: Diabetes Mellitus, HbA1c, uric acid.

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]

Haemoglobin A1C (Hba1c) is a measure of glycosylated haemoglobin over the period 3 months due to the usual lifespan of erythrocytes of 120 days and is used to monitor control of blood glucose levels in patients with DM.[²]

Serum Uric acid is the final oxidation product of purine metabolism in the circulation. Elevated serum uric acid levels are associated with increased risk for cardiovascular disease and so the metabolic diseases such as metabolic syndrome and diabetes mellitus[³]. Patients with hyperuricemia are significantly more likely to DM[⁴]. Some study suggests uric acid may be associated with glycometabolic disorders, because of this association between uric acid and glucose metabolic⁵. However, there is not a linear association between uric acid and blood glucose levels. Hyperuricemia in patients with diabetes mellitus type 2 associated with increased risk for diabetic nephropathy[⁶].
Recent studies have demonstrated that serum uric acid levels are higher in subjects with prediabetes and early type 2 diabetes than in healthy controls\(^{[7,8]}\). Hyperuricemia has been also added to the set of metabolic abnormalities associated with insulin resistance or hyperinsulinemia in metabolic syndrome.\(^{4-6}\)

**Material and Methods**

A cross-sectional, observational study was conducted in the Department of Biochemistry, IGIMS, Patna, over a period of six months. 50 patients of more than 18 years of age diagnosed with type 2 Diabetes Mellitus were included in the study and 50 age and sex matched healthy controls were taken. Patients with chronic liver or kidney diseases, cancer, or taking diuretics were excluded from the study.

Statistical analysis was done using MS Excel software. p value <0.05 was taken as statistically significant.

**Result**

There were 40 males and 10 females in the control group with the mean age of 42.5 ± 13.5 years. The mean age of cases were 54.4 ± 11.3 years. The mean HbA\(_1c\) of cases and control were 7.2 ± 1.20 % and 5.5 ± 0.4 % respectively. Uric acid level was found to be 7.4 ±2.4 mg/dl in cases with the creatinine level of 1.20 ± 0.41 mg/dl. The fasting blood glucose level in cases was 138.7 ± 47.4 mg/dl.

**Table 1:** Gender distribution of cases and control

<table>
<thead>
<tr>
<th></th>
<th>cases</th>
<th>control</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>female</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>54.4 ±11.3</td>
<td>42.5 ± 13.5</td>
</tr>
</tbody>
</table>

**Table 2:** Level of different parameters in cases and control

<table>
<thead>
<tr>
<th>parameter</th>
<th>cases</th>
<th>control</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA(_1c)</td>
<td>7.2 ±1.2</td>
<td>5.5 ±0.4</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Uric acid (mg/dl)</td>
<td>7.4 ±2.4</td>
<td>6.3 ±1.9</td>
<td>0.01</td>
</tr>
<tr>
<td>Creat. (mg/dl)</td>
<td>1.2 ±0.4</td>
<td>0.9 ± 0.2</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>BUN (mg/dl)</td>
<td>28.6 ± 10.8</td>
<td>19.9 ± 8.5</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>FBS (mg/dl)</td>
<td>138.7 ± 47.4</td>
<td>96.5 ± 38.3</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

**Discussion**

Over the years, the association between uric acid levels and glucose metabolism has been a hot research topic. A growing number of studies have indicated that there is a bell fit between uric acids and glucose concentrations. Many previous studies have linked uric acid to type 2 diabetes mellitus, but studies linking uric acids to HbA\(_1c\) are scarce. Some studies have observed an increase in Uric acid levels in type 2 diabetes mellitus and our study found that there was no association between HbA\(_1c\) and uric acid level in the subjects.

In this study a negative correlation between serum uric acid and HbA\(_1c\) was observed in patients with type 2 Diabetes Mellitus. Similar findings were seen in the research by Yuliang Cui et al. that is an inverse correlation between uric acid and HbA\(_1c\). Some studies have found that serum uric acid levels are inversely correlated with blood glucose concentration in type 2 diabetes mellitus patients. However Sirsath et al, found a positive correlation of uric acid levels with HbA\(_1c\) in diabetic subjects. Rusdiana et al, found no significant association between HbA\(_1c\) and uric acid levels among the study subjects. High insulin levels may be important factor affecting the correlation between the uric acid and HbA\(_1c\), the same with Fengjiang Wei et al. They found that serum uric acid level is inversely associated with HbA\(_1c\) in Type 2 Diabetes Mellius patients. Walid G Babkir et al showed that in patients with type 2 diabetes mellitus serum uric acid level has an adverse effect on
glycemic control, but the research by V. Pavithra etc. has strongly established an association between uric acid and HbA1c thereby linking uric acid, the end product of purine metabolism to DM.

**Conclusion**

Serum Uric Acid level is inversely associated with HbA1c in patients with type 2 Diabetes Mellitus, but positively correlated with HbA1c in normal subjects. Further studies with larger sample size is required.

**Conflict of Interest:** None

**References**

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