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Association of serum uric acid level and blood pressure in type 2 diabetes mellitus

M Savira\(^1\), Rusdiana\(^2\) and M Syahputra\(^3\)

\(^1\)Department of Physiology, Faculty of Medical, University of Sumatera Utara, Jl. dr. Mansur Kampus USU Medan 20155, Indonesia
\(^2\)Department of Biochemistry, Faculty of Medical, University of Sumatera Utara, Jl. dr. Mansur Kampus USU Medan 20155, Indonesia
\(^3\)Department of Biochemistry, Faculty of Medical, University of Sumatera Utara, Jl. dr. Mansur Kampus USU Medan 20155, Indonesia

Corresponding author: dr.mayasavira@yahoo.co.id

Abstract. Uric acid is an end product of purine degradation in humans and primarily excreted through urine. In adulthood, concentrations rise steadily over time and vary with height, body weight, blood pressure, renal function, and alcohol intake. Uric acid is known as an antioxidant, it has a beneficial role in diseases. Elevated serum uric acid associated with an increased risk of cardiovascular disease. It has been found that elevated levels of uric acid associated with high risks of a complication of type 2 diabetes mellitus and it has a strong association between elevated uric acid levels and obesity, metabolic syndrome, diabetes mellitus, hypertension, cardiovascular and renal disorders. The aim of the study analyzed the association between serum uric acid level and blood pressure in type 2 diabetes mellitus patients. This research is a descriptive analytic research with a cross-sectional design included 50 diabetic subjects aged over 40 years old. Subjects picked by consecutive sampling then we examined the weight, height, waist size, blood pressure, fasting blood sugar, and serum uric acid level. Statistical analysis using chi-square found that there was no significant association between serum uric acid level and systolic and diastolic pressure in type 2 diabetes mellitus patients (p=0.005).

1. Introduction
Uric acid is an end product of purine degradation in humans and is primarily excreted through urine.\(^1\) Uric acid is developed by breaking down purines and by direct synthesis from 5-phosphoribosyl pyrophosphate and glutamine. Serum urate levels vary by age and sex. Mean serum urate values of adult men and premenopausal women are 415 and 360 µmol/L (6.8 and 6.0 mg/dL), respectively. After menopause, values for women increase to approximate those of men. In adulthood, concentrations rise steadily over time and vary with height, body weight, blood pressure, renal function, and alcohol intake.\(^2,3\) Uric acid, as the final oxidation product of purine catabolism, has been associated with various clinical conditions such as diabetes mellitus (DM) and atherosclerotic disease.\(^4\) Elevated serum uric acid has been associated with an increased risk of cardiovascular disease.\(^5,6,7,8,9,10\) Recent studies show that uric acid is a relevant and independent risk factor for kidney disease, particularly in patients with hypertension.\(^9,10,11\) It has been found that elevated levels of uric acid associated with high risks of a complication of type 2 diabetes mellitus. Studies have reported a strong association between elevated uric acid levels and obesity, metabolic syndrome, diabetes mellitus, hypertension, cardiovascular, and renal disorders.\(^12\) Some cardiovascular risk factors, including obesity, hypertension,
Dyslipidemia and the metabolic syndrome are more prevalent in patients with Type 2 Diabetes Mellitus (T2DM) than in those without T2DM.\textsuperscript{13}

Diabetes mellitus is considered a cardiovascular risk equivalent, and cardiovascular disease is the most common cause of death in patients with diabetes mellitus.\textsuperscript{14} Hyperuricemia has recently obtained the attention because it has been reported that it not only plays a major role in the establishment of metabolic diseases but it is also a cardiovascular risk factor. Potential mechanisms by which serum uric acid may directly affect cardiovascular risk include enhanced platelet aggregation,\textsuperscript{14} and inflammatory activation of the endothelium.\textsuperscript{15} Early studies have shown that hyperuricemia, induced by a uricase inhibitor, triggered hypertension and impaired nitric oxide generation in the macula densa, while both hypertension and renal injury are reduced by inducing nitric oxide.\textsuperscript{16,17,18,19} Therefore, this study aimed to analyze the association of uric acid level and blood pressure in type 2 diabetes mellitus patients.

2. Method
This study is descriptive analytic research method with cross-sectional design. It involved 50 subjects. Subjects picked by consecutive sampling. Sample population is all of type 2 diabetes mellitus patients in accordance with the inclusion criteria. They are aged \textgreater 40 years old and cooperative and have a will to join this research by signing agreement sheet after being explained with informed consent and the exclusion criteria which are, using diuretic and/or anti-hypertension medication and in the middle of cancer therapy. This research was approved by Health Research Ethical Committee, Medical Faculty of Universitas Sumatera Utara/ H. Adam Malik General Hospital by No. 263/TGL/KEPK FK USU-RSU/HAM/2017.

First, we examined the weight, height, waist size, blood sugar level (BSL) and serum uric acid level measured by using Antech portable measuring instruments then Blood Pressure measured using NOVA sphygmomanometer. All statistical analyses were done using Microstat Statistical Programme on an IBM compatible computer. Chi-square was used to analyze the association of uric acid level and blood pressure in type 2 diabetes mellitus patients. \(p<0.05\) was considered as significant.

3. Results and Discussions

<p>| Table 1. Baseline characteristic of 50 subjects. |
|---|---|---|</p>
<table>
<thead>
<tr>
<th>N</th>
<th>Mean ± SD</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>50</td>
<td>59.50±8.62</td>
</tr>
<tr>
<td>BMI</td>
<td>50</td>
<td>26.11±3.56</td>
</tr>
<tr>
<td>Waist size</td>
<td>50</td>
<td>140.56±190.30</td>
</tr>
<tr>
<td>FBS</td>
<td>50</td>
<td>199.18±77.63</td>
</tr>
<tr>
<td>TBAC</td>
<td>50</td>
<td>10.73±13.70</td>
</tr>
<tr>
<td>Uric acid</td>
<td>50</td>
<td>6.49±1.70</td>
</tr>
<tr>
<td>Systole</td>
<td>50</td>
<td>133.57±20.72</td>
</tr>
<tr>
<td>Diastole</td>
<td>50</td>
<td>84.45±12.34</td>
</tr>
</tbody>
</table>

The previous studies have found that there was an association of elevated serum uric acid level with hypertension. Many studies showed that uric acid level also associated with cardiovascular morbidity.\textsuperscript{20,21} Animal studies and clinical observations showed direct relation between uric acid and blood pressure in pathogenesis of hypertension.\textsuperscript{22} Studies have reported a strong association between elevated uric acid levels and obesity, metabolic syndrome, diabetes mellitus, hypertension, cardiovascular and renal disorders.\textsuperscript{12}

These studies contradicted with our research that found there was no significant association between serum uric acid level and blood pressure. Another study showed no specific relation between uric acid level with blood pressure also. It concluded that it might happen because uric acid is not an essential risk factor for cardiovascular disease, there are many factors influence the important role in
4. Conclusions

In our study, we have found that there was no significant association between uric acid and blood pressure (p > 0.005).

5. Acknowledgments

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References


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