Description of Serum Uric Acid Levels in Mid Elderly Patients Diagnosed Diabetes Mellitus

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Abstract
Uric acid is a final product of nucleic acid catabolism which its level is frequently suggested to be correlated with glucose metabolism. However, several studies examined serum uric acid (SUA) level – Diabetes mellitus (DM) association are not consistent. The present study was undertaken to describe SUA levels in mid elderly patients diagnosed DM at hospital-X Cimahi City, West Java Province. This was a descriptive study, involving 30 patients diagnosed DM, without shorting out of under treatment patients or newly diagnosed patients. The mid elderly patients were in a range age of 45-59 years old, who were of either sex and randomly in number. Blood samples were drawn and were investigated for SUA levels. Data of fasting blood sugar was also collected as secondary data, taken from patient’s medical record. The values were described to fasting blood glucose (FBG) levels, with several parameters involved. As much as 3.3% patients had serum uric acid levels lower than normal range, 66.7% in the range, and 30% higher than normal range level. Although normal SUA level group were dominant, the hyperuricemia group were also significant. The result of total data found no association between SUA levels with FBG levels with p-value > 0.05. This condition might be caused by several parameter involved, such as DM time period and DM therapy. The notion is proposed based on observed data showing 77.8% of patients with hyperuricemia were undergoing insulin therapy, which is confirmed by SUA level – therapy type association with p-value of 0.034. Furthermore study shows firm association between FBG level and UA level of insulin therapy patients only, with p-value of 0.01. Therefore, further experiment affirming insulin therapy – UA level association with comprehensive data is required.

Key words: diabetes mellitus, serum uric acid, mid elderly patient, therapy.

Introduction
Most Indonesian people are in productive age mostly until they reach 56-65 years old. While mid elderly stage is the crucial productive phase mostly facing issues of gout(Bolzetta et al., 2013). Gout is a medical condition of acute inflammatory arthritis, with symptom as red, tender, hot, and swollen joints(Jin, 2012). Hyperuricemia (uric acid level above normal) is the valuation of gout. Although gout and hyperuricemia are not the same thing, but hyperuricemia is considered as the precursor of gout(Choi and Ford, 2008)(Roubenoff et al., 1991). Uric acid as a final product of nucleic acid catabolism are suggested to be associated with glucose metabolism(Yoo et al., 2005). An elevation of uric acid level is one of a risk factor for insulin resistance(Dehghan et al., 2008)(Lippi et al., 2008). However, several studies examined serum uric acid (SUA) level – Diabetes mellitus (DM) association are not consistent(Bandaru and Shankar, 2011)(Kramer et al., 2009)(Kodama S, Saito K, 2009)(Modan et al., 1987). Therefore, the present study aimed (Eliana, 2015)to describe serum uric acid (SUA) levels in mid elderly patients diagnosed Diabetes mellitus (DM), from hospital-X Cimahi City – West Java Province.

Mid elderly people as described by World Health Organization (WHO) are those in between 45-59 years old(World Health Organization, 2013). Patient with Diabetes mellitus was defined as ever diagnosed DM in medical record. In the previous patient examination, DM was defined as fasting glucose blood level ≥126 mg/dL, non-fasting glucose blood level ≥200 mg/dL, or use oral hypoglycemic medication or insulin(PERKENI, 2011).

In this descriptive study, 30 patients diagnosed DM were examined, without shorting out of under treatment patients or newly diagnosed patients. The mid elderly patients were in a range age of 45-59 years old, who were of either sex and randomly in number. Blood samples were drawn and were investigated for SUA levels. Data of fasting blood sugar was also collected as secondary data, taken from patient’s medical record. The values were described to fasting blood glucose.
(FBG) levels, with several parameters involved.

Methods
The present study was undertaken in the Department of Medical Laboratory Technology, Clinical Chemistry Laboratory, in collaboration with Clinical Pathology Department of X-Regional Public Hospital in Cimahi-Indonesia. Data collection process was conducted between February 2017 and March 2017. This was a descriptive study, with population of all mid elderly (in the age group of 45-59 years old) outpatients came to the Hospital in February 2017. The subjects who were included in this study involves 30 patients diagnosed Diabetes mellitus (DM), without shorting out of under treatment patients or newly diagnosed patients, who were of either sex, and randomly in number. Informed consents were taken from all of the subjects who were included in this study. There were no distinction in taking subjects between patients diagnosed type 1 DM and type 2 DM.

Veins blood samples were drawn and were investigated for SUA levels as primary data. Fasting blood sugar level was also collected as secondary data, in which taken from patient’s medical record. Serum uric acid (SUA) levels was estimated by an uric acid enzymatic colorimetric method (Galbán et al., 2001). An examination of uric acid control was done before running sample measurement, using Humatrol with LOT number 0003. As much as 1000µL uric acid reagent was added into tubes containing 25 µL control serum and standard uric acid respectively. An incubation was done for 10 minutes in 37°C, before measurement using MINDRAY BA-88A Photometer at 670nm wavelength. Normal value level for Humatrol was 3.9 – 4.7 mg/dL, while the pathological value level was 8.5 – 10.26 mg/dL. The measurement was conducted in several days, with uric acid control done for each measurement. For serum uric acid assay, as much as 1000 µL uric acid reagent was added into tubes containing 25 µL serum sample and 25 µL standard respectively, which then incubated and read at the same condition with control procedure. Hyperuricemia was defined as serum uric acid levels ≥ 7.2 mg/dL for men and ≥ 6.0 mg/dL for woman. Meanwhile, hypouricemia was defined as serum uric acid levels ≤ 3.5 mg/dL for men, and ≤ 2.6 mg/dL for woman.

The basic characteristics of the sample were described by descriptive statistics. The difference between the SUA level with FBG level and with therapy type were respectively analyzed using Spearmen’s rho correlation test. The difference between FBG level and SUA level of patient with insulin dependent was evaluated using chi square test. All values were interpreted according to a significance level of 95% (CI 95%, P < 0.05). All statistical methods were performed using MS.Excel for Windows 8.1, 2013.

Results
From all thirty mid elderly subjects diagnosed DM of hospital-X, there were 80% women (mean age ± standard deviation 54.3 ± 3.8) and 20% men (mean age ± standard deviation 51.0 ± 5.7). Hyperuricemia prevalence in the observed population was 30% (29.2% of women, 33.3% of men).

In evaluation of serum uric acid level with fasting blood glucose, there was no association founded with p-value > 0.05. Meanwhile, 77.8% of the total patient with hyperuricemia were undergoing insulin therapy (insulin dependent).

Table 2. Data of Participant, Including SUA, FBG, Hypertension, and Therapy

<table>
<thead>
<tr>
<th>No</th>
<th>Name Code</th>
<th>Age</th>
<th>Sex</th>
<th>Hypertension</th>
<th>Serum Uric Acid mg/dL</th>
<th>Notation</th>
<th>Fasting Glucose mg/dL</th>
<th>DM Period (year)</th>
<th>Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>NG</td>
<td>59</td>
<td>F</td>
<td>No</td>
<td>4.94</td>
<td>Normal</td>
<td>155</td>
<td>5</td>
<td>medicine</td>
</tr>
<tr>
<td>002</td>
<td>MA</td>
<td>53</td>
<td>F</td>
<td>No</td>
<td>6.03</td>
<td>Hyperuricemia</td>
<td>161</td>
<td>2</td>
<td>medicine</td>
</tr>
<tr>
<td>003</td>
<td>AK</td>
<td>50</td>
<td>M</td>
<td>No</td>
<td>9.24</td>
<td>Hyperuricemia</td>
<td>84</td>
<td>1</td>
<td>insulin</td>
</tr>
<tr>
<td>004</td>
<td>SM</td>
<td>57</td>
<td>F</td>
<td>Yes</td>
<td>4.01</td>
<td>Normal</td>
<td>110</td>
<td>0.75</td>
<td>medicine</td>
</tr>
<tr>
<td>005</td>
<td>PN</td>
<td>58</td>
<td>M</td>
<td>Yes</td>
<td>7.95</td>
<td>Hyperuricemia</td>
<td>76</td>
<td>4</td>
<td>insulin</td>
</tr>
</tbody>
</table>
According to Diabetes mellitus time period, the study classified SUA data into three group of suffered period which less than 5 years, in between 5-10 years, and more than 10 years. As much as four (44.4%) patient with hyperuricemia had been diagnosed Diabetes mellitus for less than 5 years.

Table 3. Classification of SUA group based on DM time period

<table>
<thead>
<tr>
<th>Diabetes mellitus Time Period</th>
<th>Hypouricemia</th>
<th>Normal</th>
<th>Hyperuricemia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5 Years</td>
<td>1</td>
<td>12</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>5 – 10 Years</td>
<td>0</td>
<td>6</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>&gt; 10 Years</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

In this study, blood glucose level of diagnosed DM patients were controlled by either medicine or insulin therapy, while medicine type was out of study concern. Association possibilities of serum uric acid levels with undertaken therapy type was also evaluated using Spearman’s rho correlation test as shown at table 4.
Table 4. SUA - Therapy Type Correlation Test

<table>
<thead>
<tr>
<th>Spearman's rho</th>
<th>Correlation Coefficient</th>
<th>Uric Acid</th>
<th>Therapy Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uric Acid</td>
<td>Correlation Coefficient</td>
<td>1.000</td>
<td>.388*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.034</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Therapy Type</td>
<td>Correlation Coefficient</td>
<td>.388*</td>
<td>1.000</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.034</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

The result shows middle level correlation between SUA with therapy type carried by the subjects with p-value 0.034 (p < 0.05) and correlation coefficient of 0.38v8.

Although there was no association found on SUA-FBG level of total data, the evaluation continued to see whether there is any therapy effect moreover regarding insulin. Furthermore the statistic shows firm association between FBG level and UA level of insulin therapy patients only, with p-value of 0.01.

**Discussion**

The present study shows there were high number of mid elderly subject diagnosed DM having serum uric acid above normal. Although normal SUA level group were dominant, the hyperuricemia group were also significant. The findings of 30% subjects with hyperuricemia distributed to be more in newly diagnosed DM subjects than in subject undergoing diabetes mellitus more than 10 years.

In total analysis of SUA level and FBG level, there was no association can be found showed by p-value >0.05. This result might occur influenced by variation of therapy type which undertaken by all subjects. This condition might be caused by several parameter involved, such as DM time period and DM therapy. The notion is proposed based on observed data showing 77.8% of patients with hyperuricemia were undergoing insulin therapy. However, the data analysis continue to describe whether insulin plays a role in uric acid content of blood. In previous study examining association between serum uric acid level and insulin level in blood, it was observed correlation of both variable (Gill et al., 2013).

Therefore as a result of subgroup analysis, serum uric acid levels were found to be inversely associated with fasting glucose blood level in mid elderly DM subjects with insulin dependent, with p = 0.01. The observed inverse relation between SUA level and FBG level appeared to be potential findings though was not very consistent in the subgroup analysis by DM time period.

It has been reported previously that the SUA level negatively associated with Diabetes mellitus (Oda et al., 2009)(Nan et al., 2007). H. Nan et al founded an increase in blood glucose level were accompanied by a statistically significant decrease in uric acid level. It was also purposed that hyperinsulinemia and insulin resistance enhance the tubular sodium-hydrogen exchange and facilitates the active absorption of uric acid(Nan et al., 2007). Nevertheless, the mechanism leading to the increase uric acid absorption are not clear.

**Conclusion**

In summary, serum uric acid levels tended to decrease with increasing fasting blood glucose in mid elderly patient diagnosed Diabetes mellitus with insulin therapy. However, relationship between serum uric acid and insulin level in blood of mid elderly DM patient require further investigation.

**Acknowledgment**

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References


