Original article:

Study of serum uric acid level in patients of acute myocardial infarction

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Abstract:

Introduction: Acute myocardial infarction has rapidly emerged as the major contributor towards the increasing morbidity and mortality. This study was done to determine whether raised serum uric acid levels were an independent risk factor for acute MI and to determine its prognostic importance if any.

Material and Method: This hospital based case study was performed in the parent institute. A total of 75 cases of Acute MI were studied. All the subjects were interviewed, examined and investigated as per the predesigned proforma.

Results: Mean SUA for discharged patients was 4.67 ± 1.95 mg/dl and it was 7.1 ± 1.45 mg/dl for the patients who died in the hospital. SUA levels were significantly higher in the patients who succumbed as compared to those who were discharged from the hospital (p = 0.000).

Conclusion: There is correlation between serum uric acid level after acute myocardial infarction and age and body mass index. There is no correlation between smoking status of patients and killips class at the time of admission.

Introduction:

Acute myocardial infarction (AMI) is overwhelmingly the most important form of ischemic heart disease (IHD) which continues to be the leading cause of death in the industrialized and developing countries like India, despite spectacular progress in their prevention, detection and treatment over the last three decades. Acute myocardial infarction has rapidly emerged as the major contributor towards the increasing morbidity and mortality. 1

There is strong & significant association between borderline serum uric acid levels & risk of both coronary heart disease & stroke . 2 Hyperuricemia has been associated with elevated circulating endothelin level and one of the major sites for production of uric acid in cardiovascular system is the vessel wall and particularly endothelium. Uric acid may have direct role in atherosclerotic process because atherosclerotic plaque contains more uric acid than control arteries. Hyperuricemia via purine metabolism may also promote thrombus formation. 3 The relation between uric acid and cardiovascular disease is observed not only with frank hyperuricemia (defined as more than 6mg/dl in women & more than 7 mg/dl in men) but also with uric acid levels considered to be normal but at high range. 3 This study was done to determine whether raised serum uric acid levels were an independent risk factor for acute MI and to determine its prognostic importance if any.

Material and Method:

This hospital based case study was performed in the parent institute. A total of 75 cases of Acute MI were studied. All the subjects were interviewed, examined and investigated as per the predesigned proforma. The study was approved by the institutional Ethics committee.
Selection of cases: Patients more than 18 years of age diagnosed to have acute MI who presented to hospital within 24 hours of onset of symptoms were included in the study. Acute MI was defined as, 'increased myocardial enzyme concentrations with typical chest pain persisting more than 30 minutes or electrocardiographic changes (including ischemic ST-segment depression, ST-segment elevation or pathologic Q waves). Increased enzyme concentrations were defined as peak creatine phosphokinase level more than 2 times upper limit of normal.' Patients with a condition known to elevate uric acid level e.g. chronic kidney disease, gout, haematological malignancy and hypothyroidism were excluded. Patients receiving drugs affecting serum UA levels (diuretics, ethambutol, pyrizinamide, salicylates, losartan, allopurinol, probenecid, atorvastatin, fenofibrate), Chronic alcoholics

Serum uric acid
Principle: Serum UA was measured with the Uricase Method\textsuperscript{99,100,101}. Uricase converts UA to allantoin and hydrogen peroxide. Hydrogen peroxide further reacts with a phenolic compound and 4 aminoantipyrine by the catalytic action of peroxidase to form a coloured dye complex. Intensity of the colour formed is directly proportional to the amount of UA in the sample. The following chemical equation describes this method.

\begin{align*}
\text{Uric acid} + \text{O}_2 + \text{H}_2\text{O} & \rightarrow \text{Uricase} \rightarrow \text{Allantoin} + \text{H}_2\text{O}_2 + \text{CO}_2 \\
\text{H}_2\text{O}_2 + 4 \text{ aminoantipyrine} + \text{phenolic compound} & \rightarrow \text{Quinoneimine dye} + \text{H}_2\text{O}
\end{align*}

Results:
| TABLE 1 COMPARISON OF SERUM URIC ACID ON DAY 0, 3, 7. |
|-----------------|-----------------|
|                  | N               | P-VALUE |
| PAIR 1 UADO & UAD3 | 75              | 0.820   |
| PAIR2 UADO & UAD7  | 74              | 0.466   |
| PAIR3 UAD3 & UAD7  | 69              | 0.363   |

None of the P value was significant
From table 6 it is observed that there is no correlation between serum uric acid levels on day 0 and day 3, day 3 and day 7, day 0 and day 7.
TABLE 2 CORRELATION OF SERUM URIC ACID LEVEL ON DAY OF ADMISSION WITH AGE OF PATIENTS.

Paired t-test.

<table>
<thead>
<tr>
<th>MEAN±SD</th>
<th>AGE</th>
<th>UA-DO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>55.92 ± 1238</td>
<td>5.24 ± 1.53</td>
</tr>
</tbody>
</table>

P =(<0.05) by using paired t-testso there is significant correlation between serum uric acid on day of admission and age of patients. Serum uric acid concentrations are higher in higher age group of patients.

TABLE 3 RELATION BETWEEN SUA AND MI OUTCOME

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Discharge (n=69)</th>
<th>Death (n=6)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MeanSUA±SD (in mg/dl)</td>
<td>4.67 ±1.95</td>
<td>7.1 ±1.45</td>
<td>0.000</td>
</tr>
<tr>
<td>Range (in mg/dl)</td>
<td>3.2-7.8</td>
<td>5.8-9.6</td>
<td></td>
</tr>
</tbody>
</table>

Mean SUA for discharged patients was 4.67 ±1.95 mg/dl and it was 7.1 ±1.45 mg/dl for the patients who died in the hospital. SUA levels were significantly higher in the patients who succumbed as compared to those who were discharged from the hospital (p = 0.000).

Discussion:

In our study, there were 17 cases with previous history of IHD. It was observed that mean SUA level in cases with previous IHD was significantly higher as compared to those without previous IHD. (On applying CHI-SQUARE, P VALUE - SIGNIFICANT(<0.05))

This finding is in correlation with the observation found in Japanese Acute Coronary Syndrome Study conducted by Kojima Set al (2005) and M. Y. Nadkar& et al (2008) Correlation of SUA with MI outcome: In the present study, the mean SUA for discharged patients was 4.80 ± 1.25 mg/dl and it was 7.94 ± 0.36 mg/dl for the patients who died in the hospital during 7 days of hospital stay. SUA levels were significantly higher in the patients who succumbed as compared to those who were discharged from the hospital (p = 0.000).150

Relationship between SUA and severity of heart failure following acute MI: Killip's classification is indicator of severity of heart failure. There was a correlation between serum uric acid level and Killip's class on day of admission (p=0.000).
In our study serum uric acid levels correlate with severity of cardiac failure. There was statistically significant correlation found between serum uric acid level and Killip's class on day 4 (p=0.000) and day 7 (p=0.000). Patients of Killip's class III and IV had higher levels of uric acid as compared to patients of class I and II. Out of 75 patients, 6 expired during 7 day follow up. All the patients who died had SUA level more than 7.0 mg/dl.

**Conclusion:**

There is correlation between serum uric acid level after acute myocardial infarction and age and body mass index. There is no correlation between smoking status of patients and Killips class at the time of admission. There is no correlation between serum uric acid level after acute myocardial infarction and sex, diabetic status, hypertension. Serum uric acid levels were high in the patients who died in the seven day follow up period and the patients who died were also in higher killip's class.

**References:**