Role of Serum Uric Acid as a Marker of Short-Term Mortality in Acute Myocardial Infarction

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ABSTRACT

Introduction: Serum uric acid has been shown to be an independent predictor of morbidity and mortality in the general population and in patients with heart failure. However data is limited on its role as predictor of short tern mortality among the patients with acute myocardial infraction (AMI). Study aimed to evaluate the role of serum uric acid as a marker of short-term mortality in Acute Myocardial Infarction

Material and Methods: Sixty patients with AMI were studied prospectively in Department of Medicine/ Department of Cardiology, JA Group of Hospitals from2016 -2018. Serum uric acid was measured on day 1, day 3 and day 5 and was compared with the established risk factors including hypertension, diabetes mellitus and lipid parameters. Serun uric acid was also compared with mortality.

Results: Serum uric acid was significantly decreased from day 1 (7.03±2.86) to day 3 (5.89±2.35) and day 5 (4.91±1.71) ($p<0.001$). No significant changes in patients with and without hypertension was noted ($p=0.854$). A decreasing tread was observed from day 1 to day 5 in both with and without diabetes patients ($p=0.002$). Patients who expired had significantly higher uric acid level as compared to patients who had survived ($p<0.001$). Lipid parameters had no relation with the serum uric acid levels at Day 1, Day 3 and Day 5 ($p>0.05$).

Conclusion: Serum uric acid level can be used as a marker of short-term mortality in acute MI, and hyperuricemia may be an indicator of poor prognosis. Serum uric acid levels were elevated in acute MI patients with diabetes mellitus.

Keywords: Serum Uric Acid, Diabetes Mellitus, Hypertension, Lipid

INTRODUCTION

Epidemiological studies have shown that uric acid may be a risk factor for cardiovascular diseases. Elevated serum uric acid is highly predictive of mortality in patients with heart failure in coronary artery disease. Clinical studies have proved that serum uric acid is significantly associated with cardiovascular disease.[1]

Hyperuricemia has shown a significant association with risk factors including hypertension, diabetes, dyslipidemia, and obesity for the development of coronary heart disease (CHD).[2] Adverse effects of elevated serum uric acid can alter the cardiovascular health. In one previous study the odds ratio for CHD was 2.59 for patients with uric acid levels >9 mg/dL.[4,3]

Hyperuricemia after AMI was associated with the development of heart failure. One study reported that with every 1 mg/dL increase in serum uric acid level is associated with a 26% increase in mortality.[4] Hence in present study we tried to evaluate the role of serum uric acid as a marker of short-term mortality in AMI.

MATERIAL AND METHODS

A prospective cross sectional study was performed on 60 patients diagnosed as a case of acute myocardial infarction (STEMI, NSTEMI) on the basis of clinical history, examination, ECG changes, biochemical marker, and admitted in ICCU in Department of Medicine/ Department of Cardiology, J.A. Group of Hospitals from 2016 -2018.

In all the cases written informed consent was obtained from each subjects. Institutional Ethics Committee approval was obtained before starting the study.

The patients included in the study were selected consecutively among those admitted with acute STEMI having resting chest pain lasting more than 30 min, typical ischemic ST elevation in electrocardiogram (ECG) leads and rise of serum cardiac enzymes concentration (CK-MB and Troponins). We excluded patients who did not receive thrombolytic therapy during the first six hours after the onset of chest pain, were in cardiogenic shock, had previous pacemaker implantation, had a recent myocardial infarction (<3 months), had severe valvular disease, had impaired renal function (serum creatinine level >1.5 mg/dl) and was a known cases of hypothyroidism, malignancy, gout or other inflammatory diseases and were using corticosteroid or cytotoxic drugs.

Investigations including routine haemogram (Hb, total leucocyte count, differential count), renal function test, blood sugar (random, and/or fasting, post prandial), 12 leads electrocardiogram, troponin T or troponin I, serum uric acid (on day 1, 3, 5), lipid Profile and liver function tests were performed and results were recorded. Normal serum uric acid level was considered as 2.4-6.0 mg/dL (female) and 3.4-7.0 mg/dL (male).

All the data analysis was done using IBM SPSS ver. 20

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Software. Cross tabulation and frequency distribution was used to prepare tables. Microsoft office 2010 was used to prepare the graphs. Paired sample t test and one way ANOVA was used to compare the mean whereas categorical data was compare using Chi square test. Level of significance was assessed at 5%.

RESULTS

Majority of the subjects in case (28.3%) belonged to age group of 51-60 years. Majority of the patients were males (65%). Most common complaint of patients was chest pain (86.7%).

A decreasing trend was noted from day 1 to day 5 in uric acid level that means at day 1 (7.03±2.86) a significantly higher uric acid level was observed as compared to lower uric acid level at day 3 (5.89±2.35) and day 5 (4.91±1.71) (p<0.001) (table-1).

Comparison of uric acid level at Day 1, Day 3 and Day 5 in AMI patients with and without hypertension showed no significant mean uric acid level across all days of follow up (p=0.854) (table-2).

Comparison of serum uric acid level of Day 1, Day 3 and Day 5 among the patients with and without diabetes showed that mean uric acid level was significantly higher among non-diabetic patients in day 1 (6.22±2.18 vs 7.23±3.00 in with and without diabetes respectively), day 2 (6.07±2.47 vs. 5.19±1.65 in with and without diabetes respectively) and day 5 (4.99±1.73 vs 4.58±1.71 in with and without diabetes respectively) (p=0.002). A decreasing trend was observed from day 1 to day 5 in both with and without diabetes patients (table-3).

Patients who expired had significantly higher uric acid level as compared to patients who had survived (p<0.001) (graph-1).

In present study we analysed the lipid parameters with uric acid level using person correlation we found that lipid parameters had no relation with the serum uric acid levels at Day 1, Day 3 and Day 5 (p>0.05) (table-4).

Serum uric acid	N	Mean	Std. Deviation	P value
Day 1	60	7.03	2.86	<0.001
Day 3	60	5.89	2.35	
Day 5	59	4.91	1.71	

Table-1: Showing Serum uric acid level at day 1 to day 5

Hypertension	Day 1	Day 3	Day 5	P value
No	7.09±3.02	5.94±2.46	4.92±1.75	0.854
Yes	6.62±1.63	5.58±1.42	4.80±1.60	
Total	7.03±2.86	5.89±2.35	4.91±1.71	

Table-2: Comparing day wise uric acid level with hypertension status

Diabetes mellitus	Day 1	Day 3	Day 5	P value
No	7.23±3.00	6.07±2.47	4.99±1.73	0.002
Yes	6.22±2.18	5.19±1.65	4.58±1.71	
total	7.03±2.86	5.89±2.35	4.91±1.71	

Table-3: Comparing day wise uric acid level with diabetes mellitus status

Lipid parameters		Day 1	Day 3	Day 5
TC	Pearson Correlation	-.102	-.058	.009
	P value	.439	.659	.944
TG	Pearson Correlation	.092	-.025	.137
	P value	.484	.849	.300
LDL	Pearson Correlation	.070	.089	.013
	P value	.594	.501	.924
HDL	Pearson Correlation	-.188	-.064	-.019
	P value	.150	.629	.889
VLDL	Pearson Correlation	-.197	-.187	-.226
	P value	.131	.152	.085

Table-4: Correlating day wise serum uric acid level with lipid parameters

IHD	Mean	N	Std. Deviation	P value
No	6.22	40	2.33	0.001
Yes	8.65	20	3.18	
Total	7.03	60	2.86	

Table-5: Correlation of history of Previous MI and Serum uric acid Level

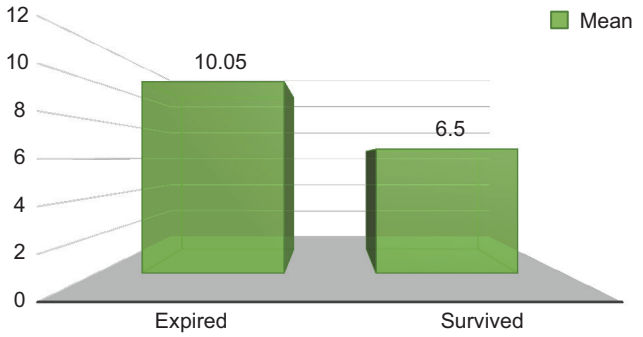

Figure-1: Correlations between Serum uric acid and outcome of the patients

Mean serum uric acid level was significantly higher among the patients who had IHD(8.65±3.18) as compared to patients who had no IHD(6.22±2.33) (p<0.001) (table-5).

DISCUSSION

Previous studies have shown that high serum uric acid is associated with higher risk of type 2 diabetes, independent of obesity, dyslipidemia, and hypertension. When we compared the uric acid level of Day 1, Day 3 and Day 5 among the patients with and without hypertension, we found that mean uric acid level was comparable across all day's of follow up (p=0.854). Harris et al reported that among the 100 study subjects, 58% were hypertensives and 71% were diabetic and hypertensive patients had more hyperuricemia and there was significant relation between serum uric acid level (p =0.040 on day1, p =0.004 on day 3 and p<0.001 on day 5) in patients who were known or found to be hypertensive on admission.[5]

When we compared the uric acid level of Day 1, Day 3 and Day 5 among the patients with and without diabetes, we found that mean uric acid level was significantly higher non diabetic patients in day 1 (6.22±2.18 vs 7.23±3.00 in with and without diabetes respectively), day 2 (6.07±2.47 vs. 5.19±1.65 in with and without diabetes respectively) and day 5 (4.99±1.73 vs 4.58±1.71 in with and without diabetes respectively) (p=0.002). A decreasing trend was observed from day 1 to day 5 in both with and without diabetes patients. Harris et al reported that 71% subjects were diabetic in our study and the serum uric acid level was significantly associated with diabetes mellitus (p= 0.003 on day 1; p= 0.001 on day 3 and p= 0.002 on day 5).[5] Beheraet al reported that there was significant difference in mean serum uric acid levels between diabetic and non-diabetic patients [p=0.03].[1] Patients who expired had significantly higher uric acid level as compared to patients who had survived (p<0.001). In line with that Chowdary et al reported that all patients who died had serum uric acid level >7.0 mg/ dL (P=0.041).[6] That means, there was a significant association between serum uric acid level and mortality. Similarly, another study by Siniša Car et al found that higher serum uric acid determined on admission was associated with higher in-hospital and 30-day mortality, and poorer long-term survival after acute MI.[7] In present study when we analyzed the lipid parameters with uric acid level using person correlation we found that lipid parameters had no relation with the serum uric acid levels at Day 1, Day 3 and Day 5 (p>0.05). It may be due to the sample sample size in present study.

In agreement to present study Beheraet al reported that there was no significant difference in mean uric acid level between the patients of increased triglyceride concentration and normal triglyceride concentration.[1] Contrary to present study Li et al assessed the clinical value of serum uric acid levels in patients with acute ST-elevation myocardial infarction (STEMI) and reported that SUA levels were correlated positively with serum TG levels (r=0.11, P=0.018), but correlated negatively with HDL-C levels. Serum TG levels were significantly higher in patients with hyperuricemia compared with controls (2.11±1.24 vs. 1.78±1.38, P =0.014). The levels of HDL-C were lower in nonhyperuricemia patients, but there was no significant difference (1.00±0.29 vs. 1.02±0.35, P=0.476).[8]

Kojima et al in their study conducted in Japan noted that hyperuricemia after AMI is associated with the development of heart failure.[9] However, Julaarattanapornet al noted that there was no observed association between hyperuricemiaand in-hospital adverse outcomes.[10] Bickel C et al reported that one mg/dl increase in serum uric acid levels was associated with a 26% increase in mortality.[4] Siniša Caret al in their study found that higher serum uric acid determined on admission is associated with higher in-hospital mortality and thirty-day mortality and poorer long-term survival after AMI.[7] which is in line with the present study findings where higher serum uric acid levels were associated with the mortality.

CONCLUSION

Based on the present study findings it can be concluded that high serum uric acid levels increasesrisk of short term mortality in patients with AMI. It was found that serum uric acid levels were elevated in AMI patients with systemic hypertension and diabetes mellitus. Hence, Serum uric acid level is an independent predictor of all-cause mortality in patients with AMI.

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