

Clinical Correlation of Role of Uric Acid in Predicting Outcome of Myocardial Infarction

Navdeep Dahiya¹, Seema Seth², Sarda Mukund Shyam³

ABSTRACT

Introduction: Acute myocardial infarction is one of the most predominant causes of mortality worldwide. As early as the 19th century, it was known that high uric acid levels are associated with hypertension. There are some markers indicating unfavourable prognosis in patients with acute myocardial infarction. Amongst which uric acid is one of the marker that has been evaluated widely in research. This study aimed at evaluating any relation between raised serum uric acid level and mortality in patients with acute myocardial infarction

Material and methods: Current study is prospective study comprise of a total of 100 acute Myocardial Infarction patients. These patients were diagnosed by ECG or via Cardiac biomarkers.

Results: When we see the distribution of raised uric acid, we found that abnormal uric acid was in 37% and 34% at Day 1 and Day 4 respectively. The change in the pattern of uric acid from Day 1 to Day 4 was statistically non-significant ($p>0.05$). An attempt was made to compare serum uric acid level on day 1 with Killip class we found that abnormal uric acid was in 71.4% and 63.6% at Day 1 in KILLIP class III and IV respectively. The association was statistically significant ($p=0.001$). Also on correlation of KILLIP class with uric acid at day 4, abnormal uric acid was in 57.1% and 72.7% at day 4 in KILLIP class III and IV respectively.

Conclusion: Our study concludes that in myocardial infarction raised serum uric acid was found, which was statistically significant ($p=0.0001$), this also correlates with the Killip classification. Thus in India where most of the people are belonging to middle and lower middle socioeconomic status can easily be monitored on using raised serum uric acid level as the biomarker for outcome of myocardial infarction.

Keywords: Clinical Correlation, Role of Uric Acid, Predicting Outcome, Myocardial Infarction

INTRODUCTION

Acute myocardial infarction is one of the most predominant causes of mortality worldwide. As early as the 19th century, it was known that high uric acid levels are associated with hypertension. There are some markers indicating unfavourable prognosis in patients with acute myocardial infarction. Uric acid is one of the markers that has been evaluated widely in research.

Uric acid is produced by the enzymatic activity of xanthine oxidase and is the final product of purine metabolism. Xanthine oxidase produces oxidants in this process that may have a role in cardiovascular disease. The role of uric acid as

a risk factor for cardiovascular disease or a prognostic factor is controversial.¹

Increased serum uric acid is significantly associated with the occurrence and mortality of coronary artery diseases. Uric acid could be a marker of adverse prognosis in patients with acute myocardial infarction but there are studies that showed no relation between serum uric acid level and mortality rate²⁻⁴

Some studies suggested that uric acid can cause intracellular stress and inflammation leading to endothelial injury and enhancement of vasoconstrictor effects.¹

This study aimed at evaluating the relation between serum uric acid level and mortality in patients with acute myocardial infarction.

The Killip classification⁵

This is a system used in individuals with an acute myocardial infarction and heart failure taking into account physical examination and the development of heart failure in order to predict and stratify their risk of mortality. Individuals with a low Killip class are less likely to die within the first 30 days after their myocardial infarction than individuals with a high Killip class. Patients were ranked by Killip class in the following way:

Killip class I: Includes individuals with no sign of congestive heart failure.

Killip class II: Presence of an S_3 and/or lung rales.

Killip class III: Pulmonary oedema.

Killip class IV: Cardiogenic shock.

The Killip classification system and mortality rate:

Killip class I: Mortality rate was found to be at 6%.

Killip class II: Mortality rate was found to be at 17%.

Killip class III: Mortality rate was found to be at 38%.

Killip class IV: Mortality rate 67%.

¹Junior Resident, Department of Medicine, Rohilkhand Medical College and Hospital, Bareilly U.P., ²Professor and Head of Department, Department of Medicine, Rohilkhand Medical College and Hospital, Bareilly U.P., ³Junior Resident, Department of Medicine, Rohilkhand Medical College and Hospital, Bareilly U.P., India

Corresponding author: Dr. Sarda Mukund Shyam, Room No. 17 PG and Interns Hostel Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India

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The Killip-Kimball classification has played a fundamental role in classic cardiology, having been used as a stratifying criterion for many other studies. Worsening Killip class has been found to be independently associated with increasing mortality in several studies.

Study aimed to compare Serum uric acid levels with Killip classification in predicting outcome, to evaluate uric acid levels in patients having myocardial infarction and to assess patients presenting in casualty as per Killip's classification

Material and methodology
The present prospective study was conducted in the department of Medicine in Rohilkhand Medical College, Bareilly, Uttar Pradesh from February 2018 to 15th March 2019.

Study group - A total number of 100 patients of Acute Myocardial Infarction admitted in department of Medicine of Rohilkhand Medical College, Bareilly, Uttar Pradesh during the study period were taken.

Informed consent

The patients who fulfilled the selection criteria were informed about the nature of study in detail and a written informed consent was obtained

Prior to the beginning, the study was approved by the Institutional Ethics Committee of Rohilkhand Medical College, Bareilly, Uttar Pradesh

Inclusion criteria

1. Age ≥ 18 years
2. All the patients of Acute Myocardial Infarction admitted within 7 days of presentation during the study period in Rohilkhand Medical College, Bareilly, Uttar Pradesh
3. Both ST segment elevation myocardial infarction (STEMI) and Non-ST segment elevation myocardial infarction (NSTEMI) will be included in the study.

Exclusion criteria

1. Any patient with the history of medical illness known to increase uric acid level were not invited to participate in the study, viz
 - Gout
 - Chronic Renal failure
 - Systemic or local infection
 - Malignancy
 - Repeated Blood Transfusion
 - Hematological disorders
 - Chronic Alcoholism
 - Non Vegetarian
2. Patient with history of intake of- Hyperuricemic drug (Thiazide, Salicylate, Ethambutol, Pyrazinamide, Allopurinol).
3. Impaired renal function (serum creatinine >2 mg/dL).
4. Had an episode of MI within 3 months.
5. Had severe valvular heart disease.

Methods of study

The patients admitted in department of medicine in Rohilkhand Medical College, Bareilly, Uttar Pradesh with symptoms of Acute Myocardial Infarction will be screened

with 12 lead ECG & Trop-T and those fulfilling the inclusion and exclusion criteria of our study will be taken as the study subject. Detailed past history of cases were taken regarding coronary artery disease, pulmonary tuberculosis, diabetes and hypertension.

Hyperuricemia was defined as uric acid level >6 mg/dl in women and >7 mg/dl in men. Serum uric acid level of patients were measured with RANDOX RX imola fully automated biochemistry analyser machine by uricase peroxidase colorimetric method on the day of admission and on the 4th day of hospitalization on the study subjects. Advanced heart failure was defined as Killip class III and Killip class IV and cardiovascular death was defined as death due to acute myocardial infarction(AMI), heart failure or arrhythmia.

RESULTS

Current study was conducted in Rohilkhand medical college and hospital in medicine department. Current study comprise of a total of 100 acute Myocardial Infarction patients. These patients were diagnosed by ECG or via Cardiac biomarkers. More than half of patients were between 40-60 years (54%) followed by >60 (32%) and <40 (14%) years. Out of 100 patients, 83 (83%) were males and 17 (17%) were females accounting a ratio of M Male to Female 4.8:1. Chest pain was most common clinical presentation (89%) and vomiting was least common (17%). Out of 100 patient's 55 (55%) were smokers, 20 (20%) were tobacco chewer, and 20 (20%) were both smoker and tobacco chewers. 5 patients did not give history of any addiction habits.

Fig. 1 shows the distribution of patients according to KILLIP class. We observed that 55 patient (55%) were in Killipclass I, 26 patients (26%) in Killipclass II, 9 patients (9%) in Killipclass III and 10 patients (10%) in Killipclass IV. Killip class I was most common (55%) and class III was least common (9%).

Table-1 shows the correlation of outcome with KILLIP class. Mortality was higher in KILLIP class III and IV. The association was statistically significant ($p=0.01$).

Fig.2 shows the correlation of KILLIP class with uric acid at Day 1. Abnormal uric acid was in 71.4% and 63.6% at Day 1 in KILLIP class III and IV respectively. The association was statistically significant ($p=0.001$).

Table-2 shows the correlation of KILLIP class with uric acid

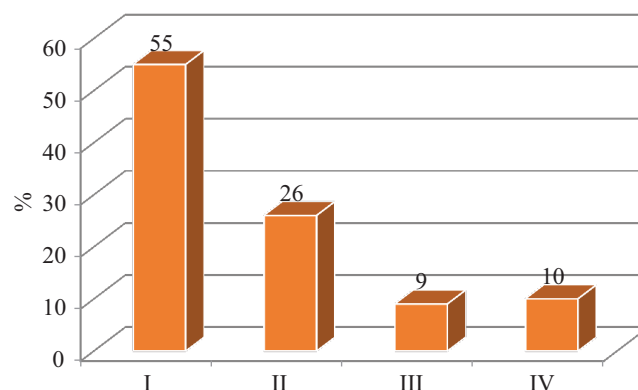


Figure-1: Distribution of patients according to KILLIP class

KILLIP classification	No. of patients	Outcome				p-value
		Expired		Discharged		
		No.	%	No.	%	
I	55	6	10.9	49	89.1	0.01*
II	26	3	11.5	23	88.5	
III	9	4	44.4	5	55.6	
IV	10	4	40.0	6	60.0	

Chi-square test, *Significant

Table-1: Correlation of outcome with KILLIP classification

KILLIP class	No. of patients	Uric acid				p-value
		Abnormal		Normal		
		No.	%	No.	%	
I	51	12	23.5	39	76.5	0.003*
II	24	6	25.0	18	75.0	
III	14	8	57.1	6	42.9	
IV	11	8	72.7	3	27.3	

Chi-square test, *Significant

Table-2: Correlation of KILLIP class with Uric acid at day 4

Uric acid	No. of patients	Outcome				p-value
		Expired		Discharged		
		No.	%	No.	%	
Day 1						0.0001*
Abnormal	37	14	37.8	23	62.2	
Normal	63	3	4.8	60	95.2	
Day 4						0.0001*
Abnormal	34	13	38.2	21	61.8	
Normal	66	4	6.1	62	93.9	

Chi-square test, *Significant

Table-3: Correlation of outcome with Uric acid

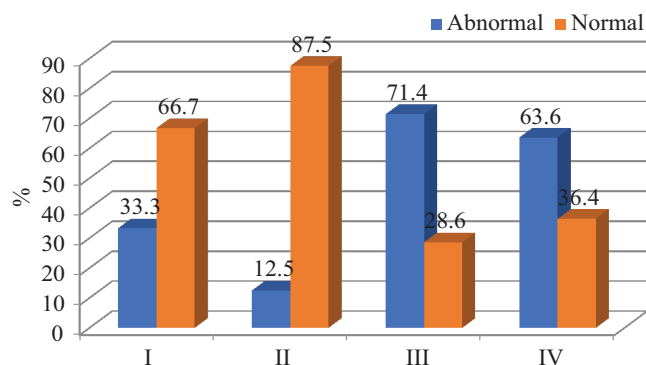


Figure-2: Correlation of KILLIP class with Uric acid

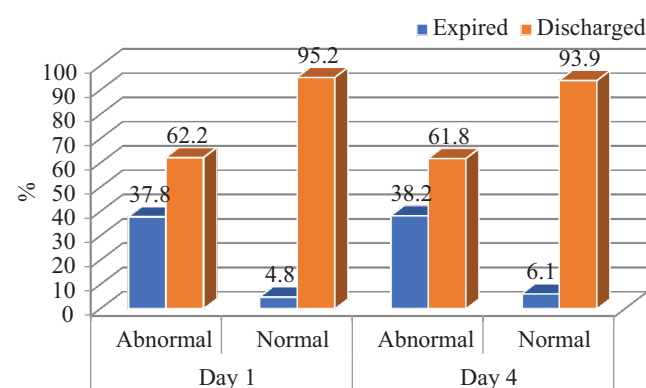


Figure-3: Correlation of outcome with Uric acid

at day 4. Abnormal uric acid was in 57.1% and 72.7% at day 4 in KILLIP class III and IV respectively. The association was statistically significant (p=0.003).

Table-3 & Fig.3 shows the correlation of outcome with uric acid at Day 1 and Day 4. Mortality was higher among abnormal uric acid at both Day 1 and Day 4. The association was statistically significant (p=0.0001).

DISCUSSION

In our study, patient’s age ranged from 26-80 years, maximum number of patients that is 54 (54%) were in the age group 41-60 years followed by age group >60 years which is 32% and below 40 years 14 (14%) patients. There were more cases of myocardial infarction after the age of 40 years as compared to below 40 years of age. This is almost similar to the study done by Shetty et al⁶ and also correlates with study by Omidvar et al.⁷

When we taking gender in to consideration, we observed that males (83%) were more as compared to females (17%). Similar conclusion was drawn by Shetty et al. According to addiction habit out of 100 patients 55 (55%) were smokers and 20 (20%) were tobacco chewer, and 20 (20%) were both smoker and tobacco chewers. 5 patients did not give history of any addiction habits. This is in contrast to the study by ErsanTatli et al⁸ they observed 95% of their patient had

history of smoking. In our study majority of patients were in Killip class I (55%), class II (26%), class III (9%) and only (10%) in class IV. Similar observation was drawn by Nadkar et al⁹ who had maximum cases in Killip class I. However in contrast to this, a study by Shetty et al⁶ who had maximum number of cases in Killip class II.

In our study 14 patients had history of hypertension and were on treatment and 86 patients were normotension. This is in contrast to the study by Shetty et al⁶ where more than 50% of their patients had hypertension. In our study 83(83%) patients were discharged after 4 days and 17 (17%) died during the hospital stay. This is in contrast to the study by Nadkar et al⁹ and Shetty et al.⁶

When we see the distribution of raised uric acid, we found that abnormal uric acid was in 37% and 34% at Day 1 and Day 4 respectively. The change in the pattern of uric acid from Day 1 to Day 4 was statistically non-significant ($p>0.05$). An attempt was made to compare serum uric acid level on day 1 with Killip class we found that abnormal uric acid was in 71.4% and 63.6% at Day 1 in KILLIP class III and IV respectively. The association was statistically significant ($p=0.001$). Also on correlation of KILLIP class with uric acid at day 4, abnormal uric acid was in 57.1% and 72.7% at day 4 in KILLIP class III and IV respectively. The association was statistically significant ($p=0.003$). Kojima et al,¹⁰ Nadkar et al⁹ Shetty et al⁶ have observed similar correlation between serum uric acid level and Killip class. In contrast to this, a study by Jularattanaporn et al¹¹ observed no association between hyperuricemia and Killip class.

In our present small sample study of 100 patients, who were evaluated and compared at various variables, we found that significant correlation was present between abnormal serum uric acid levels with higher Killip class (III and IV) and when mortality was taken in account, elevated levels of serum uric acid was found in expired patients (number -17).

CONCLUSION

It is well established fact that Killip's class have been of great importance in predicting the outcome of patients who had myocardial infarction. Similarly our study concludes that in myocardial infarction raised serum uric acid was found, which was statistically significant ($p=0.0001$), this also correlates with the Killip classification. Thus in India where most of the people are belonging to middle and lower middle socioeconomic status can easily be monitored on using raised serum uric acid level as the biomarker for outcome of myocardial infarction.

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