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Original Research Article

PROGNOSTIC SIGNIFICANCE OF SERUM URIC ACID LEVEL IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION AT TERTIARY CARE HOSPITAL, TELANGANA

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ABSTRACT

Background: Acute myocardial infarction (AMI) is a leading cause of morbidity and mortality worldwide, and early prognostic indicators are essential for managing these patients effectively. Serum uric acid (SUA), a product of purine metabolism, has been suggested as a potential biomarker for various cardiovascular conditions, including AMI. This study aimed to evaluate the prognostic significance of serum uric acid levels in patients with acute myocardial infarction. **Materials and Methods:** A total of 200 consecutive patients aged 18 years and above, who were diagnosed with acute myocardial infarction (AMI) on clinical, electrocardiographic (ECG) at a tertiary care hospital. **Result:** A cohort of AMI patients was studied, with serum uric acid levels measured at admission and their correlation with clinical outcomes, including mortality, complications, and hospital stay length. Elevated serum uric acid levels were associated with worse outcomes, including higher mortality rates, an increased incidence of heart failure, arrhythmias, and a prolonged hospital stay. The study also found that SUA levels were an independent predictor of adverse outcomes in AMI patients, even after adjusting for traditional risk factors such as age, gender, diabetes, hypertension, and cholesterol levels. **Conclusion:** In conclusion elevated serum uric acid levels at admission in patients with acute myocardial infarction may serve as an important prognostic marker for adverse clinical outcomes. Further research is needed to understand the underlying mechanisms and to explore the potential role of uric acid as a therapeutic target in the management of AMI.

INTRODUCTION

Acute Myocardial Infarction is the leading cause of mortality in both developed and developing countries (Rogers WJ et al, Kesteloot H et al,).[1,2]
Acute coronary syndromes are emerging out in epidemic proportions throughout the world. Factors contributing to death following Acute Myocardial Infarction are many.
These factors relate mainly to electrical disturbances in the form of Arrhythmia (Carmeliet E3, Thompson CA4) and mechanical disturbances in the form of pump failure (Qiyao Xu, Mei Zhang Hochman et. al, Bertrand M et. al).[3-5]
Most sudden deaths in Acute Myocardial Infarction occur within one hour due to ventricular fibrillation and also due to left ventricular failure when there is an extensive injury. (Lewis EF et. al).[6]

Rest of the deaths following Myocardial Infarction occur within first one week and death cannot be predicted and occurs suddenly. Hence many trials have been conducted to identify markers that would be helpful to predict the risk of such adverse cardiac events.
Many trials have used serum Magnesium level, (Milionis HJ et al).[7] C-Reactive Protein levels, (Ridker PM, Morrow DA et al).[8] Malonyldialdehyde, white blood cell count as a predictor for mortality and morbidity following Acute Myocardial Infarction and risk of developing adverse cardiac events like sudden cardiac death and congestive heart failure.
Previous studies have established that serum uric acid levels reflect circulating xanthine oxidase activity and oxidative stress production following Acute Myocardial Infarction.

474

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Free radicals produced in large amounts during myocardial ischemia and reperfusion take part in the degradation of cellular and sub-cellular membrane structures. The source of oxygen radicals in ischemic myocardium are Neutrophils recruited into the necrotic region as well as metabolic transformation of Hypoxanthine and Xanthine to Uric acid.

Thus it is evident that elevated Uric acid levels is a good marker of oxidative stress and useful to assess the prognostic events in Acute Myocardial Infarction.

Aim of the Study

1. To assess the prognostic significance of serum Uric acid level in Acute Myocardial Infarction.
2. To correlate levels of Uric acid in terms of short term mortality
3. To correlate serum Uric acid levels with incidence of cardiac failure
4. To validate the relation between Quantitative serum Uric acid level on admission and Killip's class status on Acute Myocardial Infarction.
5. To know whether the incidence of Arrhythmias bears a relation with serum Uric acid level in Acute Myocardial Infarction.

MATERIALS AND METHODS

This study was conducted in the Department of Medicine / Cardiology at Tertiary Care Hospital, Telangana during the period of August 2021 to August 2023. Total number of patients included in this study were 100. There were 78 males 22 females patients ranging from 23 years to 83 years.

Study Design: This study is a prospective study. This study is aimed to assess the prognostic role of serum Uric acid level following Acute Myocardial Infarction and correlating the levels with short term complications.

This study included 100 patients of Acute Myocardial Infarction of which patient who had a normal Uric acid level were taken as a control and the rest who had elevated Uric acid level were taken up as study population.

In both groups the complications and short term outcome were compared.

Inclusion Criteria

Patients with a diagnosis of Acute ST Elevation Myocardial Infarction were entered into the study. A definite diagnosis of Acute ST Elevation Myocardial Infarction was made if the patients satisfied the following criteria:

1. A History of typical retrosternal compressive chest pain lasting for more than 30 minutes, not relieved by rest or nitrates.
2. Typical ECG changes of Acute ST Elevation Myocardial Infarction (ST,T changes in two contiguous leads)

Exclusion Criteria

1. Patients with elevated renal parameters.
2. Patients with Gout.
3. Patients with History of chronic alcoholism.
4. Patients with previous History of Ischemic Heart Disease and on Aspirin therapy.
5. Patients with Diabetes mellitus.
6. Patients on Diuretic therapy.

Above patients were excluded because the coexisting disease or drug therapy might itself produce a high Uric acid level.

Very late presentations of patients more than 72 hours also excluded since uric acid level tends to fall subsequently.

RESULTS

Table 1: Control and study population

Sex	Control Population	Study Population
Male	43 (81%)	35 (74%)
Female	10 (19%)	12 (26%)

Table 2: Killips Class in High Serum Uric Acid Population

Killip Class	1 & II	III & IV
No. of Patients	19	28

Percentage of Patients with
Killip I & II in high serum   =   19 x 100 / 47
Uric acid population   =   40%
Percentage of patients with
High Killip class III & IV in   =   28 x 100 / 47
                                     =   60%

Table 3: Type of Infarction

Type	In High Serum Uric Acid Population	In Normal Serum Uric Acid Population
AWMI	19	18
ASMI	5	11
IWMI	5	12
Infero posterior MI	6	7
IWMI + RVMI	4	3
Lateral wall MI	6	1

Global MI	2	1

Table 4: Heart Failure According to Sex

Total no. of Heart failure patients	Male (%)	Female (%)
41	33 (80%)	9 (20%)

Table 5: Echocardiogram Analysis

Echo findings	In High uric acid patients	In normal uric acid patients
Normal LV systolic function	6	36
Mild LV dysfunction	14	9
Moderate LV dysfunction	13	3
Severe LV dysfunction	3	2
Total	36	50

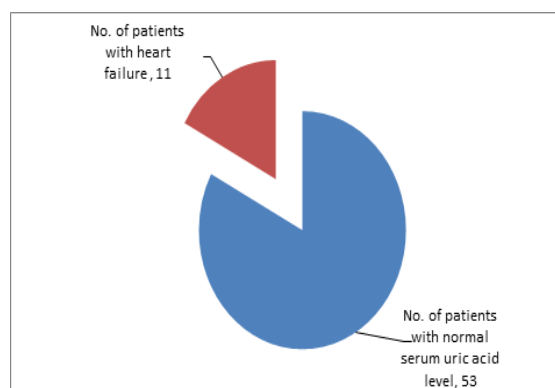**Table 6: Proportion of mortality contributed by patients with normal & high serum uric acid level**

Total No. of deaths	No. of patients with high uric acid level	No. of patients with normal uric acid level
15	12	3

Table 7: Mortality in Age Group

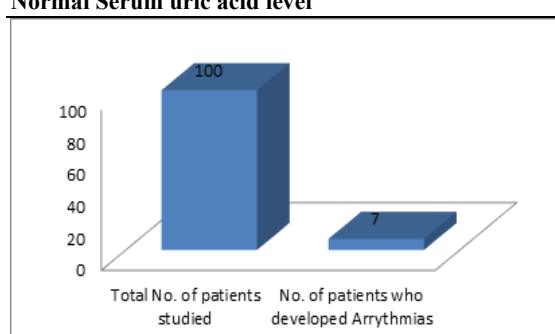| Age	Total No. of patients
41 -50	3
51-60	6
61-70	4
71-80	1
81-90	1
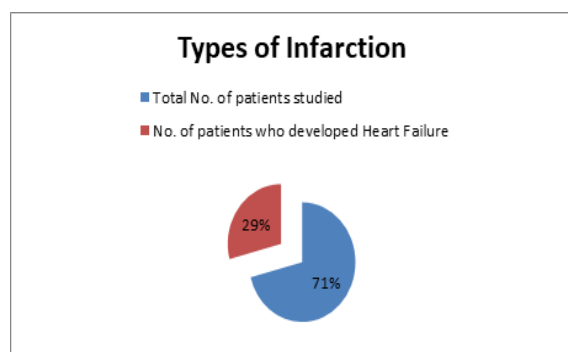
Figure 1: Incidence of Heart failure in Total population
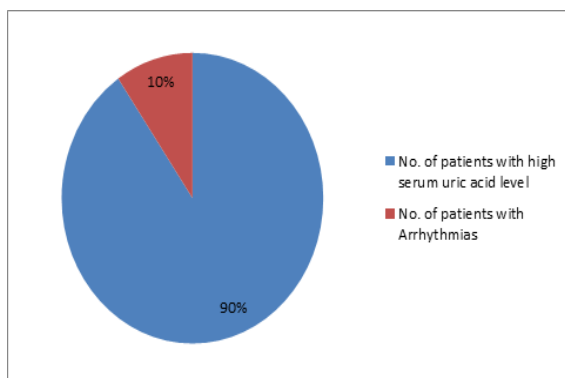

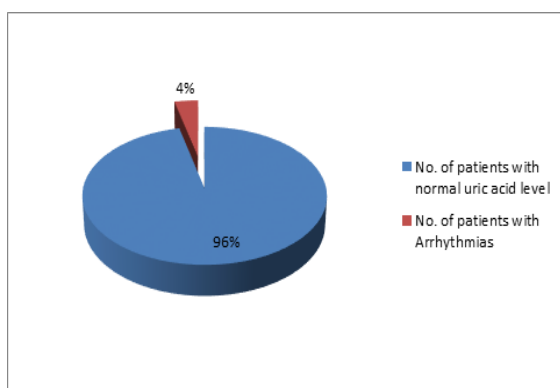**Figure 3: Incidence of Heart failure in patients with Normal Serum uric acid level**
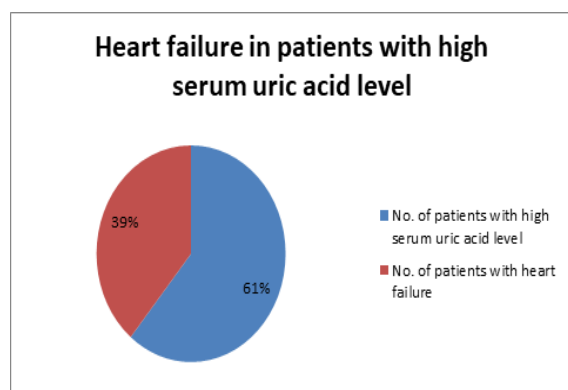
**Figure 2: Incidence of Heart failure in patients with high serum uric acid level**

Figure 4: Incidence of Arrhythmias (in total population)

476

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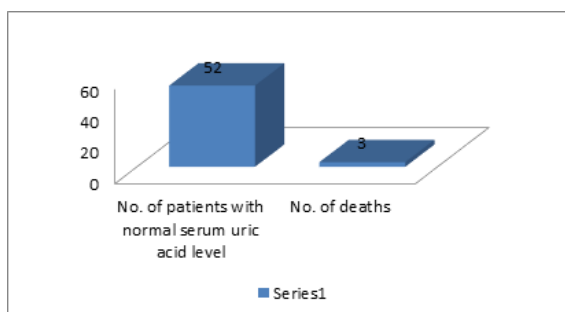ISSN (O): 2687-5365; ISSN (P): 2753-6556

Figure 5: Incidence of Arrhythmias in patients with high serum uric acid level (study group)

Figure 6: Incidence of Arrhythmias in patients with normal serum uric acid level (control group)
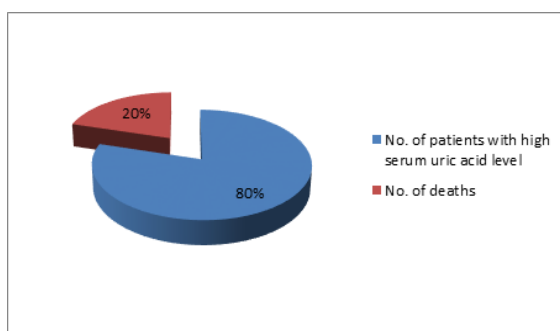
Figure 7: Incidence of mortality in patients with high serum uric acid level

Figure 8: Incidence of mortality in patients with normal serum uric acid level

DISCUSSION

Total number of patients included in this study was100, out of which 47 patients had elevated level of uric acid above normal range following Acute Myocardial Infarction.

Out of the 100 patients 2 patients were in the age group of 21-30 years, 10 patients were in the age group of 31-40 years, 20 patients were in the age group of 41 –50 years, 37 patients were in the age group of 51-60 years, 22 patients were in the age group of 61 –70 years, 7 patients were in the age group of 71-80 years and 2 patients were in the age group of 81 –90 years.

In this study the numbers of male patients were 78, while numbers of female patients were 22. Out of 100 patients studied 53 patients had Normal uric acid level and they were taken up as control. Of which 43 (81%) were males and 10 (19%) were females. The rest 47 patients had elevated uric acid level and they were taken up as study group. Of which 35(74%) were males and 12 (26%) were females. Both were compared with various out comes.

In this study 43 patients presented with Killip class I, 16 patients presented with Killip class II, 18 patients presented with Killip class III, 23 patients presented with Killip class IV. Killip class III & IV were taken as high risk category in this study and evaluated whether high uric acid concentration after myocardial infarction correlated with this high risk Killip class.

Our study correlates with Kojima S, Sakamoto et al,[9] who also showed patients who had high uric acid level belonged to higher Killip class. Hence uric acid can also be used as an predictor of prognosis, but also a predictor of severity.

In this study 37 patients presented with Anterior Wall Myocardial Infarction (AWMI) of which 19 patients had high uric acid level, 16 patients presented with Antero Septal Myocardial Infarction (ASMI), of which 5 patients had high uric acid level, 17 patients presented with Inferior Wall Myocardial Infarction (IWMI), of which 5 patients had high uric acid level, 13 patients presented with Infero posterior wall Myocardial Infarction, of which 6 patients had high uric acid level, 7 patients presented with inferior and Right Ventricular Myocardial Infarction (RVMI), of which 4 patients had high uric acid level, 7 patients presented with Lateral Wall Myocardial Infarction, of which 6 patients had high uric acid level, 3 patients presented with Global Myocardial Infarction, of which 2 patients had high uric acid level.

When areas of infarction and uric acid levels were observed, an increased level of uric acid in Anterior wall Myocardial Infarction was noted. This cannot be taken into statistical account, because the overall incidence of Anterior Wall Myocardial Infarction itself was high.

41 out of 100 patients in this study had Heart failure in the post Myocardial Infarction period. So the incidence of heart failure was 41 %. Of which 33(80%) were males, 8 (20%) were females.

It was observed that among 41 Heart failure patients, 30 patients had high uric acid level and 11

477

patients had normal uric acid level. So patients who had high uric acid level and normal uric acid level contributed to 73% and 27 % respectively to Heart failure.

It was also found that 30 patients out of 47 patients with high uric acid level had Heart failure amounting to an incidence of 64 % Heart failure in this group. While only 11 out of 53 patients with normal uric acid level had Heart failure. i.e. Only 21% of patients with normal uric acid level had Heart failure.

Our study comparable with other studies that showed similar findings and elevated serum uric acid level is an early predictor of short term outcome.

Kojima S. Sakamoto et al,[9] Anker SD, Doehner W etal,[10] Sakai H, T Sutamoto T et. al, Joshua M, Hare MD etal,[11]Virendrasingh, RK Goyal etal,[12] studies support this study. Their studies revealed that serum uric acid level reflects circulatory xanthine oxidase activity and oxidative stress production.

In high uric acid population, 6 patients had normal LV function, 14 patients had mild LV dysfunction, 13 patients had moderate LV dysfunction, 3 patients had severe LV dysfunction.

In normal uric acid level population, 36 patients had normal LV function, 9 patients had mild LV dysfunction, 3 patients had moderate LV dysfunction, 2 patients had severe LV dysfunction.

Patients who had elevated serum uric acid level in the study group showed moderate to severe LV dysfunction (34%). This has correlated with an initial observation of cardiac failure which was 27% in this population.

So serum uric acid level can also be correlated with Echocardiographic cardiac dysfunction later, retrospectively with clinical findings earlier.

So uric acid level can be used as a definite predictor of cardiac failure.

7 out of 100 patients developed Arrhythmias in this study. So the incidence of Arrhythmias was 7% of which 6 (86%) were males, 1(14%) was female. 3 patients had ventricular tachycardia and 4 patients had supra ventricular tachycardia.

It was also found that 5 patients out of 47 patients with high uric acid level had Arrhythmias amounting to an incidence of 11% Arrhythmias in this group. While only 2 out of 53 patients with normal uric acid level had Arrhythmias. i.e. only 4% of patients with normal uric acid level had Arrhythmias.

This observation can be matched with the outcome of a large randomized double blind placebo control clinical trial "Oxypurinoltheraphy for CHF" conducted in 2003. Further studies are needed to conclude.

15 out of 100 patients died due to their cardiac ailments in this study. This amounts to mortality rate of 15% of which 14 (93%) were males, 1(7%) was female.

To find out the prognostic significance of elevated uric acid level following Acute Myocardial Infarction, mortality rate in patients with normal and high uric acid level were separately calculated.

It was observed that among 15 deaths 12 deaths were contributed by patients with high uric acid levels and 3 deaths by those who had normal uric acid levels. Thus 80% of death in post infarction period occurred in those who had a high uric acid level and only 20% in those who had a normal uric acid level.

It was also found that 12 out of 47 patients with high uric acid level died. This implies a mortality rate of 26%.Like wise a mortality rate of 6% was observed for patients with normal uric acid level following Myocardial Infarction.

It this study, 4 patients died on the day of admission, 6 patients died on 2nd day, 4 patients died on 3rd day, 1 patient died on 7th day.

Out of 15 deaths, 3 patients (20%) were in the age group of 41-50 years, 6 patients (40%) were in the age group of 51-60 years, 4 patients (26%) were in the age group of 61-70 years, 1 patient (7%) was in the age group of 71-80 years and 1 patient (7%) was in the age group of 81- 90 years.

Kojima S, Sakamoto et. al., Fang J, Alderman M H et. al,[13] Williamson DF etal,[14]Culleton BF, Lassonmia etal,[15] studies supports this study. This study revealed that patients who developed short term adverse events like mortality following Myocardial Infarction had high uric acid concentrations.

Our study also parallels with previous authors and uric acid can be used as a good predictor of mortality.

CONCLUSION

Measuring serum Uric acid level is one of the predictable prognostic indicator in Acute Myocardial Infarction and one of the early and short term predictor.

A high serum Uric acid level correlated with short term mortality in Acute Myocardial Infarction.

Elevated serum Uric acid is strongly associated with cardiac Arrhythmias as against controls and can be used as an immediate prognostic indicator in Acute Myocardial Infarction.

Elevated serum Uric acid level may be Arrhythmogenic. Further studies require to confirm and to treat.

There is a strong correlation of elevated serum Uric acid and cardiac failure.

Patients with high Uric acid level belonged to higher Killip class status(III & IV) .

Elevated Uric acid level had a objective correlation with Echo cardiographic evaluation of LV dysfunction

Our study is compatible with other studies done with Uric acid as a predictor.

478

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REFERENCES

1. Roger's WJ, Canto JG et.al., Temporal trends in the treatment of over 1.5 million patients with Myocardial Infarction in the US from 1990 through 1999. The national registry of Myocardial Infarction 1,2&3. J.Am.CollCardiol 36 ; 2056;2000.

2. Kesteloot H, Sans S et.al., Evolution of all causes and Cardio vascular mortality in the age group of the 75 to 84 years in Europe during the period 1970-1996: A comparison with worldwide changes. Eur. Heart J 23:384,2002.

3. Qiyao Xu, Mei Zhang et al ,Iruni R. Abeysekera and Xiaolong Wang Saudi Medical Journal June 2017, 38 (6) 577-585; DOI: https://doi.org/10.15537/smj.2017.6.17190

4. Hochman et al., Cardiogenic shock complicating Acute Myocardial Infarction. Circulation 107;2998;2003.

5. Bertrand M, Mc Fadden E , Cardiogenic shock : Is there light at the end of tunnel? J.Am College cardiology 42;1387;2003.

6. Lewis EF, Moye LA et.al., Predictors of late development of heart failure in stable survivors of Myocardial Infarction: The CARE study. J.Am. College cardiology 42 ;1446;2003.

7. Milionis HJ, Alexandrides GE et.al., Hypomagnesemia and concurrent acid base and electrolyte abnormalities in patients with CCF. Eur. J Heart failure. 4 : 167,2002

8. Ridker PM, Morrow DA et.al., C- Reactive Protein, inflammation and coronary risk. Cardiolclin 21:315,2003

9. (Kojima S., Sakamoto, Am .JCardiol . 2005 Aug, Sakai H University of Medical Science, Otsu, Japan, Niizeki T., J. Cardiology 2006 May, Joshua M, Circulation 2003: American Heart Association.

10. Anker S, Doehner W, et.al., Uric acid and survival in chronic Heart failure : Validation and application in metabolic, functional and Hemodynamic staging. Circulation 2003 ; 107;1991-1997.

11. Hare JM. Oxidative stress and apoptosis in Heart failure progression Circ. Res . 89; 198;2001

12. Virendrasingh, RK Goyal et.al., (Journal of the Indian Medical association 1977 Sep 1

13. Fang J, Alderman M H et. al., (Serum uric acid and cardiovascular mortality, JAMA 2000)

14. Williamson DF et.al., (Relation of serum uric acid to mortality and Ischemic Heart disease Am. J. Epidemiol 1995)

15. Culleton BF, Lassonmia et.al, Serum uric acid and risk of cardiovascular disease and death Ann. Intern. Med July 6. 1999.

479

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