Original Research Article

Analysis of Serum Uric acid levels in Acute Myocardial Infarction: A Cross-sectional Study

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Abstract:

Background: Elevated serum uric acid levels are associated with hypertension, heart failure, Diabetes, obesity, metabolic syndrome, stroke, chronic kidney disease and non-alcoholic fatty liver disease. Because of this mutual relationship between uric acid and other cardio vascular risk factors, serum uric acid may have an independent role in the development of coronary artery disease. The potential relationship between the uric acid and coronary artery disease remains a topic of controversy for many years. **Aim**: To estimate and compare serum uric acid levels among acute ST Elevation Myocardial infarction (STEMI) in-patients and healthy individuals. **Materials and methods**: After receiving approval from the Institutional Ethical Committee, the study was conducted among40 patients with Acute STEMI ranging over an age group of 28-80 years diagnosed by Electrocardiograph and 40age and sex matched healthy controls attending the master health check-up department. Blood samples were taken on the day of admission. Serum uric acid levels were assessed according to the standard procedure uricase PAP method. **Results**: Mean serum uric acid level was higher significantly in those with Acute STEMI (7.12±1.8) than in the control group (5.72 ± 1.3 mg/dl: P=0.05) **Conclusion:** Serum uric acid levels were found to be elevated in acute STEMI patients compared to normal controls in our study. Elevated Serum uric acid may have a definite role in various pathologic processes such as increased oxidative stress, endothelial dysfunctions, and inflammation leading to coronary artery disease.

Keywords: coronary artery disease, myocardial infarction, serum uric acid, STEMI

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Introduction :

Elevated serum uric acid level is associated with hypertension, heart failure, metabolic syndrome, stroke, chronic kidney disease, non-alcoholic fatty liver disease, obesity, and diabetes. Because of this mutual relationship between uric acid and other cardio vascular risk factors, the independent role of serum uric acid in the development of coronary artery disease might be a possibility.[1,2] The potential relationship between uric acid and coronary artery disease have been topics of controversy for many years.

Beyond traditional cardiovascular risk factors such as, diabetes mellitus, hypertension hyperlipidemia & smoking, emerging evidence suggests a potential role for serum uric acid (SUA) level in the pathogenesis and prognosis of cardiovascular diseases, including Acute MI. Uric acid, the end product of purine metabolism, has been implicated in various pathophysiological processes relevant to

cardiovascular disease. While historically considered an inert metabolic waste product, elevated SUA levels have been associated with endothelial dysfunction, inflammation, oxidative stress, and platelet activation – all key mechanisms involved in the development and progression of atherosclerosis and acute thrombotic events like acute myocardial infarction.[3]

However, the precise nature of the association between serum uric acid levels and acute myocardial infarction remains a subject of ongoing investigation and debate. Some studies have reported a positive correlation between higher SUA levels and an increased risk or severity of acute myocardial infarction, suggesting a potential pro-inflammatory and pro-thrombotic role.[4] Conversely, other studies have yielded conflicting results, with some even suggesting a potential protective effect of serum uric acid levels in certain contexts. These discrepancies may be attributed to variations in study design, patient populations, comorbidities, and the timing of SUA measurement in relation to the acute event.

Aim and Objectives:

To estimate and compare Serum uric acid levels among Acute ST elevation MI inpatients and healthy individuals.

Materials and Methods:

Study Design: Analytical cross-sectional study

Sample size: 80

Sampling Method: Convenience Sampling

The study was conducted after obtaining approval from the Institutional Ethical Committee. 40 patients with Acute ST Elevation Myocardial infarction (STEMI) ranging over an age group of 28-80 years diagnosed by Electrocardiograph and admitted as in-patients and 40 age and sex matched healthy controls from the master health check-up department were chosen for the study.

Inclusion criteria:

Acute MI Patients diagnosed as STEMI by ECG admitted in CCU in the age group of 28 – 80 years

Exclusion criteria:

- Patients with Non-STEMI, old coronary artery disease
- Gout
- Endocrine disorders
- Chronic renal insufficiency,
- H**/o** Taking Uric acid lowering drugs (allopurinol) and steroids

Blood samples were taken on the day of admission. Serum uric acid levels were assessed according to the standard procedure uricase PAP method.

Statistical analysis:

The data were analysed by using a computerized SPSS/22 program and (P< 0.05) was considered significant accepted. Both chi-squares with fisher exact correlations had been used when needed to measure the strength of associations with Odds ratio.

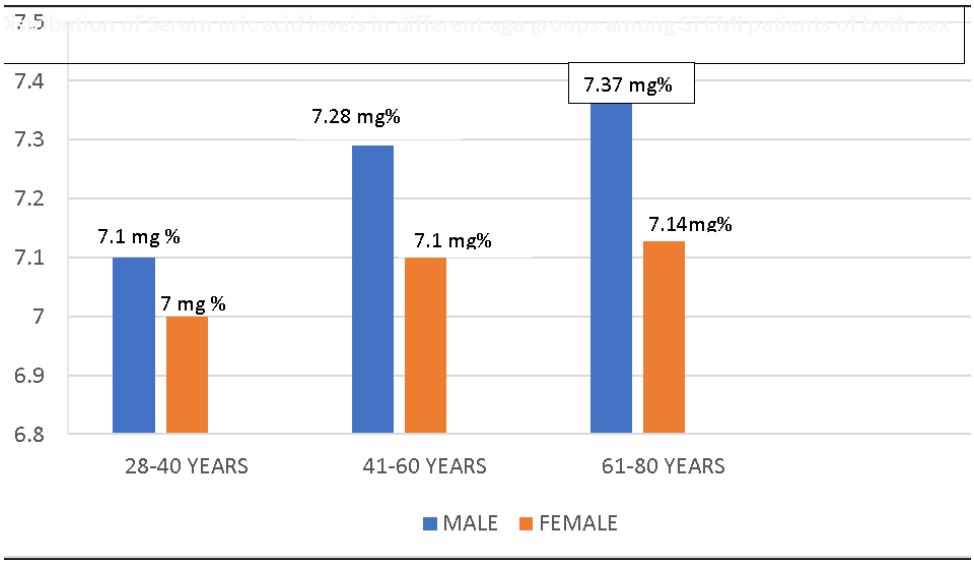
Results :

(Table:1). Mean Serum uric acid level was elevated significantly in STEMI patients ((7.12 ±1.8 mg/dl) compared to normal subjects (5.72 ± 1.3 mg/dl) (P<0.05). Serum uric acid level was observed to be elevated more in males than females in both study groups. Fig:1 shows the distribution of serum uric acid levels at different age groups between both sex in STEMI patients. Age group of 28-40 years shows mild elevation, age group of 41-60 years shows moderate elevation and age group of 61-80 years shows significantly elevated serum uric acid level in males compared to females.

Table 1: Comparison of Serum uric acid levels among the study groups

Variables	Controls (N=40) (Mean± SD)	STEMI Cases(N=40) (Mean± SD)	P Value
Serum uric acid	**5.72 ± 1.3 mg/dl**	**7.12 ±1.8 mg/dl**	**P<0.05***
Male	**5.8±0.58**mg/dl	**7.3±0.90**mg/dl	**<0.005****
Female	**5.6±0.58**mg/dl	**7.13±0.90**mg/dl	**<0.005****

Figure 1: Distribution of Serum uric acid levels in different age groups among STEMI patients of both sexes



Discussion:

Our study showed that Mean concentration of serum uric acid was higher significantly in patients with Acute STEMI than in the control group. This was in accordance with study by Nadkar MY et al and Kanbay et al.[8-12] This was in contrary to the study by Chen L et al.[6]

An elevated level of serum uric acid has been associated with the various pathological processes such as increased oxidative stress, inflammation and endothelial dysfunction.[3,4,5] There are also concerns that elevated uric acid has a pathophysiological role in the development of cardiovascular diseases. Thus, it is not surprising that increased uric acid is associated with various adverse outcomes, including acute myocardial infarction.

The consistent association of elevated SUA with worse outcomes in STEMI patients suggests its potential as a valuable, readily available, and inexpensive biomarker for risk stratification. Integrating SUA levels into risk assessment tools alongside established parameters like Killip class, Left Ventricular Ejection Fraction (LVEF), and Thrombolysis in Myocardial Infarction(TIMI)flow could improve the prediction of in-hospital and short-term mortality and major adverse cardiovascular event.

Further research is needed to elucidate the precise causal mechanisms linking SUA to STEMI prognosis and to explore whether interventions aimed at lowering serum uric acid levels (e.g., with xanthine oxidase inhibitors like allopurinol) can directly improve outcomes in STEMI patient.[9] While treatment of asymptomatic hyperuricemia in the acute phase of MI is not routinely recommended, the growing body of evidence warrants further investigation into its therapeutic potential in this high-risk population. Ultimately, understanding the multifaceted role of uric acid in STEMI can contribute to more precise risk stratification and potentially novel therapeutic strategies. Some studies have shown that in patients with MI, high serum UA level can increase the mortality rate.[6,7,8]

Limitations:

We had a small sample size owing to the severity of the disease and resource limitations. Further large-scale studies will be taken up in future for analysing the role of serum uric acid levels as a prognostic factor in mortality and morbidity associated with acute myocardial infarction.

Conclusion:

This study suggests that increased serum uric acid may be a risk factor for acute myocardial infarction. It may be used as a valuable, readily available, and inexpensive risk marker for coronary artery disease. Future studies are warranted on whether decreasing uric acid will be beneficial in acute myocardial infarction and the optimum uric acid levels for best outcomes in acute myocardial infarction.

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Conflict of interest: Nil

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