



THE PROGNOSTIC VALUE OF SERUM URIC ACID LEVELS IN ACUTE MYOCARDIAL INFARCTION: A RETROSPECTIVE STUDY

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ABSTRACT

Objective: This study aims to investigate the association between serum uric acid (SUA) levels and outcomes in patients with acute myocardial infarction (AMI), focusing on SUA's potential role as a prognostic marker.

Methods: We conducted a retrospective cohort study using medical records from January 2018 to December 2023 across several healthcare institutions. Adult patients (≥ 18 years) diagnosed with AMI were included. Data on SUA levels, myocardial damage severity, and clinical outcomes (mortality, adverse events, rehospitalization) were analyzed. Exclusion criteria included incomplete records, significant renal disease, secondary myocardial infarction, and age < 18 years. Statistical analyses were performed to determine the association between SUA levels and AMI outcomes.

Results: The study included 150 patients with a mean age of 62.5 years. SUA levels were significantly higher in patients with more severe myocardial damage. SUA levels ≥ 9.0 mg/dL were associated with a 60% incidence of severe myocardial damage compared to 15% in those with SUA levels < 5.0 mg/dL. Elevated SUA levels also correlated with increased short-term mortality (25% in SUA ≥ 9.0 mg/dL group) and adverse events. Long-term outcomes showed higher mortality (30%) and rehospitalization rates (45%) in patients with SUA ≥ 9.0 mg/dL.

Conclusion: Elevated SUA levels are associated with increased severity of myocardial damage and poorer short-term and long-term outcomes in AMI patients. SUA may serve as a useful prognostic marker in AMI management, potentially guiding risk assessment and treatment strategies. Further research is needed to explore the mechanisms underlying these associations and evaluate the benefits of SUA-targeted interventions.

Keywords: Serum uric acid, acute myocardial infarction, prognosis, biomarkers, cardiovascular outcomes..

INTRODUCTION:

Acute myocardial infarction (AMI) is a leading cause of morbidity and mortality worldwide, characterized by the abrupt interruption of myocardial blood supply, leading to myocardial necrosis (1). While traditional risk factors such as hypertension, hyperlipidemia, and diabetes mellitus are well-documented, recent research has highlighted the role of serum uric acid (SUA) as a potential biomarker in cardiovascular diseases, including AMI (2,3).

Uric acid, a product of purine metabolism, is known for its role in oxidative stress and inflammation, both of which are pivotal in the pathophysiology of AMI (4). Elevated levels of SUA have been associated with increased risk of cardiovascular events, including coronary artery disease and heart failure (5,6). In the context of AMI, SUA levels may reflect the extent of myocardial damage, oxidative stress, and inflammatory response, potentially offering insights into the severity and prognosis of the condition (7,8).

Several studies have explored the relationship between SUA and AMI, indicating that high serum uric acid levels might correlate with adverse outcomes. For instance, elevated SUA levels have been linked to increased mortality and poor prognosis in AMI patients (9,10). The mechanism behind this association could involve uric acid's role as a pro-inflammatory and pro-oxidative agent, which exacerbates myocardial injury and impairs recovery (11,12).

However, the clinical utility of SUA as a prognostic marker in AMI remains a topic of debate. While some studies suggest that SUA can be a useful indicator of myocardial infarction severity and recovery (13,14), others question its predictive value and the benefit of incorporating it into routine clinical practice (15). This discrepancy underscores the need for further investigation into the relationship between SUA levels and AMI outcomes.

This study aims to examine the association between serum uric acid levels and acute myocardial infarction, focusing on its potential as a prognostic marker. By

analyzing SUA levels in patients with AMI and correlating these with clinical outcomes, we aim to provide clarity on the role of SUA in the management of AMI and its potential for inclusion in risk stratification protocols.

Aim

To investigate the association between serum uric acid levels and acute myocardial infarction (AMI) outcomes, focusing on its potential role as a prognostic marker.

Objectives

1. To determine the relationship between serum uric acid levels and the severity of myocardial damage in patients with AMI.
2. To evaluate the prognostic value of serum uric acid levels for predicting short-term and long-term outcomes in AMI patients.

Materials and Methods

This study employed a retrospective cohort design to analyze the role of serum uric acid (SUA) in patients with acute myocardial infarction (AMI). Medical records were reviewed from January 2016 to December 2017 across multiple healthcare centers. The study included adult patients aged 18 years or older who were diagnosed with AMI according to established clinical criteria and confirmed by electrocardiogram and biomarker elevation.

Inclusion criteria were: (1) confirmed diagnosis of AMI, defined by clinical symptoms, elevated cardiac biomarkers (such as troponins), and relevant electrocardiographic changes; (2) availability of serum uric acid levels measured at the time of AMI diagnosis; and (3) comprehensive clinical follow-up data, including treatment details and outcomes.

Exclusion criteria included: (1) patients with incomplete or missing data on serum uric acid levels or clinical outcomes; (2) those with pre-existing conditions that could significantly affect uric acid levels, such as chronic kidney disease or gout; (3) patients who were younger than 18 years; and (4) those with secondary myocardial infarction due to non-cardiac causes, such as trauma or surgery.

Data collection involved extracting information on demographic characteristics, serum uric acid levels at AMI diagnosis, clinical presentation, treatment regimens, and follow-up outcomes. Statistical analyses were performed to evaluate the association between SUA levels and the severity of myocardial damage, as well as to assess SUA's prognostic value for short-term and long-term outcomes. The study was approved by the institutional review board, ensuring adherence to ethical standards and confidentiality of patient information.

Results:

Table 1: Baseline Characteristics of AMI Patients

Characteristic	Value
Total Patients (n)	150
Mean Age (years)	62.5 ± 11.2
Gender (Male/Female)	90/60
Mean Serum Uric Acid (mg/dL)	6.8 ± 1.4
Mean Duration of Follow-up (months)	12.0 ± 3.0

The study comprised 150 AMI patients with a mean age of 62.5 years. The majority of patients were male (60%). The mean serum uric acid level was 6.8 mg/dL, with a follow-up period averaging 12 months.

Table 2: Distribution of Serum Uric Acid Levels and Severity of Myocardial Damage

SUA Level (mg/dL)	Number of Patients (n)	Severity of Myocardial Damage (%)
< 5.0	20	15%
5.0 - 6.9	50	30%
7.0 - 8.9	40	45%
≥ 9.0	40	60%

Patients with higher serum uric acid levels tended to have more severe myocardial damage. For instance, 60% of patients with SUA levels ≥ 9.0 mg/dL exhibited severe myocardial damage, compared to 15% of those with SUA levels < 5.0 mg/dL.

Table 3: Association Between Serum Uric Acid Levels and Short-Term Outcomes

SUA Level (mg/dL)	Mortality Rate (%)	Adverse Events (%)
< 5.0	5%	10%
5.0 - 6.9	10%	20%
7.0 - 8.9	15%	30%
≥ 9.0	25%	40%

Higher SUA levels were associated with increased short-term mortality and adverse events. Mortality rates and the incidence of adverse events were significantly higher in patients with SUA levels ≥ 9.0 mg/dL.

Table 4: Long-Term Outcomes by Serum Uric Acid Levels

UA Level (mg/dL)	Long-Term Mortality Rate (%)	Need for Rehospitalization (%)
< 5.0	8%	15%
5.0 - 6.9	14%	25%
7.0 - 8.9	20%	35%
≥ 9.0	30%	45%

Long-term outcomes indicated that patients with higher SUA levels had increased long-term mortality and a greater need for rehospitalization. The long-term mortality rate was 30% in those with SUA levels ≥ 9.0 mg/dL, compared to 8% in those with SUA levels < 5.0 mg/dL.

Discussion:

This study elucidates the role of serum uric acid (SUA) in acute myocardial infarction (AMI), revealing significant associations between SUA levels and both the severity of myocardial damage and patient outcomes. Our findings confirm that elevated SUA levels are linked to worse AMI outcomes, including increased mortality and adverse events.

Our results show that higher SUA levels correlate with more severe myocardial damage. Specifically, patients with SUA levels ≥ 9.0 mg/dL had a notably higher incidence of severe myocardial damage compared to those with lower SUA levels (Table 2). This aligns with previous studies suggesting that elevated SUA contributes to oxidative stress and inflammation, which can exacerbate myocardial injury (11, 13). SUA is known to be a pro-inflammatory agent and can enhance oxidative stress, which plays a critical role in the pathophysiology of AMI (4,12).

In addition to the severity of myocardial damage, SUA levels were significantly associated with short-term and long-term outcomes. Higher SUA levels were linked to increased mortality and a higher incidence of adverse events shortly after AMI (Table 3). This is consistent with findings from previous research that identified elevated SUA as a predictor of poor prognosis in AMI patients (7, 14). The relationship between high SUA levels and increased mortality may

be attributed to the role of SUA in worsening the inflammatory and oxidative stress responses post-AMI (6).

Long-term outcomes also revealed that patients with elevated SUA levels experienced higher mortality rates and more frequent rehospitalizations (Table 4). This supports earlier studies suggesting that SUA could be a useful prognostic marker for long-term risk stratification in AMI patients (9, 15). The association between high SUA levels and adverse long-term outcomes highlights the potential for SUA to aid in identifying high-risk patients who may benefit from more intensive follow-up and management strategies.

However, while SUA levels show promise as a prognostic marker, it is important to note that SUA is influenced by various factors, including renal function and dietary habits, which may confound its relationship with AMI outcomes (2, 3). Future studies should explore the underlying mechanisms linking SUA to AMI severity and outcomes, and investigate whether interventions targeting SUA levels could improve patient prognosis.

In conclusion, this study reinforces the potential of SUA as a valuable biomarker in AMI. Elevated SUA levels are associated with increased severity of myocardial damage and poorer short-term and long-term outcomes. Incorporating SUA measurement into routine clinical practice could enhance risk assessment and inform treatment strategies in AMI management.

Conclusion:

This study highlights the significant association between elevated serum uric acid (SUA) levels and acute myocardial infarction (AMI) outcomes. Our findings reveal that higher SUA levels correlate with

increased severity of myocardial damage and worse short-term and long-term prognoses in AMI patients. Specifically, elevated SUA levels are linked to a greater incidence of severe myocardial damage, higher mortality rates, and increased likelihood of adverse events and rehospitalization.

These results underscore the potential of SUA as a valuable prognostic marker in AMI management. By incorporating SUA measurements into clinical practice, healthcare providers could enhance risk assessment and identify patients at higher risk for adverse outcomes, allowing for more targeted and intensive management strategies. However, further research is needed to explore the underlying mechanisms connecting SUA with AMI severity and outcomes, and to evaluate the potential benefits of SUA-lowering interventions in improving patient prognosis.

In summary, elevated SUA levels provide meaningful prognostic information that could aid in the stratification of AMI patients, potentially guiding therapeutic decisions and improving patient care.

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