

Comparison of Serum Uric Acid Levels between Patients with Acute Myocardial Infarction and Healthy Controls

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Abstract

Background: Acute myocardial infarction (AMI) is a significant cardiovascular emergency, which continues to be a major cause of death globally. Uric acid is known to be associated with various cardiovascular risk factors and could vary in conditions of tissue ischemia. High serum uric acid levels have thus been suggested as a potential biomarker of cardiovascular stress and ischemic damage.

Objective: The present study was undertaken to evaluate uric acid level in the serum of AMI patients and to find out whether there is any difference between the serum uric acid level of the AMI patients and apparently healthy controls.

Methods: It was a cross sectional analytical study conducted from July 2021 to June 2022 in the Department of Biochemistry, Mymensingh Medical College, with the Department of Cardiology, Mymensingh Medical College hospital, Bangladesh. There were 100 participants in total (50 patients with AMI and 50 healthy controls). Uric acid levels in the serum were determined by colorimetric method with commercial kit. The statistical analysis was carried out with SPSS for Windows software version 21.

Results: Patients with AMI had a mean $\pm$ SD serum uric acid concentration of 7.91 ± 0.09 mg/dL, while the controls had a serum uric acid concentration of 3.68 ± 0.72 mg/dL. The serum uric acid level of the AMI group showed significant difference when compared with the control group ($p < 0.001$).

Conclusions: The study showed a significantly higher serum uric acid level in acute myocardial infarction patients compared to the apparently healthy controls. These results indicate that there is a relationship between uric acid and AMI in the study population.

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Introduction

Coronary artery disease (CAD) is a leading cause of cardiovascular morbidity and mortality and contributes significantly to the burden of angina pectoris and acute coronary syndromes (ACS) in the world. Cardiovascular disease continues to be among the top causes of death in all populations.¹

Acute myocardial infarction is defined as myocardial cell death in the context of a prolonged myocardial ischemia. Ischemia results when the supply of oxygen to the cardiac muscle is inadequate to sustain

the metabolic needs of the muscle. This imbalance can lead to insufficient supply of oxygen and nutrients, and to the failure to eliminate metabolic wastes. Myocardial ischemia is an important pathological process in ischemic heart disease, and is many times associated with coronary artery disease.² Hyperuricemia occurs with several cardiovascular and metabolic disorders such as hypertension, atherogenic dyslipidaemia, diabetes mellitus, advanced age, alcohol abuse and renal dysfunction

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a product of the enzyme xanthine oxidase.³ The association between uric acid and tissue ischemia could be especially significant in cardiovascular diseases. Ischemia can lead to elevated xanthine oxidase activity and uric acid generation. Thus, increased serum uric acid could be a sign of metabolic alteration due to tissue ischemia.⁴

Hyperuricemia has also been linked to processes that could potentially lead to vascular injury such as endothelial dysfunction, increased platelet adhesiveness and aggregation, and oxidative stress. These mechanisms can be responsible for atherosclerosis development and progression. In previous studies, higher uric acid levels in serum have been linked to cardiovascular risk factors, such as elevated blood pressure levels and an unfavorable cardiovascular risk profile, as well as ischemic heart disease.⁵

Based on these observations, the analysis of serum uric acid could be useful for understanding the association between AMI and uric acid. For this reason, the present study was designed to measure the level of uric acid in serum of patients suffering from AMI and compare it with those of apparently healthy individuals.

Materials and Methods:

This was a cross-sectional analytical study carried out in the Department of Biochemistry, Mymensingh Medical college in association with Department of Cardiology, Mymensingh Medical college hospital Mymensingh, Bangladesh. From July 2021 to June 2022 the study was conducted.

Ethical clearance was granted prior to the beginning of the study from the Institutional Review Committee (MMC/IRB/2022/448).

There were 100 participants in the study. The participants were split into two groups;

Group I (case group): 50 patients with the diagnosis of acute myocardial infarction.

Apparently healthy individuals were included in group II (control group) of 50.

A purposive, non-random sampling technique was used to select participants based on the inclusion and exclusion criteria.

The subjects of the AMI group were hospital admission patients aged 40-65 years. The control group comprised apparently normal persons in the same age group.

Clinical history, physical examination, electrocardiographic findings and changes in cardiac biomarkers were used to diagnose acute myocardial infarction.

Inclusion criteria:

1. Acute myocardial infarction patients aged 40-65.
2. Nurses, physicians, students and other apparently healthy persons who were controls and of similar age group.

Exclusion Criteria

Those individuals who had any of the following conditions were excluded:

1. Presence of organic heart disease other than acute myocardial infarction such as heart failure or cardiomyopathy.
2. The history of chronic diuretic therapy.
3. Medications that are known to affect uric acid.

Clinical and Demographic Data Collection

Clinical examination of all participants was performed. Information on relevant demographic and clinical details such as age, sex, pulse rate and blood pressure was taken.

A structured questionnaire was used to obtain information regarding occupation, educational status, medication history, personal history and recent or chronic illnesses. The data were obtained by direct interview of the interviewees or their attendant as needed.

All participants gave their informed consent prior to their participation in the study.

Uric acid level was measured in the serum by a colorimetric method with a commercial test kit.

Statistical Analysis

The data obtained were analyzed using a Statistical Package for the Social Sciences (SPSS) for Windows version 21. Data were presented descriptively in

terms of the appropriate measure selected: mean and standard deviation.

The p value of < 0.05 was regarded as statistically significant.

Result:

The study participants were 100, equally split into two groups. The 50 patients in Group I were diagnosed as acute myocardial infarction (AMI), while the 50 subjects in Group II were apparently healthy.

Of all who participated, 84 (84%) were male and 16 (16%) were female. The male participants in the AMI group were 41, whereas the female participants were 9, with a total of 50, which represents 82% and 18%, respectively. The control group consisted of 43 males (86%) and 7 females (14%).

The age of participants ranged from 40-65 years. The mean age was 52.65 ± 4.93 years in the AMI group and 51.15 ± 6.32 years in the control group.

Table-I: Shows Mean $\pm$ SD of different clinical characteristics of the study subjects

Variable	Group I (case) Mean $\pm$ SD	Group II (control) Mean $\pm$ SD
Age(years)	52.65 ± 4.93	51.15 ± 6.32
BMI (kg/m^2)	24.31 ± 1.14	24.23 ± 1.20

The serum uric acid levels were determined for both groups. The mean serum uric acid levels were 7.91 ± 0.09 mg/dL and 3.68 ± 0.72 mg/dL in the AMI group and control group, respectively.

Participants who had AMI had higher serum uric acid levels than healthy controls were found. There was a very significant difference between the two groups ($p < 0.001$) as shown by statistical analysis.

Table-II: Comparison of mean serum Uric Acid in the study population

Variable	Group I (case) Mean $\pm$ SD	Group II (control) Mean $\pm$ SD	P value
Age(years)	7.91 ± 0.09	3.68 ± 0.72	$< 0.001^{**}$

A p value of less than 0.001 was noted as highly significant whereas p value less than 0.05 was noted as statistically significant.

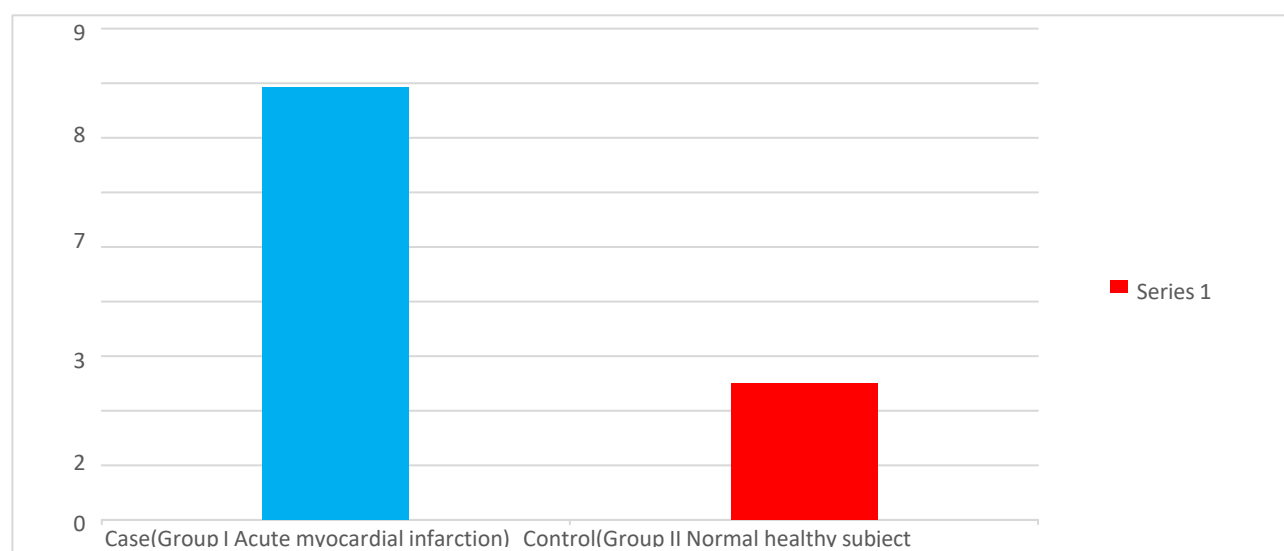


Fig-1: Comparison of mean serum uric acid levels in the study population.

Discussion

Acute myocardial infarction is a severe clinical condition of CAD and it is an important cause of morbidity and mortality. When myocardial ischemia causes permanent myocardial damage and death. Acute ischemia most often is related to rupture of an atherosclerotic plaque and the development of a thrombus in a coronary artery. These vascular events can then result in other complications such as cardiac dysfunction, arrhythmia and in severe cases, cardiac death.⁶

Higher serum uric acid level was seen in the AMI group compared to the apparently healthy group in the present study. The serum uric acid level was 7.91 ± 0.09 mg/dL in the AMI group and 3.68 ± 0.72 mg/dL in the control group. This is a statistically highly significant difference between the two groups ($p < 0.001$).

The present finding supports that serum uric acid is associated with AMI, as do the other studies that have been reported in the original study such as the studies done by Padma and Banupriya (2017) and Amrut et al. (2016) which studied serum uric acid in AMI patients.^{8,9}

There are multiple mechanisms that can account for the association between high uric acid and cardiovascular disease. Oxidative processes and lipid oxidation could be related to increased uric acid and cause vascular injury. The original study also mentions the potential of uric acid involvement in inflammatory reactions and platelet aggregation, which may contribute to the progression of atherosclerosis and coronary thrombosis.¹⁰

A further possible explanation is associated with the changes in purine metabolism during ischemia. Vascular smooth muscle and cardiac tissue can produce adenosine which is subsequently converted to uric acid. Xanthine oxidase activity and uric acid production could increase under ischemic conditions. Thus, increased serum uric acid levels could be an indicator of metabolic changes related to tissue ischemia.¹¹

This study was cross-sectional and the results should be interpreted as such. A difference in serum uric acid between the groups of AMI patients and

controls is observed but can't necessarily be interpreted as a causal link between hyperuricemia and AMI.

Conclusion

This study showed that the level of uric acid in the serum of patients with AMI was significantly higher than that of apparently normal people. The mean serum uric acid level was 7.91 ± 0.09 mg/dl in the AMI group and 3.68 ± 0.72 mg/dl in the control group and was statistically significant ($p < 0.001$).

The results suggest that hyperuricemia is a risk factor for acute myocardial infarction in the studied group. Therefore, uric acid in the serum may serve as another biochemical variable for the clinical evaluation of the patients with AMI. More studies of larger sample sizes and appropriate longitudinal design are helpful to elucidate clinical significance of this association.

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Conflict of Interest

The authors do not have any conflicts of interest to declare with respect to this article.

Author Contributions

Khadiza Diluara: Study design, supervision.

Mohammad Taufiq-Ul-Alam: Data collection, manuscript writing.

Md Abdur Razzaque Mia: Data collection & analysis.

Samsunnahar: Literature review and Manuscript revision.

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Data Availability

The information underlying the conclusions of this study is available on reasonable request from the corresponding author.

AI Disclosure

This manuscript has not been prepared with the aid of any artificial intelligence (AI) tools.

References:

1. Newby DE, Grubb NR. Cardiology. In: Ralston SH, Penman ID, Strachan MWJ, Hobson RP, editors. Davidson's Principles and Practice of Medicine. 23rd ed. Edinburgh: Churchill Livingstone Elsevier; 2018. pp. 444–445.
2. Cotran RS, Kumar V, Robbins SL, editors. Robbins Pathologic Basis of Disease. 9th ed. Philadelphia: W.B. Saunders; 2012.
3. Wasserman A, Shnell M, Boursi B. Prognostic significance of serum uric acid in patients admitted to the department of medicine. *Am J MedSci*.2010;339(1):15–21.
DOI: 10.1097/MAJ.0b013e3181c98eed
4. Anker SD, Doehner W, Rauchhaus M, et al. Uric acid and survival in chronic heart failure: validation and application in metabolic, functional, and haemodynamic staging. *Circulation*.2003;107(15):1991–1997.
DOI: 10.1161/01.CIR.0000065637.10517.A0
5. Fang J, Alderman MH. Serum uric acid and cardiovascular mortality: the NHANES I epidemiologic follow-up study. *JAMA*. 2000;283:2404–2410.
DOI:10.1001/jama.283.18.2404
6. Kuller LH, Eichner JE, Orchard TJ, et al. The relation between serum albumin levels and risk of coronary heart disease in the Multiple Risk Factor Intervention Trial. *Am J Epidemiol*. 1991;134:1266–1277.
DOI:10.1093/oxfordjournals.aje.a116028
7. Tunstall-Pedoe H, Kuulasmaa K, Mähönen M, Tolonen H, Ruokokoski E, Amouyel P. Contribution of trends in survival and coronary event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA Project populations. *Lancet*. 1999;353(9164):1547–1557.
DOI: 10.1016/S0140-6736(99)04021-0
8. Padma V, Banuopriya A. Serum uric acid levels in acute myocardial infarction. *Int J Adv Med*. 2017;4(4):1010–1013.
DOI: 10.18203/2349-3933.ijam20173044
9. Amrut A, Dambal D, Sridevi S, Samata K, Padaki SH, et al. Serum uric acid in myocardial infarction – A comparative study. *International Journal of Clinical Biochemistry and Research*. 2016;3(2):27–30.
10. Lippi G, Montagnana M, Salvagno GL, Targher G, Guidi GC. Epidemiological association between uric acid concentration in plasma, lipoprotein(a) and the traditional lipid profile. *ClinCardiol*.2010;33:76–80.
DOI:10.1002/clc.20672