Evaluation of independent prognostic importance of hyperuricemia in hospital death after acute myocardial infarction

Shahram Homayounfar, MD, **Mostafa Ansari,** MD, **Khosro M. Kashani,** MSc.

ABSTRACT

Objective: To evaluate the role of hyperuricemia (serum uric acid level greater than 7 mg/dl) as an independent short term (in hospital) prognostic factor after acute myocardial infarction (AMI).

Methods: Included in the study were 2218 patients who were hospitalized with well established AMI from June 1996 through to December 2002 in the Coronary Care Unit of Ekbatan General Hospital, Hamedan University of Medical Sciences, Iran. All patients with exclusive criteria, were omitted from study. Furthermore, frequency of hyperuricemia in patients (N=59) who expired after AMI was compared with patients (N=104) whom were discharged from the hospital after AMI.

Results: Frequency of hyperuricemia was measured according to the extension of myocardial necrosis (as the most important prognostic risk factor) based on serum creatine phosphokinase level greater or less than 2000 IU, which was 13.3% and 20.7% in the case group, and 9.5% and 9.7% in the controls, respectively.

Conclusion: These findings indicate that hyperuricemia is not an independent prognostic risk factor in hospital death after AMI.

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Address correspondence and reprint request to: Dr. Shahram Homayounfar, Ekbatan General Hospital, Hamedan University of Medical Sciences, Ostadan Street, PO Box 65168-56773, Hamedan, Iran. Tel. +98 (811) 8226858. Fax. +98 (811) 8268034. E-mail: Homayounfar@umsha.ac.ir

$\mathbf{A}$cute myocardial infarction (AMI) is one of the most common causes of mortality in the world. There are different known prognostic risk factors, which determine the outcome of patients after AMI. Infracted tissue size and left ventricular ejection fraction are the most important prognostic risk factors after AMI. Several prospective studies have shown an association between baseline hyperuricemia and incident of coronary heart disease, cardiovascular disease, and death.[1-10] But none of these studies have evaluated an association between hyperuricemia and short term (in hospital) death after AMI. Uric acid production increases in AMI due to myocardial cell necrosis and destruction of adenosine tri-phosphate. Also, extensive myocardial infarction and left ventricular dysfunction decrease cardiac output, renal blood flow and glomerular filtration rate. These factors lead to the reduction of uric acid excretion. Reduced tissue perfusion as a result of cardiogenic shock causes metabolic acidosis and increases lactate production, which competes with the secretion of uric acid in renal proximal tubules and decreases uric acid excretion. In patients with AMI, blood volume reduces as a result of perspiration, vomiting and thirsty mechanism disturbance, especially in old person, which increases uric acid reabsorption after secretion at renal tubules. So, serum uric acid level could be one of the hemodynamic status indicator after AMI.

Diabetes mellitus, systemic hypertension, renal and heart failure, dyslipidemia and the use of diuretics, all influence serum uric acid level. In many studies, these interactive factors was not considered.[2,10,11] In this research, with consideration of the above mentioned risk factors, we evaluated the independent prognostic role of hyperuricemia (serum uric acid more than 7 mg/dl) in hospital death after AMI.

Methods. This research is a descriptive-analytic, retrospective and case-control study, which is one type of epidemiologic observational investigation. In this study, 2218 patients whom were hospitalized with well established

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AMI (serial electrocardiographic changes leading to development of new ST segment or non ST elevation myocardial infarction (MI), characteristic increase and decrease in serum myocardial markers) from June 1996 through to December 2002 in the Coronary Care Unit of Ekbatan General Hospital of Hamedan, Iran were evaluated. All patients with exclusive criteria such as diabetes mellitus (fasting blood glucose level of 140 mg/dl or greater, history the use of insulin or an oral hypoglycemic agent), systemic hypertension (systolic blood pressure or diastolic blood pressure equal or higher than 140 mmHg, 90 mmHg respectively or the current use of antihypertensive drugs), dyslipidemia (fasting serum cholesterol level greater than 200 mg/dl or serum triglyceride level greater than 200 mg/dl), renal failure (serum creatinine level greater than 1.5 mg/dl), history of congestive heart failure before AMI, current use of diuretics and thrombolytic agents were omitted from the study. According to sample volume determination formula of case- control study, 50 patients for each group were considered but for greater reliance, the number of control group was doubled to 100 patients. In this regard, the frequency of hyperuricemia in patients (N=59) who expired after AMI was compared with patients (N=104) whom were discharged from hospital after AMI. Also, we studied relation of hyperuricemia with gender, location (anterolateral or inferoposterior) and size of infarction (according to total serum creatine phosphokinase (CPK) level greater or less than 2000 IU). Finally, accumulated data were analyzed using EPI6, and Chi-square and t-test for statistical analysis. A *p* value less that 0.05 is considered significant.

Results. Of the total 104 patients who were discharged after AMI from hospital (control group), 92 men (88.46%) and 12 women (11.53%), was compared

Table 1 - Frequency rate of hyperuricemia in both gender in case and control groups.

Groups	No of patients (%)				Total		*p*-value
	With hyperuricemia		Without hyperuricemia				
	Men	Women	Men	Women			
Case	9 (22)	1 (5.6)	32 (78)	17 (94.4)	59	(100)	X²=2.39 *p*=0.12 Non-significant
Control	9 (9.8)	1 (8.3)	83 (90.2)	11 (91.7)	104	(100)	X²=0.026 *p*=0.87 Non-significant

Table 2 - Comparison of the 2 groups based on the mean value of serum uric acid level.

Groups	Number	Mean Serum uric acid level (mg/dl)	SD	SE	Confidence* interval 95%	*p* value
Case	59	5.86	1.92	0.25	5.36 - 6.36	t=2.64 *p*=0.009
Control	104	5.12	1.58	0.15	4.82 - 5.42	

*Confidence interval = Mean+2 SE

Table 3 - Frequency rate of hyperuricemia in cases and controls.

Groups	No. of patients (%)			*p*-value
	With hyperuricemia	Without hyperuricemia	Total	
Case	10 (16.9)	49 (83.1)	59 (100)	X²=1.8 *p*=0.17
Control	10 (9.6)	94 (90.4)	104 (100)	Non-significant

odds ratio = 1.92, 95% confidence interval of odds ratio = 0.49 - 4.92

with 59 patients who expired after AMI (case group), 41 men (69.49%), and 18 women (30.50%). Mean age of control was 61.33 years (SD= ±11.52) and in case group was 68.06 years (SD= ±9.53).

In the control group, 58 (55.76%) patients had anterior AMI and 46 patients (46.23%) had inferior AMI, and in the case group, 33 patients (55.93%) had anterior AMI and 26 patients (44.06%) had inferior AMI. Also in the control group, 101 patients (97.11%) had Qwave AMI and 3 patients (2.88%) NonQwave AMI, while in the case group, 59 patients (100%) had Qwave AMI.

The mean value of plasma CPK level in the control group was 1902.74 (SD= ±1392.63), and in the case group was 2485.35 (SD= ±1891.51).

Frequency of hyperuricemia in men and women in the 2 groups is shown in **Table 1**.

Comparison of mean serum uric acid level in 2 groups is shown in **Table 2**.

There is no relation between frequency of hyperuricemia with location of AMI, and serum CPK level in both groups.

The mean value of serum uric acid level in the controls with serum CPK level greater than 2000 IU was 4.99 mg/dl (SD= ±1.42) and with serum CPK level less than 2000 IU was 5.21 mg/dl (SD= ±1.68), also in the case group with serum CPK level greater than 2000 IU was 5.8 mg/dl (SD= ±1.8) and with serum CPK level less than 2000 IU was 5.9 mg/dl (SD= ±2.05).

Finally, the frequency of hyperuricemia in the controls was 9.6% and in the cases was 16.9% (p=0.17) (**Table 3**).

Discussion. In this study, as such as other investigations in AMI women and patients older than 65 years had more poor prognosis (p=0.003).

In our study, hyperuricemia was more prevalent in men in both groups, but there was no valuable correlation between its frequency and fatality in patients who expired after AMI (p=0.12). In the study by Freedman and coworkers[3] there was a correlation between hyperuricemia and fatality only in women but not in men.

In this investigation as such as other studies there was a good correlation between the type and location of AMI with fatality ratio but there was no correlation between hyperuricemia and increased fatality in the case group (p=0.27). Also, there is a significant correlation between the amount of serum CPK level and fatality (p=0.04), but there was no other correlation between hyperuricemia frequency and serum CPK level in patients in the case group (p=0.8). As well as the mean value of serum uric acid level in patients who expired after AMI and had serum CPK level greater than 2000 IU was less than patients whose serum CPK level was less than 2000 IU (5.8 mg/dl versus 5.9 mg/dl), this

showed no correlation between extension of AMI and serum uric acid level in the case group.

In the study by Culleton and coworkers[12] that was performed in the Framingham Heart Study Center, after elimination of other interactive risk factors, which increase fatality after AMI, there was no correlation between serum uric acid level and incidence of coronary artery disease, mortality after cardiovascular disease and mortality of other causes. In our study, frequency of hyperuricemia in the case group was 16.9% and in the control was 9.6% (p=0.17). With regards to the p value, we can say that there is no valuable correlation between hyperuricemia and increased fatality after AMI. However, we feel that more studies should be encouraged in this matter.

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