ORIGINAL ARTICLES

ASSOCIATION OF SERUM URIC ACID LEVEL WITH SHORT TERM IN-HOSPITAL MORTALITY IN ST ELEVATION MYOCARDIAL INFARCTION

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ABSTRACT

Objective: Association of raised serum uric acid level with short term in-hospital mortality in ST elevation myocardial infarction.

Study Design: Cohort study.

Place and Duration of Study: Army Cardiac Centre Lahore, from Oct 2014 to Sep 2015.

Methodology: Total of 420 patients, males and females with ST elevation myocardial infarction were recruited from Emergency Department, Army Cardiac Centre Lahore. Samples for serum uric acid were sent at reception. Patients were divided into two groups according to serum uric acid level. Both groups received same treatment. Assessment was done by medical history, physical examination, baseline investigations including ECG and cardiac enzymes at reception and monitoring continued till 07 days.

Results: Out of 420 cases (210 in each group), mean age ± SD was calculated as 50.66 ± 8.19 and 48.14 ± 7.69 years respectively. Males were 57.14% and 61.43% in group A and group B respectively while females were 42.86% and 38.57% respectively. Mean serum uric acid levels were calculated as 8.52 ± 0.30 mg/dl in group A and 5.55 ± 0.31 mg/dl in group B. Frequency of in hospital mortality was recorded as 12.86% in group A and 3.33% in group B while 87.14% in group A and 96.67% in group B were discharged. A *p*-value was calculated as 0.000 showing a significant difference, Relative risk was calculated as 3.8571.

Conclusion: Raised serum uric acid level is significantly associated with short term in-hospital mortality in ST elevation myocardial infarction.

Keywords: Uric acid, ST elevation myocardial infarction, Short term in-hospital mortality.

INTRODUCTION

Ischaemic heart disease is the leading cause of mortality worldwide whichaccountsfor 12.7% of global mortality[1]. In 2010, the total number of deaths in USA due to ischaemic heart disease were 563000 accounting for 21.1% of all deaths[2]. The prevalence of ischemic heart disease is 6.25% in Pakistani population over 20 years of age[3].

The risk factors for ischaemic heart disease can be divided into non-modifiable, modifiable, and some non-conventional or novel. Non-modifiable conventional risk factors include gender, family history, ethnicity and age, while modifiable conventional include dyslipidaemia, hypertension, smoking, diabetes mellitus, obesity, lack of physical activity and psychosocial factors[4]. Non-conventional or novel factors include C-reactive protein, lipoprotein (a), homo-cysteine, fibrinogen[5].

Recently, studies have proved an association between serum uric acid and cardiovascular disease[6,7]. Hyperuricemia is often associated with dyslipidemia involving complex genetic and metabolic defects. Moreover, arterioles of glo-meruli involved in lipid metabolic disorder result in transrenal excretion of uric acid[8]. Uric acid promotes the development of atherosclerosis, resulting in ischaemic heart disease[9]. High level of serum uric acid promotes oxidation of LDL Cholesterol, peroxidation of lipids and formation of oxygen free radicals[9]. It also increases platelets aggregation, mediates inflammation, increases smooth muscle proliferation, all resulting in increased coronary thrombosis[9].

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Received: 03 Dec 2018; revised received: 24 Jan 2019; accepted: 25 Jan 2019

Some of the recently conducted studies have proved the association between serum uric acid level and mortality in ischaemic heart disease[9-11], while study done by Homayounfar *et al*, has shown no correlation between serum uric acid and mortality in ischaemic heart disease[12]. Timoteo *et al*, conducted study in Portugal showed significant (p<0.001) in-hospital mortality difference of 9.2% and 2.5% in patients of ST elevation myocardial infarction with high and normal serum uric acid level respectively[9].

Presently, there are no studies on the subject from Pakistan. The rationale of my study is to determine the association between serum uric acid level and mortality in ST elevation myocardial infarction in our population. Pakistan being poor country with unavailability of modern health system in far flung areas depends on pharmaco-invasive method for the management of myocardial infarction. The availability of such inexpensive, simple, non-invasive and easily available test can help in identification of high risk patients and transfer at an early stage to tertiary care centre for immediate invasive treatment and intensive care management.

METHODOLGY

This cohort study was carried out in department of Medicine, Combined Military Hospital Lahore from October 2014 to September 2015.Using WHO calculator, sample size was calculated as follows : Level of significance (%) = 5, Power of the test (%) = 80, Anticipated population proportion 1(%) = 9.2[7], Anticipated population proportion 2 (%) = 2.5[7], Sample size of each group = 210.

Total of 420 patients, male and female with ST elevation myocardial infarction were recruited from Emergency Department, Army Cardiac Centre, Combined Military Hospital, Lahore with age ranging between 35-65 years. Both males and females were enrolled in the study using consecutive, non-probability sampling technique. Study was started after taking approval from ethical review committee of the institute. Consent form was signed by each patient. All the data and procedures were entered in the proforma by the researcher.

Patients Were Divided Into Two Groups

a. Exposed group labelled as group A having serum uric acid level more than 8mg/dl and 7.5mg/dl in men and women respectively.

b. Non-exposed group labelled as group B having serum uric acid level less or equal to 8mg/dl and 7.5mg/dl in men and women respectively.

Patients who reported to hospital within 12hrs of onset of ischaemic symptoms having ST elevation myocardial infarction and treated with fibrinolytic therapy were included in the study. Patients having gout, impaired hepatic function and renal insufficiency, cardiac failure, other conditions that require hospitalization e.g. cancer, severe respiratory, gastrointestinal, pancreatic or haematological disorders, history of head injury, physically and mentally handicapped, taking diuretics, losartan, vitamin C, fenofibrate, BMI >30 were excluded from the study. Patients with ST elevation myocardial infarction were recruited from Emergency Department, Army Cardiac Centre, Combined Military Hospital, Lahore. Sample for serum uric acid was sent at reception in Emergency Department. Patients were observed for 7 days. Assessment for medical history, physical examination, vital signs, body weight, baseline investigations including ECG, blood complete picture, blood sugar random, liver function tests, renal function tests, lipid profile, chest X-ray, coagulation profile and cardiac enzymes were done at reception and monitoring continued onward till 7 days. Data was entered and analyzed using SPSS version 10. Descriptive statistics were calculated for both qualitative and quantitative variables. For quantitative variables like age and uric acid level mean ± SD were calculated. For qualitative variables like gender and in hospital mortality, frequency and percentages were calculated. Qualitative variables were presented as tables and charts. Chi-square test was used to compare qualitative variables like mortality between two groups. A p-value less

than 0.05 were considered significant. Relative risk was calculated. Effect modifiers like age, gender, diabetes mellitus, hypertension and hyperlipidemia were controlled by stratification. Post stratification chi-square test was applied.

RESULTS

A total of 420 cases fulfilling the inclusion/ exclusion criteria were enrolled to determine the association of raised serum uric acid level with short term in-hospital mortality in ST elevation myocardial infarction.

Age distribution of the patients showed that 103 (49.05%) in exposed group and 127 (60.48%) in unexposed group were between 35-50 years of age while 107 (50.95%) in exposed group and 83 (39.52% in unexposed group were between 51-65 years of age, mean age ± SD was calculated as 50.66 ± 8.19 and 48.14 ± 7.69 years respectively.

Table-I: In-hospital mortality with regards to age.

(a) age: 35-50 years.

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	15	88	<0.001	9.24
Unexposed	2	125		

(b) Age: 51-65 years.

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	12	95	0.21	1.86
Unexposed	5	78		

Table-II: In-hospital mortality with regards to gender.

(a) Male

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	9	111	0.057	3.225
Unexposed	3	126		

(b) Female

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	18	72	0.003	4.05
Unexposed	4	77		

Patients were distributed according to gender showing that 120 (57.14%) in exposed group and 129 (61.43%) in unexposed group were male while 90 (42.86%) in exposed group and 81 (38.57%) in unexposed group were females.

Mean serum uric acid levels were calculated as 8.52 ± 0.30 mg/dl in exposed and 5.55 ± 0.31 mg/dl in unexposed group, *p*-value was calculated as <0.001 showing a significant difference.

Table-III: In-hospital mortality with regards to diabetes mellitus.

(a) Yes

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	19	113	0.01	2.90
Unexposed	6	115		

(b) No

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	8	70	0.01	9.12
Unexposed	1	88		

Table-IV: In-hospital mortality with regards to hypertension.

(a) Yes

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	13	131	0.08	2.22
Unexposed	6	142		

(b) No

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	14	52	0.001	13.15
Unexposed	1	61		

Table-V: Stratification for in-hospital mortality with regards to hyperlipidemia.

(a) Yes

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	23	117	0.001	5.79
Unexposed	4	137		

(b) No

Group	In Hospital Mortality		*p*-value	Relative Risk
	Yes	No		
Exposed	4	66	0.50	1.31
Unexposed	3	66		

Frequency of in hospital mortality was recorded as 27 (12.86%) in exposed group and 7 (3.33%) in unexposed group while 183 (87.14%) in

exposed and 203 (96.67%) in unexposed group were discharged alive from hospital, *p*-value was calculated as <0.001 showing a significant difference. Relative risk was 3.8571.

Frequency of diabetes mellitus as recorded in our study was 132 (68.86%) in exposed group and 121 (57.62%) in unexposed group. Moreover, the frequency of hypertension was 144 (68.57%) in exposed group and 148 (70.48%) in unexposed group. The frequency of hyperlipidemia noted was 140 (66.67%) in exposed group and 141 (67.14%) in unexposed group.

The data was stratified for effect modifiers like age, gender, diabetes mellitus, hypertension and hyperlipidemia were controlled by stratification. Post stratification chi-square test was also applied table-I, V.

DISCUSSION

Clinical and epidemiological studies have proved that serum uric acid is significantly correlated with cardiovascular disease[6,7]. Increased serum uric acidis significantly associated with the occurrence and mortality of coronary artery disease[13,14]. But few studies have investigated serum uric acid levels in patients with acute ST-elevation myocardial infarction (STEMI)[8,9,12].

Some of the studies have proved the association between serum uric acid level and mortality in ischaemic heart disease[8,9] while study done by Homayounfar *et al* has shown no correlation between serum uric acid and mortality in ischaemic heart disease[12]. Behera *et al* observed that patients of STEMI with Killip class I and II had lower levels of uric acid as compared to patients of class III and IV at admission and during hospital stay. Killip class when combined with serum uric acid levels was a good predictor of severity heart failure and subsequent short-term mortality after STEMI[1].

Timoteo *et al,* conducted study in Portugal showed significant (*p*<0.001) in-hospital mortality difference of 9.2% and 2.5% in patients of ST elevation myocardial infarction with high and normal serum uric acid level respectively[9]. While frequency of in-hospital mortality observed in our study was recorded as 12.86% and 3.33% respectively with high and normal serum uric acid level. Our findings are in agreement with this study. Mean age of population in study carried out by Timoteo *et al*, was 64 ± 13 with 69% of individuals were male[9].

Ali *et al*[15], evaluated the relationship between serum uric acid levels in acute myocardial infarction, and short-term adverse effects (heart failure and in-hospital mortality). He concluded that serum uric acid level is a prognostic marker for short term acute myocardial infarction-related adverse events (heart failure and in hospital death). A similar study done by Gazi *et al*[16] and other studies[17,18] showed that serum uric is an independent predictor of mortality and morbidity during early in-hospital period after acute myocardial infarction.

The results of our study in accordance with other studies justify the hypothesis that "High serum acid level is associated with high in-hospital mortality in ST elevation myocardial infarction". The limitation of our study was that the sample size was not large which could enable us for more accurate comparison. Furthermore, acute STEMI was not categorized into territorial distribution like anterior, inferior, anterolateral wall myocardial infarction, however, in coming trials it may be done for validation of results.

CONCLUSION

We concluded that the raised serum uric acid level is significantly associated with short term in-hospital mortality in ST elevation myocardial infarction. The availability of such inexpensive, simple, non-invasive and easily available test is helpful for identifying high risk patients and may result in more rationalization of resources.

CONFLICT OF INTEREST

This study has no conflict of interest to declare on any author.

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