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Original Article

SERUM URIC ACID LEVEL IN HYPERTENSIVE PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

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ABSTRACT

Objectives : To estimate serum uric acid level in hypertensive patients with acute myocardial infarction and hypertensive patients without myocardial infarction.
Study Design : Cross-sectional study.
Setting : Department of Medicine, Mayo Hospital, Lahore.
Duration of Study with Dates : Study was carried over a period of six months from 01-01-2007 to 30-06-2007.
Subjects and Methods: Eighty hypertensive patients were included in the study out of which 40 patients with acute myocardial infarction were put in MI group and 40 patients without any history of myocardial infarction were labeled as non-MI group.
Results : Mean age of the patients in MI group and non-MI was found to be 50.0±12.4 and 51.8±10.1 years, respectively. Results of Serum uric acid level in MI group were 6.9±1.0 mg/dl [0.407 ± 0.059 mmol/L] and in non-MI group were 5.8±1.5 mg/dl [0.342 ± 0.088 mmol/L] ($p<0.001$). (where 1 mmol/L = 16.78 mg/dl or 1 mg/dl = 0.059 mmol/L).
Conclusion : The present study proved that raised serum uric acid level can cause hypertension and further rise can lead to MI.

Key Words : Serum uric acid, Myocardial infarction, Hypertension

INTRODUCTION

Serum uric acid levels are increased in patients with ischaemic heart disease. Levels also increase with age, obesity, high alcohol consumption, combined hyperlipidemias, diabetes mellitus and hypertension, these cluster of abnormalities in turn significantly increase the risk of atherosclerotic vascular diseases like myocardial infarction (MI) and stroke [1,2].

Patient with arterial hypertension and no definable cause are said to have essential or primary hypertension, which is found to be associated with increased levels of serum uric acid [3]. Recent evidence suggests that uric acid may be an important contributing factor to the progression of atherosclerosis and its complications like renal disease and hypertension thus resulting in cardiovascular disease. The role of uric acid as a risk factor for myocardial infarction was controversial until the results of Rotterdam study showed that high serum uric acid levels were associated with risk of myocardial infarction and stroke [4]. In another study serum uric acid was found to be significantly high ($P<0.001$) in hypertensive patients with ischaemic heart disease. The mean values were also found to be high in normotensive patients with ischaemic heart disease but the difference was statistically non-significant [5]. In the Chin-Shan Community Cardiovascular Cohort Study subgroup analysis demonstrated uric acid had significant risk only in hypertension and metabolic syndrome subgroups, not in their counterparts.

It was concluded that uric acid, in the baseline and time-dependent variables, could predict cardiovascular events in the community of relatively low coronary heart disease but high stroke risk in Taiwan [6].

Uric acid level of more than or equal to 5.2mg/dl was found to independently impart a 3.5-fold increased risk for cardiovascular death over a 5 year period [7].

This study is being done to find out whether the value of serum uric acid is increased more in hypertensive patients with acute myocardial infarction than in hypertensive patients without myocardial infarction, if so we can prevent myocardial infarction in hypertensive patients by keeping serum uric acid level low.

MATERIAL AND METHODS:

SETTING: This study was carried out in the Department of Medicine, Mayo Hospital, Lahore, over a period of six months from 01-01-2007 to 30-06-2007.

In this cross-sectional study eighty hypertensive patients were included using non-probability and purposive sampling, out of which 40 patients with acute myocardial infarction were put in MI group and 40 patients without any history of myocardial infarction were labeled as non-MI group. Informed consent was taken from all patients.

The study included newly diagnosed cases of myocardial infarction on the basis of history, ECG changes and raised cardiac enzymes. All the patients were more than 25 years. Those patients who had chronic renal disease, diabetes mellitus or history of gout were not included.

DATA COLLECTION : In MI group patients with myocardial infarction coming through emergency department fulfilling inclusion and exclusion criteria were admitted. History was taken and examination was done concentrating on the symptoms and signs of myocardial infarction. ECG was done. Blood for cardiac enzymes, serum uric acid, blood sugar random and fasting lipid profile was taken and sent to pathology laboratory of King Edward Medical University.

In non-MI group hypertensive patients coming through emergency or outdoor department was included. History was taken and examination was done. ECG of all the patients was done. For admitted patients blood for serum uric acid, blood sugar random and fasting lipid profile was taken and sent to pathology laboratory and the patients who were not admitted advised to get these tests done and report back to outdoor for review.

The confounding variables like age, sex, blood pressure, blood sugar random were matched. There is no risk benefit ratio. Thedata of each patient was recorded on proforma designed for the purpose.

Data was entered using SAPSS 12.0 version and analyzed statistically. Variables include age, sex, blood pressure, random blood, sugar, fasting lipid profile and serum uric acid level, these variables were analyzed using simple descriptive statistics. These were presented as Mean±Standard Deviation. Frequency and percentage was calculated for qualitative variables i.e. sex and chest pain features.

The two groups were compared regarding serum uric acid levels. The comparison was made by using independent sample t-test as this variable is quantitative in nature. A p-value of equal to or less than 0.05 was considered as significant.

RESULTS

During the six months study period from 01-01-2007 to 30-06-2007, eighty cases of hypertension were selected from department of medicine Mayo hospital, Lahore, out of which 40 were included in MI group and 40 were included in non-MI.

All the patients included in the study were above 30 years. In the MI group 12 patients were between 41 to 50 years (30%), 11 were between 30 to 40 years (27.5%), 10 were between 51 to 60 years (25%) and 7 patients were above 61 years (17.5%). Mean age of the patients was found to be 50.0±12.4 years. In the non-MI group 15 patients were between 41 to 50 years (37.5%), 12 were between 51 to 60 years (30%), 6 were between 30 to 40 years (15%), and 7 patients were above 61 years (17.5%). Mean age of the patients was found to be 51.8±10.1 years.

In MI group 28 patients were male (70%) and 12 patients were female (30%), whereas in the non-MI group 26 patients were male (65%) and 14 patients were female (35%). P value was found to be 0.633.

The ECG that was done in the MI-group showed ST-elevation in different leads according to which diagnosis was made. In Patients having MI 13 patients had acute inferior wall MI (32.5%), 7 had anter-o-septal wall MI (17.5%), 10 had anterior wall MI (25.0%), 6 had anter-o-lateral wall MI (15%), 1 had inferior wall MI with right ventricular infarct (2.5%), 2 had subendocardial infarction (5.0%) and 1 had non-ST elevation MI (2.5%). The ECG done in patients in non-MI group were normal in 25 patients (62.5%), showed bradycardia in 3 patients (7.5%) and strain pattern in lateral leads in 12 patients (30%).

On examining the patients pulse was 80.7±11.0 beats per minute in MI group and 73.8±7.7 beats per minute in non-MI group (p=0.002). The reading of systolic BP noted in the MI group was 137.2±11.3 mmHg while that in the non-MI group was 138.0±13.4

TABLE I
COMPARISON OF GROUP-A (WITH MYOCARDIAL INFARCTION)WITH GROUP-B (NON-MYOCARDIAL INFARCTION)
N = 80

Variables	Group-A with myocardial infarction n = 40	Group-B without myocardial infarction n = 40	P value
	Mean±SD	Mean±SD	
Systolic blood pressure(mmHg)	137.2±11.3	138.0±13.4	0.788 (NS)
Diastolic blood pressure(mmHg)	83.2±18.3	83.3±10.0	0.970 (NS)
Cardiac enzymes (CKMB) U/L	68.03±59.4	9.9±7.0	< 0.001
Serum uric acid level (mg/dl)	6.9±1.0	5.8±1.5	<0.001

Non-significant (NS)

mmHg (p=0.788). Diastolic blood pressure recorded in the MI group was 83.2±18.3 mmHg and in non-MI group it was 83.3±10.0 mmHg (p=0.970) (Table-I).

The investigations that were done after admission include cardiac enzymes (CKMB), blood sugar random, fasting lipid profile and serum uric acid levels. Value of CKMB in MI group was 68.03±59.4 U/L while in non-MI group it was 9.9±7.0 U/L (p< 0.001). Results of blood sugar random in MI group were 114.7±24.9 mg/dl and in non-MI group were 125.7±24.3 mg/dl (p=0.050). Serum cholesterol level in the MI group was 192.9±21.4 mg/dl and in non-MI group it was 184.3±19.0 mg/dl (p=0.061). Value of Serum triglycerides was 180.1±70.1 mg/dl in MI group and was 171.3±43.7 mg/dl in non-MI group (p=0.502). Serum HDL in MI group was 38.5±4.6 mg/dl and in non-MI group was 36.8±5.6 mg/dl (p=0.144). Serum LDL in MI group was 122.7±19.8 mg/dl and in non-MI group was 113.1±13.9 mg/dl (p=0.014). Results of Serum uric acid level in MI group were 6.9±1.0 mg/dl [0.407 ± 0.059 mmol/L] and in non-MI group were 5.8±1.5 mg/dl [0.342 ± 0.088 mmol/L] (p<0.001). (Table-I). (where 1 mmol/L = 16.78 mg/dl or 1 mg/dl = 0.059 mmol/L)

DISCUSSION

Large cohort studies have shown that uric acid is an important independent risk factor for cardiovascular mortality [11,12]. Some studies reported an independent association between uric acid and coronary heart disease [13,14]. Yet in others, the associations disappeared after adjustment for confounders [9,10,15].

In the present study uric acid level in MI group was 6.9 ± 1.0 mg/dl [0.407 ± 0.059 mmol/L] and in non-MI group were 5.8±1.5 mg/dl [0.342 ± 0.088 mmol/L] (p<0.001). Thus it shows that uric acid level is higher in hypertensive patients with acute MI than in hypertensive patients without MI and uric acid level is a risk factor for acute MI.

Results of the present study are in agreement with those of a study by Short et al in which Uric acid > or = 5.2 mg/dl [0.306 mmol/L] was found to independently impart a 3.5 fold increased risk for cardiovascular death over a 5-year period [7]. Similar results were seen in a large cohort PIUMA study of subjects with essential hypertension, in which pretreatment SUA showed an association with subsequent CV events and death from all causes. In the highest quartile of SUA (>0.369 mmol/L [6.2 mg/dL] in men; >0.274 mmol/L [4.6 mg/dL] in women), such association was clinically consistent and independent of many potential confounders including age, gender, body mass index, diabetes, TC/HDL-C, serum creatinine, LV hypertrophy, ambulatory BP, and diuretic treatment during follow-up. Results indicate that SUA should not be necessarily viewed as a causative factor for CV disease but most likely as a valuable biological marker that reflects and integrates different risk factors and their possible interactions. It is worth noting that under the present experimental conditions, SUA was more accurate than other markers for prediction of CV disease risk and all-cause mortality [16]. In the present study also age, sex, blood sugar random, BP and fasting lipid profile were treated as confounding variables.

Results of present study match the results of a study by Alderman et al, which found an association between SUA and subsequent CV events in a large multiracial population of subjects with essential hypertension but is generally more demonstratable in non-whites than in whites. In that study, CV disease risk was better predicted by in-treatment than by pretreatment SUA, and such association persisted after adjustment for diuretic therapy, serum creatinine, and race in addition to traditional risk factors. Because the mean SUA levels for men (0.399 mmol/L or 6.69 mg/dl) and women (0.321 mmol/L or 5.38 mg/dl) differed significantly, patients were stratified by gender specific quartile cut points. Overall age and gender adjusted CVD rates were positively related to SUA, with a relative risk of 1.48 (95% CI, 1.18-1.86) for the highest versus the lowest quartile. Non-smokers, those without diabetes or hyperlipidemia and less obese patients displayed a more pronounced increase in CVD events with increasing SUA than did patients with those characteristics. Mean treatment SUA increased with increasing diuretic exposure [19]. This is again in accordance with the present study as all patients were non-diabetic and did not have hyperlipidemia.

In the present study in the MI group mean age of the patients was found to be 50.0 years with a standard deviation of 12.4 years while in the non-MI group mean age of the patients was found to be 51.8 years with a standard deviation of 10.1 years. According to a study by Nishtar et al there is difference of mean age in different parts of world. In western communities the mean age is higher than in south Asia [20]. The GRACE trial showed that mean age of AMI patients in developing countries ranges from 55 to 65 years, which is lower than that in the developed world (65–68 years). This difference may be because of different environmental, psychosocial factors and genetic makeup of different communities of the world [21]. Also in the Rotterdam study conducted in the west all the patients were above 55 years [4]. Unlike the studies mentioned, present study shows that the patients are suffering from hypertension and MI at a much younger age. Study conducted by Alderman et al had younger patients like present study and the patients were aged 20 to 85 years [17].

In present study in the MI group 28 patients were male (70%) and 12 patients were female (30%), whereas in the non-MI group 26 patients were male (65%) and 14 patients were female (35%). In the study by Alderman et al [17] out of 7978 patients 4883 were men (61%) and 3095 were females (39%), whereas Rotterdam and PIUMA study used sex as a confounding variable [4.16]. Percentage of male and female patients in both the groups of the present study is almost match that of Alderman et al [17].

In the present study blood pressure has been used as a confounding variable, the readings of systolic and diastolic BP noted in both the non-MI and MI group were within the same range and p-value was statistically not significant. Study conducted by Dollery et al showed that hypertensive patients have higher SUA than normotensive subjects, so in that study blood pressure was not treated as a confounding variable [22]. Other studies by and Messerli et al, Staessen et al and Stanton et al also proved that is serum uric acid level is more in hypertensive patients than in non-hypertensive patients [8,18,23].

In the present study blood sugar random was within normal range in all the patients as all were non-diabetics also fasting lipid profile was within normal range. Thus blood sugar and fasting lipid profile were also treated as a confounding variable like in study conducted by Alderman et al [17].

CONCLUSION

Acute Myocardial infarction is a common cause of mortality and morbidity in developing countries. Different risk factors like smoking, hypertension, diabetes mellitus and ischemic heart disease contribute differently to morbidity and mortality in different populations. This difference is because of different genetic makeup and environmental factors. There should be a strong emphasis on early identification and management of risk factors. There should be proper awareness of the masses regarding preventable risk factors and adaptation of healthy life styles.

The present study proved that raised serum uric acid level can cause hypertension and further rise can lead to MI. From this inference can be drawn that while monitoring for hypertension and ischemic heart disease we should get serum uric acid level done, if found to be raised it should be controlled so as to prevent or delay hypertension which can further prevent MI.

We have very little data in Pakistan regarding uric acid and its effects on hypertension and MI, so more studies at national level need to be done to assess whether lowering of uric acid levels can actually reduce the risk of coronary heart disease. The data in the present study was of limited number of patients because of certain constraints and there is a need to conduct a multi center study on larger number of patients with follow-up to develop the national guidelines for the management of myocardial infarction and its risk factors. These guidelines may help us at national level in reduction of morbidity and mortality due to IHD, in a developing country like Pakistan, whose resources are very limited

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