

Serum Uric Acid in Myocardial Infarction- A Comparative Study

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Abstract

Introduction: Acute Myocardial Infarction, the most important form of Cardio Vascular Disease (CVD) continues to be the leading cause of death in the industrialized countries. Increased serum uric acid levels are observed in patients with Myocardial Infarction. Serum Uric acid levels reflect the xanthine oxidase activity and increased levels are associated with reduced production of nitric oxide and endothelial dysfunction. So the present study was taken up to assess the variation in the levels of serum Uric Acid and to correlate them with CK-MB in patients with MI.

Materials and Methods: This study was taken up on 50 subjects with Myocardial Infarction and 50 apparently normal healthy subjects. Venous blood sample was collected from all the subjects. Serum CK-MB and uric acid were estimated in cases and serum uric acid in controls. Unpaired t test and Pearson's correlation coefficient were employed to analyze the results.

Results: The mean \pm SD of serum uric acid among cases and controls were 7.10 ± 0.9 and 5.62 ± 0.58 respectively displaying a highly significant statistical difference ($p < 0.001$). The mean CK-MB among the cases was 48.2 ± 3.4 IU/ L. Serum uric acid showed positive correlation with CK-MB in subjects with Myocardial Infarction with 'r' and 'p' value being +0.38 and 0.007 respectively.

Conclusion: This study concludes that serum uric acid levels were high and had a positive correlation with CK-MB in patients with Myocardial Infarction.

Keywords: Myocardial Infarction (MI), Uric Acid, CK-MB, Anti-oxidant, Pro-oxidant.

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Introduction

Cardio Vascular Diseases (CVD) are considered today to contribute the global burden of diseases¹. Acute Myocardial Infarction (AMI), overwhelmingly the most important form of CVD continues to be the leading cause of death in the industrialized countries and India². It is considered as the modern epidemic in the present century.³ In today's world about 17 million deaths are as a result of CVD. Coronary Heart Disease (CHD) is an important component of CVD. It accounts for 25-30% of the deaths in most industrialized countries⁴.

Uric acid may function as an antioxidant and probably one of the most important antioxidants in the plasma. As per the literature there is a meaningful relation between hyperuricaemia and Myocardial Infarction⁵. A serum uric acid level reflects the plasma xanthine oxidase activity.

In ischemia, the ATP is drastically decreased and is changed to hypoxanthine and then to uric acid by xanthine oxidase upon reperfusion.⁶

Hyperuricemia highly predicts mortality in patients with MI⁷. There are studies which demonstrate the development of cardiac failure after MI in association with hyperuricemia⁸. Hyperuricemia due to impaired xanthine oxidase activity is known to be associated with harmful effects on endothelial dysfunction, oxidative metabolism, platelet adhesiveness and aggregation.⁹

In view of the above facts this study aimed to assess the variation in the levels of serum Uric Acid and to correlate them with CK-MB in patients with MI.

Material and Methods

A comparative study was conducted on 50 patients with clinically diagnosed myocardial infarction admitted in Intensive Cardiac Care Unit in Hanagal Shri Kumareshwar Hospital and Research Centre, Bagalkot, and age and sex matched 50 apparently healthy subjects chosen as controls from the general population by simple random sampling. Sample size was calculated from the formula $n = Z^2pq / E^2$. The study was done from January 2010 to March 2011. Ethical clearance was obtained from the S. Nijalingappa Medical College Ethical Clearance Committee. Patients who were diagnosed as Myocardial Infarction on the basis of Clinical history, examination, ECG changes reflecting ST elevation

myocardial infarction (STEMI) or non ST elevation myocardial infarction (Non STEMI) with increased serum CK-MB levels were included in this study as cases.

Patients with previous history of MI, Primary Lipidemia, Diabetes Mellitus, Hypertension, Gout, Chronic Kidney Diseases and Patients consuming drugs like Diuretics, Salicylates, Ethambutol, Pyrizinamide were excluded from this study as they are responsible for increased production and decreased renal clearance of urate.

The objectives of the study were explained to all eligible subjects. Informed consent was obtained from all subjects included in the study for venipuncture. 3ml of venous blood sample was collected under all aseptic precautions in a plain vacutainer after establishing as

myocardial infarction with the above inclusion criteria. Blood was allowed to clot and then centrifuged for serum separation. Estimation of CK-MB and Serum Uric Acid were conducted by modified IFCC¹⁰method and Uricase- Peroxidase method.¹¹

Data was analyzed by statistical tests using SPSS package version number 17. Data were expressed in terms of mean±SD. Chi- square test was applied to estimate the difference between the two study groups . Unpaired 't'-test was used to study the changes in the serum uric acid. p value < 0.05 was taken as significant. p value < 0.01 was taken as highly significant. Pearson's Correlation Coefficient was used to study the relationship between CK-MB and serum uric acid among cases.

Results

Table 1: Comparison of Age and Serum Uric acid levels among Cases and Controls

	Cases	Controls	p value
Mean Age±SD(years)	59.5±12.0	58.5±13.1	0.70*
Serum Uric Acid(mg/dL)	7.10±0.90	5.62±0.58	< 0.001**

* statistically non-significant difference for age in cases and controls

** highly significant difference in serum uric acid levels in cases and controls

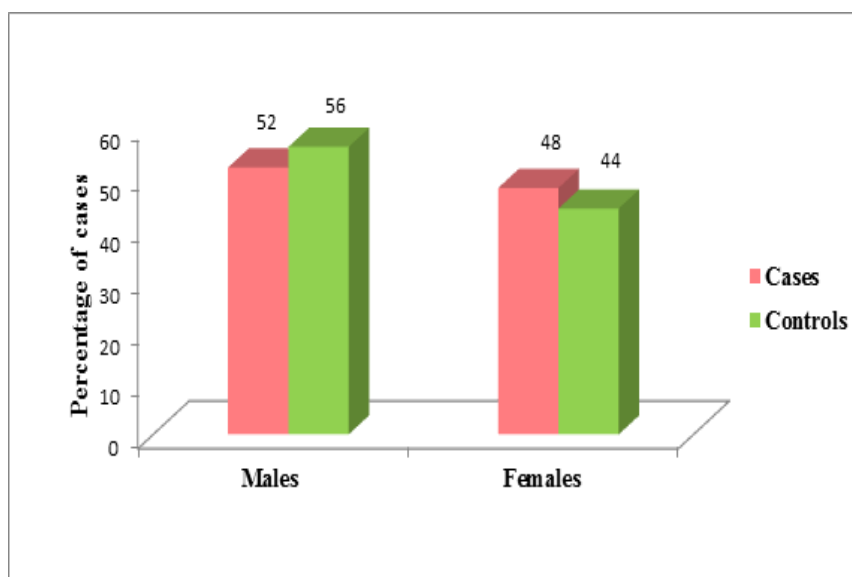


Fig. 1: Gender Distribution in Cases and Controls

Statistically non-significant difference in gender among cases and controls (p=0.69)

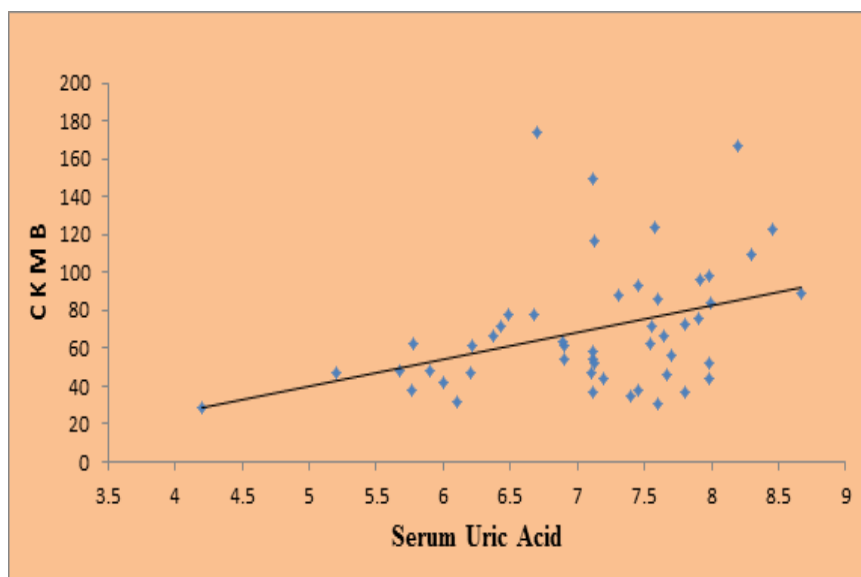


Fig. 2: Correlation between Serum Uric Acid and CK-MB levels in Cases

Significant positive correlation between Uric acid and CK-MB ($r = +0.38$, $p = 0.007$).

Discussion

Statistically significant increase in the levels of serum uric acid ($P < 0.001$) (Table 1) and a highly positive correlation between Serum Uric acid and CKMB levels among cases (Fig. 2) was observed in our study. Our study is in accordance with the study done by Nadkar et al,⁹ who found significant increase in the serum uric acid levels in patients with MI and stated that it was a good predictor of mortality in those patients. Sokhanvar S et al⁵ concluded that there was a meaningful relation between hyperuricaemia and MI wherein serum uric acid behaved as an independent variable and had no relationship with other risk factors. Jacobs D et al¹² in his study found that hyperuricaemia correlated strongly as an associated risk factor in MI. He stated that serum uric acid is a variable, subject to modification by a large array of complex and often associated factors and suggested that possible risk factors such as hyperuricaemia be assessed and treated as a routine, so as to possibly reduce the incidence of MI. In a similar study done by Fang J et al,⁷ hyperuricaemia is associated with MI and they suggested hyperuricaemic levels are independently and significantly associated with risk of cardiac mortality. Seo Young Kim et al, in 2009, conducted a meta-analysis to determine the association between hyperuricaemia and the risk of cerebrovascular accidents. The Newcastle–Ottawa Scale was used to assess the quality of individual studies and concluded that high serum uric acid levels may modestly increase the risk of stroke incidence and mortality.¹³

Serum uric acid levels reflect the xanthine oxidase activity which contributes to endothelial dysfunction. Uric acid synthesizes monocyte chemoattractant protein 1 by stimulating p38 MAP kinase and the nuclear transcription factor NF-Kb and AP-1. These

chemokines are important in causing vascular dysfunction and tissue injury.¹⁴

High level of Serum Uric Acid increases platelet aggregation and the formation of uric acid crystals. Excess deposition of uric acid in the arterial wall would be responsible for the damage of tunica intima of arteries, promoting coronary thrombosis¹⁵. Hyperuricemia is associated with reduced production of nitric oxide and endothelial dysfunction and myocardial microvascular diseases^{16,17}. Hyperuricemia may also be related to impaired uric acid excretion caused by low cardiac output and tissue hypoxia.¹⁸

Based on high serum uric acid levels and highly significant positive correlation of uric acid with CK-MB among patients with Myocardial Infarction as observed in our study, it could be contemplated that hyperuricemia may be a cause for plaque rupture responsible for myocardial infarction.

Further studies on a larger sample are needed to substantiate our findings before firm conclusion can be drawn on the utility of this parameter for the diagnostic assessment of Myocardial Infarction

Conclusion

Serum uric acid was significantly high in patients with myocardial infarction. Serum uric acid had highly significant positive correlation with CK-MB levels in patients with myocardial infarction. The above results of our study showed that hyperuricemia is associated with myocardial infarction by promoting vascular dysfunction and coronary thrombosis.

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