



HYPERURICEMIA - A BIOCHEMICAL MARKER IN DEFINING THE SEVERITY OF CORONARY ARTERY DISEASE (CAD).

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ABSTRACT

It has been found that there has been a strong correlation between patients with CAD and hyperuricemia. Most of the studies showed that patients with hyperuricemia have worst prognosis compared to the patients with normal serum uric acid levels. Uric acid has some anti-oxidant effect which is attributed to the advantages offered against CAD, at the same time uric acid also is considered to be the factor in metabolic syndrome which when present is postulated to aggravate CAD. Hence, the advantages and disadvantages of uric acid should be clearly defined to manage patient appropriately.

SUMMARY: This study included 100 patients with CAD with hyperuricemia. As the severity of CAD increased, there was consequent increase in uric acid. Thus, it is postulated that the hyperuricemia can be used in defining severity of CAD.

KEYWORDS : URIC ACID, CAD, HYPERURICEMIA, BIOCHEMICAL.

INTRODUCTION

Uric acid is the end product of purine nucleotide metabolism, formed from the breakdown of adenosine and guanine. Uric acid is a weak acid and has a pH of 5.8. UA mainly exists as urate, the salt of uric acid, and is excreted in urine.(1) The solubility of Uric acid in human blood is low. When the serum level of uric acid is higher than the solubility limit (6.8 mg/dl). This results in crystallisation of uric acid to form monosodium urate.(2)

The reason for elevated uric acid in serum i.e., Hyperuricemia is attributed to the dysfunction of the endothelium. Thus, these dysfunctions in endothelium are associated with cerebrovascular accidents, diabetes mellitus, cardiovascular disease, kidney disease as well as metabolic syndrome.(3)

Uric acid is found to penetrate the endothelial cells. Since it is biologically active, it has various mechanisms of action like stimulating oxidative stress, inflammation, vasoconstriction, endothelial dysfunction and many other negative actions.(4)

The products such as allantoin and 6-aminouracil are the results of degradation of uric acid. Uric acid is the molecule which acts as a carrier of Nitric Oxide. The action of nitric oxide is as follows: decreasing vascular tone, increasing blood flow and protecting the vascular endothelial cells from external oxidative stress.(5) This has a major role in cardiac dysfunction including the sarcolemma and the mitochondrial membranes. In addition to these effects, the entry of uric acid into cells causes oxidative stress and reduces the bioavailability of nitric oxide. Uric acid is also found to induce inflammation. Uric acid is also associated with many numbers of vascular risk factors.(6)

The overall risk of cardiovascular mortality has shown to increase by 12% for each increase of 1 mg/dl of uric acid serum levels, and hyperuricemia is also found to increase the risk of death in women.(7,10)

Most of the studies have postulated that higher concentration of uric acid levels in serum is an independent risk factor for CAD, whereas other studies have concluded that the association between uric acid and coronary artery disease was confounded by other factors of metabolic syndrome. (8,9)

Some of the studies have also postulated that elevated serum uric acid level is considered as the physiological marker of hypertension, insulin resistance, obesity and hyperlipidaemia rather than a direct cause of atherosclerotic disease. (11) Serum uric acid levels also tend to be higher among those who were current or chronic smokers. Serum uric acid also has significant and independent correlations with male sex,

diabetes mellitus, hypertension, triglyceride and use of diuretics. (12)

MATERIALS AND METHODS

After obtaining clearance from IEC and consent from patients, we included 100 patients age 21-85 years, admitted in Sree Mookambika Institute of Medical Sciences from May 2021 to July 2021, who had CAD and hyperuricemia. Inclusion criteria included CAD patients with hyperuricemia admitted in cardiac ward. Patients with CAD and hyperuricemia admitted in intensive medical care unit were excluded. Relevant data such as serum uric acid values and coronary artery angiogram reports were analyzed. Descriptive and analytical statistics was performed by SPSS version 16. A p value of less than 0.5 was considered statistically significant.

RESULTS

Table 1: Age And Gender Distribution

VARIABLES	PERCENTAGE
Age, years (mean)	50 years +/- 8.6
21-40years	28%
41-60years	60%
61-85years	12%
Gender	
Males	65%
Females	35%

Based on the severity of the CAD patients, they are classified into mild, moderate and severe. Mild - one coronary artery affected - medical management. Moderate - two coronary arteries affected - intervention like percutaneous transluminal angioplasty. Severe- 3 or more coronary arteries affected - surgical like coronary artery bypass grafting.

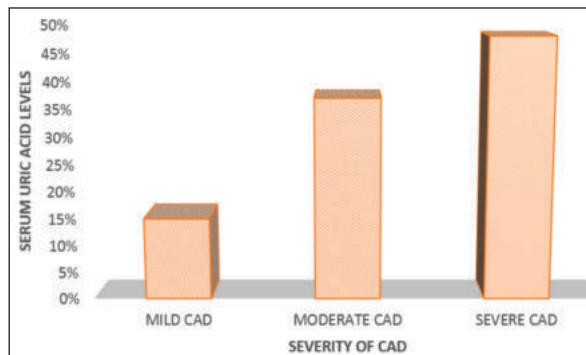


Figure 1: Hyperuricemia Defining The Severity Of Cad

The patients were classified into mild, moderate and severe hyperuricemia. Mild - 5.5mg/dl to 6.9mg/dl, moderate - 7mg/dl

to 8.9mg/dl and severe - more than 9mg/dl. In this study, the patients with severe coronary artery disease were found to have severe hyperuricemia.

DISCUSSION

Initially hyperuricemia was attributed to various reasons like dehydration in patients with CAD, presence of renal failure along with coronary artery disease and component of metabolic syndrome. But in further studies, it was found that hyperuricemia was also encountered in isolated coronary artery disease patients. Recently in many studies hyperuricemia is found to be two sides of the same coin. It is postulated that uric acid has both advantages and at the same time also has a number of disadvantages pertaining to cardiovascular system.

Thus, when hyperuricemia exists, it exerts various mechanisms like stimulating oxidative stress, inflammation, vasoconstriction, endothelial dysfunction and many other negative actions, which can lead to major complications like cerebrovascular accidents, diabetes mellitus, cardiovascular disease, kidney disease as well as metabolic syndrome.

In a recent study by Bagheri et al in 2016 concluded that there is a strong association between hyperuricemia and CAD based on severity.

In this study 100 patients with CAD with hyperuricemia was studied. Here majority of patients had severe CAD who had very high serum uric acid levels. Patients with moderate CAD showed moderately raised serum uric acid. Patients with mild CAD had only mild hyperuricemia.

CONCLUSION

This study shows significant association between the serum levels of uric acid and the severity of coronary artery disease. Thus, it is postulated that early treatment of hyperuricemia can be beneficial at times though not yet proved. Though this study did not focus on the management of hyperuricemia, it is postulated that all the coronary artery disease patients with elevated serum creatinine should be taken into high risk or moderate risk groups based on the serum uric acid and managed appropriately at an early stage.

Source of funding: Nil

Conflicts of interest: None declared

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