Original Research Article

A comparative study of the relationship between uric acid with the severity of coronary artery disease

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ABSTRACT

Background: Coronary Artery disease (CAD) is defined as the presence of stenosis of atleast 50% of the vessel diameter in any of the main coronary arteries. Coronary Artery Disease (CAD) is the leading cause of death worldwide. According to WHO estimates, 17.5 million people died of CAD in 2005. Uric acid (UA) is the end product of purine nucleotide metabolism, it could induce the proliferation and inflammation of vascular smooth muscle cells. This study is undertaken to evaluate the role of serum uric acid levels in severity CAD in our centre.

Methods: This is a cross sectional study of 120 patients with CAD visiting the OPD or admitted in Medicine department at hospitals attached to BMCRI between June 2018 to July 2019. All CAD patients were assessed for the presence of comorbid conditions and ongoing medications. Serum Uric acid levels, creatinine level, fasting lipid profile were measured in all patients before Coronary Angiogram. The severity of CAD (percentage of stenosis) was assessed by the Gensini scoring system.

Results: Of 120 CAD patients' majority were in the age group of 51-60 years, 89 were men and 31 were women. Of the study patients, 93 (77.5%) symptoms like chest pain and/or breathlessness, 84 (70%) had a smoking history, 43 (35.8) had gensini score of 4 with uric acid levels of (mean 5.49), 26 (21.7%) had gensini score of 8 with uric acid levels of (mean 6.36), 49 (40.8%) had gensini score of 16 with uric acid levels of (mean 7.03) and 2 (1.7%) had gensini score of 32 with uric acid levels of (mean 7.35). Based on this analysis, we found that serum uric acid levels were in linear correlation with the severity of CAD.

Conclusions: In conclusion, serum uric acid levels were found to be associated with the severity of CAD.

Keywords: Coronary artery disease, Gensini scoring system, Uric acid

INTRODUCTION

Coronary artery disease (CAD) is defined as the presence of stenosis of at least 50% of the vessel diameter in any of the main coronary arteries.[1] Coronary Artery Disease (CAD) is still the leading cause of death in the world. According to WHO estimates, 17.5 million people died of CAD in 2005.[2] The severity of CAD has been graded by scoring system named as Gensini Scoring System. The severity is scored as 1 for 1% to 25% stenosis, 2 for 26% to 50% stenosis, 4 for 51% to 75% stenosis, 8 for 76% to 90% stenosis, 16 for 91% to 99% stenosis and 32 for complete occlusion. The score is then multiplied by a factor according to the coronary artery occluded.[1]

Uric acid (UA) is the end product of purine nucleotide metabolism, formed from the breakdown of adenosine and guanine. Oxidants are produced during UA production which disturbs the nitric oxide synthesis and requirement. UA could induce the proliferation and inflammation of vascular smooth muscle cells. Many studies have revealed that UA could induce CRP

expression in endothelial cells, and this indicate that UA has proinflammatory and proatherogenic effects. Hyperuricemia is a frequently seen in insulin-resistant states and has significant role in glucose uptake dysregulation. All these damaging effects of UA are associated with endothelial dysfunction and finally lead to cardiovascular disease.[3]

This is a study comparing Serum Uric acid levels with the Gensini score in patients with CAD which can also be used as an adjuvant tool for assessing the severity of Coronary Artery Disease, which further helps in improving the management of patients with Coronary Artery Disease.

Aims and objectives of the study was to estimate the Serum Uric acid levels, to Calculate the Gensini Score based on Coronary Angiogram and to compare the Serum Uric acid levels with Gensini score in patients with Coronary Artery Disease.

METHODS

This cross-sectional study was conducted in hospitals attached to BMCRI, between June 2018 to July 2019. The study protocol is approved by the hospital ethical committee.

Inclusion criteria

- Patients willing to give written consent
- Patients of either sex aged above 18 years
- Patients with Coronary Artery Disease confirmed by Coronary Angiography (CT/Invasive).

Exclusion criteria

- Chronic infectious disease
- Abnormal kidney function
- Pregnancy
- Neoplastic disease
- Patients on Thiazide diuretics

Statistical analysis

SPSS (Statistical Package for Social Sciences) version 20. (IBM SPASS statistics (IBM corp. Armonk, NY, USA released 2011)) was used to perform the statistical analysis

- Data was entered in the excel spread sheet.
- Descriptive statistics of the explanatory and outcome variables was calculated by mean, standard deviation for quantitative variables, frequency and proportions for qualitative variables.
- Inferential statistics like
  - Chi square test was used to test the significance between qualitative variables.

- ANOVA test was used to test the significant difference for quantitative variables for more than 2 groups.
- The level of significance was set at 5%.

RESULTS

During the study period a total of 120 patients who fit into the inclusion criteria were studied. Of these, most were in the age group of 51-60 years (31.7 %) (Table 1). The table denotes that majority of the patients were in the age group of 51 to 60 years (38), and least in the age group of more than 80 years (1).

Table 1: Age group of the study subjects.

Age group	Frequency	Percent
>80	1	0.8
31-40	12	10.0
41-50	32	26.7
51-60	38	31.7
61-70	33	27.5
71-80	4	3.3
Total	120	100.0

Most of the study population were males (74.2%) (89 out of 120) and the remaining 25.8% were women (31 out of 120) (Table 2), 84 (70%) patients were smokers, 36 (30%) patients were nonsmokers (Table 3). 93 (77.5%) patients had symptoms, 27 (22.5%) patients didn't had symptoms (Table 4).

Table 2: Gender wise of the study subjects.

Gender	Frequency	Percent
Female	31	25.8
Male	89	74.2
Total	120	100.0

Table 3: Smoking history of the study subjects.

Smoker	Frequency	Percent
No	36	30.0
Yes	84	70.0
Total	120	100.0

Table 4: Symptoms of the study subjects.

Symptoms	Frequency	Percent
Nil	27	22.5
Chest pain and/or breathlessness	93	77.5
Total	120	100.0

The mean Systolic Blood Pressure (SBP) was 128 mmHg and of Diastolic Blood pressure (DBP) was 80 mmHg (Table 5). 43 (35.8) had gensini score of 4 with uric acid levels of (mean 5.49) (Table 8), 26 (21.7%) had gensini

score of 8 with uric acid levels of (mean 6.36), 49 (40.8%) had gensini score of 16 with uric acid levels of (mean 7.03) and 2 (1.7%) had gensini score of 32 with uric acid levels of (mean 7.35).

Table 5: Mean blood pressure of the study subjects.

Blood pressure	Minimum	Maximum	Mean	SD
SBP	90	170	128.38	18.517
DBP	50	100	79.67	10.764

Table 5 denotes that the mean Systolic Blood Pressure of the patients is 128.38mmHg and Mean Diastolic Blood Pressure is 79.67mm Hg.

Table 6: Gensini Scores of the study subjects.

Gensini	Frequency	Percent
4	43	35.8
8	26	21.7
16	49	40.8
32	2	1.7
Total	120	100.0

Table 6 shows that out of 120 patients, 43 patients had gensini score of 4, 26 patients had score of 8, 49 patients had score of 16, 2 patients had score of 32.

Table 7 shows that there is no correlation between Hemoglobin value and Gensini Scores.

Table 7: Gensini Scores and hemoglobin of the study subjects.

Variable	Gensini Score	N	Mean	SD	F value	p value
HB	4	43	11.60	1.74	2.700	0.049
	8	26	11.20	1.39		
	16	49	12.31	1.89		
	32	2	11.70	0.42		
	Total	120	11.81	1.77		

Table 8: Gensini Scores and uric acid of the study subjects.

Variable	Gensini Score	N	Mean	SD	F value	p value
Uric acid	4	43	5.49	0.23	371.382	0.001
	8	26	6.36	0.20		
	16	49	7.03	0.24		
	32	2	7.35	0.07		
	Total	120	6.34	0.72		

DISCUSSION

In the present study, awareness of wound management after dog bite was studied. It showed that wound to be cleaned with water 79 (54.8%), followed by tie the wound 70 (48.6%), clean with soap and water 64 (44.4%), applying antiseptics 60 (41.6%), application of lime 24 (16.6%). While the study conducted by Ichhpujani Uric acid is the end-product of purine catabolism.

It has antioxidant properties and is responsible for scavenging of 60% of the free radicals in human serum. Along with its anti-oxidant, uric acid also stimulates granulocyte adhesion on endothelial cells and release of peroxide and superoxide free radicals into blood.

A close relationship has been observed between high serum uric acid level and inflammatory markers, such as the total number of leukocytes, the number of neutrophils, Creactive protein, interleukins and tumour necrosis factor alpha.[4]

Uric acid behaves like an antioxidant in the early stages of the atherosclerosis process. When serum uric acid level rise above 6 mg/dl in women and 6.5-7.0 mg/dl in men, the antioxidant state is paradoxically changed to a pro-oxidant state in the later stages of the atherosclerosis process.

The risk factors for this paradoxal state include reduction in antioxidants and increase in other oxidants and acidity of tissues.

Comparison with other studies -

- A study done by Tian TT et al on 1093 patients with angiographically confirmed coronary artery disease Department of Cardiovascular surgery, The Affiliated Hospital of Qingdao, University TEDA International Cardiovascular Hospital, Tianjin,

China, from January 2013 to June 2017 and concluded the positive relation between Serum Uric acid level and severity of CAD.[3]

- A study done by Lv S et al, on 771 adults (18-35 years of age) with angiographically confirmed coronary artery disease Department of Cardiovascular surgery, at Anzhen Hospital from January 2005 to December 2015 and concluded the positive relation between Serum Uric acid level and severity of CAD.[5]
- A study done by Larsen TR et al, on 1825 patients with angiographically confirmed coronary artery disease in 2009 and concluded the positive relation between Serum Uric acid level and severity of CAD.[6]
- A study done by Bagheri B et al, on 148 males and 152 females aged 35-76 years with angiographically confirmed coronary artery disease in 2009 and concluded the dependent positive relation between Serum Uric acid level and severity of CAD.[7]
- Qureshi AE et al, conducted a cross-sectional study on 100 consecutive male patients presenting with ACS at Punjab Institute of Cardiology in 2013 and concluded the positive relation between Serum Uric acid level and severity of CAD.[8]
- Akanda MA et al, conducted an observational cohort study 180 patients admitted at our institution due to symptoms related to CAD in National Institute of Cardiovascular Diseases in 2012 and concluded the positive relation between Serum Uric acid level and severity of CAD.[9]
- Sinan Deveci O et al, conducted a study on 1012 CAD patients admitted in Department of Cardiology, Kecioren Research and Training Hospital, Ankara, Turkey in 2010 and concluded the positive relation between Serum Uric acid level and severity of CAD.[10]
- Goodarzynejad H et al, conducted a study on 540 CAD patients admitted in Department of Cardiology, Tehran Heart Center, Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran in 2008 and concluded the positive relation between Serum Uric acid level and severity of CAD.[11]
- Lim HE and et al, conducted a study on 687 CAD patients admitted in, Department of Internal Medicine, Guro Hospital, Korea in 2005 and concluded the positive relation between Serum Uric acid level and severity of CAD.[12]

The limitations of the study are that it is a cross sectional study, of a small sample size. It would be better to follow up patients for prognostic significance, and study the effect of varying uric acid levels.

CONCLUSION

In conclusion it has been found that there is a strong association between serum uric acid level and the severity of CAD.

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