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HYPERURICEMIA IN ACUTE CORONARY SYNDROME AND ITS RELATION WITH METABOLIC SYNDROME

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ABSTRACT:

BACKGROUND: *High mortality and morbidity are associated with coronary artery disease (CAD), the most common form of cardiovascular disease. In humans uric acid is produced as a byproduct of purine decomposition. Numerous epidemiological studies have shown that high levels of blood uric acid are associated with an increased risk of ischemic heart disease and other cardiovascular disorders.*

AIMS & OBJECTIVE: *The objectives of the present study are: To determine frequency of hyperuricemia in acute coronary syndrome. To compare frequency of metabolic syndrome in patients of acute coronary syndrome with and without hyperuricemia.*

MATERIAL & METHODS: *It was a cross sectional study. Patients admitted with Acute Coronary Syndrome to the Punjab Institute of Cardiology Lahore between March 20 and September 20 of 2016 were included in this study. A total of 200 patients with Acute Coronary Syndrome who fulfilled the study's inclusion criteria and provided written informed consent were included. The demographic and clinical characteristics of each patient were recorded in the appropriate sections of the proforma, as required by the operational definition.*

RESULTS: *In our study, out of 200 cases of ACS, 26.5% were between 30-50 years of age while 73.5% were between 51-70 years. Mean age was calculated 54.24+8.91 years. There were 47.5% male and 52.5 females. Frequency of hyperuricemia in ACS was calculated as 29.5% and frequency of MetS in patients with ACS with and without hyperuricemia was recorded as 38.98% vs 19.15% with p value 0.003 showing a significant difference.*

CONCLUSION: *Prevalence of hyperuricemia is much greater in patients presenting with acute coronary syndrome, whereas the prevalence of metabolic syndrome is markedly higher in hyperuricemic cases compared to those without hyperuricemia.*

KEY WORDS: *Acute coronary syndrome, hyperuricemia, metabolic syndrome*

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Author's Contribution: IN: Study design, study writing, sample size collection. TJ: Data colection. SRZ: SPSS output after data analysis. UM: Data collection. AN: Advice, suggestions, proof reading. SH: Data collection.

INTRODUCTION:

Uric acid is the end product of purine metabolism in humans, with roughly two-thirds of purines coming from the diet and one-third from the xanthine oxidase enzyme. Increased uric acid levels in the blood, either through increased production or decreased clearance by the kidneys, led to hyperuricemia.[1] Uric acid's diverse significance in the pathophysiology of IHD stems from its pro-inflammatory and antioxidant capabilities.[2] Hyperuricemia was found to affect 13.10% of the population in the study by Li-ying C et al, (2007). [3] Unstable angina, non-ST elevation myocardial infarction (NSTEMI), and ST elevation myocardial infarction (STEMI) are all types of IHD that fall under the broad definition "acute coronary syndrome" (ACS). ACS is a major cause of death and disability in both sexes. It is responsible for around 30% of all deaths worldwide.[4] The burden of acute coronary syndrome in the Pakistani population is growing.[5] A probable explanation is the high prevalence of its risk factors, such as diabetes, hypertension, dyslipidemia, and obesity, all of which are components of the MetS, particularly in developing nations.[6] According to Majeed MZ et al. (2014), 37.3% of patients with acute coronary syndrome have elevated serum uric acid.[7] Another study, conducted by Abdullah SA et al. (2015), found that elevated uric acid was detected in 24.7% of individuals with acute coronary syndrome.[8] Abrar A et al identified 47% of patients with coronary artery disease had metabolic syndrome in their study, while Yasmin S et al observed 31%. [9,10] According to Brodov Y et al, (2010), hyperuricemic individuals with metabolic syndrome had a considerably higher risk of myocardial infarction and sudden cardiac arrest than normouricemic patients with metabolic syndrome. [11] However, after controlling for other risk factors including diuretic usage, the Framingham Heart Study found no significant connection between serum uric acid levels and cardiovascular disease in either men or women. [12] According to the Choi HK et al, (2007) study, the prevalence of the MetS increases significantly with increasing levels of blood uric acid. [13] While Chuang SY et al. (2012) found that hyperuricemia was associated with the onset of IHD on its own, not just in the general population but also in people who did not have any risk factors for metabolic syndrome. [14] This study aims to assess the incidence of MetS in patients with ACS, both with and without hyperuricemia, as well as the prevalence of hyperuricemia in patients with ACS.

MATERIAL AND METHODS:

The study included 200 patients of ACS who met the inclusion criteria and provided written informed consent. The demographic and clinical characteristics of the patient, as defined by the operational definition, were reported in the appropriate locations on the proforma. After informed agreement and a 12-hour fast, a blood sample from a peripheral vein was obtained with minimum pain and centrifuged at the Biochemistry laboratory of PIC. The centrifuged serum was placed in sealed off tubes and refrigerated at 4°C before being tested for serum uric acid using the enzyme uricase technique, as well as fasting blood glucose, serum triglycerides, and HDL-C in the Biochemistry laboratory of the Punjab Institute of Cardiology in Lahore. The results of blood tests, such as fasting blood glucose, serum triglycerides and HDL-C, serum uric acid, and outcome variables, such as hyperuricemia and metabolic syndrome, were entered in the appropriate spots on the proforma. 1) Male and female 2) Age between 30 and 70 years 3) First attack of Acute coronary syndrome were included in this study.

1) Those with a history of joint aches or swelling, kidney stones, psoriasis, cancer or its treatment, and use of uric acid lowering medications. 2) Renal failure (serum creatinine >1.5 mg/dl) or dialysis patients 3) Patients receiving hyperuricemia-causing medications, such as thiazide or loop diuretics, low-dose aspirin (1-2 g/day), cyclosporine, or pyrazinamide. 4) Patients with a history of Ischemic heart disease, heart failure, PCI, valvular heart disease, or CABG were excluded from the study.

Hyperuricemia: defined as serum Uric Acid greater than 7 mg/dl in males and 6 mg/dl in females as evaluated by blood test Metabolic syndrome: according to National Cholesterol Educational Program Adult Treatment Panel-III was diagnosed if at least three of the following five parameters were present:

Abdnormal obesity:

A measuring tape was placed halfway between the top edge of the iliac crest and the bottom edge of the rib cage. For Asian men, the waist circumference had to be more than 90 cm and for Asian women, it had to be more than 80 cm.

Triglyceride level:

After 12 hours of fasting, a blood test was done to measure triglycerides, and the cut-off point was more than 150 mg/dl.

HDL – C:

it was measured with a blood test after 12 hours of fasting. The cutoff point for men was 40 mg/dl and for women it was 50 mg/dl.

Blood Pressure:

BP was measured by Sphygmomanometer as systolic / diastolic reading of more than 130 / 85 mmHg.

Fasting Blood Sugar:

It was measured by blood test after 12 hours fasting of more than 110 mg/dl. Acute coronary syndrome: Any two of the following three criteria must be present: a history of abrupt onset chest pain lasting more than 15 minutes and lasting less than two days, accompanied by nausea, vomiting, cold sweats, or dyspnea. (Choose any of those.) 12 lead electrocardiography demonstrating ST segment elevation or depression greater than or equal to 1mm in limb leads and greater than or equal to 2mm in chest leads, new onset left or right bundle branch block, T wave straightening or inversion, and poor R wave progression from V1 to V6 in chest leads. Troponin I > 0.16 ng/ml 6 hours after the onset of chest discomfort.

STATISTICAL ANALYSIS OF DATA:

SPSS 17.0 was used to enter and analyse the data. Age, serum uric acid, TG, HDL, blood pressure, blood sugar, waist circumference, height, and weight are all quantitative factors. BMI was displayed as mean+sd. Gender, metabolic syndrome, and outcome, i.e. hyperuricemia, were provided as frequency and percentages. Stratification was used to control the effect modifiers age, gender, BMI, and metabolic syndrome. The post stratification chi square test was used to determine the influence of these on the outcome (i.e. hyperuricemia), with a p value of 0.05 considered significant.

RESULTS:

Table 1: Stratification of age, gender and BMI

Age (in years)	Hyperuricemia		P value
	Yes	No	
30-50	15	38	0.82
51-70	44	103	
Gender	**Hyperuricemia**		**P value**
	Yes	**No**	
Male	34	61	0.06
Female	25	80	
BMI	**Hyperuricemia**		**P value**
	Yes	**NO**	
<35	17	104	0.000
≥35	42	37	

Table 2: Descriptive statistics of Baseline Variables.

Variables	Mean	SD
Serum Uric Acid	5.96	0.85
Triglyceride	158.07	11.45
HDL	37.85	7.48
Blood pressure	134.43/87.45	6.5/4.12
Blood sugar	117.48	10.87
Waist circumference	84.45	14.71
Height	5.7'	2.1
Weight	77.43	6.89
BMI	36.64	4.12

Table -3: Frequency of metabolic syndrome in patients of acute coronary syndrome with and without hyperuricemia (n=200)				
Metabolic syndrome	**hyperuricemia (n=59)**		**Without hyperuricemia (141)**	
	No. of Patients	%	No. of Patients	%
Yes	23	38.98	27	19.15
No	36	61.02	114	80.85
Total	59	100	141	100
P value = 0.003				

15 patients with hyperuricemia in our data were of age range 30-50 and 44 were of age range 51-70 years. In this data there were 34 males and 25 females found with hyperuricemia. Stratification of BMI showed significant p-value 0.000 showing significant association of BMI with hyperuricemia as 17 patients of BMI <35 and 42 with BMI >35 found with hyperuricemia. (table-1)

Mean variables of the study was calculated as 5.96+0.85 for serum uric acid, 158.07+11.45 for triglycerides, 37.85+7.48 for HDL,134.43/87.45 for blood pressure, 117.48+10.87 for fasting blood sugar, 84.45+14.71 for waist circumference, 5.7+2.1 for height, 77.43+6.89 for weight and 36.64+4.12 for BMI. (table-2)

Frequency of metabolic syndrome in patients of acute coronary syndrome with hyperuricemia was recorded as 38.98% (n=23) out of 59 cases of hyperuricemia while 19.15% (n=27) cases in patients without hyperuricemia, p value was calculated as 0.003 showing a significant difference in frequency of metabolic syndrome in patients with and without hyperuricemia. (table-3)

DISCUSSION:

CAD is the most common form of cardiovascular disease and is associated with a high rate of death and morbidity. In humans, uric acid serves as the final breakdown product of purine degradation. In various epidemiologic investigations, elevated blood uric acid has been shown to be a risk factor for ischemic heart disease and other cardiovascular disorders.

We designed this investigation with the understanding that uric acid has a contentious role in patients with acute coronary syndrome due to its relationship with multiple cardiovascular risk variables that are also components of metabolic syndrome. However, this study may bridge the gap and reinforce the function of uric acid as a risk factor in acute coronary syndrome, as well as elucidate its association with various metabolic syndrome indicators in patients with acute coronary syndrome.

In our study, out of 200 cases of ACS, 26.5% were between 30-50 years of age while 73.5% were between 51-70 years. The mean age was calculated as 54.24+8.91 years, 47.5% were male and 52.5% were female. The prevalence of metabolic syndrome was found to be 38.98% out of 59 cases of hyperuricemia and 19.15% cases in patients without hyperuricemia. The p value was computed as 0.003, indicating a significant difference.

37.3% of patients with ACS had high blood uric acid, according to research by Majeed MZ et al. (2014). [7] In a different study, Abdullah SA et al. (2015) discovered that 24.7% of people with acute coronary syndrome had increased uric acid levels. [8] While Yasmin S. et al. found 31% of those with coronary artery disease had metabolic syndrome, Abrar A. et al. found 47% of those with the condition.[9,10]

Our results fall within the range of hyperuricemia in ACS cases that has previously been described. In 2010, Brodov Y et colleagues determined that hyperuricemic individuals with metabolic syndrome had a considerably higher risk of myocardial infarction and sudden cardiac arrest than normouricemic patients with metabolic syndrome.[11] However, after controlling for other risk factors including diuretic usage, the Framingham Heart Study found no significant connection between serum uric acid levels and cardiovascular disease in either men or women.[12]

Blood uric acid levels are positively correlated with the prevalence of the metabolic syndrome, as reported by the research conducted by Choi HK et al, (2007). When uric acid levels were less than 6 mg/dL, the prevalence of the metabolic syndrome was 18.9%, when they were between 6 and 6.9 mg/dL, 36.0%, when they were between 7 and 7.9 mg/dL, and when they were 8 or 8.9 mg/dL, it was 59.7%.[13] Hyperuricemia was found to be independently linked to the onset of IHD, not only in the general population but also in those without other risk factors for metabolic syndrome,

as reported by Chuang SY et al. (2012).[14] Although we did not examine different quantities of serum uric acid in our investigation, our data suggest a substantial connection of hyperuricemia in cases of metabolic syndrome as compared to individuals who did not have hyperuricemia.

Serum Uric acid is a very simple, inexpensive, and widely available laboratory test that may play an important role in the early stratification of patients with acute coronary syndrome, and thus the burden of acute coronary syndrome and its complications can be reduced by taking early appropriate steps. However, the findings of our study must be confirmed by comparing them to those of other local trials.

CONCLUSION:

We observed that the frequency of hyperuricemia is much greater in patients with acute coronary syndrome, whereas the frequency of metabolic syndrome is significantly higher in hyperuricemic cases as compared to non-hyperuricemics.

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