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Correlation of Friesinger Score of Angiographic Severity of Coronary Artery with or without Hyperuricaemia among Acute Coronary Syndrome Patients

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Abstract

Background: Angiographic severity of coronary artery is essential to correlate with serum uric acid among acute coronary syndrome patients. **Objective:** The purpose of the present study was to correlate the Friesinger Score of angiographic severity of coronary artery with or without hyperuricaemia among acute coronary syndrome patients. **Methodology:** This cross-sectional study was carried out in the Department of Cardiology at National Institute of Cardiovascular Diseases, Dhaka, Bangladesh during the period of December 2011 to November 2012. Patients who were newly diagnosed as acute coronary syndrome during admission undergoing coronary angiography in National Institute of Cardiovascular Diseases, Dhaka during the specified period of time were the study population. Coronary angiography was done within 4 weeks after hospital admission. Study subjects were divided into two groups on the basis of serum uric acid levels. Patients who were newly diagnosed as acute coronary syndrome having normal serum uric acid levels (less than 7 mg/dL in men and less than 6 mg/dL in women) were included in group I. Patients who were newly diagnosed as acute coronary syndrome having elevated serum uric acid levels (more than 7 mg/dL in men and more than 6mg/dL in women) were included in group II. **Results:** A total number of 103 patients were recruited for this study who were divided into two groups and 53 patients having normal serum uric acid were considered in group I and 50 patients having hyperuricaemia acid were considered in group II. The mean age of study subjects among group I and group II are 50.45±10.33 years and 52.98±10.559 years respectively. The value of stenosis in Friesinger score in group II (9.30±3.955) was remarkably higher than that of group I (3.77±3.43) and it was statistically highly significant (p=0.001). Here, the vessel score is also markedly higher in group II (2.14±0.83) than that of group I (0.77±0.75) (p=0.001). The Pearson's correlation coefficient (r) was 0.288 which was significant (p< 0.037). **Conclusion:** In conclusion it showed that there was a positive linear correlation between Friesinger scores and normal level of serum uric acid. *[Journal of National Institute of Neurosciences Bangladesh, January 2023;9(1):81-87]*

Keywords: Correlation; Friesinger score; angiographic severity; coronary artery; hyperuricaemia; acute coronary syndrome

Introduction Coronary heart disease (CHD) is a major cause of mortality and is a global health problem reaching epidemic proportions in both developed as well as in developing countries[1]. Coronary heart disease risk is usually assessed by prediction models like 'Framingham point scores' developed in Framingham Heart Study, which usually assess classic vascular risk factors. However, as many as 20.0% of coronary artery disease (CAD) events occur in absence of any of the major classic vascular risk factors[2]. The recently published INTERHEART study shows that more than 80% of the global burden of coronary heart disease,

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irrespective of the ethnic origin, can be attributed to five main conventional cardiac risk factors abnormal lipids, diabetes mellitus, cigarette smoking, hypertensions and lack of exercise[3].

Hyperuricaemia was postulated to be a risk factor for coronary artery disease more than five decades ago[4]. Since then numerous studies have investigated the association between elevated serum uric acid and coronary artery disease. Some studies found hyperuricaemia to be an independent risk factor for coronary artery disease[5].Others reported that it was merely confounded by the relation of uric acid with conventional risk factors for coronary artery disease including DM, hypertension and hyperlipidaemia, or other co-existing condition such as metabolic syndrome, impaired renal function and diuretic therapy[6]. Although it has been extensively studied and a recent report revealed high serum uric acid is associated with the presence of coronary artery disease; few studies have assessed the relationship of hyperuricaemia with severity of coronary artery disease[7].

Patients with hyperuricaemia may be defined as serum uric acid concentration more than 7 mg/dL in men and more than 6 mg/dL in women[8]. Hyperuricaemia is an independent risk factor for hypertension, vascular disease, renal disease and cardiovascular events. Inherited isolated renal tubular defect, renal failure, chronic drug therapy like thiazide and loop diuretics, salicylate, ciclosporin and pyrazinamide, lead toxicity, alcohol, chronic myeloproliferative and lymphoproliferative disorders like polycythemia, chronic lymphatic leukemia predispose to hyperuricaemia[9]. High dose aspirin (more than 3 gm/day) is urisocuric, moderate dose (2 to 3 gm/day) does not alter urate excretion, low dose (less than 2 gm/day) cause hyperuricaernia, but lowest dose aspirin (75 mg/day) does not significantly incase serum uric acid concentration except in patients of chronic renal failure[10]. The purpose of the present study was to correlate the Friesinger Score of angiographic severity of coronary artery with or without hyperuricaemia among acute coronary syndrome patients.

Methodology

Study Population and Settings: This study was designed as a cross-sectional analytical study which was carried out in the Department of Cardiology at National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh. The study was performed during the period of December 2011 to November 2012. Patients who were newly diagnosed as acute coronary syndrome during admission undergoing coronary angiography in NICVD during the specified period of time were the study population. Coronary angiography was done within 4 weeks after hospital admission. Patient with heart failure, valvular heart disease, congenital heart disease, cardiomyopathy and Suspected myocarditis or pericarditis or patients having tuberculosis, malignancies, multiple myeloma, chronic myeloproliferative or lymphoproliferative disorder like polycythemia, chronic lymphatic leukemia or patients suffering from major non cardiovascular disorders such as severe renal impairment and liver disease or prior coronary revascularization percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) or patients taking drug therapy such as thiazide and loop diuretics like frusemide, ethacrynic acid, cytotxic drug like ciclosporin, antitubercular drug like pyrazinamide, low dose aspirin, antioxidant as well as taking medications like allopurinol, febuxostat, probenecid, sulphinpyrazone, benzbromarone targeted to lower uric acid level were excluded from this study.

Study Procedure: Consecutive non-randomized purposive sampling method was used to identify the sample number of the study population. Study subjects were divided into two groups on the basis of serum uric acid levels. Patients who were newly diagnosed as acute coronary syndrome having normal serum uric acid levels less than 7 mg/dL in men and less than 6 mg/dL in women) were included in group I. Patients who were newly diagnosed as acute coronary syndrome having elevated serum uric acid levels more than 7 mg/dL in men and more than 6mg/dL in women) were included in group II. Meticulous history was taken and detailed clinical examination had been performed and recorded in predesigned structured proforma (data sheet). Demographic profile such as age, gender, occupation, height (cm), weight (kg), body mass index (kg/m2) were noted. Risk factors profile included tobacco consumption, hypertension, diabetes, dyslipidaemia, family history of CAD had been noted. Routine investigations were done fasting blood sugar (FBS), serum creatinine, serum electrolytes, fasting lipid profile, screening blood tests for angiogram. A 12 lead resting ECG was done at a paper speed of 25 mm/s and 10mm standardization at admission. Transthoracic echocardiography was done by 2D & M-mode and Doppler echocardiography modalities. Standard echocardiographic measurements were done averaged in 4 cardiac cycles, left ventricular ejection fraction (LVEF) and regional wall motion abnormality were recorded.

Laboratory Procedure: Ten (10) ml of blood samples was collected in a heparinized syringe in between 6 to 48 hours of onset of chest pain for Troponin I. Serum Troponin I concentration was determined by immunometric assay (Immulite turbo-troponin I; DPC; Los angeles, USA). The troponin kit reagent used in this study has a cut-off value of 1.0 ng/ml. Another blood sample was collected after 12 hours fasting period and multiple aliquots of plasma and serum sample were prepared for measuring fasting lipid profile, fasting blood sugar (FBS) and fasting serum uric acid level. Serum uric acid assay was carried out by Vitros 250 (J & J)/Dade Behring Dimension RxL Random Access Multibatch chemistry analyzer and enzymatic colorimetric method by using uricase and peroxidase. Coronary angiogram was done by conventional method within 4 weeks of hospital admission.

Cardiac Procedures: Angiographic pattern and severity of coronary artery disease was assessed by interpretation of coronary angiogram done by visual estimation by two cardiologists who were blind about the serum uric acid level to assess the severity of coronary artery disease. Severity of coronary stenosis was graded according to the number of major epicardial vessels with significant stenosis by applying scoring systems like Vessel score and Friesinger score. Vessel score was the number of vessels with significant stenosis for left main coronary artery 50.0% or greater and for others 70.0% or greater reduction in luminal diameter9. Score ranges from 0 to 3, depending on the number of vessel involve. Left main coronary artery was scored as single vessel disease10. The Friesinger index is a score ranges from 0 to 15. Each of the three main coronary arteries is scored separately from 0 to 5. The maximum possible value of the affection of the 3 arteries taken together will be thus 15 points.

Statistical Analysis: The numerical data obtained from the study was analyzed and the significance of differences was estimated by using statistical methods. After processing of all available information, statistical analysis was performed by using computer-based SPSS (Statistical Package for Social Science). Data was expressed in percentage, frequencies, means and standard deviation. Continuous data was expressed as mean ± standard deviation (SD) and dichotomous data was represented as percentage. Continuous variables were compared through the Student's t-test and for the categorical variables the chi-square test was applied. Other statistical test such as Pearson's correlation coefficient test was also used as inferential tool of relationship to measure strength of association between dependent and independent variables. P value of <0.05 was considered as significant.

Ethical Clearance: The study protocol was approved by the institutional review board of NICVD, All the patients included in this study informed about the nature, risk and benefit about the research study. Informed consent was taken from each patient or near relatives. Confidentiality was maintained strictly and the patient must have a right to withdraw himself/herself from the study at any time during the study period. Proper permission has taken from the department and respective authority. Data was collected in an approved data collection form.

Results

A total number of 103 patients newly diagnosed as acute coronary syndrome were divided into two groups-53 patients having normal serum uric acid (<7 mg/dl in men and <6 mg/dl in women) were considered in group I and 50 patients having hyperuricaemia acid (≥7mg/dl in men and ≥6 mg/dl in women) were considered in group II.

Age Distribution: The study populations were mainly between 40 to 75 years which were 90.6% cases and 92.0% cases in group I and group II respectively. Only 9.4% study population in group I and 8.0% in group II were below 40 years of age. The mean age of study subjects among group I and group II were 50.45±10.33 years and 52.98±10.559 years respectively and there were no statistically significant differences observed between two groups in respect of mean age (p=0.222) (Table 1).

Table 1: Comparison of Age between Two Groups

Age Group	Group I	Group II	P value
25 to 39 Years	5(9.4%)	4(8.0%)	
40 to 49 Years	17(32.1%)	15(30.0%)	
50 to 59 Years	18 (34.0%)	15 (30.0%)	0.34
60 to 75 Years	13(24.5%)	16(32.0%)	
Total	**53(100.0%)**	**50(100.0%)**	
Mean±SD	50.45±10.330	52.98±10.559	0.222

Group-I: ACS patients with normal serum uric acid level; Group-II: ACS patients with elevated serum uric acid level. Data were analysed by representing as mean±SD and unpaired t-test was done to determine the statistical significance of observed difference between the mean age of the study group

Angiographic Severity: Study findings revealed that the value of stenosis in Friesinger score in group II (9.30±3.955) was remarkably higher than that of group I (3.77±3.43) and it was statistically highly significant

(p=0.001). Here, the vessel score is also markedly higher in group II (2.14±0.83) than that of group-I (0.77±0.75) and it is statistically significant (p=0.001).

Table 2: Comparison of Angiographic Severity between Two Groups

Type of Score	Mean±SD	P value
Group I	3.77 ±3.43	0.001
Group II	9.30 ±3.955	

Group-I: ACS patients with normal serum uric acid level; Group-II: ACS patients with elevated serum uric acid level. Data were analysed by representing as mean±SD and unpaired t-test was done to determine the statistical significance of observed difference between the mean age of the study groups

Correlation between Serum Uric Acid and Friesinger Score: Figure I showed the correlation between Friesinger score and normal level of serum uric acid for group I. The Pearson's correlation coefficient (r) was 0.288 which was significant (p< 0.037). Therefore, it showed that there was a positive linear correlation between Friesinger scores and normal level of serum uric acid. This had indicated that when the level of serum uric acid had increased, the score was also increased.

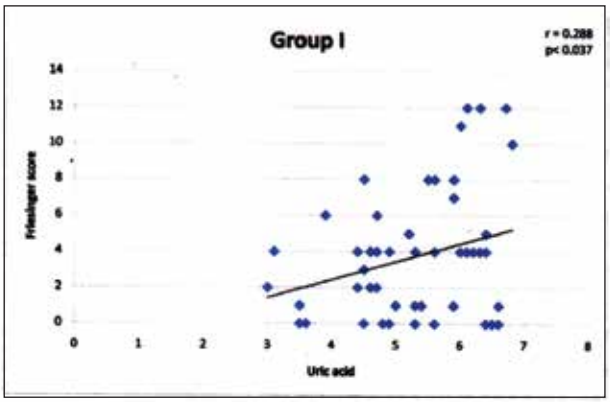

Figure I: Correlation between Friesinger score and normal serum uric acid

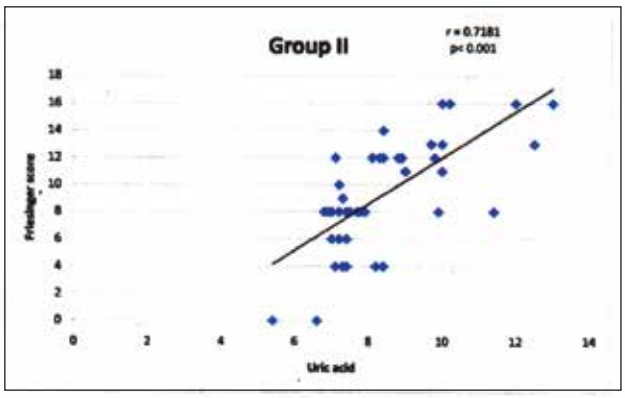

Figure II: Correlation between Friesinger score and Elevated Serum Uric Acid

Figure II showed the correlation between Friesinger score and elevated serum uric acid level for group II. The Pearson's correlation coefficient (r) was 0.7181 which was more significant (p<0.001) than group I. Therefore, it showed that there was a strongly positive linear correlation between Friesinger scores and elevated serum uric acid level.

Discussion

This cross-sectional comparative study was conducted in National Institute of Cardiovascular Diseases (NICVD), Dhaka. One hundred and three consecutive patients with CAD admitted in NICVD and had undergone angiogram were included in this study and the patients were divided in two groups. Group I (53) included who had serum uric acid levels are normal (<7mg/dl in men & <6mg/dl in women) while 50 patients were enrolled as group II member who had serum uric acid levels are elevated (>7mgldl in men & >6mg/dl in women).

The study populations were mainly between 40 to 75 years which was 90.6% cases and 92% cases in group I and group II respectively. Only 9.4% study population in group I and 8% in group II are less than 40 years of age. The mean age of group I and group II was 50.45±10.33 and 52.98±10.55 years respectively. There was no statistically significant difference was found in between two groups but it is found that acute coronary syndrome incidence is higher after age 40 years. It has been reported that most of the AMI takes place after 40 years of age in Bangladesh[11].

It was found that majority of the study participants were male in both groups 88.68% cases male and 11.32% cases female are in group I and 88.0% male and 12.0% female are in group II respectively (p=0.914) which indicates higher incidence among men than women. It has found an association between hyperuricaemia with CAD and a trend for more coronary diseased vessels in men with hyperuricaemia[7]. The mean pulse (p=0.530), SBP (p=0.107), DBF (p=0.570), height (p=0.701), weight (p=0.071) and BMI (p=0.093) are almost identically distributed among both groups. Lim et al[12] found no relationship between systolic and diastolic BP with CAD in hyperuricaemic patients. Goodarzynejad et al[7] showed no significant difference in respect of weight in CAD patients having hyperuricaemia. Jelic-Ivanovic et al11 found significant relationship between BMI with CAD in hyperuriicaemie patients but Bae et al[13] found no such type of association in their study.

The data of biochemical investigations reveals that HDL-C is comparatively lower in group II (38.72±2.187) than group I (39.64±2.107) and it is statistically significant (p=0.032). Other parameters like FBS, TC, TG, LDL and creatinine level are almost identically distributed among both groups. Akanda et al[14] have found significant relation between low HDL and CAD in hyperuricaemic patients and he found no relation between TG, LDL-C, FBS, creatinine level with CAD in such patients.

Several risk factors for developing coronary heart diseases are discussed in many studies[7,15-16]. This study has revealed several risk factors such as smoking, hypertension, diabetes, dyslipidaemia family history of IHD are 37.7% cases, 35.8% cases, 32.1% cases, 52.8% cases, 11.3% cases in group I and 36.0% cases, 42.0% cases, 38.0% cases, 52.0% cases, 14.0% cases in group Il respectively. But there is no significant difference observed between two groups in respect of smoking (p=0.855), hypertension (p=0.522), DM (p=0.529), dyslipidaemia (p=0.933) and family history of IHD (p=0.682). Lim et al[12] have found no significant relationship between hypertension and smoking with patients of CAD having high serum uric acid. Akanda et al14 have revealed no association between family history of IHD with CAD in patients having high serum uric acid. Tavil et al[17] described that higher level of serum uric acid is associated-with atherogenesis which is independent of hypertension. Bae et al[13] have showed no significant relationship between hypertension, diabetes mellitus, dyslipidaemia with patients of high serum uric acid having CAD.

Study describes the relationship between hyperuricaemia and severity of coronary artery disease in terms of vessel score and Friesinger score. Among total patients, the adverse angiographic result on the basis of vessel score has been identified as 46.6% cases and 29.1% cases in group II and group I respectively. It is found that higher percent of patients of group-II were detected as vessel score-2 (42%) and score-3 (38%) than that of patients of group I (5% and 3% respectively) and it is statistically highly significant (p=0.001). Study findings also reveals that maximum patients achieved higher Friesinger score-4 (60%) and score-5 (30%) in group II than that of group I (41.51%) and 5.6% respectively and it is statistically significant (p=0.001). In respect of angiographic severity, the mean vessel score is markedly higher in group II (2.14±0.83) than that of group I (0.77±0.75) and it is statistically significant (p=0.001). The severity of stenosis of vessel in terms of Friesinger score was remarkably higher among the patients of group II (9.30±3.955) than that of group I (3.77±3.43) and it is statistically highly significant (p=0.001). In a case control study, although Hiyamuta et al18 failed to show the relationship between uric acid and the coronary artery disease, but Jelic-Ivanovic et al[11] found an independent association of high serum uric acid concentration with angiographically defined coronary artery disease.

The mean distribution of serum uric acid level in male was 8.2 mg/dl and 5.5 mg/dl in group-11 and in case of female that was 7.3 mg/dl and 4.5 mg/dl in group II and group I respectively. In case of correlation between Friesinger scores and uric acid for group I, the Pearson's correlation coefficient was 0.288 (p<0.037). Although it is statistically significant, but it shows that there is a weak positive linear correlation between Friesinger scores and high normal limit of serum uric acid in group-I. Jelic-Ivanovic et al[11] found that male with uric acid >5.40mg/dL (>324.7 (mmol/L) were 5 times more likely CAD than male with lower uric acid (OR=5, CI=2.928-8.612, P=0.01) and female having uric acid >4.3 mg/dl (>258.0 mmol/L) has obtained similar result than female with lower uric acid (OR=5, CI=2.61-9.64, P<0.0 1). Here the Pearson's correlation coefficient in group-11 was 0.7181 (p<0.001) which is remarkably more significant than group I. Therefore, it shows that a strongly positive linear correlation exists between Friesinger scores and hyperuricaemia in group II population.

Here, patients of unstable angina (UA), ST segment elevated myocardial infarction (STEMI) and non ST segment elevated myocardial infarction (NSTEMI) are 41.5% cases, 47.2% cases and 11.3% cases in group I and 24% cases, 48.0% cases and 28.0% cases in group II respectively. Here NSTEMI patients are higher in percentage in group II than group I and patients of UA are higher in percentage in group I than group II and STEMI patients are identical in both groups. Findings also describe correlation between vessel score & serum uric acid level and the Pearson's correlation coefficient was 0.3078 (p< 0.025) which is significant in group I, but it shows that there is a linear and weak positive correlation between vessel scores and normal uric acid in group.

In case of group II, the Pearson's correlation coefficient was 0.7238 (p<0.001) which is markedly more significant than group I. Therefore, it shows that a strongly positive linear correlation exists between

vessel scores and hyperuricamia in group n population. Goodarzynejad et al[7] have found strongly significant linear trend of higher prevalence of hyperuricaemia as well as higher concentration of uric acid with increasing numbers of diseased vessel and the P value 0.001 & P <0.001 for the Mantel-Hanzel test of linear trend respectively.

Conclusion

In conclusion, it showed that there was a positive linear correlation between Friesinger scores and normal level of serum uric acid. The value of stenosis in Friesinger score in group II is remarkably higher than that of group I. Again, the vessel score is also markedly higher in group II than that of group I and it is statistically significant.

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Data Availability
Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate
Ethical approval for the study was obtained from the Institutional Review Board. As this was a prospective study the written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations.

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