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Association of Hyperuricaemia with Angiographic Severity of Coronary Artery Disease in Patients of Acute Coronary Syndrome

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Abstract **Original Research Article**

Background: Coronary artery disease (CAD) is a major cause of death and a global health issue that has reached pandemic proportions in both industrialized and developing countries. Coronary artery disease is primarily caused by atherosclerosis of the epicardial coronary arteries. ***Aim of the study:*** The aim of our study was to investigate the relationship between hyperuricemia and the angiographic severity of coronary artery disease in patients who have recently been diagnosed with acute coronary syndrome. ***Methods:*** This cross-sectional analytical study was conducted in the department of Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh, from December 2011 to November 2012. The study included 103 patients who were newly diagnosed as acute coronary syndrome. The individuals in this study were separated into two groups based on their serum uric acid levels. All acquired data was entered into a Microsoft Excel Work Sheet and analyzed using descriptive statistics in SPSS 11.5. ***Results:*** The study populations are mainly between 40 to 75 years (90.6% & 92% remaining in group- I & group- II respectively). It was found that majority of the study participants were male in both groups. Findings of the study shows that there is no statistically significant difference observed in respect smoking habit (p-0.86), hypertension (p-0.32), DM (p-0.53), dyslipidemia p-6.93) and family history of IHD (p-0.68) between two groups. The data of biochemical parameters reveals that HDL level is comparatively lower in group-II (38.72± 2.19) than group- I (39.64 ± 2.11) and it is statistically significant (p=0.03). This study findings reveals that the value of stenosis in Friesinger score in group-II (9.30± 3.96) is remarkably higher than that of group-I (0.77± 3.43) and it is statistically highly significant (p-0.001). ***Conclusion:*** This study reveals that hyperuricaemia may be an independent risk factor and predictor of the severity of coronary artery disease in patients with acute coronary syndrome.

Keywords: Coronary artery disease, Hyperuricaemia, Acute coronary syndrome, Serum uric acid.

INTRODUCTION

Ischemic heart disease is the top cause of death in industrialized countries and the second greatest cause of death in developing countries by 2020, it will be the major cause of disability according to the World Health Organization [1]. Coronary heart disease (CHD) is a leading cause of death worldwide, with pandemic proportions in both industrialized and developing countries [2]. In 2004, an estimated 17.1 million people died from cardiovascular disease (CVD), accounting for 29% of all global deaths, with coronary heart disease accounting for 7.2 million of these deaths [3]. In 2006, the prevalence of coronary artery disease (CAD) among persons aged 20 and older was 17,600,000, with approximately 9,200,000 males and 8,400,000 women in the United States of America (USA). In 2006, CAD was responsible for approximately one out of every six deaths in the United States. It is the leading cause of death for both men and women in the United States. Every 25 seconds, an American will experience a coronary episode, and every minute, someone will die [4]. Cardiovascular disease (CAD) is the leading cause of death in the United Kingdom (UK) and many other countries of the world. However, over the previous

decade, the mortality rate in the UK has decreased significantly, with roughly 60 fatalities per 100,000 people occurring each year. Sudden cardiac death is a common symptom of CAD. Sudden death was shown to be the initial, last, and only symptom in one out of every six cardiac attacks [5]. South Asian countries such as India, Pakistan, Bangladesh, Sri Lanka, and Nepal bear the greatest part of the worldwide burden of Cardiovascular Diseases (CVDs) [6]. According to estimates from the global burden disease research, by 2020, this region of the world will have more people with atherosclerotic cardiovascular disease than any other [7]. Bangladesh is a small but populous country. Cardiovascular disorders have placed a serious strain on Bangladesh's health-care system. Three small-scale population-based investigations in Bangladesh found an average prevalence of ischemic heart disease of 6.5 per thousand rural residents [8]. Lack of physical exercise, lesser consumption of fruits and vegetables, and a general proclivity for illness are more widespread in Bangladeshis than in Pakistanis or Indians. Another factor explaining the variation in mortality from coronary heart disease among different subgroups of South Asians is disadvantageous socioeconomic level [9]. Gertler and colleagues proposed hyperuricemia as a risk factor for CAD more than five decades ago. Numerous investigations have already been conducted to evaluate the relationship between high blood uric acid and CAD. Some investigations demonstrated hyperuricemia to be an independent risk factor for CAD [10]. Others reported that it was simply confirmed by the association of uric acid with traditional risk factors for CAD such as diabetes, hypertension, and hyperlipidaemia, or other co-existing conditions such as metabolic syndrome, impaired renal function, and diuretic therapy [11]. Although it has been extensively examined, and a recent analysis found high blood uric acid to be linked with the existence of CAD, few studies have assessed the relationship of hyperuricaemia with CAD severity [12]. The goal of this study is to assess hyperuricaemia as a risk factor for coronary artery disease and to look for a possible link between hyperuricaemia and the angiographic severity of CAD in patients with acute coronary syndrome after controlling for gender, BMI, family history of ischemic heart disease, smoking status, hypertension, dyslipidaeia, and diabetes mellitus. As a result, the proposed study could be both sensible and time-consuming.

METHODOLOGY

This cross-sectional analytical study was conducted in the department of Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh, from December 2011 to November 2012. A total of 103 patients with newly diagnosed acute coronary syndrome were studied. The individuals in this study were separated into two groups based on their serum uric acid levels. Group I included 53 patients with newly diagnosed acute coronary syndrome and normal blood uric acid levels (<7 mg/dl in males and <6 mg/dl in women). Patients with newly diagnosed acute coronary syndrome and increased blood uric acid levels (>7 mg/dl in men and > 6mg/dl in women) were included in group II. All acquired data was entered into a Microsoft Excel Work Sheet and analyzed using descriptive statistics in SPSS 11.5.

RESULT

The study populations are mainly between 40 to 75 years (90.6% & 92% remaining in group- I & group-II respectively). Only 9.4% study population in group- I and 8% in group II are below 40 years of age. The mean age of study subjects among group- I and group- II are 50.45±10.33 years and 32.96±10.56 years respectively and there is no statistically significant differences observed between two groups in respect of mean age (p-0.22) [Table-1]. It was found that majority of the study participants were male in both groups. Here 47 patients (88.68%) were male and the rest 6 patients (11.32%) were female subjects in group- I, whereas 44 patients (88.0%) were male and the rest 6 patients (12.0%) were female subjects in group-II. There is no significant difference (p-0.91) observed between two groups [Table 2]. [Table-3] reveals that 18 patients (26%) are smoker, 21 patients (42%) as hypertensive, 19 patient diabetic, 25 patients (32.0%) are dyslipidaemia and 7 patients (145) have family history of IHD among the group II population whereas that of smoker are 20 in number (17.7%), hypertensive are 19 in number (35.8%), diabetic are 17 in number (32.1%), dyslipidaemia are 28 in number (52.8%) and family history of IHD are 6 in number (11.3%) as Group-I population. Findings of the study shows that there is no statistically significant difference observed in respect smoking habit (p-0.86), hypertension (p-0.32), DM (p-0.53), dyslipidemia p-6.93) and family history of IHD (p-0.68) between two groups. The data of biochemical parameters reveals that HDL level is comparatively lower in group-II (38.72± 2.19) than group- I (39.64 ± 2.11) and it is statistically significant (p=0.03). Other parameters like FBS, TC, TG, LDL and creatinine level are almost identically distributed among both groups [Table-4]. Study findings in [Table-5] reveals that the value of stenosis in Friesinger score in group-II (9.30± 3.96) is remarkably higher than that of group-I (0.77± 3.43) and it is 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 -1: Comparison of age between two groups (N=103)

Age in years	Group-I (n=53)	Group-II (n=50)	P-value
25-39	05 (9.4)	04 (08)	0.22
40-49	17 (32.1)	15 (30)	
50-59	18 (34)	15 (30)	
60-75	13 (24.5)	16 (32)	
Mean ± SD	50.45 ± 10.33	52.98 ± 10.55	

Table-2: Percentage distribution of study subjects by gender (N=103)

Gender	Group-I (n=53)	Group-II (n=50)	P-value
Male	47 (88.68)	44 (88)	0.91
Female	06 (11.32)	06 (12)	

Table-3: Percentage distribution of study subjects by risk factors (N=103)

Risk factors	Group-I (n=53)	Group-II (n=50)	P-value
Smoking	20 (37.7)	18 (36)	0.86
Hypertension	19 (35.8)	21 (42)	0.52
DM	17 (32.1)	19 (38)	0.53
Dyslipidaemia	28 (52.8)	26 (52)	0.93
F/H of IHD	06 (11.3)	07 (14)	0.68

Table -4: Comparison of biochemical parameters between two groups (N=103)

Biochemical parameters	Group-I (n=53) Mean ± SD	Group-II (n=50) Mean ± SD	P-value
Fasting blood sugar	6.46 ± 1.74	6.36 ± 2.04	0.79
TC (mg/dl)	154.51 ± 42.17	165.46 ± 44.78	0.20
TG (mg/dl)	139.11 ± 73.27	155.04 ± 91.68	0.33
LDL (mg/dl)	97.42 ± 12.11	99.38 ± 11	0.39
HDL (mg/dl)	39.64 ± 2.11	38.72 ± 2.19	0.03*
Creatinine (mg/dl)	0.97 ± 0.18	1.08 ± 0.83	0.36

Table -5: Comparison of angiographic severity between two groups (N=103)

Type of score	Group-I (n=53) Mean ± SD	Group-II (n=50) Mean ± SD	P-value
Friesinger score	3.77 ± 3.43	9.30 ± 3.96	0.001*
Vessel score	0.77 ± 0.75	2.14 ± 0.83	0.001*

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 (>7mg/dl in men & >6mg/dl in women). The study populations ranged in age from 40 to 75 years old (90.6% and 92% in groups I and II, respectively). Only 9.4% of the study population in Group I and 8% of the study population in Group II are over 40. Group I and II had mean ages of 50.45±10.33 and 52.98±10.56 years, respectively. There was no statistically significant difference detected between the two groups, but it was shown that the incidence of acute coronary syndrome increases after the age of 40. The majority of AMI occurs after the age of 40 in Bangladesh [13]. In both groups, the majority of the study participants were male.Group I has 88.68% males and 11.32% females, while Group II has 88% males and 12% females (p=0.91), indicating that men have a greater

incidence than women. Hamidreza discovered a link between hyperuricemia and CAD, as well as a trend toward more coronary diseased arteries in hyperuric males [14]. The results of biochemical studies show that HDL-C is lower in group II (38.72±2.19) than in group I (39.64±2.11), and this difference is statistically significant (p=0.032). Other indicators such as FBS, TC, TG, LDL, and creatinine level are nearly evenly distributed across the two groups. A significant relationship between low HDL and CAD in hyperuricaemic patients, but no relationship between TG, LDL-C, FBS, or creatinine level and CAD in these patients [15]. Several risk factors for developing coronary heart diseases are discussed in many studies [16,17]. This study revealed several risk factors such as smoking, hypertension, diabetes, dyslipidaemia family history of IHD are 37.7%, 35.8%, 32.1%, 52.8%, 11.3% in group-I and 36%, 42%, 38%, 52%, 14% in group-II respectively. But there is no significant difference observed between two groups in respect of smoking (p=0.86), hypertension (p=0.52), DM (p=0.53), Dyslipidaemia (p=0.93) and family history of IHD (p=0.68). Hong Buy Lim (2010) found no significant relationship between hypertension and smoking with patients of CAD having high serum uric acid [18]. Akanda (2012) revealed no association between family history of IHD with CAD in patients having high serim uric acid [19]. Tavil (2008) described that higher level of serum uric acid is associated with atherogenesis which is independent of hypertension [20]. Jelic-Ivanovic (2007) showed no significant relationship between hypertension, DM, dyslipidaemia with patients of high serum uric acid having CAD [21]. 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 and colleagues failed to show the relationship between uric acid and the CAD, but Zorana found an independent association of high serum uric acid concentration with angiographically defined CAD [22].

Limitation of the study:

A single-center study with a small sample size is insufficient to generalize the findings. Because the trial was conducted over a short period of time, patients were not observed for an extended amount of time to determine the outcome. The majority of the confounding factors were examined, although there may be some other confounding factors that influence CAD.

CONCLUSION & RECOMMENDATION

This study reveals that hyperuricaemia may be an independent risk factor and predictor of the severity of coronary artery disease in patients with acute coronary syndrome.

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