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Association of Haemoglobin and C-Reactive Protein level with Different Risk Factors among Acute Coronary Syndrome Patients

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Abstract

Background: Different risk factors may be related with the haemoglobin and CRP level among the acute coronary syndrome patients. **Objective:** The purpose of the present study was to see the association of haemoglobin and CRP level with different type of risk factors among the acute coronary syndrome patients. **Methodology:** This cross-sectional study was conducted in the Department of Cardiology at Mymensingh Medical College, Mymensingh, Bangladesh from December 2010 to November 2011 for a period of two (02) years. Patients of ACS who were presented within 12 hours of chest pain were included as study population. Study population were categorized in four groups according to the level of hemoglobin and C-reactive protein. Age, cardiovascular risks factor, history, family history of cardiovascular disease, treatment history and ECG were taken during admission. Blood sample was collected for baseline laboratory investigations like Troponin-I, Random Blood Sugar (RBS), Blood urea, Serum creatinine, lipid profile, Hemoglobin & CRP level. Sample were then send to standard laboratory/Biochemistry department of MMCH. **Result:** The mean age of the population was 52.18±8.88 years. Smoking was the highest percentage in Group 1 which was 54(50.0%) cases (P=0.001). Hypertension was found most common in group 1 (47.6%), Group 2 (33.3%), Group 3 (10.7%) and Group 4 (8.3%). Smoking (p=0.001) and hypertension (p=0.016) was found statistically significant. Diabetes was found in Group 1 (37.7%), Group 2 (43.5%), Group 3 (11.6%) and Group 4 (7.2%). Group 1 (50%) and Group 2 (50%) patients were dyslipidaemic. Family history of IHD was present group-1 (36.8%), Group 2 (44.7%), Group 3 (73.2%) and Group 4 (53%). Among the smoker patient 65.6% cases had CRP level >12 mg/l; 39.8% cases had CRP level <12mg/L. Among the nonsmoker 34.4% cases had CRP level >12mg/l and 60.2% cases had CRP level <12mg/L. The finding was statistically significant. **Conclusion:** In conclusion haemoglobin and CRP level is associated with different type of risk factors among the acute coronary syndrome patients. *[Journal of National Institute of Neurosciences Bangladesh, 2019;5(2): 156-160]*

Keywords: Association; Hb and CRP level; different risk factors; acute coronary syndrome Patients

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Introduction

Acute coronary syndrome (ACS) encompasses different clinical entities associated with acute myocardial ischemia including ST-segment elevation myocardial infarction (STEMI), non ST elevation myocardial infarction (N STEMI) and unstable angina[1]. Because of life threatening nature of an ACS, it is prudent to have a low threshold in suspecting a patient with acute chest

pain as potentially having an ACS. Because the efficient diagnosis and optimal management of these chest pain are derived from information mostly only readily available from initial clinical presentation, there is overlap of those with true ACS and those that ultimately do not have CHD as a cause of their cardiac symptoms[2]. In addition, it may not be possible to differentiate patient with myocardial infarction from those with unstable angina in the initial hours as the biomarkers of myonecrosis can be normal initially[3].

Incidence of ACS is increasing in developing countries including Bangladesh with socioeconomic improvement and change in the life style and dietary habit, smoking, decrease physical activity increasing body weight and consequently increasing rate of diabetes mellitus, hypertension and dyslipidemia which contribute to increase coronary heart disease[4]. Several factors are known to increase liability to coronary heart disease. The factors, which increases liability of CHD, some are modifiable, some are not. The factors which are established modifiable are smoking, hypertension, diabetes mellitus, dyslipidaemia, stress, obesity, sedentary work and so on[5].

Low hemoglobin level has the potential to worsens the myocardial ischemic insult in acute MI and other acute coronary syndrome both by decreasing the oxygen content of the blood supplied to the jeopardized myocardium and by increasing myocardial oxygen demand though necessitating a higher cardiac output to maintain adequate systemic oxygen delivery[6]. Inflammation is a recognized key component of acute coronary syndrome, such pathogenic achievement has led to the use of inflammatory cells and protein as prognostic marker in these syndromes. Common markers of inflammation such as CRP, the prototypic acute phase protein and to lesser extent fibrinogen have been proven to be reliable and important markers of risk in ischemic heart disease[7].

CRP in particular has been found be associated with short and long term prognosis in acute coronary syndrome including ST-elevation myocardial infarction and unstable angina and to predict the risk of re stenosis and major events including death after revascularization procedure[8]. There are many studies on high C- reactive protein level correlated with coronary artery disease in the world. This present study was undertaken to see the association of haemoglobin and CRP level with different type of risk factors among the acute coronary syndrome patients.

Methodology

This comparative cross-sectional study was conducted in the Department of Cardiology at Mymensingh Medical College, Mymensingh, Bangladesh from December 2010 to November 2011 for a period of two (02) years. Patients of ACS who were presented within 12 hours of chest pain were included as study population. Patient who were admitted in CCU with clinical features of ischaemic type of chest pain of both sexes within 12 hours of onset of chest pain and diagnosed as ACS were included in this study. Patients with iron therapy before admission, blood transfusion before admission, History of previous or current haemostatic disorder, patient with recent bleeding, renal insufficiency, patient admitted with Chronic disease or inflammatory condition, Patient with malignancy, history of PCI or history of CABG were excluded from this study. All the data were recorded in a data collection sheet. Study population were categorized in four groups according to the level of hemoglobin and C-reactive protein. Patients who had less than 10 gm/dl haemoglobin level and more than or equal to 12 mg/L of CRP were designated as Group I. Patients who had more than 10 gm/dl haemoglobin level and less than 12 mg/L of CRP were designated as Group II. Patients who had more than 10 gm/dl haemoglobin level and more than or equal to 12 mg/L of CRP were designated as Group III. Patients who had less than 10 gm/dl haemoglobin level and less than 12 mg/L of CRP were designated as Group IV. Age, sex, cardiovascular risks factor, history, family history of cardiovascular disease, treatment history and ECG were taken during admission. Blood sample was collected for baseline laboratory investigations like Troponin-I, Random Blood Sugar (RBS), Blood urea, Serum creatinine, lipid profile , Hemoglobin & CRP level .Sample were then send to standard laboratory /Biochemistry department of MMCH. The period of follow up was 5 days after admission. Permission from the ethical committee was taken. Continuous data were expressed as mean±SD. Categorical data were analyzed with test, Student's unpaired 't' test was used for analysis of continuous variables. Comparison between groups was done by unpaired t-test. Avitex CRP (Omega Diagnostics Ltd. Scotland. UK) is a rapid latex agglutination test kit for detection of C-reactive protein in human serum. The detection limit is 6mg/L. Hemoglobin estimation was done by analyzer.

Results

Majority of the study population were in the age group

Table 1: Age distribution of the study population

Age Group	Group Name				Total
	Group 1	Group 2	Group 3	Group 4	
30 to 40 Years	11 (14.7%)	6 (6.5%)	5 (22.7%)	0 (0.0%)	22 (10.9%)
41 to 50 Years	23 (30.7%)	38 (41.3%)	7 (31.8%)	5 (41.7%)	73 (36.3%)
51 to 60 Years	28 (37.3%)	33 (35.9%)	8 (36.4%)	4 (33.3%)	73 (36.3%)
61 to 70 Years	13 (17.3%)	15 (16.3%)	2 (9.1%)	3 (25.0%)	33 (16.4%)
Total	**75(100.0%)**	**92(100.0%)**	**22(100.0%)**	**12(100.0%)**	**201(100.0%)**

Mean±SD = 52.18±8.88; $\chi 2 = 9.56$, P = 0.39 NS; Group 1=Hb < 10 gm/dl CRP > 12 mg/L; Group 2=Hb > 10 gm/dl CRP< 12 mg/L; Group 3=Hb > 10 gm/dl CRP > 12 mg/L; Group4= Hb < 10 gm/dl CRP< 12 gm/L

Table 2: Distribution of the study population by Risk factors

Risk Factor	Group Name				Total	P value
	Group 1	Group 2	Group 3	Group 4		
Smoking	54(50.0%)	39(36.1%)	11(10.2%)	4(3.7%)	108(100.0%)	0.001S
Hypertension	40(47.6%)	28(33.3%)	9(10.7%)	7(8.3%)	84(100.0%)	0.016 S
Diabetes	26(37.7%)	30(43.5%)	8(11.6%)	5(7.2%)	69(100.0%)	0.93 NS
Dyslipidaemia	4 (50.0%)	4(50.0%)	0(0.0%)	0(0.0%)	8(100.0%)	0.62 NS
IHD F/H	14(36.8%)	17(44.7%)	5(13.2%)	2(5.3%)	38(100.0%)	0.97 NS

Group 1=Hb < 10 gm/dl CRP > 12 mg/L; Group 2=Hb > 10 gm/dl CRP< 12 mg/L; Group 3=Hb > 10 gm/dl CRP > 12 mg/L; Group4= Hb < 10 gm/dl CRP< 12 gm/L; F/H=Family History; IHD=Ischaemic Heart Disease

of 41 to 50 Years and 51 to 60 Years of age group which were 73(36.3%) cases in each followed by 61 to 70 Years which was 33(16.4%) cases. The mean age of the population was 52.18±8.88 years. Statistically non-significant mean age difference among the groups (Table 1).

The common risk factors for acute coronary syndrome were compared at admission. Smoking was the highest percentage in Group 1 which was 54(50.0%) cases (P=0.001). Hypertension was found most common in group 1 (47.6%), Group 2 (33.3%), Group 3 (10.7%) and Group 4 (8.3%). Smoking (p=0.001) and hypertension (p=0.016) was found statistically significant. Diabetes was found in Group 1 (37.7%), Group 2 (43.5%), Group 3 (11.6%) and Group 4 (7.2%). Group 1 (50%) and Group 2 (50%) patients were dyslipidaemic. Family history of IHD was present group-1 (36.8%), Group 2 (44.7%), Group 3 (73.2%) and Group 4 (53%) (Table 2).

The mean CRP level of the study population was 10.63 ±6.25 mg/L, mean hemoglobin of the study population was 10.54±1.40 gm/dL. The mean RBS of the study population was 10.55±6.40 mmol/L. The mean Troponin I was 2.27±2.26 ng/L and the mean creatinine level was1.56±.44 mg/dL (Table 3).

Table 3: Biochemical parameters of the study population (Mean & SD)

Biochemical parameters	Group Name				Total
	Group 1	Group 2	Group 3	Group 4	
CRP	15.20±4.56	5.88±0.79	17.45±7.84	6.00±0.00	10.63±6.25
Hb	9.41±0.41	11.51±1.33	10.95±0.72	9.42±0.79	10.54±1.40
RBS	10.05±4.48	11.00±8.03	9.84±4.82	11.49±5.10	10.55±6.40
Troponin-I	2.64±2.59	2.29±2.05	1.21±1.28	0.26±0.09	2.27±2.26
S. Creatinine	1.69±0.51	1.51±0.41	1.37±0.25	1.42±0.22	1.56±0.44

Group 1=Hb < 10 gm/dl CRP > 12 mg/L; Group 2=Hb > 10 gm/dl CRP< 12 mg/L; Group 3=Hb > 10 gm/dl CRP > 12 mg/L; Group4= Hb < 10 gm/dl CRP< 12 gm/L; RBS=Random blood sugar; S. creatinine=serum creatinine; Hb=Haemoglobin; CRP=C - reactive protein

The association of CRP level with smoking was calculated. Among the smoker patient 65.6% cases had CRP level >12 mg/l; 39.8% cases had CRP level <12mg/L. Among the nonsmoker 34.4% cases had CRP level >12mg/l and 60.2% cases had CRP level <12mg/L. The finding was statistically significant (Table 4).

Table 4: Correlation of CRP Level and Smoking Habit

Smoking Habit	<12 mg/L	≥12 mg/L	Total	Significance
Smoker	43(39.8%)	61(65.6%)	104(51.7%)	$\chi 2 = 13.297$,
Non smoker	65(60.2%)	32(34.4%)	97(48.3%)	P = 0.000
Total	**108(100.0%)**	**93(100.0%)**	**201(100.0%)**	

Group 1=Hb < 10 gm/dl CRP > 12 mg/L; Group 2=Hb > 10 gm/dl CRP< 12 mg/L; Group 3=Hb > 10 gm/dl CRP > 12 mg/L; Group4= Hb < 10 gm/dl CRP< 12 gm/L

Discussion

This prospective observational study was carried out in the department of cardiology, Mymensingh Medical College Hospital, Mymensingh during the period of December 2010 to November 2011. This study was done to find out the correlation of hemoglobin and C-reactive protein with acute coronary syndrome and in hospital outcome.

Among the admitted patient in coronary care unit Mymensingh Medical College Hospital, a total of 201 patient diagnosed as acute coronary syndrome including unstable angina, non-ST elevation myocardial infarction & ST elevation myocardial infraction were included in the study after considering the inclusion and exclusion criteria. The patients were divided in to 4 groups Group I, Group II, Group III and Group IV according to level of hemoglobin and C-reactive protein level. Among the 201 patient 75 patients were in Group I (Hemoglobin less than 10 gm/dl, CRP more than or equal to 12 mg/L), 92 patients in Group II (Hemoglobin more than 10 gm/dl, CRP less than 12 mg/L,) 22 patients in Group III (Hemoglobin more than 10 gm/dl, CRP more than 12 mg/L,) 12 patients included in Group IV (Hemoglobin less than 10 gm/dl, CRP less than 12 mg/L).

There were no significant difference of age distribution between these groups. The mean age of the patients were 52.18+8.88 years. The highest percentage of group I were 51 to 60 years, and group II were 41 to 50 years, Islam et al[9] found the mean age of the ACS patients were 53.60+8.5 in Bangladeshi population. Enas and Senthilkumar[10] found the mean age of ACS patients were 53.2+10.6 years in Bangladeshi population which supported the finding of present study.

The common risk factors for acute coronary syndrome were compared at admission. Smoking was the highest percentage in Group 1 which was 54(50.0%) cases (P=0.001). Hypertension was found most common in group 1 (47.6%), Group 2 (33.3%), Group 3 (10.7%) and Group 4 (8.3%). Smoking (p=0.001) and hypertension (p=0.016) was found statistically significant. Diabetes was found in Group 1 (37.7%), Group 2 (43.5%), Group 3 (11.6%) and Group 4 (7.2%). Group 1 (50%) and Group 2 (50%) patients were dyslipidemia. Family history of IHD was present group-1 (36.8%), Group 2 (44.7%), Group 3 (73.2%) and Group 4 (53%). At baseline, group I and group II has significant difference regarding the presence of smoking, hypertension, diabetes and has no significant difference regarding dyslipidemia and family history of IHD. Group III and Group IV were not considered as there were small number of cases. Among the risk factor smoking and hypertension were most prevalent in group-I than group-II and they were (50%, vs 36.1%) and (47.6%,vs 33.3%), diabetes was more prevalent in group II than Group-I (43.5%, vs 37.7%). Smoking and hypertension were statistically significant. The mean C-reactive protein level was in Group-I = 15.20+4.56 mg/L, Group-II= 5.88+0.79 mg/L, Group-III = 17.45 mg/L and Group IV = 6.00 gm/L. The mean C-reactive protein level in Group-I was consistent with Majumder et al[11] where the finding was 15.57+12.85 mg/L in a group.

The mean hemoglobin concentration was 9.41±0.041 in group I, 11.51±1.33 in group II, 10.95±0.72 in Group-III and Group-IV= 9.42+.79 gm/dl. The mean hemoglobin concentration was 10.54+1.40 gm/dl, which was discordant with the finding of Lipsic et al[12] where the mean hemoglobin concentration was 12.9±0.04 gm/dl. Anker et al[2] where base line mean hemoglobin was 12.6±1.3 gm/dl in women and 13.7±1.4 gm/dl in men in ACS patients.

There was no significant mean difference among group 1, group 2, group 3 and group 4 considering random blood sugar level (10.05±4.48 mmol/L, 11.00±8.03 mmol/L, 9.84±4.82 mmol/L 11.49±5.10 mmol/L), serum creatinine (1.69±0.51, 1.51±0.41, 1.37±0.41, 1.42±0.22) and Troponin I (2.64±2.59, 2.29±2.05,1.21±2.05, 0.26±0.09).

Smoker have high C-reactive protein level than nonsmoker 65.6% have CRP level more than 12 mg/L and 39.8% have CRP level less than 12 mg/L. Nonsmokers 34.4% have CRP level > 12 mg/L and

60.2% have CRP level less than 12 mg/L. There was a significant relationship between CRP and smoking. This data is consistent with Moghbeli et al[13]. Where they found despite fewer traditional risk factor, smokers who had ACS had higher CRP level than nonsmoker.

Conclusion

In conclusion haemoglobin and CRP level is associated with different type of risk factors among the acute coronary syndrome patients. So categorizations of patient with ACS on basis of hemoglobin and CRP level may help for risk stratification and management. Hemoglobin and CRP count is a simple, affordable and widely available test which is easily done for each and every patient admitted in the hospital. Establishment of hemoglobin and CRP level as a risk factor for ACS needs further large scale study.

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