Association of HDL Cholesterol with In-Hospital Outcome of Patients with Acute Coronary Syndrome

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Abstract:

Background: Acute coronary syndrome is a cardiac emergency. It is increasing dramatically and becoming a major burden in our health care system. Relation between serum lipid profile and acute coronary syndrome is well established. Our study tried to reveal association of high density lipoprotein cholesterol (HDL-C) with in-hospital outcome of patients with acute coronary syndrome. **Methods:** The study was a cross sectional comparative study. Clinical & biochemical evaluation was done in hospital settings. A total number of 271 patients were included in the study and divided into two groups. Patients with low HDL-C level were in group I and patients with normal HDL-C were in group II. **Results:** Group I populations had more complications & more in-hospital stay than group II (74.3% vs 28.9%, P<0.001 and 6.65±2.04 days vs 5.09±1.44 days, p<0.001 respectively). **Conclusion:** The study revealed significant association of HDL-C with outcome of acute coronary syndrome patients. Complications of acute coronary syndrome were more in patients with low HDL-C level.

*Key words:*Acute Coronary Syndrome, Ischemic Heart Disease, HDL Clesterol

Introduction:

Coronary artery disease (CAD) has become a major health problem and is the most common cause of mortality and morbidity in the entire world[1]. Among the CAD, acute coronary syndrome (ACS) is the leading cause of death in developed countries and second leading cause of death in developing countries and by the year 2020, CAD will hold the first place in the WHO's list of leading cause of disability[2]. The progressively increasing trend of the disease in our country shows that the prevalence of CAD in our country was 3.3/1000 in 1976 and 17.2/1000 in 1986 indicating a 5 fold increase in 10 years. CAD is becoming a significant burden on health care services in Bangladesh[3.] It is a multifactorial disease involving well-known risk factors such as age, male sex, smoking, hypertension, diabetes mellitus, renal impairment, obesity, hypercholesterolemia, family history of premature CAD and sedentary life style[4.] Preexisting atherosclerotic plaque rupture with superimposed thrombosis in epicardial coronary arteries is by far the most frequent underlying cause of ACS[5.] There is consistent epidemiological and clinical evidence showing low HDL-cholesterol to be a strong independent risk factor for coronary heart disease (CHD), likely due to reverse cholesterol transport, anti-inflammatory and antioxidant effects of HDL[6,7.] Low HDL-cholesterol level is strongly associated with increased risk of in-hospital mortality and adverse cardiac events in patients with ACS[8-11]. Patients

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from South Asia have a distinct cardiovascular risk profile with profound health consequence. The genesis of this risk is multifactorial of which lower level of HDL-C is an important culprit.[12] These observations emphasize the need for studies evaluating impact of low HDL-cholesterol on the outcome of hospitalized patients with ACS in Bangladesh. The aim of this study is to evaluate the association of HDL-C with in-hospital outcome of ACS patients in our setting.

Methods:

This cross sectional comparative study was conducted at the Department of Cardiology, Dhaka Medical College Hospital from April 2011 to March 2012 with the objective to assess association of HDL cholesterol (HDL-C) with in-hospital outcome of patients with acute coronary syndrome (ACS). Study population was all the patients with ACS admitted into the Department of Cardiology, Dhaka Medical College Hospital within the study period. Patients having previous history of ACS/Percutaneous Coronary Intervention/ Coronary Artery Bypass Grafting, cardiomyopathy, congenital heart disease, valvular heart disease and patients with serious co-morbid conditions were excluded. After fulfilling the inclusion and exclusion criteria index patients were included. Fasting serum lipid profile was measured within 24 hours of the event by standard procedure. Level of serum HDL-C was grouped as follows:

Group I: with HDL-C level
            In male   - <40mg/dl
            In female   - <50mg/dl

Group II: with HDL-C level
            In male   - ≥40mg/dl
            In female   - ≥50mg/dl

Patients were evaluated both clinically & by investigation from the time of selection till discharge (giving more importance on rate, rhythm & character of pulse and measuring blood pressure regularly; measuring serum electrolyte, serum troponin-I level, ECG monitoring & echocardiographic findings). In-hospital outcomes of all the patients were evaluated as outcome variables (heart failure, arrhythmias, second degree/ third degree heart block, cardiogenic shock, duration of hospital stay and death).

Data was collected properly & systematically analyzed by using SPSS version 12. Test statistics used to analyze the data were descriptive statistics, chi square and unpaired t-tests. Level of significance was set at 0.05.

Results:

There were no statistically significant difference between two groups regarding age, sex, traditional risk factors, clinical diagnosis & family history. Distribution of patients was same. Regarding symptoms, presentation with chest pain between two groups was not significant (p=0.068). However, significantly higher number of patients of group I presented with breathlessness than patients of group II (P=0.001). Conversely, significantly more number of patients of group II presented with chest discomfort than patients of group I (p=0.033). Type of myocardial infarction between two groups was not statistically significant. Heart rate of group I was significantly higher than group II (p= 0.005). Ejection fraction was significantly lower in group I than group II (p=0.032). Regarding biochemical parameters, difference in fasting blood glucose & serum creatinine was not statistically significant between two groups (p= 0.557 & 0.797 respectively).

In the contrary, serum troponin I concentration in group I was significantly higher than group II (p=0.032). Mean serum total cholesterol and serum triglyceride were significantly more in group I than group II (p<0.001 and p=0.002 respectively). Similarly mean LDL cholesterol was significantly more in group I than group II (p= 0.002).

However, mean HDL cholesterol was significantly less in group I than group II (p<0.001). Regarding in- hospital outcomes, patients of group I significantly developed heart failure (23.5% vs 8.9%, p= 0.029), arrhythmia (15.5% vs 4.4%, p= 0.049) and cardiogenic shock (12.4% vs 2.2%, p= 0.044) than group II. There is no statistically significant difference in mortality (p= 0.287), cardiac arrest (p=0.631) & heart block (p=0.409) between two groups. Group I patients stayed at hospital for significantly more days than group II patients (p<0.001).

Table-I

Distribution of the study subjects according to different clinical presentation

Clinical presentation	Groups			p
	Group I (n=226) n (%)	Group II (n=45) n (%)	Total (n=271) n (%)	
Chest pain	148(65.5%)	23(51.1%)	171(63.1%)	0.068
Breathlessness	76(33.6%)	4(8.9%)	80(29.5%)	0.001
Chest discomfort	64(28.3%)	20(44.4%)	84(31.0%)	0.033

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Table-II

Distribution of study subjects according to clinical diagnosis

Clinical diagnosis	Groups			P
	Group I (n=226)	Group II (n=45)	Total (n=271)	
	n (%)	n (%)	n (%)	
NSTEMI	44(19.5%)	10(22.2%)	54(19.9%)	0.914
STEMI	119(52.7%)	23(51.1%)	142(52.4%)	
Unstable angina	63(27.9%)	12(26.7%)	75(27.7%)	

NSTEMI=Non ST- segment elevation myocardial infarction.

STEMI= ST- segment elevation myocardial infarction.

Table-III

Distribution of the study subjects according to type of myocardial infarction

Type of MI	Groups			p
	Group I (n=163)	Group II (n=33)	Total (n=196)	
	n (%)	n (%)	n (%)	
Anterior MI	93(57.1%)	15(45.5)	108(55.1%)	0.381
Inferior MI without RV infarction	40(24.5%)	13(39.4%)	53(27.0%)	0.079
Inferior MI with RV infarction	30(18.4%)	5(15.1%)	35(17.9%)	0.656

MI = Myocardial infarction, RV= Right ventricle

Table-IV

Distribution of the study subjects by traditional risk factors

Traditional risk factors	Groups			P
	Group I (n=226)	Group II (n=45)	Total (n=271)	
	n (%)	n (%)	n (%)	
Smoking	115(50.9%)	30(66.7%)	145(53.5 %)	0.053
Hypertension	111(49.1%)	19(42.2%)	130(48.0%)	0.398
Diabetes mellitus	80(35.4%)	18(40.0%)	98(36.2%)	0.557
Family history of CAD	28(12.4%)	10(22.2%)	38(14.0%)	0.083
Renal impairment (serum creatinine level >1.4mg/dl)	33(15.0%)	3(7.0%)	36(13.3%)	0.152

CAD= Coronary artery disease.

Table-V

Distribution of study subjects according to hemodynamic status (n=271)

Hemodynamic status	Groups		P
	Group I(n=226)	Group II(n=45)	
	mean ±SD	Mean ±SD	
Pulse (beat/min)	88.20±15.43	81.33±10.95	0.005
SBP (mmHg)	130.12±26.02	127.82±18.45	0.599
DBP (mmHg)	80.66±14.95	77.77±11.69	0.254
Ejection fraction (%)	45.17±11.47	51.25±9.0	0.032

SBP- Systolic blood pressure, DBP- Diastolic blood pressure.

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Table-VI

Distribution of study subjects according to fasting lipid profile (n=271)

Fasting lipid profile	Groups		P
	Group I(n=226) mean ±SD	Group II(n=45) mean ±SD	
Total cholesterol (mg/dl)	184.39±47.43	151.91±43.25	0.000
LDL cholesterol (mg/dl)	94.03±27.86	80.00±22.78	0.002
HDL cholesterol (mg/dl)	30.51±5.75	44.36±5.22	0. 000
Triglyceride (mg/dl)	204.00±98.46	153.42±99.07	0.002

LDL- Low density lipoprotein, HDL- High density lipoprotein

Table-VII

Comparison of individual in-hospital outcome between two groups (n=271)

Individual in-hospital outcome	Groups		Total(n=271)	P
	Group I(n=226) n (%)	Group II(n=45) n (%)	n (%)	
Heart failure	53(23.5%)	4(8.9%)	57(21.0%)	0.029
Arrhythmia	35(15.5%)	2(4.4%)	37(13.7%)	0.049
Heart block	18(8.0%)	2(4.4%)	20(7.4%)	0.409
Cardiogenic shock	28 (12.4%)	1(2.2%)	29(10.7%)	0.044
Cardiac arrest	20(8.8%)	3(6.7%)	23(8.5%)	0.631
Death	14(6.2%)	1(2.2%)	15(5.5%)	0.287

Discussion:

The study was intended to assess association of HDL cholesterol with in- hospital outcome of patients with acute coronary syndrome. Among the total 271 patients with ACS, we found that 226 (83.4%) patients had low HDL cholesterol level. Roe et al. (2008) found that among NSTE-ACS patients, 18.1% had very low & 34.5% had low HDL cholesterol level, which is a bit lower than our finding. Our study revealed that among total patients, total number of male patients was more than total number of female patients (72.7% vs 27.3%). Our observation was supported by Al-Rasadi et al. (2011), (77% vs 23%) and Faizal et al. 2009) (80.63% vs 19.37%). We found that chest pain was the most common presentation in both groups of patients. The difference in presentation with chest pain between two groups was not statistically significant (65.5% vs 51.1%, p= 0.068). However, significantly higher number of patients of group I presented with breathlessness than patients of group II (33.6% vs 8.9%, p=0.001). Conversely, significantly more number of patients of group II presented with chest discomfort than patients of group I (44.4% vs 28.3%, p=0.033). Our findings were supported by Khan and Mojumder (2009). Our study revealed that the difference in the history of smoking, hypertension, diabetes mellitus & family history of CAD were not statistically significant. The observation of the current study was supported by the findings of Khan & Mojumder (2009), Al-Rasadi et al. (2011), Manurung (2006), Faizal et al. (2009).

Our study showed that haemodynamic status was poor in patients of group I. The mean pulse rate of group I was significantly higher than patients of group II (p= 0.005). There were no statistically significant difference in mortality, cardiac arrest and development heart block between two groups (p>0.05). Any complication developed in 168 (74.3%) patients in group I and 13 (28.9%) patients in group II. Patients of group I significantly developed more complications than group II (p<0.001). The mean ± SD hospital stay of group I patients was significantly higher than patients of group II (6.65±2.04 vs 5.09±1.44 days, p<0.001). These findings were supported by the findings of Al-Rasadi et al. (2011), Faizal et al. (2009), Wolfram et al. (2006), Xavier et al. (2008) and Wilson (1990). Al- Rasadi et al. (2011) found that low HDL-C was associated with higher all-cause mortality and cardiogenic shock, compared with the satisfactory HDL-C group. The impact of low HDL-C on other in-hospital outcomes (re-infarction, re-ischaemia, congestive heart failure) was not significant. Faizal et al. (2009) studied 253 ACS patients and found that 41 patients were died with mortality rate of 16.21%.

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Study limitation:

Sample size was relative small.

The study was conducted in a tertiary care hospital which does not represent the general population of the whole country.

Regression analysis was not done. So, outcome might be influenced by confounding variables.

The study was conducted in a single centre.

Conclusion:

The current study has showed that ACS patients with low HDL-cholesterol have poor in-hospital outcome than those with normal HDL-cholesterol level. Heart failure, arrhythmia, cardiogenic shock and duration of hospital stay were found to be significantly more prevalent in ACS patients with low HDL-cholesterol group. This study may provide the basis for large further studies aiming in-hospital outcome analysis in ACS patients with low and normal HDL-cholesterol levels. We hope that the current study will also help in making planning strategies for better management of ACS patients with low HDL-cholesterol level.

Conflict of Interest – None

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