

Original article:

Role of C reactive protein and LDL/HDL ratio in acute myocardial infarction

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Abstract:

Introduction: In atherosclerosis there is high correlation between total plasma cholesterol and LDL levels and severity of atherosclerosis. Our objectives were to identify frequency of the following markers of atherosclerosis risk. High C- reactive protein and ratio between serum LDL and HDL and to determine the association of high serum CRP levels and HDL/LDL.

Methodology: It was case control study of 50 patients carried out at National Institute of Medical Sciences.

Result: The study says CRP levels were significantly high ($p= 0.003$) and serum HDL levels were low ($p=0.006$) . HDL and LDL ratio was not significantly different among the two groups.

Conclusion: high serum CRP levels rather than high HDL/LDL ratio are associated in patients presented with myocardial infarction at NIMS.

Keywords: Acute coronary syndrome , C reactive protein

Introduction:

Acute coronary syndrome (ACS) is a unifying term representing a common end result of acute myocardial ischemia which includes ST segment elevation myocardial infarction (STEMI), Non ST segment elevation myocardial infarction (NSTEMI) and Unstable Angina.¹ Cardiovascular disorders are among the most common cause of death globally, hence WHO has called it as “modern epidemic”.² With increasing urbanisation prevalence of ACS is rising rapidly in developing countries³ including India.⁴ Atherosclerosis was previously known to result from a passive process of lipid accumulation. In recent studies it is considered to be an active process of cell activation, inflammation and thrombosis.⁵ Inflammation is the key mechanism in the pathogenesis of different stages of atherosclerosis

which includes onset and progression of atheroma, plaque instability and rupture and restenosis following angioplasty.⁶⁻⁸ The inflammatory process is enhanced by the cardiovascular risk factors, particularly elevated LDL cholesterol. It has been proved that modifying these risk factors reduces inflammation and helps in prevention of atherosclerotic events.⁹ several studies proved that CRP is not only marker of inflammation but also plays an active role in atherogenesis.^{10,11} CRP levels correlate directly with various cardiovascular risk factors including Body Mass Index (BMI), smoking, levels of triglycerides and total cholesterol and history of coronary artery disease and stroke.^{12,13} Hence this study is conducted to correlate the association of C reactive protein and LDL/HDL ratio in acute myocardial infarction. Our aim was to know

the association of C reactive protein and LDL/HDL ratio in acute myocardial infarction.

Methodology:

Study group:

200 patients admitted to ICU/CCU of National Institute of Medical Sciences & Hospital with the diagnosis of

ST Elevation Acute myocardial Infarction (STEMI) & Unstable angina/Non ST Elevation Myocardial Infarction (NSTEMI)

Diagnosis of Acute myocardial infarction was made by history, physical examination and electrocardiogram, Troponin-T,CPK-MB & 2D-Echocardiography.

Study methods:

Estimation of lipid profile:

Fasting lipid profile was done with the HUMA STAR 300 autoanalyser. Total cholesterol, Triglycerides and HDL were estimated and LDL was calculated by the

Friedwald's equation:

$$\text{LDL Cholesterol} = \text{Total cholesterol} - \frac{\text{Triglycerides}}{5} - \text{HDL-C.}$$

Total cholesterol was calculated by PAP method.

Procedure for Performing C-reactive protein Assay:

The C reactive protein assay was performed according to the following procedure.

Principle:

This is the rapid slide agglutination test for the direct detection and semiquantitation of C-reactive protein. The reagent is a latex particle suspension coated with specific antihuman C-reactive protein antibodies which agglutinates in the presence of CRP in serum of the patients. Based on this, values of less than 0.6 mg/dL were taken as normal concentration of CRP. Values of more than 0.6 mg/dL were taken as elevated levels of CRP.

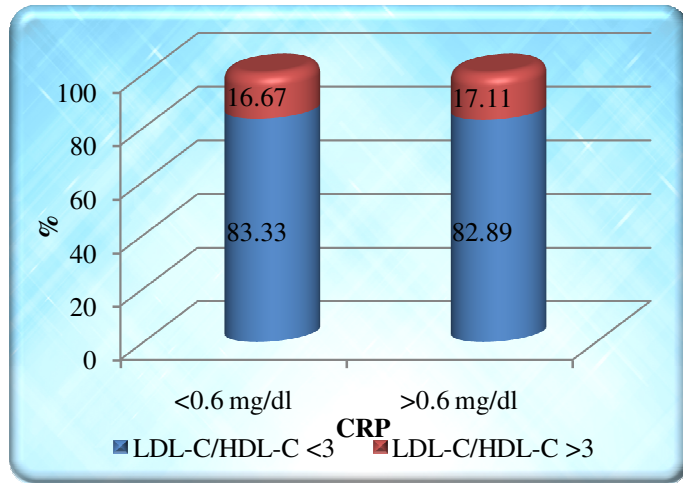
Distribution according to CRP and LDL/HDL ratio

CRP mg/dl	LDL-C/HDL-C < 3		LDL-C/HDL-C > 3		Total	
	No.	%	No.	%	No.	%
< 0.6 mg/dl	40	83.33	8	16.67	48	100.00
> 0.6 mg/dl	126	82.89	26	17.11	152	100.00
Total	166	83.00	34	17.00	200	100.00

Chi-square = 0.022 with 1 degree of freedom; P = 0.881

Above table is showing distribution according to CRP and LDL/HDL ratio. In the present study of 200 patients, according to qualitative method of assay of C reactive protein estimation, a level, equal to or more than 0.6 mg/dl is detected as positive. A level below 0.6mg/dl is denoted as negative. In our study 152 (76%) patients had C reactive protein level detectable (i.e, equal to or more than 0.6 mg/dl). The

following table shows elevated C reactive protein levels and their relation to complications. Chi square value found out by Yates correction, $\chi^2_{yc}=0.002$. at one degree of freedom p value is highly significant ($p > 0.01$). This indicate that, the patient with high serum C reactive level also had LDL/HDL ratio > 3 as compared to the patients with low serum C reactive level.



Distribution According to CRP and LDL/HDL Ratio

Discussion:

There is high correlation between total plasma cholesterol and LDL levels and the severity of atherosclerosis as judged by the mortality rate from ischemic heart disease. Hence it is considered a consequences of hyperlipidemia, especially, hypercholesterolemia but recent evidence shows that it is an inflammatory disease. Current views regard atherosclerosis as a dynamic and progressive disease arising from the combination of endothelial dysfunction and inflammation. In fact, the lesions of atherosclerosis represent a series of highly specific cellular and molecular responses that can be described, in aggregate, as an inflammatory disease. In our study of 200 patients of acute myocardial infarction, LDL-cholesterol was found to be high and HDL-cholesterol was low, as found in other studies as well. In total 166 patients out of 200 patients had LDL-C/HDL-C ratio <3 which accounts for 83% and only 34 patients had LDL-C/HDL-C ratio >3 which was only 17%. So the ratio is not significant ($p < 0.01$) with the incidence of myocardial infarction.

Our study coincide with the study by Framingham in 1981 who reported that persons with LDL-C:HDL-C ratio greater than 5 are at higher risk of developing CHD and person with LDL-C:HDL-C ratio between 2 and 5 are at intermediate risk of developing CHD.

In the present study of 200 patients when we compared, we observed that C- reactive protein was high (≥ 0.6 mg/dl) in 152 patients which account for 76% of the total patients whereas 48 patients had serum C-reactive protein below 0.6 mg/dl which was 24% of the total number of patients. Among 152 patients who were CRP positive 88 patients developed complications after myocardial infarction whereas 64 patients did not develop any complications.

Among 152 patients who were CRP positive (≥ 0.6 mg/dl) 126 patients (82.89%) have LDL-C/HDL-C ratio <3 whereas only 26 patients (17.11%) had LDL-C/HDL-C ratio >3.

Of 48 patients who were CRP negative (<0.6mg/dl) 40 patients (83.33%) had LDL-C/HDL-C ratio <3 whereas only 8 patients (16.67%) had LDL-C/HDL-C ratio >3. In total 166 patients out of 200 patients

had LDL-C/HDL-C ratio <3 which accounts for 83% and only 34 patients had LDL-C/HDL-C ratio >3 which was only 17%.

In 2006 BibiKulsoom¹⁴ et al observed association of serum C-reactive protein and LDL/HDL cholesterol ratio with myocardial infarction and concluded that high serum CRP levels rather than high LDL/HDL cholesterol ratio are associated with myocardial infarction. In 2003 Ridker PM¹⁵ stated that the CRP level adds prognostic information when it combined with the LDL cholesterol levels of Framingham risk score. Thus we conclude that CRP is an independent and significant prognostic indicator. And is associated

with more adverse events. So CRP levels confer a significantly increased risk in myocardial infarction.

Conclusion:

Plasma CRP levels on admission serves to identify high risk patients in the setting of acute myocardial infarction. The effective risk stratification provided may be of specific value for early therapeutic decision making and patient treatment in the heterogeneous population of patients presenting with acute myocardial infarction. The significant LDL/HDL ratio was increased in less number of patients. So the raised C Reactive protein level is more significant with the acute myocardial infarction as compared to LDL/HDL ratio.

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