Original Research Article

Alterations of serum high sensitive C reactive protein and lipid levels in newly diagnosed myocardial infarction subjects

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ABSTRACT

Background: Acute Myocardial Infarction (AMI) is one of the major causes of mortality in the world. Atherosclerosis leading to AMI is the most common and severe clinical manifestation observed. Dyslipidemia is one of main traditional risk factor for MI, but in more than 50% of CHD events dyslipidemia was absent. Atherosclerosis is considered as both a chronic inflammatory condition and a disorder of lipid metabolism. The present study was aimed to estimate the levels of serum lipids (total cholesterol, LDL cholesterol, HDL cholesterol) and hs-CRP an inflammatory marker in newly diagnosed AMI cases and to find out any correlation between these two.
Methods: The study was conducted on 50 newly diagnosed myocardial infarction cases, admitted in Cardiology Department Narayana Medical College, Nellore. Both the sexes were included. Fifty age and sex matched healthy individuals were selected as controls. Lipid levels are estimated by end point colorimetric assay (HUMANSTAR kit) and hs-CRP was estimated by immunofluorescence technique (Boditechkit).
Results: Significant raised levels of hs-CRP (p value <0.0001) and low HDL cholesterol (p value =0.0085) levels among the cases was noticed. A significant positive correlation was observed between LDL cholesterol and hsCRP (r=0.109, p=0.040). A non-significant positive correlation between hsCRP and HDL cholesterol (r=0.291, p=0.453) was observed.
Conclusions: The results of the study implicate the role of inflammatory component in causing atherosclerosis or coronary artery disease rather than dyslipidaemias alone to be attributed for atherogenesis. Concomitantly HDL cholesterol levels were found to be low in cases that results from the inflammatory component in atherogenesis.

Keywords: Cardiovascular disease, High density lipoproteins, High sensitive C reactive protein, Low density lipoproteins, Myocardial infarction

INTRODUCTION

Cardiovascular Disease (CVD) has become the leading cause of mortality in India. Eighty percent of CVD deaths are caused by ischemic heart disease and stroke. The mortality rate due to CVD is increased by 59% from 1990 (23.2 million) to 2010 (37 million).[1] in cardiovascular diseases, Atherosclerosis leading to Myocardial Infarction (MI) is the most common and severe clinical manifestation observed. MI usually results from the rupture of the atherosclerotic plaque with thrombus formation and occlusion of the coronary vessel, resulting in an acute reduction of blood supply to a portion of the myocardium.[2]

Dyslipidemia is a well-known traditional biochemical risk factor of cardiovascular diseases, increased serum levels of total cholesterol, LDL cholesterol, and decreased HDL cholesterol has been associated with increased risk of CVD, up to half of all events associated with CHD are reported to have few or none of the traditional risk factors including dyslipidemia.[3,4] So, the

attention is drawn to new factors such as inflammation in the development of atherosclerosis.

Inflammation plays a key role in 80% of sudden cardiac deaths. Cumulative evidence indicates that inflammation at both focal and systemic levels plays a key role in destabilization and rupture of atherosclerotic plaques, leading to acute cardiovascular events.[5] Atherosclerosis is a pathology characterized by low-grade vascular inflammation rather than the accumulation of lipids. Chronic inflammation plays a role at every stage of atherosclerosis right from its onset and progression, finally to plaque rupture.[6]

C-Reactive Protein (CRP) is an acute-phase protein produced in response to inflammation influences complement activation, apoptosis, vascular cell activation, monocyte recruitment, lipid accumulation and thrombosis.[7] an elevated level of CRP in the circulating blood suggests persistent inflammation, particularly in the coronary wall, so that CRP can be used to monitor the progression of vascular inflammation.[7]

C reactive protein synthesized in the liver. CRP levels in the serum increased in response to acute infections, inflammatory conditions, and trauma. Elevated levels of CRP are associated with increased risk of CVD even in the absence of hyperlipidemia. Earlier studies also show that high CRP/low LDL-Cholesterol persons are at higher absolute risk than low CRP/ high LDL cholesterol - Persons.[8]

High sensitive C Reactive Protein (hs-CRP) is an excellent biomarker for acute phase response and it is an independent predictor of CVD. High sensitivity assay techniques can detect CRP with a sensitivity range of 0.01 to 10 mg/l. These high sensitivity assays help quantify low grades of systemic inflammation.[9]

High sensitivity CRP measurement assays are standardized, and the analyte is stable for long periods. Acute phase CRP values are not affected by sex, fasting state or diurnal patterns and have a long half-life. High sensitivity-CRP levels can be easily measured and provide similar results with fresh or stored plasma. All these factors make it a relatively stable serum protein compared with many other inflammatory markers.[10]

Reduction in systemic inflammation in addition to lipid-lowering has got cardiovascular benefits.[11] So, the present study was aimed to find out the correlation between serum lipids and hs-CRP as an inflammatory marker in MI patients.

METHODS

The present study was carried out on fifty newly diagnosed (MI) Myocardial Infarction patients admitted in cardiology department, Narayana Medical College, Nellore, Andhra Pradesh. Both the sexes between 35 to 65 years of age were included. Healthy people of the same age and sex were selected as controls.

Exclusion criteria

- Individuals with diabetes, renal or liver failure, infectious diseases, chronic use of inflammatory drugs, smokers and alcoholics were excluded from this study.

The study was carried out for over a period of 6 months (July 2018 to January 2019) Fasting venous blood samples were collected from both the subjects and controls. Lipid levels were estimated on the day of sample collection. Serum separated was stored for up to 3 months at -300 C for hs CRP estimation.

Serum total cholesterol, LDL cholesterol, HDL cholesterol, and Triglycerides (TGL) were estimated by commercially available kits. Serum hs-CRP was estimated by fluorescence immunoassay technique (Boditech kit).

High sensitive C reactive protein estimation was based on this principle of sandwich immune detection method; the detector antibody in buffer binds to antigen in sample, forming antigen antibody complexes, and migrates onto nitrocellulose matrix to be captured by the other immobilized antibody on test strip.

The more antigen in sample forms the more antigen antibody complex and leads to stronger intensity of fluorescence signal on detector antibody, which is processed by instrument for ichroma tests to show CRP concentration in sample.

Statistical analysis was done using SPSS software version 25. Pearson correlation test was used to find out the correlation between hsCRP and lipids (LDL, HDL).

RESULTS

The statistical analysis was done using the SPSS 25 software. All the Biochemical parameters are expressed as mean±SD. Pearson correlation coefficient test was done to see the correlation between hsCRP and lipids (HDL and LDL), p value of <0.05 was considered as significant.

hsCRP, total cholesterol and LDL cholesterol are elevated in cases than controls but statistically significant only for hsCRP. HDL cholesterol levels in cases are significantly decreased when compared with the controls.

A positive correlation between LDL cholesterol and hsCRP was observed (r=0.109, p=0.040)) and it is statistically significant. A positive correlation between hsCRP and HDL cholesterol was observed (r=0.291, p=0.453) but it is statistically not significant.

Table 1: Comparison of lipid levels and hsCRP between cases and controls.

	Cases Mean±SD	Controls Mean±SD	p value (<0.005) significant
hsCRP	11.7±7.9	0.90±0.31	(p<0.0001)
HDL	39.4±6.6	43.38±8.11	(p=0.0085)
Total cholesterol	179±35.0	153±20.7	(p>0.05)
LDL	100.8±16.7	100.76±19.02	(p>0.05)

DISCUSSION

The present study has shown a significant increase in serum hs-CRP levels in acute myocardial infarction cases compared to that of controls which is concurrent with similar studies, supporting the statement that Atherosclerosis is now considered as an inflammatory disease and CRP plays a pro-atherogenic role in the process of atherosclerosis by up regulating and stimulating the release of several cytokines and growth factors and by down regulating nitric oxide, a potent vasodilator. CRP promotes the recruitment of monocytes into atheromatous plaque and also induces endothelial dysfunction by suppressing nitric oxide release. CRP also increases the expression of vascular endothelial plasminogen activator inhibitor and other adhesion molecules and alter LDL cholesterol uptake by macrophages.[12]

Serum HDL cholesterol levels were significantly low in MI Myocardial Infarction cases compared with controls. HDL is known as good cholesterol and high serum HDL cholesterol levels are known to be associated with reduced risk of atherosclerosis HDL cholesterol particles are believed to be anti-atherogenic and plays a role in antagonized pathways of inflammation, thrombosis, and oxidation of LDL cholesterol.[13] These protective functions of HDL cholesterol could not be fulfilled in MI Myocardial Infarction cases because of low serum HDL cholesterol levels.

In the present study, the HDL cholesterol levels might be decreased by the inflammation. Ansell BJ et al, stated that Inflammation decreases HDL cholesterol by increasing the activity of endothelial lipase and soluble phospholipase A2 and also apo A1 of HDL cholesterol gets replaced with serum amyloid in inflammations.[14]

Many studies shown, a significant negative correlation between hscrp and HDL cholesterol in MI cases, unlike this study which showed a non-significant positive correlation.[15]

LDL cholesterol is called bad cholesterol, rich in cholesterol esters, participates in the development of atherosclerosis. Dyslipidemia with particular reference to high LDL cholesterol has been considered as a risk factor for the development of atherosclerosis.[16]

During acute phase reactions, LDL cholesterol synthesis will increase, and LDL cholesterol receptor activity will be up regulated , which however fosters the intracellular accumulation of cholesterol. Oxidized LDL are more atherogenic, can amplify the inflammatory response. In the present study we have observed a significant positive correlation between LDL cholesterol and hs-CRP. Oxidized LDL cholesterol can cause a low grade local inflammation leading to cytokine release like IL-1, IL-6, and TNF α which can regulate the production of CRP. Phagocytosis of oxidized LDL cholesterol by monocytes transforms them into foam cells initiating the atherosclerotic plaque formation.[17]

CONCLUSION

Increased levels of hsCRP and decreased HDL cholesterol levels are important factors to assess risk of myocardial infarction. So, the combined use of assessment of inflammatory marker hsCRP and lipid profile to assess the high risk of myocardial infarction was emphasized.

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