

Role of hsCRP as an indicator of prognosis in acute coronary syndrome

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Abstract

Background: Acute coronary syndromes (ACS) has become the leading cause of death worldwide. Inflammation plays an important role in ACS. C- reactive protein is a prototypical acute phase reactant, whose levels are increased proportional to the extent of inflammation. This study is done to measure high sensitivity c-reactive protein levels (hsCRP) in patients of acute coronary syndrome and determine its significance in prognosis. **Methods:** 100 patients with acute coronary syndrome (STEMI and NSTEMI-ACS) were included in the study. Serum high sensitivity c reactive protein (hsCRP) was measured at admission. Patients were followed up in hospital for mortality and complications. **Results:** STEMI was seen in 76 patients and 24 patients had NSTEMI-ACS. The hsCRP levels were increased in 76 patients out of 100 patients of ACS. Patients with high hsCRP at admission (≥ 3 mg/L) are prone for going into complications ($n=54$) out of 60 patients (90%) ($p<0.01$). **Conclusion:** hsCRP levels obtained at admission can be used as a marker for identification of patients who are likely to develop significant complications in the immediate in-hospital course and to predict the prognosis.

Key words: STEMI, NSTEMI-ACS, ACS, hsCRP, inflammation, prognosis.

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INTRODUCTION

Coronary artery disease is one of the major health problems worldwide and in India in particular.¹ The Registrar General of India reported that Coronary heart diseases led to 23% of total and 32% of adult deaths in 2010-2013. The prevalence varies from 1%-2% in rural populations and 2%-4% in urban populations^{2,3}. CVD has been known to be associated with several modifiable and nonmodifiable risk factors. Among them major modifiable risk factors are hypertension (HTN), diabetes mellitus (DM), smoking and dyslipidemia and non-modifiable risk factors include age, gender, ethnicity and family history of

premature CAD. However, not all coronary events can be predicted by these risk factors. In particular, nearly half of all myocardial infarctions or stroke occurs among individuals without the traditional modifiable and non modifiable risk factors. Consequently, alternate risk assessment approaches are being explored to facilitate early and accurate identification of individuals at risk of having CVD¹⁶. Since atherosclerosis is an inflammatory process, several markers of inflammation have been evaluated for this purpose. Among the various markers of inflammation, high-sensitive C-reactive protein (hs-CRP) has emerged as the most important cardiovascular risk marker. More than a simple marker of inflammation, hs-CRP may influence vascular vulnerability directly through several mechanisms including, enhanced expression of adhesive molecules, reduced nitric oxide, increased expression of endothelial PAI-1 and altered LDL uptake by macrophages. A scientific statement issued by Centre for Disease Control (CDC) and American Heart Association (AHA) has mentioned hs-CRP as the only inflammatory marker that can be used for risk prediction both for primary and secondary prevention of cardiovascular events¹⁶. Despite substantial differences in ethnicities, habits, cultures, the prevalence of traditional

cardiovascular risk factors and affordable therapies, atherosclerosis remains the major cause of death in developing and developed countries. However, irrespective of these differences, inflammation is currently recognized as the common pathway for the major complications of atherosclerosis, stroke, and ischemic heart disease¹⁵. The role of inflammation has been established firmly in the pathogenesis of atherosclerosis in the past two decades. Numerous studies, both randomized controlled trials (RCTs) and observational (nested case control and prospective cohort) have shown an association of pro-inflammatory biomarkers with incident metabolic syndrome, coronary artery disease (CAD), acute coronary syndrome (ACS), hypertension, peripheral artery disease, recurrent coronary and cerebrovascular events and stroke. Approximately 25 large observational studies published since the 1990s have established that high sensitivity C-reactive protein (hsCRP), a biomarker of inflammation, as an independent predictor for coronary artery disease^{10,11,12,13}. Multiple small Indian studies employing varying designs have found an association between hsCRP and coronary artery disease, diabetes mellitus and the metabolic syndrome. In the Indian population the values of hsCRP normal or basal values are likely to be higher. Larger prospective cohort studies employing standardized hsCRP measurement assays with adequate follow up duration are required to derive risk cut-off values for CVD

in the Indian population.¹⁴ Raised hsCRP levels are independent markers of adverse outcomes and hsCRP levels. Obtained at admission in ACS can be used as a marker for identification of patients who are likely to develop significant complications in the immediate in-hospital course and to predict the prognosis⁴.

AIMS AND OBJECTIVES

The objective of this study is to find the serum high sensitivity-Creactiveprotein (hs-CRP) in acute coronary syndrome patients at the time of admission and their association with in hospital mortality and morbidity

MATERIALS AND METHODS

Patients diagnosed as acute coronary syndrome (ST Elevation Acute myocardial Infarction and Unstable angina/Non ST Elevation Myocardial Infarction) and admitted to Navodaya Medical College and Hospital, Raichur are the subjects.

Exclusion Criteria: Age < 40, Recent history of surgery or trauma within the preceding 2 months, Patients on dialysis, malignancy, Connective tissue disorders.

CBC, FBS /PPBS, hsCRP, Troponin T, 12 lead ECG and 2D ECHO was done in all patients. All patients were followed up in hospital for mortality and complications.

RESULTS

Table 1: Post MI complications in relation to hsCRP levels

COMPLICATIONS	hsCRP		TOTAL
	<3	>=3	
Left Ventricular Failure	2	34	36
Cardiogenic shock	2	8	10
Atrioventricular Block	0	5	5
Bundle Branch Block	1	3	4
VT/VF and Death	1	4	5
TOTAL	6	54	60
P VALUE	0.001<0.01**		

Table 2: hsCRP and complications

hsCRP	ACS with complications	ACS without complications	TOTAL
hsCRP<3	6	26	32
hsCRP>=3	54	14	68
TOTAL	60	40	100
P VALUE	P=0.000<0.001** x² = 35.023		

DISCUSSION

Age: In our study mean age of occurrence of ACS is 57.92 years. In Foussas *et al*⁵ study and Mohmoud Suleiman *et al*⁶ study mean age was seventh decade. And in Indian subcontinent coronary artery diseases occur a decade earlier than the western population.

Sex:76% of our patients are males and 24% are females.

This is similar to Foussas *et al* (79% males) and Mohmoud Suleiman *et al* (80%) study.

Hypertension: In our study 56 (56%) patients had hypertension as the risk factor, this correlates with other studies. In Foussas *et al*⁵ study, hypertension was seen in 51% of patients and in Mohmoud Suleiman *et al*⁶ study, hypertension was present in 53% of patients. In "INTER

HEART” study by Prof.Salim Yusuf *et al*⁷, hypertension was seen in only 19.3% of patients, if only South Asian population is considered. In P S Singh *et al*⁸ study, Hypertension was seen in 33%.

Smoking: In the present study smoking was the next most common risk factor, found in 55 (55%) patients. In Foussas *et al*⁵ study, smoking was observed in 57% of patients. In Mohmoud Suleiman *et al*⁶ study, smoking was observed in 40% of patients. Prof Salim Yusuf *et al*⁷ study, 65.19% of patients were smokers.

Lipid Abnormalities: In our study 53 (53%) patients had lipid abnormalities. Most common lipid abnormalities were high triglycerides and low HDL levels. In Foussas *et al*⁵ study 64.6% of patients had lipid abnormalities. And in Mohmoud Suleiman *et al*⁶ study 41% of patients had dyslipidemias. LDL/HDL ratio was taken in all patients. Among 100 patients LDL/HDL ratio was greater than 3 in 10 patients and less than 3 in 90 patients. So the ratio is not significant($p < 0.01$) with the incidence of myocardial infarction.

Diabetes Mellitus: In the present study 31 (31%) patients had diabetes as the risk factor. In Foussas *et al*⁵ study Diabetes mellitus was seen in 31% of patients and Mohmoud Suleiman *et al*⁶ study diabetes was present in 30% of patients.

Type of Myocardial Infarction: In our study 76 (76%) patients had ST segment Elevation Myocardial infarction. Almost similar number of patients had ST segment Elevation Myocardial infarction in Mohmoud Suleiman *et al*⁶ study.

High sensitive C Reactive Protein Levels: We have studied 100 patients with acute coronary syndrome. In this study 68 (68%) patients had raised levels ($> 3\text{mg/dl}$). Out of 68 patients, 54 had complications and 14 patients had no complications and 32 (32%) patients had hsCRP levels ($< 3\text{mg/dl}$).

Foussas *et al*⁵ studied 1,846 patients with acute myocardial infarction and showed that, elevated plasma CRP levels confer a significantly increased risk of future fatal or non-fatal ischemic complications.

Mohmoud Suleiman *et al*⁶ concluded that, plasma CRP levels obtained within 12-24 hours of symptom onset is an independent marker of 30 day mortality and the development of heart failure in patients with acute myocardial infarction.

BibiKulsoom *et al*⁹ studied 50 cases of acute myocardial infarction and observed that high serum CRP levels rather than high LDL:HDL are associated with myocardial infarction in the patients presenting at NICVD with myocardial infarction. This study has observed that high serum C-reactive protein is significantly associated with myocardial infarction rather than high LDL:HDL, especially in age group 46-60 years.

CONCLUSION

Plasma hsCRP levels on admission serves to identify high risk patients in the setting of acute coronary syndrome. Raised hsCRP levels are independent markers of adverse outcomes. Hence hsCRP levels obtained at admission in acute coronary syndromes can be used as a marker for identification of patients who are likely to develop significant complications in the immediate in-hospital course and to predict the prognosis.

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