Original Research Article

Evaluation of hs-CRP levels in acute coronary syndromes

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Abstract

Background: The incidents of CAD is increasing alarmingly and evidence is emerging about the role of novel risk factors. hs-CRP is emerging as a crucial risk factor for premature atherothrombosis and cardio vascular events. Elevated hs- CRP concentrations early in Acute Coronary Syndrome (ACS), prior to the tissue necrosis, may be a surrogate marker for cardiovascular co-morbidities.
Aim: This study was undertaken to measure the levels of serum hs-CRP in patients with CAD as established by CAG.
Materials and methods: This study included 100 patients admitted in General Medicine and Cardiology departments with a spectrum of coronary artery disease and undergoing coronary angiography. Routine blood investigation, ECG, Chest cardiograph, and 2D Echo test were performed.
Results: A total 100 patients established that hs-CRP were elevated in all the patients irrespective of risk factor status. Also there was statistically significant difference between the levels of hs-CRP and angiographic extent of lesion. hs-CRP levels were also found to be higher in in patients with positive family history of CAD and elevated LDL-C, decreased HDL-C.
Conclusion: measurement of hs-CRP should not be used as an alternative for but as an adjunct to major risk factors in assessing and thus better define the intensity of preventive therapies to be initiated.

Key words

High sensitive C - reactive protein (hs-CRP), Coronary artery disease (CAD), LDL-C, HDL-C, Gensini score.

Introduction

The propensity of Indians to coronary artery disease (CAD) has been demonstrated beyond doubt by various investigators yet [1-4]. Indian population is more sensitive to develop CAD at early ages [1, 2]. By the end of this decade, India will become the largest coronary artery disease burden in the world [4, 5].

CRP has become the most effective and sensitive marker for inflammation and unremarkable predictor of cardiovascular risk [6, 7]. CRP's predictive power for vascular risk detection resides between 0.1 to 0.5 mg/dl, a level which is present in most of the healthy individuals without inflammation. Hence, a high sensitive assay is required [8].

High sensitive CRP (hs-CRP) is well standardized and it has limits of detection as low as 0.02g/d [9-10]. Reports of Physician Health Study (PHS) and Women's Health Study WHS [11, 12] have revealed that their predictive value of hs-CRP is higher in related to other traditional cardiovascular risk biochemical markers. Therefore, it is interesting to discuss the measurements of hs-CRP in patients with coronary artery disease (CAD).

Materials and methods

Cross sectional hospital based prospective study with 100 adult patients presenting with STEMI to AMC/ICCU was conducted in Department of General Medicine, MNR Medical College & Hospital and Osmania General Hospital during December 2010 to July 2012. Informed consent is taken from all the patients involved in the study and ethics committee approval was taken.

Inclusion criteria

Patients with angiographically proven coronary artery disease were included in this study.

Exclusion criteria

- Patients with insignificant coronary artery disease defined as angiographic extent of lesion less than 50%.
- Patients with chronic CAD and patients with documented evidence of extra cardiac atherosclerosis like ischemic stroke, peripheral vascular diseases
- Patients with cardiac valve disease and life threatening arrhythmias.
- Patients on Aspirin, Statins and NSAIDS.
- Collagen vascular disease and rheumatologic disorders.
- Patients with acute or chronic kidney disease.
- Patients with acute or chronic liver disease
- Febrile disorders,[body temperature > 37.5°C]
- Malignancy.

Parameters studies

Blood analysis, complete urine examination, random blood sugar, lipid profile, ECG, chest radiograph, 2D Echo, ECG, Coronary angiography.

Results

In the present study patients <50 years constituted 47% of the study group and 53% were >50 years. The mean hs-CRP among patients <50 years was 5 mg/dl and 5.09 mg/dl in patients > 50 year, however this difference was not statistically significant. Males constitued 61% of the study group. Females constitued 39% of the study group. The mean hs CRP among males was 5.02mg/dl The mean hs CRP among females was 5.09 mg/dl. There was no statistically significant difference of hs-CRP levels among males and females. (**Table - 1**)

Table – 1: Total no. of patients based Mean CRP level.

hs-CRP	Males	Females
3.0 - 3.9	5	6
4.0 - 4.9	27	13
5.0 - 5.9	24	17
6.0 - 6.9	5	3
Total	61	39
Grand total	100	
Chi-square	1.94	
P- Value	0.585	

A total 34% of the study group had BMI between 20 - 22.9 and 66% of the study group had BMI between 23-30. The mean hs-CRP of normal BMI group was 4.95 mg/dl and 5.45 mg/dl in pre-obese group but this difference was not statistically significant. In the present study 38% of study group had Hypertension, 5% of study group had Diabetes Mellitus, 32% of study group had no risk factors (neither hypertension or diabetes) and 25% of study group had both Hypertension and Diabetes Mellitus.

Table – 2: SVD, DVD, TVD and mean hs-CRP values of subjects.

hs-CRP		3-3.9	4-4.9	5-5.9	6-6.9	Totals
Vessel disease	**SVD**	10	33	4	2	49
	DVD	1	7	32	4	44
	TVD	0	0	5	2	7
Total						100
Chi-square value	56.08					
p-value	0.0001					

In this study 20% of the study group had family history of CAD (Mean hs-CRP - 5.02 mg/dl and LDL-C - 84.7 mg/dl.) and 80% don't have family history (Mean hs-CRP- 4.82 mg/dl and LDL-C - 78.2 mg/dl). However these differences were not statistically significant (**Table – 2**).

In this study29% of the study group had infarction of 12-16% and mean hs-CRP was 4.52 mg/dl, 45% had infarction of 17-24% and mean hs-CRP was 4.99 mg/dl and 26% of had infarction >25% and mean hs-CRP was 5.75 mg/dl. These differences in hs-CRP with incearing infarction percentages was statistically significant (**Table – 3**).

The above table states that 50% of the study group who had mild gensini score had LDL-C ranging from 81-90 mg/dl, 66.6% had moderate gensini score had LDL-C ranging from 71-90 mg/dl and 35% had severe gensini score had LDL-C ranging from 81-90 mg/dl. However these differences were not statistically significant. (**Table - 4**)

Table – 3: Distribution of patients according to gensini score.

hs-CRP	Mild	Moderate	Severe
3.0-3.5	1	0	0
3.6-4.5	17	9	1
4.6-5.5	6	28	5
>5.5	2	17	14
Total	26	54	20
Chisquare	48.13		
p-value	0.0001		

Table – 4: Distribution of subjects based on gensini score and LDL-C range.

LDL-C	Mild	Moderate	Severe
71-80	9	18	4
81-90	13	18	7
91-100	4	8	4
>101	0	10	5
Total	26	54	20
Chisquare	9.607		
p-value	0.476		

In the stydy group 38% were only Hypertensive and their mean hs-CRP is 4.81 mg/dl, 25% were both Hypertensive and Diabetic and mean hs-CRP was 5.68 mg/dl, 32% had neither

Hypertension nor Diabetes and the mean hs-CRP is 4.83 mg/dl and 5% were only Diabetic and mean hs-CRP was 5.12 mg/dl. These differences of hs-CRP with the conventional risk factors were statistically significant (**Table – 5**).

Table – 5: HDL-C, LDL-C and mean hs-CRP values of subjects.

HDL-C	**25-35**	**36-45**	**>45**
Mean hs-CRP	5.12	4.89	4.76
LDL-C	88.37	86.92	80.66
Chi-square value	13.32		
p-value	0.004		

Discussion

Coronary artery disease is emerging as a global health problem assuming epidemic proportions worldwide, particualry in the Indian subcontinent [13]. The age of onset in the Indian population is younger compared to the population in the West. The other aspect is the high incidents of CAD in patients without conventional risk factors. Thus there is a need to investigate and identify the role of novel and emerging risk factors like hsCRP, which according to various studies has been proven to have an important role [14].

Several population based studies have revealed that high sensitive C-reactive protein (hs-CRP) is an exquisitely sensitive systemic marker of inflammation and a powerful predictive marker of future cardiovascular risk [15, 16].

In this study 20% of the study group had family history of CAD and mean hsCRP was 5.02 mg/dl, mean LDL-C was 84.7 mg/dl.80% of the study group had no family history of CAD and mean hsCRP was 4.82 mg/dl,mean LDL C was 78.2 mg/dl . However these differences were not statistically significant ($p = 0.18$).

In our study group 49% of the patients had evidence of SVD on CAG with a mean hsCRP of 4.59 mg/dl. There was evidence of DVD in 44% of patients with mean hsCRP of 5.43 mg/dl. 7% had evidence of TVD with a mean hsCRP of 5.85 mg/dl. There was a statistically significant difference among mean hsCRP levels and the vessel score on CAG ($p < 0.0001$). 65.3% of the study group who had mild gensini score had hs CRP from 3.6-4.5 mg/dl .51.8% of the study group who had moderate gensini score had hs CRP ranging from 4.6-5.5 mg/dl. 70% of the study group who had severe gensini score had hs CRP >5.5mg/dl.These differences among gensini score with hs CRP was statistically significant ($p <0.0001$).

In the present study 50% of the study group who had mild gensini score had LDL ranging from 81-90 mg/dl .66.6% of the study group who had moderate gensini score had LDL C ranging from 71-90 mg/dl. 35% of the study group who had severe gensini score had LDL C ranging from 81-90 mg/dl. However these differences were not statistically significant ($p = 0.476$).

CRP measurement has a lot of advantages. Firstly, it is a stable compound and secondly, it can be measured at any time of the day without regards to the biological clock. In contrast to results of cytokine measurements, such as IL-6, no circadian variation appears to exist for hs-CRP. Thus, clinical testing for hs-CRP can be accomplished without regard for the time of day [17].

The major limitation of the study is that it was done in a small group and may not represent the entire population. The study is a non randomized and non follow-up case study.

Conclusion

In conclusion, measurement of hs-CRP should not be used as an alternative for but as an adjunct to major risk factors in assessing and thus better define the intensity of preventive therapies to be initiated. This study demonstrates that hs CRP can identify individuals at increased risk of developing future coronary events who otherwise would have been missed if only lipid and conventional risk measurements were used.

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