

## ORIGINAL ARTICLE

## High sensitivity C - reactive protein level in troponin I positive myocardial infarction patients

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## ABSTRACT

**BACKGROUND:** The objective of this study is to shed light on the level of high sensitivity C-reactive protein (hs-CRP) in Myocardial Infarction (MI) patients. Patients in the study group (MI patients) were having high Troponin I. **MATERIALS AND METHODS:** Serum sample of 100 (study group) patients having high Troponin I level and 50 (control group) serum sample having normal Troponin I level. Troponin I samples were measured in Abbott Architect i100sr (Chemiluminescent microparticle immunoassay) and hs-CRP sample were measured in Erba XL- 640 (colorimetry). **RESULTS:** the result showed that hs-CRP level was significantly high in study group (MI) as compared to control group (p<0.001). **CONCLUSION:** hs-CRP level rises in acute coronary syndrome as CRP is an inflammatory substance and with hs-CRP we may early predict ischemic heart disease.

**Keywords:** High Sensitivity C-Reactive Protein (hs-CRP), C-Reactive Protein (CRP), Troponin I, Myocardial infarction (MI), Ischemic Heart Disease (IHD)

## INTRODUCTION

A newer test, the high sensitivity-C reactive protein (hs-CRP) assay is now being used to detect these very small elevations of CRP.<sup>1</sup> To improve global cardiovascular risk prediction, considerable interest has focused on CRP, a marker of inflammation that has been shown in multiple prospective epidemiological studies to predict incident myocardial infarction, Stroke, peripheral arterial disease, and sudden cardiac death.<sup>2</sup>

CRP, named for its ability to precipitate the somatic C-polysaccharide of *Streptococcus pneumoniae*, was the first acute-phase protein to be described and is an exquisitely sensitive systemic marker of inflammation and tissue damage. The acute-phase response comprises the nonspecific physiological and biochemical responses of endothermic animals to most forms of tissue damage, infection, inflammation, and malignant neoplasia. In the mid 1990s, immunoassays for CRP, with greater sensitivity than those previously in routine use, revealed that increased CRP values, even within the range previously considered normal, strongly predict future coronary events.<sup>3</sup>

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This study provides information about hs-CRP as a protein and an acute-phase reactant, and a knowledge-based framework for interpretation and analysis of Clinical observations of hs-CRP in troponin I positive Ischemic heart disease (IHD) patients.

## MATERIALS AND METHODS

In the present study, 100 cases of known IHD and 50 apparently healthy subjects as a control group were studied. They were primarily diagnosed by clinical examination and further evaluated by Biochemical investigations. All cases were admitted to the Intensive cardiac care Unit (ICCU) study was performed between April – 2016 to September - 2016. The subjects in control group were selected from the staff working in Biochemistry department and people coming for their physical fitness at Civil Hospital, Ahmedabad. The supernatant blood serum was used for the analysis of Troponin I and hs-CRP in Abbott architect i100sr (CMIA Method) and Erba XL-640 (Colorimetry/spectrophotometry Method) respectively. Biological reference interval: 0.3 to 3 mg/L for hs-CRP and 0.02 to 0.033 µg/L for troponin I

## RESULTS

In view of these findings the present study was conducted to evaluate the predictive value of hs-CRP as a risk factor in cardiovascular disease. Mean age in the study group was 59 ± 12 years

and that in control group was  $47.28 \pm 15.83$  years. Total 98% patients were above 40 years of age, the rest of 2% belonged to younger age group.

**Table 1: hs-CRP level in study & control group**

hs-CRP	Study	Control	Total
>3 mg/L	95	5	100
<3 mg/L	5	45	50
Total	100	50	150

**Table 2: Troponin I level in study & control group**

Troponin I	Study	Control	Total
>0.033 µg/L	97	0	53
<0.033 µg/L	3	50	97
Total	100	50	150

**Table 3: Comparison of hs-CRP levels between control & Study group**

Groups →	hs-CRP control	hs-CRP Study
Mean mg/L	2.12 mg/L	34.28 mg/L
Standard deviation (SD)	0.76	42.75
Sample Size (Nos.)	50	100
Std. error of Mean (SEM)	0.10	4.27
Minimum	0.6	0.6
Maximum	3.5	280
Significance	t = 5.309, df = 148, **p < 0.0001	

In the present study, the hs-CRP mean values were significantly higher in patients of Ischemic Heart Disease 34.28 mg/L as compared to controls 2.12 mg/L as mentioned in table-3.

t- test was used for comparison of hs-CRP levels in study & control group. The two-tailed p value < 0.0001, is considered highly significant.

Troponin I level below 0.02 µg/l, 3 patients had Troponin I level between 0.02-0.033 µg/l, 97 patients had Troponin I level more than 0.033 µg/l. Total 97 patients had the Troponin I level more than 0.033 µg/l and hs-CRP level more than 3 mg/L, which indicate that hs-CRP level was more than 3 mg/L which can be strongly correlate with the inflammatory process like atherosclerosis.

**DISCUSSION**

The present study was conducted on 100 patients of known IHD admitted in Civil Hospital, Ahmedabad and the results were compared with 50 healthy controls. The age incidence of IHD indicates that the risk of IHD increases in older age as compare to young age. In a study conducted by Nader Rifai in 1997 in Boston the mean age in cases was  $50.9 \pm 9$ .<sup>4</sup>

In our study, the hs-CRP values were significantly higher in patients of IHD (34.28 mg/L) as compared to controls (2.12 mg/L). The

centres for Disease Control and Prevention and the American Heart Association recommended interpretation of hs-CRP results, such as patients with hs-CRP level < 1 mg/L are at low risk, 1–3 mg/L are at average risk and > 3 mg/L are at high risk.<sup>5</sup>

Based on various studies it has been demonstrated that individuals without inflammation usually have hs-CRP levels below 1.0 mg/L. Patients with hs-CRP levels between 1 and 3 mg/L have intermediate risk and above 3 mg/L have high risk of CAD. The hs-CRP values > 3 mg/L observed in an apparently healthy individual should be repeated to rule out a recent episode of infection or tissue injury.<sup>5</sup> Thus estimation of hs-CRP plays an important role in cardiovascular risk detection.

In a study conducted by P M Ridker, distribution of hs-CRP among apparently healthy American men and women was as given below.<sup>6</sup>

Quintile	range mg/dl	risk estimate
1	0.01 – 0.07	low
2	0.07 – 0.11	mild
3	0.12 -0.19	moderate
4	0.20-0.38	high
5	0.38-1.50	highest

In our study, the levels of hs-CRP in control group were in between 0.3 to 3 mg/L. The mean value in control group was 2.12 mg/L. In study group 95% patients had the level of hs-CRP more than 3 mg/L which indicate marked increase in hs-CRP level in patients of IHD. In a study conducted by Nader Rifia et al. [4], men with angiographically documented CHD, it was demonstrated that there was a highly significant (p<0.0001) difference in hs-CRP values between cases and controls. In a case control study conducted by Paul M. Ridker et al. the mean CRP in CHD cases was significantly higher 6.45 mg/L as compared to controls 3.75 mg/L (p<0.0001).<sup>7</sup>

Out of 100 patients in study group, no patients had Troponin I level below 0.02 µg/l, 3 patients had Troponin I level between 0.02-0.033 µg/l, 97 patients had Troponin I level more than 0.033 µg/l. Total 97 patients had the Troponin I level more than 0.033 µg/l and hs-CRP level more than 3 mg/L, which indicate that hs-CRP level was more than 3 mg/L which can be strongly correlate with the inflammatory process like

atherosclerosis. We found that hs-CRP level rises in IHD (in Myocardial Infarction). As high hs-CRP in study group suggest that inflammation plays key role in the pathogenesis of atherosclerosis. As atherosclerosis is a chronic inflammatory process and this process having multiple acute clinical events are there like plaque rupture. This ultimately leads to acute coronary syndrome (Angina). Initially it was suggested that hs-CRP was a standard marker of inflammation but subsequent works demonstrated it was risk marker in both ACS and in patients with myocardial infarction.

**Table 4: Comparison of hs-CRP and Troponin I Study Groups**

Troponin µg/dl (n=100)	hs-CRP mg/L (n=100)		Total
	>3 mg/L	<3 mg/L	
>0.033 µg/dl	95	3	98
<0.033 µg/dl	0	2	2
<b>Total</b>	95	5	100

According to table 4 comparison hs-CRP level rises in IHD (in Myocardial Infarction). As high hs-CRP in study group suggest that inflammation plays key role in the pathogenesis of atherosclerosis. As atherosclerosis is a chronic inflammatory process and this process having multiple acute clinical events are there like plaque rupture. Which ultimately leading to acute coronary syndrome (Angina).

**CONCLUSION**

The result of the present study showed that hs-CRP values are high in myocardial infarction/IHD which is compared with Troponin I value and it indicates that hs-CRP level high in high Troponin I values. Troponin I is highest sensitive parameter for the detection of IHD its sensitivity is 97% and specificity is 100%.hs-CRP values are high in myocardial infarction / IHD which is compared Troponin I value and it indicates that hs-CRP level high in high Troponin I values. Troponin I is highest sensitive parameter for the detection of IHD its sensitivity is 97% and specificity is 100%. hs-CRP followed by Troponin I it’s sensitivity 90% and specificity is 95%.So, the support the hypothesis that hs-CRP level goes high in IHD / Myocardial infarction and its value is useful in diagnosis and it is also useful for prediction of IHD in case of non-availability of troponin I.From the present study, we conclude that the levels of hs-CRP were found to be elevated in

patients of IHD having high Troponin I value and were found highly significant (p<0.001) as compare to the control group. Studies also suggest that hs-CRP level rises in acute coronary syndrome as CRP is an inflammatory substance and with hs-CRP we may early predict IHD.

**REFERENCES**

1. Educational Commentary – The Use of High Sensitivity CRP In Cardiovascular Disease American Proficiency Institute – 2005 3rd Test Event.
2. Paul M Ridker, MD: Clinical Application of C - reactive protein for Cardiovascular Disease Detection and Prevention. *Circulation* 2003; 107; 363-369.
3. Paul M Ridker, MD, MPH, and Nader Rifai, PhD. C-reactive protein And Cardiovascular Disease. Eds. 393 Pages. St-Laurent, Canada: MedieditionInc; 2006 *Circulation* 2006; 114; 253-254.
4. Nader Rifai, Inflammatory Markers in Men withAngiographically Documented Coronary Heart Disease. *Clin. Chem.* (1999) 45:11,1967–1973.
5. www.Cholestech.com, High sensitive C-reactive protein Technical Bulletin Number-116.
6. Ridker PM. High-Sensitivity C-reactive Protein: Potential Adjunct for Global Risk Assessment in The Primary Prevention of Cardiovascular Disease. *Circulation.* 2001; 103:1813–1818.
7. Paul M. Ridker, Julie E. Buring: Prospective Study of C-reactive Protein and the Risk of Future Cardiovascular Events Among Apparently Healthy Women. *Circulation.* 1998; 98:731-733.