

# “hsCRP – Not a Predictor of Angiographic Severity in Established Coronary Artery Disease Patients”

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## Abstract

**Introduction:** Coronary artery disease (CAD) is a most common cause of death in developed as well as developing countries. Inflammation plays an important role in the pathogenesis of CAD. **Aim and Objective:** To identify the hsCRP levels in established CAD patients and its correlation with angiographic severity. **Research Design and Methods:** A cross sectional study conducted on 72 patients of established CAD aged between 35 and 55 years. The coronary angiographic severity was assessed by number of coronary vessels involved and Gensini scoring system. The serum hsCRP was estimated by Enzyme Linked Immunosorbent Assay. **Results:** The mean hsCRP level was 14.85 mg/dL. Among the total 72 study participants 33 had single vessel disease, 13 and 25 had double vessel and triple vessel involvement respectively. There was no significant correlation of hsCRP with angiographic finding ( $r=0.103$ ,  $p=0.385$ ). **Conclusion:** We found that hsCRP was highly elevated but not a predictor of angiographic severity among established CAD with presence of other cardiovascular risk factors.

**Keywords:** hsCRP, Coronary artery disease, Gensini score.

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## INTRODUCTION

Coronary artery disease (CAD), is one of the major causes of mortality in developing and developed countries. Inflammation plays an essential role in the development, progression, and prognosis of CAD, and has been widely alarmed as an independent risk factor for the development of CAD [1]. Atherosclerosis is a chronic inflammatory process as a result of an acute clinical event by rupture of plaque which in turn causes acute coronary syndromes [2]. The hsCRP (high-sensitivity C-reactive protein), an inflammatory marker can act as a surrogate biomarker, for primary cardiovascular prevention by predicting the cardiovascular risk [3-5].

Asian Indians are at high risk of cardiovascular risk factors such as higher waist circumference, insulin resistance in spite of lower body mass index and premature CAD due to lower adiponectin and higher hsCRP [6].

Since 1990s, 25 large observational studies conducted have established high hsCRP, as an independent predictor for CAD [7]. But they are highly conflicting results in predicting the coronary

angiographic severity by hsCRP. As the prevalence of CAD is highly increasing among young Indians, we aimed to identify the hsCRP levels in established CAD patients and its correlation with coronary angiographic severity.

## METHODOLOGY

### Study participants and design

A cross sectional study was conducted among 72 consecutive patients of established CAD aged between 35-55 years. The patients with autoimmune disorder, previous h/o angiography, any chronic decompensate hepatic and renal failure is excluded from the study. The sample size calculation was done using G\*Power version 3.1.9 with 80% power, 0.30 effect size, and 0.05 level of significance. Participants are recruited in the study after obtaining institutional ethical clearance and informed consent.

### Measurement of Anthropometric and Biochemical parameters and Angiographic severity

Body massindex was calculated using standard formula:  $\text{weight (kg)/height (m)}^2$ . hs- CRP were estimated using commercially available enzyme- linked immunosorbent assay, DLD kits onEL × 800 (BioTek® Instruments, Inc.). Coronary angiographic findings

were assessed by Gensini scoring system [8]. Scoring is done based on the degree of stenosis and multiplied by factor assigned based on the geographical importance of vessels.

**STATISTICAL ANALYSIS**

Data analysis were done using SPSS version 23.0. Continuous variables were expressed as mean ± SD. Categorical variables were compared using Chi-square test. One way ANOVA used for normally distributed parameters to compare between multiple groups. The parameters which were not normally distributed were compared using Kruskal Walli’s test. Pearson correlation used for normally distributed parameters. Spearman correlation was used for parameters which were not normally distributed.

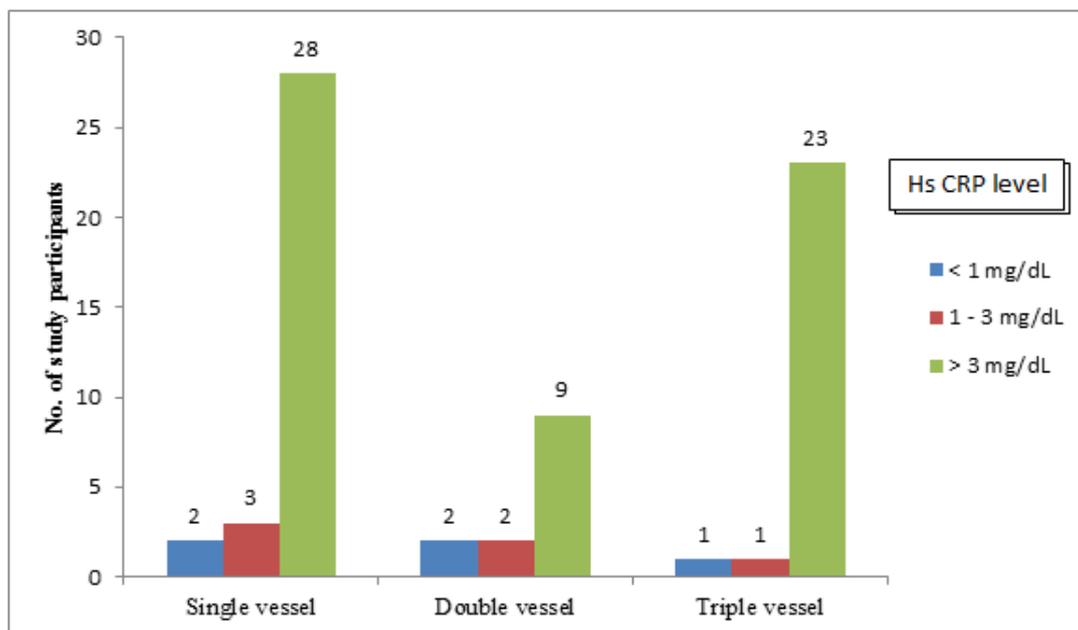
**RESULTS**

Out of 72 participants analyzed, 54 were males and 18 were females. Participants with cardiac risk factors such as diabetics and hypertensive were 51 and 39 respectively. hsCRP was found to be relatively high in all groups with a mean of 14.85 mg/dL in the entire study population. Mean age of the study population was 54.8 ± 6.15. Based on number of coronary vessels involved, 33 had single vessel disease, 13 had double vessel disease and 25 had triple vessel disease. Baseline characteristics of the study participants based on the number of coronary vessels involved is shown in Table 1. Categorizing the participants based on the hsCRP level ie. < 1 mg/dL – low risk, 1-3 mg/dL – moderate risk, > 3 mg/dL – high risk as shown in figure 1. Majority of the participants in all CAD groups had highly elevated hsCRP.

**Table-1: Baseline characteristics of the study participants based on the number of vessels involved**

Parameter	Single vessel disease n(%) 33	Double vessel disease n(%) 13	Triple vessel disease n(%) 25	P value
Age (years)	55 ± 7	53 ± 4	55 ± 5	0.289
BMI (kg/m <sup>2</sup> )	22.47 ± 3.08	24.21 ± 3.31	22.33 ± 2.51	0.269
Gender (male/female)	25/9	9/4	20/5	0.340
<sup>s</sup> Gensini score	23.21 ± 20	37.84 ± 21.36	78.88 ± 41.04	0.000*
<sup>s</sup> hsCRP (mg/L)	13.67 ± 23	17.12 ± 31.6	15.83 ± 19.7	0.950
T.Cholesterol (mg/dL)	167.36 ± 37.83	193.15 ± 74.59	159.44 ± 51.73	0.259
HDL (mg/dL)	42.91 ± 7.66	43.53 ± 5.7	38.59 ± 11.54	0.134
TC/HDL	3.96 ± 1.14	4.45 ± 1.72	4.32 ± 1.45	0.625
<sup>#</sup> H/o DM (yes/no)	24/10	9/4	18/7	0.863
<sup>#</sup> H/o HTN (yes/no)	19/14	4/9	16/9	0.157
<sup>#</sup> Treatment Advised Medical/PTCA/CABG	5/18/0	0/13/0	8/7/10	0.000*

BMI-Body Mass Index, hsCRP-high sensitivity C- Reactive Protein, HDL- High density lipoprotein, TC- Total Cholesterol, DM- Diabetes Mellitus, HTN – Hypertension.. P value <0.05 was considered significant. <sup>#</sup> Chi square analysis done. <sup>s</sup>Kruskal Walli’s analysis done.



**Fig-1: Prevalence of CAD groups based on the hsCRP level**

**Table-2: Correlation of hsCRP with biochemical parameters**

	Correlation coefficient (r)	P value
Age (years)	0.164	0.164
Gensini score	0.103	0.385
T.Cholesterol (mg/dL)	-0.150	0.205
HDL (mg/dL)	-0.001	0.995
TC/HDL	-0.175	0.139

HDL- High density lipoprotein, TC- Total Cholesterol P value <0.05 was considered significant.

## DISCUSSIONS

In the present study we did not find any significant correlation of hsCRP with number of coronary vessels involved or with angiographic severity assessed by Gensini score. High hsCRP was found among the study participants as CAD is an inflammatory disease. This result was consistent with the study conducted by Habib *et al.* 2013 [9]. He concluded that angiographically diagnosed CAD patients had highly elevated hsCRP. We did not find any statistically significant association between hsCRP and angiographic severity. A study by Razban *et al.* 2016 [10] also did not find any significant correlation of hsCRP with angiographic severity. A study by Ulucay *et al.* 2008 [11] also did not find any statistically significant association between hsCRP and angiographic severity. This may be due to small sample size of 51 patients. In a study by Berk and Luizz *et al.* [12,13] hsCRP was highly elevated in stable and unstable angina but hsCRP failed in clinically differentiating stable angina and acute coronary syndrome.

Many other studies showed positive correlation of hsCRP with angiographic findings. A study by Masood *et al.* 2011 [14] which was aimed to assess the relationship between Gensini score and risk group according to hsCRP level found significant correlation between angiographic findings and hsCRP. Seyedian, SM *et al.* 2016 [15] also found significantly higher hsCRP in unstable angina compared to stable angina and normal coronary angiography. In a prospective study by Soinio *et al.* 2006 [16] where type 2 diabetes patients were followed for 7 years for mortality due to CAD and incidence of nonfatal myocardial infarction concluded that hsCRP is an independent predictor for CAD death.

CAD is a chronic inflammatory disease leading to the production of hsCRP by vascular smooth muscles, artheromatous tissues and lipid tissues cytokines [17] hsCRP enhances the activation of complement pathway, 1999 [18] engulfment of LDL particles by macrophages [19] and is associated with endothelial dysfunction [20].

Our study showed high hsCRP levels in established CAD patients which suggest that inflammation plays an important role in CAD. But our study did not show any significant correlation of hsCRP with angiographic severity assessed by Gensini score

which may be due to presence of other cardiovascular risk factors such as diabetes, hypertension and dyslipidemia.

## CONCLUSION

We found that hsCRP was highly elevated but not a predictor of angiographic severity among established CAD with presence of other cardiovascular risk factors.

## Limitation

As the current study is a cross sectional study, casual relationship between hsCRP and angiographic severity of CAD cannot be found. We had only single baseline hsCRP values and no follow up values. Our study population was not categorized into Acute Myocardial infarction, unstable angina or Stable angina.

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