

Correlate the Level of HS-CRP with Hyperlipidemia, Obesity, number of Vessel Involved and Percentage of Stenosis: A Cross Sectional Study

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Abstract

Background: Ischemic heart disease (IHD) and stroke constitute the majority of CVD mortality in India (83%), with IHD being predominant. **Objectives:** To correlate the level of Hs-crp with risk factors like age, hyperlipidemia, obesity and to correlate the level of Hs-CRP with number of vessel involved and percentage of stenosis. **Material and Methods:** This cross sectional study was conducted on patients admitted in the Intensive cardiac Care Unit of Karnataka Institute of Medical Sciences, Hubli between November 2015 – January 2017. A total number of 110 patients were recruited for the study. **Results:** Out of the total 110 cases 78(70.9%) were male patients and 32(29.1%) female patients. Most of patients were in age group of 51-60 yrs (40%). 77 patients (70%) were obese BMI>25. 56(52.8%) were SVD, 12(11.3%) were DVD, 20(18.9%) were TVD, and 18(17%) had normal coronaries. There was significant difference in mean hsCRP with respect to vessel blocked distribution, higher was seen with TVD(6.4mg/l)>DVD(2.7mg/l)>SVD(1.3mg/l)>normal coronaries(1.2mg/l) There was positive correlation between hscrp and LDL, TG, and significant negative correlation with HDL. There was significant negative correlation of hscrp with EF. **Conclusion:** It was concluded hsCRP correlates with cardiovascular risk factors like obesity, dyslipidemia. hscrp can predict the number of vessel involved and indirectly severity of disease. hscrp and EF together could predict severity of disease.

Keywords: Ischemic Heart Disease; Hs-CRP; Hyperlipidemia; Obesity; Ejection Fraction.

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Introduction

With the turn of the century, cardiovascular diseases (CVDs) have become the leading cause of mortality in India.¹ In comparison with the people of European ancestry, CVD affects Indians at least a decade earlier and in their most productive midlife years.^{2,3} For example, in Western populations only 23% of CVD deaths occur before the age of 70 years; in India, this number is 52%.^{1,4}

The epidemiological transition in India in the past 2 decades has been dramatic; in a short time frame, the predominant epidemiological characteristics have transitioned from infectious diseases, diseases of undernutrition, and maternal and childhood diseases to noncommunicable diseases.²

Nearly two-thirds of the burden of NCD mortality in India is currently contributed by CVD-related conditions.³

According to the Global Burden of Disease study age-standardized estimates (2010), nearly a quarter (24.8%) of all deaths in India are attributable to CVD.⁴

The age standardized CVD death rate of 272 per 100 000 population in India is higher than the global average of 235 per 100 000 population. Reports of 3 large prospective studies from India suggest a higher proportion of mortality attributable to CVD (30%–42%) and an age-standardized CVD mortality rate (255–525 per 100 000 population in men and 225–299 per 100 000 population in women) in comparison with the Global Burden of Disease study.^{5,6,7}

Conventional risk factors in the Framingham risk score (FRS), such as age, male sex, hypercholesterolemia, hypertension, and smoking, account for most of the risk of coronary heart disease (CHD) and have been the bedrock of risk assessment for decades. However, approximately one-third of individuals with 0 or 1 risk factor develop CHD and up to 40% of individuals with cholesterol levels below the population average die from CHD.⁸

We know atherosclerosis is most important cause of CHD, and Inflammation is the key mechanism in the pathogenesis of the different stages of atherosclerosis, from onset, progression of atheroma, plaque instability and rupture and restenosis following angioplasty.⁹

Inflammatory biomarkers provide useful information on the inflammatory process of atherosclerosis; they act as a window into the process of cell activation, recruitment of inflammatory cells and proliferation.¹⁰

In recent decades, many studies have shown that CPR is associated with cardiovascular risk.

This molecule has characteristics that make it a particularly attractive subject of study:

As a positive acute phase protein it is a marker of systemic inflammation that increases in response to various types of injury, particularly bacterial infections, that function as inflammatory stimuli.¹¹

Its production in the liver is induced mainly by interleukin-6 (IL-6) and, unlike other acute phase markers, its levels are relatively stable, with no significant diurnal variation, and can thus be accurately measured.¹²

During the 1990s high-sensitivity techniques were developed to detect lower serum CRP levels than by previous laboratory methods (down to 0.3 mg/l), known as high-sensitivity CRP (hs-CRP),

and these techniques should be used when assessing the cardiovascular risk associated with the chronic vascular inflammation of atherosclerosis.

There is growing evidence that CRP is not merely a marker of inflammation, but also plays an active role in atherogenesis.¹³ Hence the present study conducted to correlate the level of Hs-crp with risk factors like age, hyperlipidemia, obesity and to correlate the level of Hs-crp with number of vessel involved and percentage of stenosis.

Materials and Methods

This cross sectional study was conducted on patients admitted in the Intensive cardiac Care Unit of Karnataka Institute of Medical Sciences, Hubli between November 2015 – January 2017. A total number of 110 patients were recruited for the study. Approval for the study was obtained from the KIMS, Hubli Ethics Committee. Informed consent was taken prior to inclusion in the study.

Inclusion criteria: All patients with ACS

1. STemi 2. NSTEMI 3. Unstable angina

Sample size: A total of 110 cases of ACS were included in the study during the period extending between December 2015 to January 2017. Sample size is calculated to be 110, considering the prevalence of ACS as 7.5% with confident interval of 95% and precession of 5%.

Exclusion criteria: Patient with past CABG, Patient with PTCA, Patient with valvular heart disease. Patient with hepatic dysfunction, Patient with renal dysfunction creatinine > 1.5 mg / dL, Patient with collagen vascular disease, All patients with recent or ongoing infection, fever or inflammatory disorder & Recent trauma.

Method of collection of data: Patients presenting with h/o chest pain, shortness of breath, palpitation were taking thorough clinical history for previous h/o DM, HTN, IHD & measurement of blood pressure, & BMI, ECG and 2 Decho was done, patients with clinical features, ECG & 2 Decho features suggestive of STEMI, NST-ACS, were selected for blood investigation which included Lipid profile, his CRP, urea, creatinine, complete blood count and LFT, RA factor, and coronary angiography. patients with raised total count and abnormal LFT & Positive RA factor a features suggestive of inflammation were excluded from study. Informed written consent was taken from every patient.

Statistical analysis: Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Continuous data was represented as mean and standard deviation. Independent t test or was used as test of significance to identify the mean difference between two quantitative variables. ANOVA (Analysis of Variance) was the test of significance to identify the mean difference between more than two groups for quantitative data. Pearson correlation or Spearman’s correlation was done to find the correlation between two quantitative variables and qualitative variables respectively.

Result

110 patients presenting with ACS who satisfied the inclusion criteria were enrolled in the study. The data both clinical as well as laboratory values were collected and then analysed accordingly. Out of the total 110 cases 78(70.9%) were male patients and 32(29.1%) female patients. 25(22.7%) patients were diabetic and 20(18.2%) patients were hypertensive on medication, 93 (84.5%) were smokers. By means of ECG out of 110 cases 81(73.6%) patients diagnosed as STEMI, 29(26.4%) were NST-ACS. On coronary angiography 56(52.8%) has SVD, 12(11.3%) has DVD, 20(18.9%)has TVD & 18(17.0%) has normal coronaries.

In the study majority of subjects were in the age group 51 to 60 years (40%), 20% were in the age group 41 to 50 years, 19.1% were in the age group 61 to 70 years, 16.4% were in the age group <40 years and 4.5% were in the age group >70 years. In the study 29.1% were females and 70.9% were males. In the study 73.6% had STEMI and 26.4% had NST-ACS.

In the study 9.1% had normal BMI, 20.9% were overweight and 70% were Obese according to Asian BMI classification.

In the study on angiogram, 52.8% had Single vessel Disease (SVD), 11.3% had Double Vessel Disease (DVD), 18.9% had Triple Vessel Disease (TVD) and 17% had Normal Coronary vessel.

In the study mean Total Cholesterol, LDL and Triglyceride was significantly higher among those with hsCRP >3 mg% compared to HSCR 1 to 3 mg% and <1 mg%. Table 1

In the study there was significant association between HsCRP and vessel blocked. I.e. among those with SVD block, 53.6% had hsCRP of <1 mg%, 44.6% had hsCRP of 1 to 3 mg% and 1.8% had hsCRP of >3 mg%. Among those with DVD, 75% had hsCRP of 1 to 3mg% an 25% had hsCRP of >3 mg% and among those with TVD, 10% had hsCRP of 1 to 3 mg% and 90% had hsCRP of >3 mg% and among those with Normal coronaries, 88.9% had hsCRP of <1 mg%, 5.6% had HSCR 1 to 3 mg% and 5.6% had hsCRP of >3 mg%.Table 2.

$$\chi^2 = 94.307, df = 6, p < 0.001^*$$

Table 1: Association between hsCRP and Lipid profile

	HSCR						P value
	<1 mg%		1 to 3 mg%		>3 mg%		
	Mean	SD	Mean	SD	Mean	SD	
Total Cholesterol	210.3	42.3	223.9	54.3	242.3	59.2	0.046*
LDL	95.3	23.7	111.0	36.3	132.9	51.7	<0.001*
HDL	48.5	9.3	45.5	11.9	43.3	13.5	0.167
Triglyceride	126.2	42.2	144.4	35.4	161.5	45.2	0.003*
Urea	23.6	8.1	28.7	17.9	27.1	6.3	0.151
Creatinine	0.7	0.2	0.8	0.3	0.8	0.2	0.785

Table 2: Association between hsCRP and Vessels blocked

		hsCRP					
		<1 mg%		1 to 3 mg%		>3 mg%	
		Count	%	Count	%	Count	%
Vessel Blocked	SVD	30	53.6%	25	44.6%	1	1.8%
	DVD	0	0.0%	9	75.0%	3	25.0%
	TVD	0	0.0%	2	10.0%	18	90.0%
	Normal Coronary	16	88.9%	1	5.6%	1	5.6%

In the study among those with STEMI, 38.3% had hsCRP of <1 mg%, 37% had hsCRP of 1 to 3 mg% and 24.7% had hsCRP of >3 mg% and among those with unstable angina, 58.6% had hsCRP of <1 mg%, 31% had hsCRP of 1 to 3 mg% and 10.3% had hsCRP of >3 mg%. There was no significant association between hsCRP and ECG findings. Table 3

$$\chi^2 = 4.34, df = 2, p = 0.114$$

In the study mean hsCRP among those with SVD was 1.3 ± 0.7 , among those with DVD was 2.7 ± 1.6 , among those with TVD was 6.4 ± 2.2 and among those with normal coronary was 1.2 ± 2.2 . There was

significant difference in mean hsCRP with respect to Vessel blocked distribution. Higher hsCRP was seen among those with TVD and lower hsCRP was seen among normal vessel subjects. Table 4

ANOVA Test

In the study there was significant positive correlation between HSCRP and Age, BMI, LDL and Triglyceride. I.e. with increase in hsCRP levels there was increase in Age, BMI, LDL and Triglyceride and vice versa. Table 5

Table 3: Association between hsCRP and Type of MI

		hsCRP					
		<1 mg%		1 to 3 mg%		>3 mg%	
		Count	%	Count	%	Count	%
ECG	STEMI	31	38.3%	30	37.0%	20	24.7%
	NST-ACS	17	58.6%	9	31.0%	3	10.3%

Table 4: Comparison of HSCRP with respect to Vessel Blocked

		hsCRP			P value
		Mean	SD	Median	
Vessel Blocked	SVD	1.3	0.7	0.9	<0.001*
	DVD	2.7	1.6	1.9	
	TVD	6.4	2.2	6.2	
	Normal Coronary	1.2	2.2	0.6	

Table 5: Correlation between HSCRP and various quantitative parameters in the study

Correlations		HSCRP	Age	BMI	Total Cholesterol	LDL	HDL	Triglyceride	Urea	Creatinine	EF
hsC	Pearson Correlation	1	0.21*	0.29**	0.145	0.30**	-0.21*	0.214*	0.0	0.115	-0.21*
RP	P value		0.026*	0.002*	0.131	0.001*	0.02*	0.025*	0.3	0.230	0.025*
	N	110	110	110	110	110	110	110	110	110	110

Discussion

The present study is a cross sectional study aimed at assessing the relationship of hsCRP with various cardiac risk factors and angiographic profile. Our study analysed 110 patients with diagnosis of acute coronary syndrome admitted in ICCU at KIMS hospital HUBALLI. There were 78 (70.9%) males and 32 (29.1%) females in the study. Mean age was 53.5 which correlates with the study done by S. Guruprasad et al.,¹⁴ Tenzin Nyandak et al.,¹⁵

and in our study there was a significant positive correlation between hsCRP and age.

In our study mean BMI of patients was 26.5, which is near to values obtained from study done by V. Mohan et al.¹⁶ and Syed Shahid Habib et al.¹⁷ Our study shows a significant positive correlation between hsCRP and BMI with p value of 0.002.

Total cholesterol and triglyceride values were near to study conducted by Guru Prasad et al.¹⁴ and HDL value near to study conducted by Tenzin Nyandak et al.¹⁵ In our study there was significant

positive correlation between hsCRP and LDL and triglyceride (pvalue-0.001 and 0.025 respectively) and had significant negative correlation between hsCRP and HDL (p value-0.022)

Study conducted by Guruprasad et. al.¹⁴ had EF of 48.3 which was near to our observation. In our study there was significant negative correlation between hsCRP and ejection fraction (p value-0.025)

In our study it was found that mean hsCRP value increased as the number of vessel increased and which suggests the severity of diseases which was in consistent with study conducted by Guruprasad et. al.¹⁴

In our study there was significant difference in mean HSCRP with respect to Vessel blocked distribution lowest among normal coronaries (1.2) and increased as number vessel increased SVD(1.3),DVD(2.7),TVD(6.4). Many other study also support this that Syed Shahid Habib et. al.¹⁷ studied 87 pts and concluded that triple vessel disease has significant higher hsCRP value than one vessel and double vessel disease.

Conclusion

HsCRP correlates with cardiovascular risk factors like obesity, dyslipidemia. hsCRP can predict the number of vessel involved and indirectly severity of disease. hsCRP and EF together could predict severity of disease. hsCRP could be included in assessment for cardiovascular risk factor. Screening for high risk individual for cardiovascular assessment, which helps in primary prevention, by detecting low grade inflammation.

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Declarations

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Conflict of interest: None

Ethical approval: Permission for the study was obtained from the College authorities prior to commencement.

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