High-sensitivity C-Reactive Protein concentration in Patients with Acute Coronary Syndrome of Central India

Authors
Dr Mayank Jain[1], Dr Priyanka Kiyawat[2]
[1]Consultant Interventional Cardiologist, Choithram Hospital and Research Centre (CHRC), Indore
[2]Asst. Prof., Dept. of Pathology, Sri Aurobindo Medical College and PG Institute, Indore (M.P.)
Corresponding Author
Dr Priyanka Kiyawat
Asst. Prof., Dept. of Pathology, Sri Aurobindo Medical College and PG Institute, Indore (M.P.)

Abstract

Background and Objectives: *Atherosclerosis is now known to be an active process of cell activation, inflammation and thrombosis.[1] To study, the serum hs- CRP level, a biomarker of inflammation in patients with acute coronary syndrome, such studies are sparse in India.*

Methods: *Patients with ACS who were fulfilling the inclusion criteria, attending cardiology services of Choithram Hospital and Research Centre (CHRC), Indore (a teaching hospital), were enrolled prospectively in the study during the period February 2017 to February 2018. The patients were further classified three risk groups according to serum hs-CRP levels. < 1 mg/L - low risk, 1-3 mg/L - average risk and >3 mg/L- high risk.*

Results: *In our study, majority of the patients were having serum hs-CRP level >3mg/l putting them in high risk category. Of 100 patients, 60 patients (60%) had serum hs-CRP level > 3mg/l, 33 patients (33%) were having serum hs-CRP level 1-3mg/l, while only 7 patients (7%) had serum hs-CRP level < 1.*
The mean value of the serum hs-CRP levels in our study were 4.18±3.30 mg/L. In patients with unstable angina serum hs-CRP was 2.43±1.67 mg/l, with NSTEMI it was 3.70±2.09 mg/l and with STEMI it was highest 5.41±3.83 mg/l,

Conclusion: *In our study we showed, the mean value of the serum hs-CRP levels in Indian subjects were 4.18±3.30 mg/L, which is higher to those reported in other ethnic groups.*

Introduction

Atherosclerosis, once considered to result from a passive process of lipid accumulation, is now known to be an active process of cell activation, inflammation and thrombosis.[1]

Over the past decade, identification of novel risk factors and predictors for CVD has been an area of major interest in preventive cardiology. Serum high sensitivity C- reactive protein (hs-CRP), a biomarker of inflammation, has been shown to effectively predict the risk of adverse cardiovascular (CV) events consistently. Serum hs-CRP levels may aid in identifying patients at high risk for a first CV event who might otherwise be missed by screening for lipids and other conventional risk factors alone.

Studies discussing serum hs-CRP in patients with

acute coronary syndrome are available in Western literature, such similar studies are however sparse in India. The need for such a study assumes tremendous significance as it is well known that the patient population and pattern of disease in India varies considerably from that of the West.

Aims and Objectives

To study the serum hs-CRP level in patients with acute coronary syndrome.

Material and Methods

During the period February 2017 to February 2018 ,total 100 patients with the clinical diagnosis of acute coronary syndrome, who were fulfill the following criteria, included in the study.The definition of ACS was made according to the 2012 "Third universal definition of myocardial infarction" expert consensus document[2].-

Inclusion Criteria

- Patients with acute coronary syndrome irrespective of risk factors.
- Patient/party willing to give informed consent for active participation in the study.

Exclusion Criteria

- Patients on statins for more than one month,
- Patients with any systemic infection,
- Patients with malignancies,
- Patients with rheumatologic/autoimmune diseases,
- Patients with chronic inflammatory disorders,
- Patients with renal/hepatic compromise,
- Patients with recent trauma.
- Patients' refusal to give consent.
- Patients with psychiatric illness and those under legal custody.

It was a hospital based non-comparative prospective cross-sectional study. Serum hs-CRP assessment was performed using the IMMULITE method containing one monoclonal and one polyclonal anti-CRP antibodies. This method provides a measurement range from 0.1 to 500 mg/L.

Patients were divided into three risk groups according to serum hs-CRP levels.

- < 1 mg/L - low risk,
- 1-3 mg/L - average risk
- >3 mg/L- high risk.

Observations

Baseline Characteristics

Table No. 1 shows the baseline characteristics of study participants.

Table No. 1 Baseline demographic and clinical data of study patients (n=100)

Characteristic	
Age (Years) (mean± SD, range)	56.61±10.0 (29-86)
Sex	No. (%)
Male	77 (77%)
Female	23 (23%)
Type of Presentation	
STEMI	52 (52%)
NSTEMI	16 (16%)
UA	32 (32%)
Serum hs-CRP Level	
< 1 mg/L - low risk,	7 (7%)
1-3 mg/L - average risk	33 (33%)
>3 mg/L- high risk.	60 (60%)
Risk Factor	
Smoking	69 (69%)
Hypertension	47 (47%)
Dyslipidemia	42 (42%)
Diabetes	29 (29%)
Family h/o CAD/CV death	26 (26%)
Serum hs-CRP levels (mean± SD, range) (mg/L)	4.18±3.30 (0.11-16.3)

4. Serum hs-CRP Level

In our study, majority of the patients were having serum hs-CRP level >3mg/l putting them in high risk category. Of 100 patients, 60 patients (60%) had serum hs-CRP level > 3mg/l, 33 patients (33%) were having serum hs-CRP level 1-3mg/l, while only 7 patients (7%) had serum hs-CRP level < 1 (Fig. 1).

The mean value of the serum hs-CRP levels in our study were 4.18±3.30 mg/L. In patients with unstable angina serum hs-CRP was 2.43±1.67 mg/l, with NSTEMI it was3.70±2.09 mg/l and with STEMI it was highest5.41±3.83 mg/l, (Table No.2) (Fig.2).
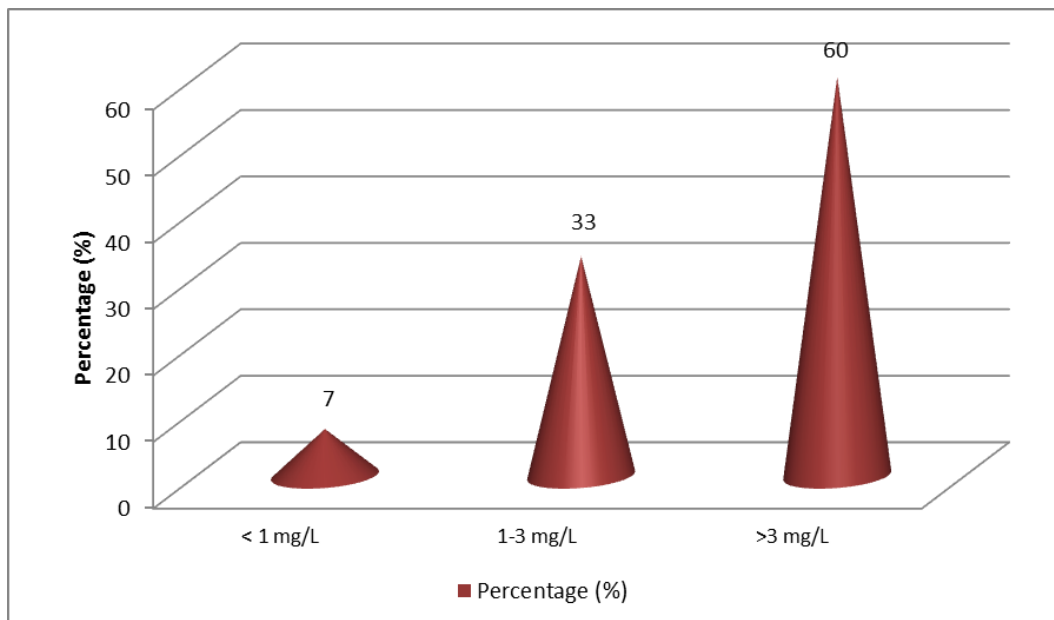
Fig.1: Distribution of Patients According to Serum hs-CRP Level

Table No. 2 Levels of serum hS-CRP and Type of Presentation

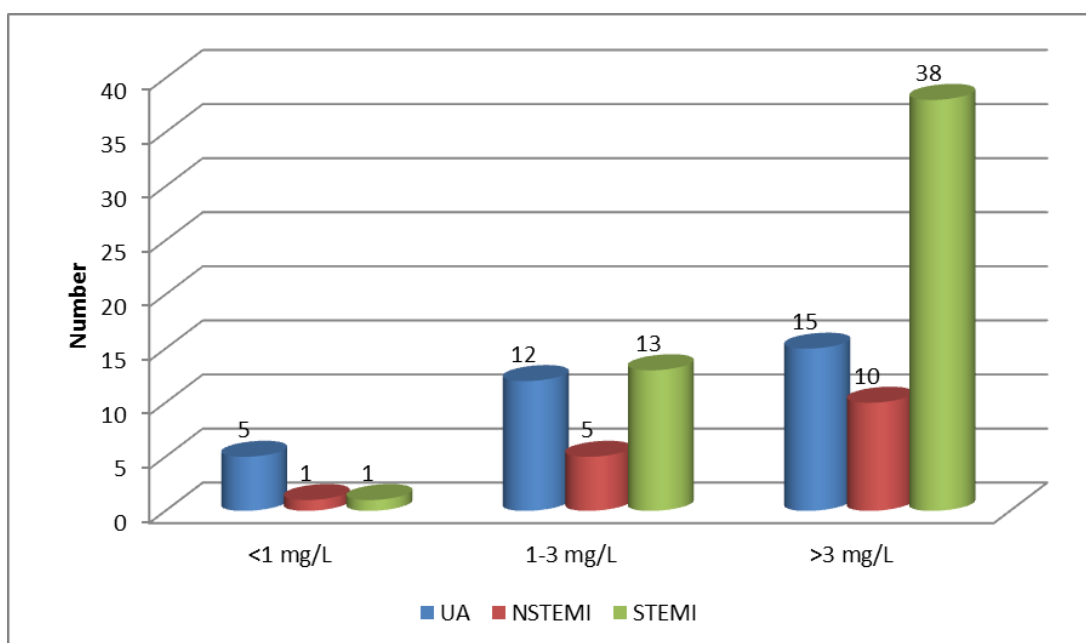| Serum hs-CRP level (mg/l)	UA	NSTEMI	STEMI
<1 mg/l	5	1	1
1-3 mg/l	12	5	13
>3 mg/l	15	10	38
Total	32	16	52
Mean serum hs-CRP levels	2.43±1.67	3.70±2.09	5.41±3.83

Fig.2: Distribution of Patients According to Serum hs-CRP Level and Type of Presentation

Serum hs-CRP Level in Different Subgroups

The mean serum hs-CRP in different risk subgroups (Table No. 3) was similar in patients with and without many of the study risk factors/profiles (gender; p=0.300, and hypertension; p=0.396), while it was significantly higher in those with hyperlipidaemia (p=0.000), With diabetes (p=0.021) with a family history of CAD/CV death (p=0.017), history of smoking (p=0.001), than in those without.

Table No. 3 Serum hs-CRP level in different risk factors subgroups*

Characteristic	Sr. hS-CRP
Male	4.39±3.20
Female	3.51±3.62
P value	0.300
With diabetes	5.65±4.30
Without diabetes	3.59±2.61
P value	0.021
With systemic hypertension	3.89±2.99
Without systemic hypertension	4.45±3.57
P value	0.396
With dyslipidemia	5.91±3.95
Without dyslipidemia	2.94±1.99
P value	0.000
With a family history of CAD/CVdeath	5.75±4.07
Without a family history of CAD/CVdeath	3.61±2.79
P value	0.017
With history of smoking	4.83±3.54
Without history of smoking	2.76±2.14
P value	0.001

*Data are presented as mean ± standard deviation; data were analyzed by *t* tests

Discussion

Serum hs-CRP Level

In our study we showed, the mean value of the serum hs-CRP levels in Indian subjects were 4.18±3.30 mg/L, which is higher to those reported in other ethnic groups,[3-4] and is much higher than that reported in Japanese subjects,[5] consistent with studies to suggest that the concentration of serum hs-CRP is high in Indians.[6-10]

In our study, majority of the patients were having serum hs-CRP level >3 mg/l putting them in high risk category, increased serum hs-CRP serum level in patients with acute coronary syndrome support to a role of serum hs-CRP in plaque vulnerability, which is consistent with another study done by Espligureal R *et al*, showed that, serum hs-CRP was significantly higher in patients with acute coronary syndrome compared to chronic stable angina (*p*=0.004) and correlate with complex angiographic lesion (*p*=0.001).[11]

Serum hs-CRP Level in Different Subgroups

With serum hs-CRP gaining importance as a marker for future cardiovascular events, interest has developed in patient characteristics as well as life-style factors associated with reduced or elevated systemic inflammatory activity.

There are a variety of factors that can influence the concentration of serum hs-CRP. Elevated blood pressure, obesity, smoking, diabetes mellitus, metabolic syndrome, dyslipidaemia and hormone use are the individual characteristics that can increase level of serum hs-CRP along with chronic infection of inflammation. Moderate alcohol consumption, improved fitness, weight loss and medications like statins, fibrates, niacin, aspirin, and non-steroidal anti-inflammatory drugs (NSAIDs) can decrease the level of hsCRP.[12] Extraneous factors that can influence the concentration are seasonal variation, diurnal influence, age, gender and ethnic differences.

In our study, mean serum hs-CRP in different risk subgroups was significantly higher in those with dyslipidaemia (p=0.000), With diabetes (p=0.021) with a family history of CAD/CV death (p=0.017), and with history of smoking (p=0.001), which is consistent with other studies, while it was similar in patients with and without many of the study risk factors/profiles (gender; p=0.300, and hypertension; p=0.396).

Our study cannot prove significant association that history of hypertension is related to the mean serum hs-CRP level , although hypertension was identified as an important risk factor that can increase level of serum hs-CRP.[12] The non-significant association might be attributable to the relatively unawareness

of patients to therefore a self-reported history of hypertension can underestimate the diagnosis of hypertension, as found in a recent hypertension survey also[13] and this study was conducted after an ACS, a fact that might have contributed to lower blood pressure than in stable clinical conditions before the ACS.

Regarding sex, men tend to have lower CRP concentrations, (Frohlich et al.,[14] Geffken et al.,[15]; Hutchinson et al.,[16]; Imhof et al.,[17]) however some authors report no difference of the CRP concentration by gender (Garcia-Lorda et al.,[18]). In our study, there was no difference of the CRP concentration by gender (p=0.300)

Limitations of our study

Although the results of this study support the hypothesis, there are some facts to be considered which might affect the results:

- Number of study population was limited.
- Moreover, other putative factors that could affect the serum hs-CRP (e.g. nutritional status and physical activity) were not included in the regression analyses.
- This study was conducted after an ACS, a fact that might have contributed to lower lipid levels and blood pressure than in stable clinical conditions before the ACS. In addition, at this time, high fasting glucose levels could be related to stress-induced

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