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C-reactive protein levels in acute coronary syndrome and its correlation with the outcome – A cross-sectional study

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Abstract

Background: Coronary artery disease has emerged as one of the major cardiovascular diseases. Developing countries now experience much greater burden of cardiovascular disease than developed countries. Hence in countries like India are expected to experience the greatest rise in cardiovascular disease burden over next few years. Inflammatory mechanisms play a central role in the pathogenesis of atherosclerosis and its complications.The possible use of plasma inflammatory markers, particularly C-reactive protein (CRP), as risk predictors among those at risk for cardiovascular events has recently received attention.Therefore, the current study's objective is to assess the prognostic significance of CRP in predicting cardiovascular prognosis in patients presenting with acute coronary syndromes.

Objective: To study the C-reactive protein levels in Acute coronary syndrome and its correlation with the adverse cardiovascular events.

Material and Methods:A cross sectional observational study was done with patients diagnosed as acute coronary syndrome over period of two years. Total 200 patients, were included in this study. CRP was done at the time of admission and patients were observed for subsequent adverse cardiovascular events.

Results:Out of 200 patients, CRP was raised in 88 patients, out of which 68(77.27%) patients, met with complications related to ACS. The mean CRP level was significantly high (10.14+0.99 mg/dl) among cases of ACS with adverse cardiovascular events.

Conclusion:In patients of Acute coronary syndrome withadverse complication, CRP levels were noticeably elevated.CRP has the potential to be the most accurate and sensitive indicator of inflammation as well as an average predictor of cardiovascular risk.

Keywords: coronary artery disease, myocardial infarction, c-reactive protein, acute coronary syndrome.

Introduction

The term "Acute Coronary Syndrome" (ACS)encompasses a range of thrombotic coronary artery diseases, including Unstable angina (UA), and both ST – segment elevation (STEMI) and Non-ST – segment elevation myocardial infarction (NSTEMI), mostly induced by local coronary thrombosis as an acute complication of atherosclerosis.[1] Patients with an acute coronary syndrome have a high risk of suffering subsequent cardiac events.[2-4]

Atherosclerosis of the coronary vessels commonly cause ischemic heart diseases. With growing evidence that atherosclerosis is an inflammatory process, several plasma markers of inflammation have been evaluated as potential tools for the prediction of coronary events.[5] Recently, attention has been focused on the potential role of plasma markers of inflammation, especially C-reactive protein (CRP), as risk predictors among those at risk for cardiovascular events. With inflammation there will be release of inflammatory cytokines from the inflamed tissue, which stimulates liver to synthesize a number of acute phase proteins, including the prototypical acute phase reactant, C-reactive protein. In clinical studies, it is shown that, circulating levels of CRP were found to correlate with total infarct size in acute myocardial infarction, and with prognosis. Thus, CRP is an indicator of underlying coronary inflammation as well as extent of myocardial necrosis.[6]

Therefore, the present study aims to evaluate the prognostic value of CRP in predicting cardiovascular outcome in patients presenting with acute coronary syndromes.

Objective

To study the C-reactive protein levels in Acute coronary syndrome and its correlation with theadverse cardiovascular events.

Material and Methods

A cross sectional observational study was conducted over period of two years from November 2020 to November 2022 in Medicine department of Ashwini rural medical college, hospital and research Centre, Kumbhari Solapur. Patients aged >18years, admitted to emergency department and ICCUwith diagnosis Acute coronary syndromewere included in the study. All cases of stable angina, patients with infectious disease, Osteoarthritis, Rheumatoid arthritis, Psoriatic arthritis, Gout and patients taking Statins, Fibrates, Aspirin, estrogen and progesterone pills were excluded.

Sample Size for present study was calculated by following formula:

$N=4 \times P \times Q / L^2$where P=87 Q=100-87=13

Allowable error i.e. L=6%

Hence The Sample Size is 125. However, 200 subjects were included in study.A consecutive sampling method was used till desired sample size was achieved.The patients fulfilling to the inclusion criteria were enrolled into the study.The patients presenting with chest pain were evaluated with standard 12 lead ECG, and cardiac

enzymes (CPK-MB or Troponins).A detailed history was taken about the chest pain, presence of risk factors and duration of risk factors as appropriate.Detailed history regarding hypertension, diabetes mellitus, dyslipidemia, smoking habits etc. was asked.C-reactive protein was done at the time of admission using semi-quantitive method and patients were categorized accordingly.The collected data was entered in Microsoft excel.The categorical variables were presented as number and percentage, whereas continuous variableswere presented as mean and SD. Chi square test $\chi 2$,ANOVA and Student's t test were used as test of significance. A p value of <0.05 was considered statistically significant.

Results and Observations

Present study consists of 200 patients with diagnosis of ACS. Table no. 1 shows most of the study subjects were males contributing 150(75%) and females 50(25%). M:F ratio was 3:1.

Table1: Gender distribution (N=200)

Gender	Frequency	Percentage
Male	150	75
Female	50	25
Total	200	100

Fig.1: Distribution of study subjects according to age(N=200)

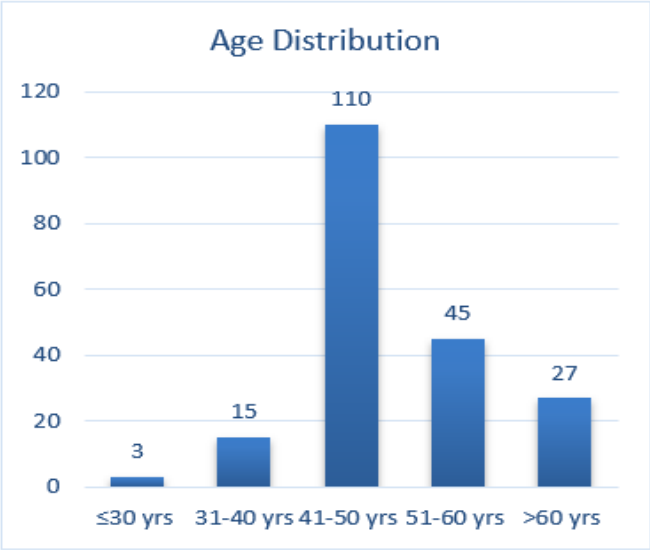


Fig. no. 1 shows majority of study subjects were from age group 41-50 years contributing 110(55%) followed by 51-60 years 45(22.5%), >60 years 27(13.5%), 31-40 years 15(7.5%) and ≤30 years 3(1.5%) respectively.

Fig. 2: Classification of acute coronary syndrome (N=200)

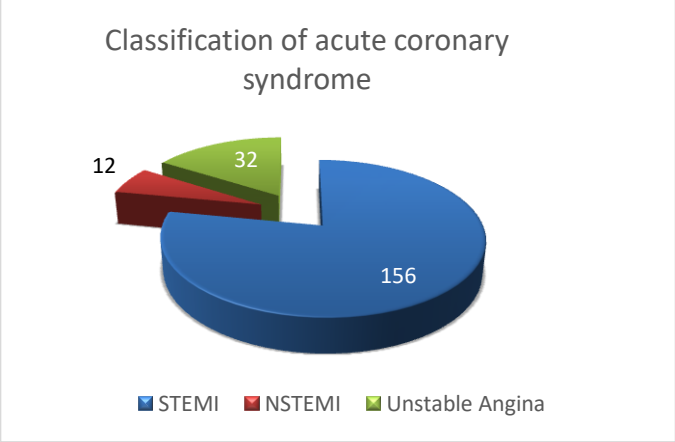


Fig. 2 shows majority of study subjects presented as ST segment elevation myocardial infarction contributing 156(78%) followed by Unstable Angina 32(16%) and Non-ST segment elevation myocardial infarction in 12(6%) cases respectively.

Fig. 3: Clinical features of the study participants (N=200)

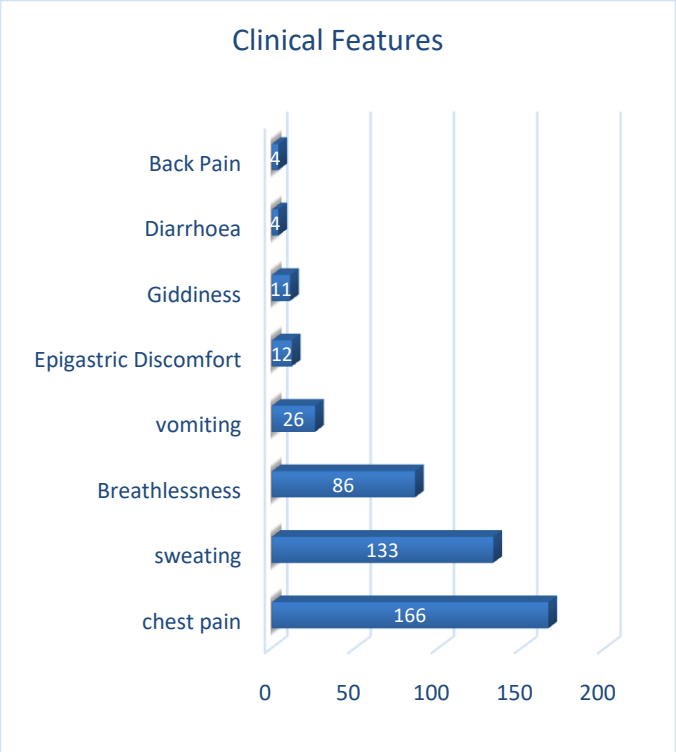


Fig. 3 shows Chest pain was most common symptom among 166(83%) study participants followed by Sweating 133(66.5%), Breathlessness 86(43%), Vomiting 26(13%), Epigastric Discomfort 12(6%), Giddiness 11(5.5%), Diarrhea 4(2%) and Back Pain in 4(2%) cases respectively.

Fig. 4 shows majority of cases of STEMI presented as Anterior wall MI 110(70.51%) [Extensive Anterior Wall Myocardial Infarction contributing 88(56.41%) followed by Anteroseptal 14(8.97%) and Anterolateral MI 8(5.12%) cases respectively], Inferior wall MI contributed 42(26.92%) [Inferior wall 36(23.07%), Inferior wall with Rt ventricular extension 4(2.56%), Inferior wall with posterior wall MI 2(1.28%) respectively].

Inferior wall with Lateral wall MI contributed 4(2.56%) cases.

Fig.4: ECG localization of Myocardial Infarction among cases of STEMI (N=156)

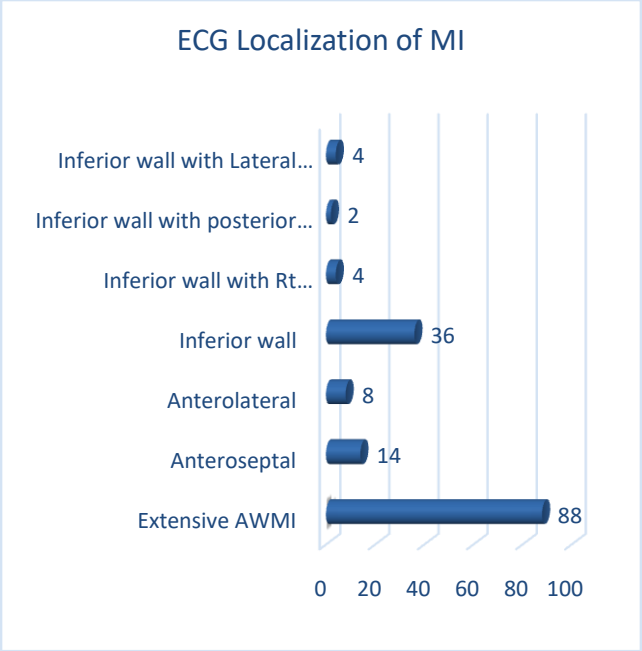
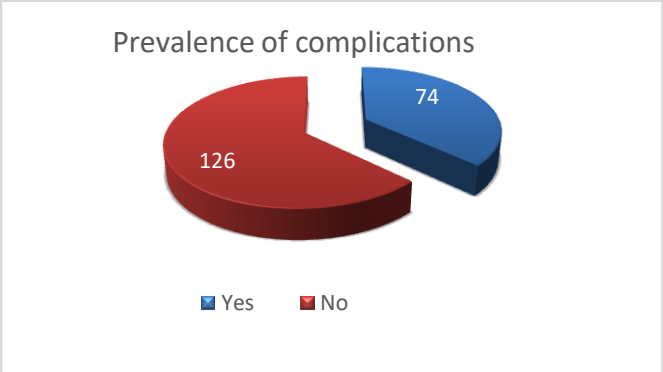


Fig. 5: Prevalence of complications of ACS (N=200)



Complications of ACS were present in 74(37%) of cases as shown in fig. no.5

Table 2: Complications among cases of ACS(N=200)

Complication	Frequency	Percentage
Left Ventricular failure	20	10
Cardiogenic Shock	16	8
Complete heart Block	8	4
LBBB	2	1
Atrioventricular Block	2	1
Supraventricular tachyarrhythmias	2	1
Ventricular tachyarrhythmias	10	5
Post Infarct Angina	8	4
Recurrent Angina	4	2
Congestive Heart Failure	4	2

Table 2: Shows Left Ventricular failure was most common complication among cases of ACS contributing 20(10%) followed by Cardiogenic Shock 16(8%), Complete heart Block 8(4%), Left Bundle Branch Block 2(1%), Atrioventricular Block 2(1%), Supra ventricular tachyarrhythmias 2(1%), Ventricular tachyarrhythmia 10(5%), Post Infarct Angina 8(4%), Recurrent Angina 4(2%), and Congestive Heart Failure 4(2%) respectively

Table 3: Association of CRP level with complications (N=200)

CRP (mg/dl)	ACS with complications		ACS without complications		Total	P*
	N	%	N	%		
≤0.6	6	5.35	106	94.65	112	<.00001
>0.6	68	77.27	20	22.72	88	
Total	74	37	126	63	200	

The chi-square =109.3388. Df=1; Significant at p<0.05.

Table no. 3 shows prevalence of complications was significantly high [77.27%] among cases of ACS with CRP >0.6 mg/dl as compared to those with normal CRP.

Table 4: Correlation of mean CRP level with adverse cardiovascular events (N=200)

	ACS with complications (n=74)		ACS without complications (n=126)		T	P*
CRP (mg/dl)	Mean	SD	Mean	SD	16.21	<.00001 [HS]
	10.1486 ±0.999	4.38	1.5937 ±0.533	3.05		

P* by independent sample t test, HS–Highly significant.

Table no. 4 shows mean C-Reactive Protein level was significantly high (10.1486 ±0.999 mg/dl) among cases of ACS with adverse cardiovascular events as compared to cases of ACS without complications (1.5937 ±0.533 mg/dl).

Discussion

This cross-sectional study was conducted among 200 cases of acute coronary syndrome at a tertiary care hospital for a period of two years.

Age and Gender

Mean age of the study subjects was 49.83 ±1.354 years. Majority of study subjects were from age group 41-50 years contributing 110(55%)[Fig. 1]. A similar study by Mani P et al[8]revealed that, mean age was 60.3 years. Most of the study subjects were males contributing 150(75%) and females 50(25%). M:F ratio was 3:1[Table1].

Presenting symptoms

Chest pain was most common symptom among 166(83%) study participants followed by sweating 133(66.5%), Breathlessness 86(43%), vomiting 26(13%),Epigastric Discomfort 12 (6%),Giddiness 11(5.5%), Diarrhea 4 (2%) and Back Pain in 4 (2%) cases [Fig. No.3].A study by Alam MK et al[10] shown that, Chest pain was the most common symptom and accounting for 87% of patients.

Type of ACS

Majority of study subjects presented as ST segment elevation myocardial infarction contributing 156(78%) followed by Unstable Angina 32(16%) and Non-ST segment elevation myocardial infarction in 12 (6%) cases respectively[Fig. No.2].A similar study by Schaan BD et al[9]found similar prevalence.

Majority of cases of STEMI presented as Anterior wall MI 110(70.51%), Inferior wall MI contributed 42(26.92%),Inferior wall with Lateral wall MI contributed 4(2.56%) cases[Fig. No.4].

Complications

Complications of ACS were present in 74(37%) of cases(Fig. No.5).Left Ventricular failure was most common complication among cases of ACS contributing 20(10%) followed by Cardiogenic Shock 16(8%), [Table No.2]. A study by Alam MK et al[10] shown that heart failure was more frequent (25%) and occurred more in higher CRP quartiles.

Correlation with CRP

Prevalence of complications was significantly high [77.27%] among cases of ACS with CRP >0.6 mg/dl as compared to those with normal CRP.Astatistically significant association was there between CRP levels with complications of ACS in current study($p<0.00001$) [Table No.3]. A similar study by Sheikh AS et al[7]shown that, the overall incidence of a major coronary event was 87% in patients with abnormal CRP vs 13% in patients with a normal CRP.

Mean C-Reactive Protein level was significantly high (10.1486 ±0.999 mg/dl) among cases of ACS with adverse cardiovascular events as compared to cases of ACS without complications (1.5937 ±0.533 mg/dl). A statistically significant Correlation was seen between CRP level and adverse cardiovascular events among cases of ACS ($P<0.00001$)[Table No.4].

Conclusion

Acute coronary syndrome includes a thrombotic coronary artery disorder with underlying inflammatory pathology that can have fatal consequences. In present study, majority of participants were from 5th decade of life in whichthere was male predominance. The majority of the study participants had STEMI presentations. Smoking was most common risk factor for ACS.Left ventricular failure was most frequent adverse cardiovascular event in present study. Mean CRP levels were significantly high among cases of ACS with complications as compared to those without complications. Thus, to conclude CRP can be most effective and sensitive marker for inflammation and unremarkable predictor of cardiovascular risk.

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