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Original Article

Frequency of CRP Levels in Patients Presenting with Acute Coronary Syndrome

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ABSTRACT

Myocardial necrosis is thought to be the etiology of acute coronary syndrome (ACS) and elevated CRP levels in the first 12 hours after an intervention is linked to a higher risk of cardiovascular recurrence and death. **Objectives:** To evaluate if CRP has any predictive value in predicting cardiovascular outcomes in ACS patients. **Methods:** We conducted a cross-sectional study at Jinnah Post Graduate Medical Centre from Oct 2021 to March 2022. 117 patients of both gender aged between 40 to 80 years, presenting with chest pain were included in the study. Data were analyzed on SPSS Version 25. Chi-square was used to compare the outcomes of both groups. The age and gender were stratified to control the effect modifiers. The p-value of <0.05 was considered significant. **Results:** There were a total of 117 patients enrolled in this study. Among them, there were 63 (53.85%) males, and 79 (67.52%) were above 60 years of age. There were 90(76.92%) patients who had a raised CRP level, and 78(66.67%) had a duration of ACS > 12 hours. Differences between the duration of elevated CRP and non-elevated CRP were statistically significant (p-value = 0.013). **Conclusions:** CRP levels may be indicative of suspected acute coronary syndrome. Physicians can identify such patients and provide them with more intensive health care and cardiac management. Resources are scarce in the developing world. Having such tools that are more economical can help with the diagnosis and provide better care.

INTRODUCTION

Cardiovascular disease (CVD) is the chief cause of mortality worldwide. The developed world has shown progress but CVD now shows a deteriorating trend. They observed that the death rate due to CVD was anticipated to nearly increase twofold in low and middle-income nations [1]. People without hyperlipidemia are responsible for roughly half of all heart attacks and strokes. New risk assessment methods are being developed to help identify people at risk earlier. C-reactive protein (CRP) has been classified as a significant marker to assess the outcomes of cardiovascular diseases [2]. The term "acute coronary syndrome" (ACS) includes unstable angina (UA), Non-ST-segment elevation myocardial infarction (NSTEMI), and St-segment elevation (STEMI) which is usually caused by atherosclerosis leading to coronary thrombosis [3]. Patients with ACS have an elevated probability of suffering from subsequent cardiac events [4]. Atherosclerosis results in acute ischemic syndromes including acute MI, unstable angina, and sudden death due to coronary plaque disruption leading to platelet aggregation and thrombosis [5]. There has been increasing evidence of atherosclerosis being an inflammatory process and the literature has

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started assessing multiple plasma markers of inflammation as a probable tool to predict the probability of experiencing coronary events [6]. These inflammatory markets include homocysteine, serum amyloid A, fibrinogen levels, interleukin- 6, lipoprotein (a), apolipoprotein- A, fibrinolytic capacity, apolipoprotein B-100, and CRP [7]. It has been noted among patients suffering from unstable angina and myocardial infarction (MI), that there are increased concentrations of CRP [8, 9]. Zhang with his team of researchers has reported that the CRP levels along with serum amyloid A level in unstable angina tend to elevate whether there has been a myocardial cell injury or not. They also highlighted that at the time of hospital admission, the raised levels of CRP (>3.0 mg/l) were highly predictive of the worst outcome in ACS patients [10]. Therefore, we conducted the following study aiming to determine the significance of CRP in predicting cardiovascular outcomes in patients presenting with the features of ACS.

METHODS

A total of 117 patients were included in this cross-sectional study conducted at the Cardiology Department of Jinnah Post Graduate Medical Centre from Oct 2021 to March 2022. The calculation of the sample size was done by the WHO sample size calculator where Alpha=5%, power of test 1beta=90, by taking the percentage of ACS patients to be 54.7% [11]. The sample size of 117 patients was calculated for the study. The sampling technique used for the data collection was the non-probability consecutive sampling technique. All patients, either sex, between 40 to 80 years of age, presenting with chest pain were included in the study. All those patients who did not permit to be included in this trial were excluded. Patients with a history of pneumonia, tuberculosis, Arthritis, Asthma, and chronic pulmonary disease (COPD) were excluded. Data collection were done after obtaining approval from the ethics review committee. Consenting patients visiting the Department of Cardiology, Jinnah Post Graduate Medical Centre. A brief history of demographic information and written informed consent was taken from each patient. The findings of quantitative variables and qualitative variables were entered into the study's questionnaire. The diagnosis of the ACS was made with the help of the following criteria: increased chest discomfort (VAS 5) for more than 20 minutes and not relieved by nitroglycerin or rest is an indication of STEMI. If the levels of Troponin I are greater than or equal to 0.01 ng/mL and the ECG shows indications of STEMI, then the patient has a positive test. A fresh or suspected new left bundle branch block (LBBB) appears on the initial electrocardiogram (ECG). NSTEMI: chest pain lasting more than 20 minutes and not eased by rest or nitroglycerin. Negative Trop-I with a level greater than 0.01 ng/mL but no ECG abnormalities that would indicate STEMI. Angina that lasts more than 20 minutes and isn't relieved by rest or nitroglycerin is known as unstable angina. Data were analyzed on SPSS Version 25.0. For the categorical data, the frequencies and percentages were calculated. The chi-square was applied to assess the relationship between the outcomes of both groups. Effect modifiers were controlled through stratification of age, and gender. After doing the stratification chi-square test was done considering a p-value of ≤ 0.05 as statistically significant.

RESULTS

There was a total of 117 patients enrolled in this study. Among them, there were 63 (53.85%) males, and 79 (67.52%) were above 60 years of age. In our study 95 (81.20%) lived in an urban setting. There were 76 (64.96%) who did not smoke. There were 85 (72.65%) patients who had a raised CRP level, 58 (49.57%) had anemia, 74 (63.25%) had dyslipidemia, 91 (77.78%) had hypertension, 81 (69.23%) had diabetes mellitus, and 78 (66.67%) had a duration of ACS > 12 hours, as shown in Table 1.

Variables	n (%)
Age	
40 to 60 years	38 (32.48)
61 to 80 years	79 (67.52)
Gender	
Male	63 (53.85)
Female	54 (46.15)
Residence status	
Urban	95 (81.20)
Rural	22 (18.80)
Duration of ACS	
< 12 hours	39 (33.33)
>12 hours	78 (66.67)
Diabetes Mellitus	
Yes	81 (69.23)
No	36 (30.77)
Hypertension	
Yes	91 (77.78)
No	26 (22.22)
Dyslipidemia	
Yes	74 (63.25)
No	43 (36.75)
Smoking status	
Yes	41 (35.04)
No	76 (64.96)
Obesity	
Yes	49 (41.88)
No	68 (58.12)
Anemia	
Yes	58(49.57)
No	59(50.43)
Status of CRP	
Raised	85 (72.65)
Not raised	32 (27.35)
Total	117 (100)

Table 1: Benefits of Organization Diversity [9]

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Age, gender, diabetes, hypertension, dyslipidemia, anemia, and obesity were not found to be statistically different when the data were stratified based on CRP levels (p-value>0.05). However, the statistically significant difference between the duration of ACS and high CRP (p-value = 0.013) is relevant. Patients with raised CRP were found in 87.18 percent of the cases, whereas those with non-elevated CRP were found in 12 percent of the cases. In contrast, 51 (65.38%) patients with increased CRP had an ACS duration of fewer than 12 hours, while 27 (34.62%) had an ACS duration of more than 12 hours. A 74.98% shift occurred in just under 12 hours. In the first 12 hours, the proportional difference was 74.36%; in the second 12 hours, the proportional difference was 30.76%. When the data were stratified according to the length of the ACS, the CRP levels were shown to be statistically different (p-value = 0.013), while the distribution of patients by age group was not (p-value = 0.53). There was no statistically significant difference in the length of time spent in ACS between patients with and without diabetes (p-value = 0.201). When we looked at the duration of ACS, there was no statistically significant difference in the state of hypertension, dyslipidemia, obesity, or anemia (p-value>0.05), as shown in Table 2.

Variables	Elevated CRP n(%)	Not elevated CRP n(%)	p- value
	Age		
40 to 60 years	29 (76.32)	9 (23.68)	0.53
61 to 80 years	56 (70.89)	23 (29.11)	
	Gender		
Male	44 (69.84)	19 (30.16)	0.46
Female	41 (75.93)	13 (24.07)	
	Residence status		
Urban	75 (78.95)	20 (21.05)	0.28
Rural	15 (68.18)	7 (31.82)	
	Duration of ACS		
< 12 hours	34 (87.18)	5 (12.82)	0.013
>12 hours	51 (65.38)	27 (34.62)	
	Diabetes Mellitus		
Yes	56 (69.14)	25 (30.86)	0.201
No	29 (80.56)	7 (19.44)	
	Hypertension		
Yes	68 (74.73)	23 (25.27)	0.346
No	17 (65.38)	9 (34.62)	
	Dyslipidemia		
Yes	52 (70.27)	22 (29.73).	0.449
No	33 (76.74)	10 (23.26)	
	Smoking status		
Yes	34 (82.93)	7 (17.07)	0.067
No	51 (67.11)	25 (32.89)	
	Obesity		
Yes	37 (75.51)	12 (24.49)	0.556
No	48 (70.59)	20 (29.41)	
	Anemia		
Yes	41 (70.69)	17 (29.31)	0.637
No	44 (74.58)	15 (25.42)	

Table 2: Distribution of patient characteristics according to the CRP groups

DISCUSSION

In our research, we noted that there were 34 (87.18%) patients with elevated CRP and there were 5 (12.82%) patients in the non-elevated CRP group who had ACS duration of ≤12 hours. On the other hand, there were 51 (65.38%) patients with elevated CRP who had a duration of ⩾12 hours and 27 (34.62%) patients who had an ACS duration of ⩾12 hours and no elevated levels of CRP. The proportion of subjects with elevated CRP was much higher (87.18%) among those with acute ACS, as compared to the duration > 12 hours where 65.38% of patients had elevated CRP (p-value = 0.013). The difference in proportion was 74.36% in ≤ 12 hours however the difference in proportion was 30.76% in the > 12 hours group. Our findings are consistent with those of Li *et al.*, and Yuksel *et al.*, in that they indicate a similar trend [12, 13]. In all investigations, people with acute coronary syndromes had greater CRP levels than control subjects within the first several hours after the onset of symptoms. CRP levels are elevated in the early stages of coronary artery disease (ACS), which is thought to be caused by the inflammatory process. In a study by Chew *et al.*, CRP levels are shown to predict the chances of death or myocardial infarction within 30 days in those patients who were undergoing percutaneous coronary intervention [14]. In one of the studies, the CRP levels were found to be higher in patients who were smokers, diabetics, and obese [15]. Similar was found in our study as well however the association is not significant. The literature implies that an inflammatory response increases a patient's risk of ischemia-induced damage consequences, including heart failure . For those who are at risk of developing congestive heart failure after a cardiac arrest, increased levels of CRP may help to identify them. As a result, doctors might devote more time and energy to treating individuals like these. Knowledge gained from testing CRP at the time of hospital admission helps to identify those patients who are most likely to develop heart failure and die [3]. The literature related to the variability in the levels of CRP is quite controversial [16-18]. In a study conducted by Kavsak *et al.*, the raised concentration of CRP levels predicted heart failure and death despite being independent of the patient's gender, age, and raised troponin concentrations [19]. The findings of Morrow *et al.*, were however opposite. They reported the rise of CRP levels in parallel to the muscle necrosis level which peaks around day 2 following the myocardial infarction (MI) and then drops [20]. In our study as well, a greater number of patients reported the raised CRP within 12 hours of the MI episode. To reduce the inflammatory effects, statin therapy can be used as recent trials have revealed statin therapy to be quite effective in lowering CRP levels [21-23].

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Zhang *et al.*, conducted a study in which increased CRP levels were found to be linked to poor patient outcomes. Another study, on the other hand, found that high CRP levels are not caused by coronary artery disease. The rise in CRP levels in patients with the acute coronary syndrome may therefore be attributed to inflammation. These increased levels are linked to poor patient outcomes [10, 11].

CONCLUSIONS

We conclude that CRP levels are important biomarkers to predict the episode of the acute coronary syndrome. It is mostly elevated in the acute phase so it should be also measured in the hospital setups while assessing patients for acute coronary syndrome to avoid unfavorable outcomes.

Conflicts of Interest

The authors declare no conflict of interest.

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