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Hs Crp As a Prognostic Factor in Acute Myocardial Infarction.

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KEYWORDS

ABSTRACT:

Background: Acute myocardial infarction (AMI) remains a significant public health issue in both industrialized and developing nations, such as India, despite the advancements made in diagnosis and management over the past thirty years. the current investigation was undertaken to understand the Association between Elevated Levels of hs-CRP and its Risks During and After Acute Myocardial Infarction. The primary objective was to determine the relationship between hs-CRP levels and the likelihood of developing recurrent acute coronary syndrome, new-onset atrial fibrillation, ventricular tachycardia, heart failure, decompensation, and mortality. Materials & Methods: This is hospital based cross sectional observational study which was conducted in the Department of general medicine of Private medical college with study period of 6 months. The total sample size of the study was 50 patients. The collected data was entered in Microsoft Excel. Coding of the variables was done. Analysis was done using SPSS software (Version 27, IBM). Results: Of the 50 patients, 41 (82%) were males and 8 (18%) were females. Maximum patients (35%) were aged between 41 and 50 years followed by 61-70 years (30%), 51-60 years (25%) and 31-40 years (10%). The youngest patients had 34 years of age and oldest was 70 years. 30% are hypertensive, and 34% have diabetes mellitus. Most of the patients (95%) had symptoms of chest pain. the types of AMI 49% had extensive anterior wall, 30% had inferior, 12% had anteroseptal and 9% had anterolateral. Hs – crp and ESR was found to be 90% and 64% respectively high among the study patients. Conclusion: Elevated hs-CRP levels in AMI patients indicate inflammation's role in MI development, with prognostic significance; high levels upon admission are linked to poor outcomes, suggesting increased complication risk during hospitalization. Keywords: Hs CRP, Prognostic factor, Acute myocardial infarction

INTRODUCTION

Acute myocardial infarction (AMI) remains a significant public health issue in both industrialized and developing nations, such as India, despite the advancements made in diagnosis and management over the past thirty years. While considerable progress has been made in managing patients with AMI, it continues to be a critical event from a clinical, psychological, and social standpoint[1].

Myocardial infarction, commonly known as heart attack, is a significant health concern that requires ongoing attention from researchers, epidemiologists, and physicians. Despite the fact that many individuals are unaware of their genetic predisposition, smoking habits, unhealthy dietary choices, or physical inactivity, they are at a high risk of experiencing a first heart attack. Unfortunately, medical practice often fails to provide adequate preventive measures for asymptomatic high-

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risk individuals and patients with existing coronary disease, leaving them at a substantial risk of recurrent disease and death[2].

Approximately one-third of individuals experiencing evolving myocardial infarction (MI) pass away before they can receive effective treatment at a hospital. The enhanced survival rates of acute coronary syndromes have led to a sizable population of patients with chronic conditions, which is further compounded by the aging of the general population[3].

Hs-CRP, often referred to as the classic acute-phase protein, does not directly participate in the coagulation process, but it serves as an extremely sensitive indication of inflammation, tissue damage, and infection. Its plasma half-life of 19 hours remains consistent under all conditions, unlike coagulation proteins and most other significant acute-phase reactants. As a result, the synthesis rate of hs-CRP is the sole factor that determines its plasma concentration. High-quality anti-CRP antibodies and a well-established World Health Organization (WHO) international reference standard for hs-CRP are readily available, enabling precise, sensitive, and robust clinical serum/plasma assays. The measurement of hs-CRP offers numerous benefits in detecting and monitoring the acute-phase response in general and in relation to atheroma and its complications in particular[4].

To validate the established connection between hs-CRP levels and the risk of coronary heart disease in substantial, unselected populations, serum hs-CRP was quantified in 936 men aged between 45 and 64 years, who were randomly selected from the general population and participated in the first Augsburg survey of the MONICA (monitoring trends and determinants in cardiovascular disease) study conducted in 1984-1985. After an 8-year follow-up, the study revealed the predictive value of hs-CRP levels for the occurrence of a first major coronary event in these men[5,6].

In clinical trials, it was discovered that circulating levels of hs-CRP were closely linked to both the total infarct size in AMI cases and patient prognosis. This suggests that hs-CRP serves as a reliable indicator of both the extent of coronary inflammation and the severity of myocardial necrosis.

Considering the aforementioned context, the current investigation was undertaken to understand the Association between Elevated Levels of hs-CRP and its Risks During and After Acute Myocardial Infarction. The primary objective was to determine the relationship between hs-CRP levels and the likelihood of developing recurrent acute coronary syndrome, new-onset atrial fibrillation, ventricular tachycardia, heart failure, decompensation, and mortality.

MATERIALS & METHODS

This is hospital based cross sectional observational study which was conducted in the Department of general medicine of Private medical college with study period of 6 months. The total sample size of the study was 50 patients. Inclusion criteria – 1) The study included patients aged ≥18 years of both genders, 2) Patients with Acute coronary syndrome with STEMI & NSTEMI. Exclusion criteria – 1) The study excluded patients < 18 years of age, 2) Patients with Chronic inflammatory conditions like connective tissue disorder. The study was approved by Institutional Ethics Committee of the private medical college. A written informed consent was obtained from all the patients. All the patients underwent clinical examination and detailed history. Laboratory investigations such as routine blood investigations, ECG, echocardiography was done. hs-C-reactive protein test was done.

The collected data was entered in Microsoft Excel. Coding of the variables was done. Analysis was done using SPSS software (Version 27, IBM). Descriptive statistics was used. Association between categorical tests. The outcomes of the treatment groups were compared using a test to reach the hypothesis, a P value less than 0.5 was considered significant.

RESULT

Of the 50 patients, 41 (82%) were males and 8 (18%) were females. Maximum patients (35%) were aged between 41 and 50 years followed by 61-70 years (30%), 51-60 years (25%) and 31-40 years (10%). The youngest patients had 34 years of age and oldest was 70 years. **(Chart-1, Chart-2).**

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Chart 1: Gender distribution among the study participants

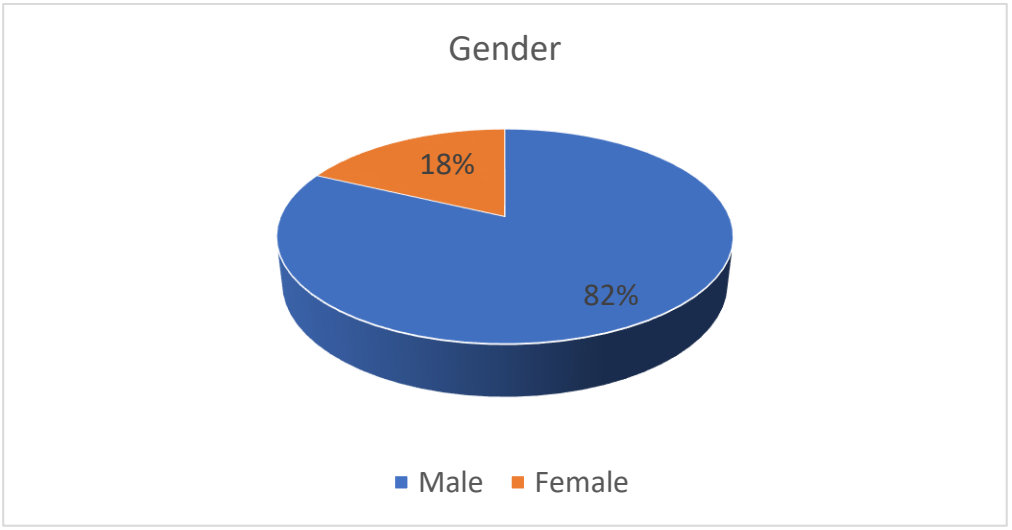

Chart 2: Age distribution among the study participants

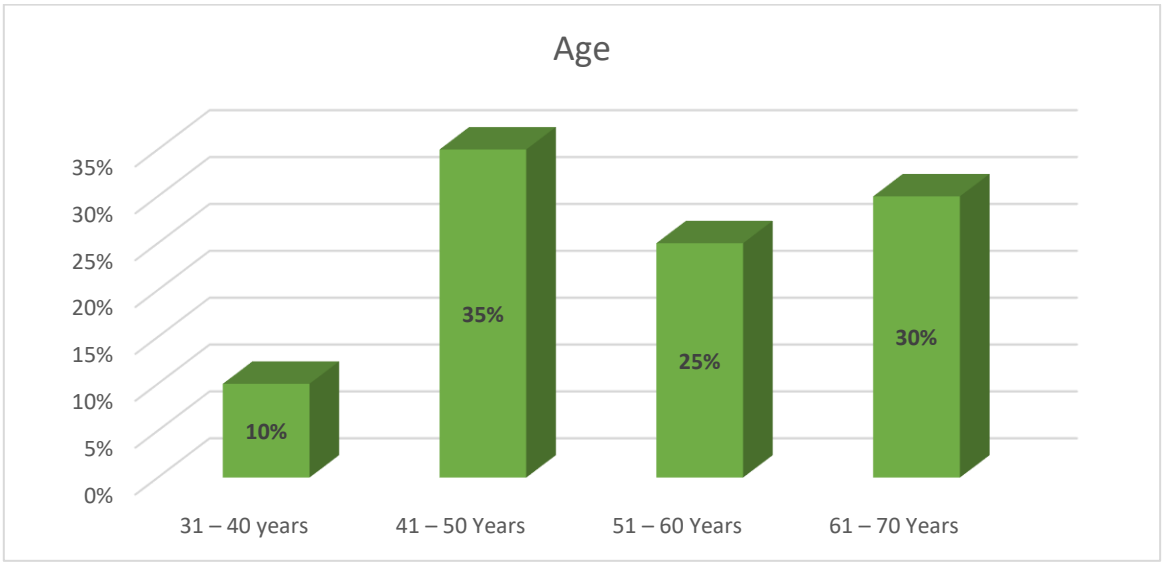

Table 1: Details of co-morbidities

Co-Morbidities	**Frequency**	**Percentage (%)**
Hypertensive	15	30%
Diabetic Mellitus	17	34%
Both (Hypertensive & Diabetic Mellitus)	14	28%
No Comorbidities	4	8%
Total	50	100%

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The prevalence of various co-morbidities in a sample of 50 individuals. Among them, 30% are hypertensive, and 34% have diabetes mellitus. Notably, 28% of the individuals suffer from both hypertension and diabetes. while 8% have no co-morbidities at all.

Most of the patients (95%) had symptoms of chest pain followed by sweating (69%), vomiting (45%), breathlessness (37%) and giddiness (20%). Smoking was recorded in 84% as a risk factor. Family history of ischemic heart disease (IHD) was noted in 12% of patients. With regard to the types of AMI 49% had extensive anterior wall, 30% had inferior, 12% had anteroseptal and 9% had anterolateral. **(Chart 3, Chart 4)**

Chart 3: Symptoms of MI

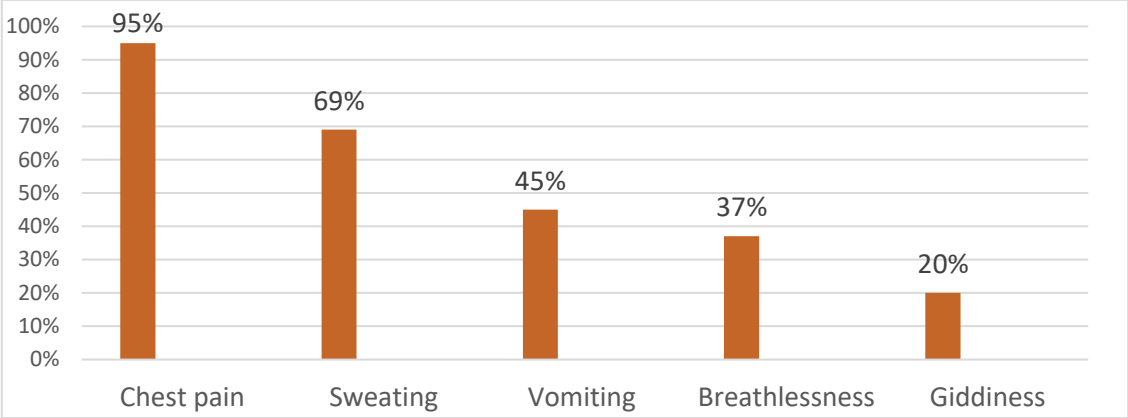
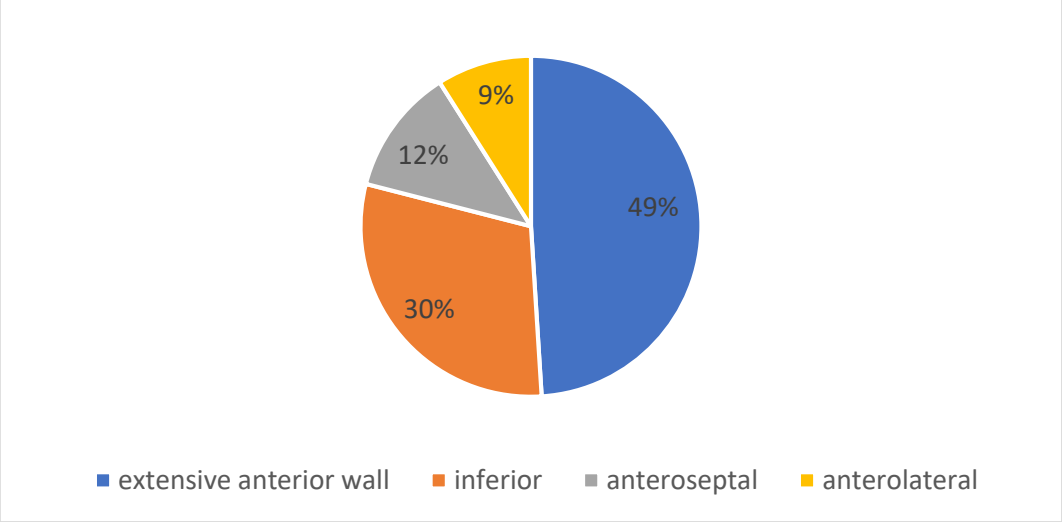


Chart 4: Types of MI



Mean hs-CRP levels at admission were 3.732 ± 2.168 mg/dL, whereas on day seven it was 1.299 ± 0.35 mg/dL. In all 37 patients with complications hs-CRP levels more than 0.6 mg/dL, whereas in patients without having any complication 9 had >0.6 mg/dL and 4 had < 0.6 mg/dL. On admission, the mean hs-CRP levels in patients with complications were 4.224 ± 2.29 mg/dL, whereas among those without complication, the hs-CRP levels were 2.32 ± 0.379 mg/dL. ESR was found to be 64% high among the study patients.

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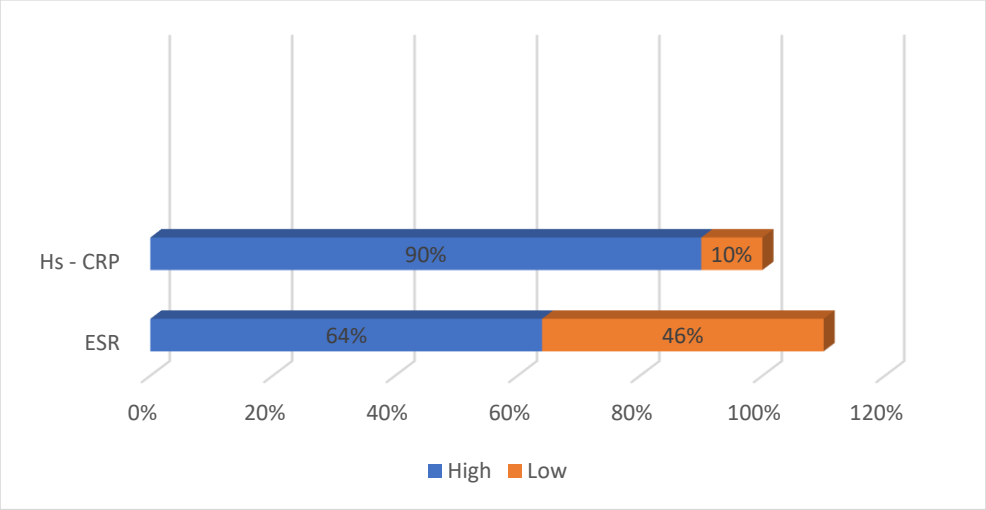

The investigations showed raised leukocyte count (>11000/mm) in 60% patients. With regard to the lipid profile, 40% of patients had elevated cholesterol (>250 mg/ dL) levels, 10% had elevated triglycerides (>170 mg/dL), 55% had very low high-density lipoprotein (HDL) (< 35 mg/dL) and 30% had borderline HDL (between 40 and 50 mg/dL). Random blood sugar findings revealed 25% had diabetes mellitus and it was high.

DISCUSSION:

Out of 50 patients taken in this study 82% were males and 18% were females. The current view to explain the lower incidence in females is that the females are protected by the sex hormones (estrogen) and also by the relatively lower rates of exposure to certain risk factors like smoking.

In the study group mean age of occurrence of AMI was 53 years. In Indian sub-continent, the CAD is said to peak between 50 and 60 years. As mentioned by Parrinello CM et al[7]. this is about a decade earlier compared to the Western developed countries. The sex distribution in the study group was 82% of patients were male and 18% were female. This was similar to that described in Stumpf C et al[8]

The mean age of the female patients was 62 years and that of male was 53 years. As mentioned by Parrinello CM et al.[7] The mean age of the female patients was 63 years and that of male was 42 years. Which was found that female patients present a decade later than male patients of AMI. In our study, also we found the difference more than a decade.

The findings of our study group showed that 95% of patients exhibited the classic symptoms of AMI. This was in agreement with the findings of Kavsak PA et al[9]. The onset of AMI was more common during the morning hours, as previously described by Milano et al.,[10] who also reported on the circadian variation in the frequency of AMI onset.

In this study, 84% of patients were found to be smokers. In contrast, the Centers for Disease Control and Prevention (CDC) reported that the prevalence of smoking in the US is approximately 25%. Smoking is responsible for approximately 20% of all cardiovascular disease deaths in the US. Additionally, 30% of patients in this study had hypertension. The National Health and Nutrition Examination Survey (NHANES) documented a prevalence of hypertension in adult Americans of 24%. Furthermore, 34% of patients in this study had diabetes mellitus. It is important to note that the relationship between diabetes and cardiovascular disease is not uniform in all populations. The World Health Organization (WHO) multinational intervention study of vascular disease in diabetes has shown the incidence of diabetes in atherosclerotic arterial disease to be between 32% and 67%. Finally, Devaraj S et al[11] described the relative risk of diabetes mellitus in cases of coronary artery disease.

Erythrocyte sedimentation rate (ESR) serves as a reliable indicator of acute inflammation, and it tends to elevate in cases of AMI. Kushneri et al[12]. provided an extensive account of the acute phase proteins and various systemic reactions to inflammation, including the increase in ESR.

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In this particular investigation, it was observed that ESR was raised in approximately 54% of the patients, a finding that aligns with the previous findings of Bursi F et al.[13]

The total number of leukocytes was elevated in approximately 60% of patients, with neutrophils being the predominant cell type. Research conducted by Kumar B et al[14] revealed and documented the increase in both total and differential leukocyte counts. The typical peak white blood cell count typically falls between 12 and 15 × 103 /mm3, but in some cases, it can reach up to 20 × 103 /mm3. As for the lipid profile, 40% of patients had elevated cholesterol levels, 10% had elevated triglycerides, 55% had elevated low-density lipoprotein (LDL), and 30% had lower levels of high-density lipoprotein (HDL). These findings were similar to those reported by Kang DO et al[15]. in their study.

In the study group, the markers of acute inflammation, ESR and hs-CRP, showed elevated levels. Specifically, hs-CRP was found to be greater than 0.6 mg/dL in 90% of patients, while ESR was raised in 64% of patients. Pietila et al[16,17].'s research also revealed elevated markers of acute inflammation in patients with AMI, with 50 patients being studied within 50 hours of experiencing chest pain. Among these patients, 90% had elevated hs-CRP levels (>0.6 mg/dL), and in most cases, hs-CRP levels returned to normal on the 7th day. Among the 45 patients who had elevated hs-CRP levels upon admission, 35 (70%) developed complications. Unfortunately, two patients (4%) succumbed to death.

The present study found similar results to other studies, demonstrating that patients with AMI who have higher serum hs-CRP levels on admission are more likely to develop complications during their hospital stay. In studies like Al Aseri ZA et al[18]. hs-CRP levels on admission in 319 patients with AMI and concluded that these levels predict reperfusion failure, short and long-term prognosis after ST elevation in AMI. In another study 50 cases of AMI and found that serum hs-CRP concentration on admission was a significant prognostic indicator of their in-hospital stay. Similar study measured hs-CRP levels in 234 patients with AMI and suggested that these levels reflect the vulnerability of the culprit coronary lesion and predict adverse coronary events after primary PTCA or stenting. Gheno et al. studied serum hs-CRP levels in 205 older women with AMI and observed that hs-CRP levels were elevated in many patients and independently stratified patients with in-hospital mortality risk. Yet another study nine patients with AMI and cardiac rupture and 28 patients with AMI without cardiac rupture retrospectively and concluded that patients with persistently high hsCRP levels had a high probability of sub-acute cardiac rupture.

Griselli M et al[19] and his colleagues assessed hs-CRP levels in 2121 outpatients with angina, tracking them for up to 2 years. They discovered that elevated circulating levels of hsCRP were indicators of coronary events in patients with stable or unstable angina. The findings of this study were consistent with those of the previous research.

The study conducted by Ribeiro DR et al.[20] involved 17 patients with MI, and it was observed that hs-CRP levels were elevated in all of them. It was found that four patients had raised serum hs-CRP levels before a rise in creatinine kinase MB isoenzyme on admission. The authors suggested that monitoring serum hs-CRP levels in parallel with cardiac proteins of short and long half-life can provide valuable information for diagnosis and detecting post-infarct complications.

According to Pietila et al.,[17] measuring hs-CRP levels in 23 patients with AMI revealed a linear relationship between infarct size and hs-CRP response in 14 patients who did not receive thrombolytic treatment. Based on these findings, the authors suggested that daily measurement of serum hs-CRP could be useful for evaluating infarct size in AMI patients who do not receive thrombolytic therapy. Moreover, in patients who underwent streptokinase treatment, hs-CRP concentrations can potentially be used to assess the success of thrombolysis. In our study, we also observed elevated hs-CRP levels on admission that returned to normal by the seventh day in patients treated with streptokinase.

CONCLUSION:

The elevated levels of hs-CRP observed in most patients with AMI indicate the involvement of inflammation in the etiopathogenesis of MI and suggest prognostic utility in AMI. Serum hs-CRP levels are strong predictors of prognosis for patients with AMI, and elevated levels at the time of admission are indicative of a poor prognosis. Consequently, the present study concludes that patients

with higher serum hs-CRP levels on admission are more prone to developing complications during their hospital stay.

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Conflicts of interest: Nil

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