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Research Article

# Prognostic Significance of C-reactive protein Vs Neutrophil Lymphocyte Ratio in Patients with Acute Myocardial Infarction in a Tertiary Care Hospital

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**ABSTRACT**
**Background:** Prior studies have independently researched the prognostic significance of CRP and NLR in the context of AMI, the comparative effectiveness of these biomarkers and their alignment with in-hospital outcomes remain largely unexplored territories. This study aimed to study the prognostic significance of C - reactive protein versus Neutrophil to Lymphocyte Ratio and their correlation with in-hospital outcomes in patients with AMI.
**Methods:** A prospective observational study was conducted in patients admitted to the Cardiac Care Unit from October 2022 to July 2024. Study participants include Patients diagnosed with AMI admitted to the Cardiac Care Unit. 105 patients were included n the study. Blood samples were drawn at admission, on day 3 of admission, and sent for C-reactive protein levels, complete blood count. Complete blood counts were used to calculate the neutrophil-lymphocyte ratio. Patients were followed up during their hospital stay for in-hospital outcomes.
**Results:** Of total, 60% (n=63) belonged to age group of 51-70 years, 75.2% (n=79) were males. The mean (SD) CRP level among patients with hospital stay ≤7 days was 25.1 (39.5) mg/dL and in 8-14 days it was 42.4 (57.5). The mean (SD) CRP level among patients who succumbed to illness was 130.9 (119.2) mg/dL and who recovered was 22.4 (20.1). The mean (SD) NLR level among patients with hospital stay ≤7 days was 4.6 (3.3) and in 8-14 days it was 4.9 (2.5). The mean (SD) NLR level among patients with cardiogenic shock was 5.4 (3.1) and without cardiogenic shock was 4.6 (3.1). The mean (SD) NLR level among patients who succumbed to illness was 6.9 (3.3) and who recovered was 4.6 (3.0).
**Conclusion:** The study demonstrates the significance of inflammatory markers, particularly CRP, as predictors of adverse outcomes in patients with AMI. Elevated CRP levels on the first- and third-days following AMI were associated with longer hospital stays, cardiogenic shock, and mortality. These findings suggest that CRP could serve as a valuable prognostic indicator for identifying patients at higher risk of complications post-AMI.

**Keywords:** C - reactive protein, Neutrophil Lymphocyte Ratio, Myocardial Infarction, Prognosis.

## INTRODUCTION

Within the complex landscape of cardiovascular diseases, acute myocardial infarction (AMI) stands out as a formidable challenge that resonates throughout global healthcare systems, exerting a profound influence on both individual patients and society as a whole, given its devastating morbidity and mortality rates.(1)The global prevalence of MI in individuals < 60 years was found 3.8% and in individuals (> 60 years), this value was 9.5%.(2)Despite the remarkable strides made in diagnostic and therapeutic avenues, the undeniable variability in clinical presentations and treatment outcomes among AMI patients accentuates the pressing need for further exploration to refine risk assessment strategies and enhance prognostic accuracy.(3) In the contemporary medical research landscape, there has been increased interest in the intricate relationship between inflammation and cardiovascular disorders, particularly within the realm of AMI.(4) Inflammation has increasingly been acknowledged as a pivotal player in the genesis, progression, and eventual complications of atherosclerosis, the fundamental basis for the majority of AMI cases.(5–7) Against this backdrop, a myriad of

inflammatory biomarkers have been scrutinized for their potential utility in predicting adverse events and informing therapeutic decisions in the context of AMI.

One such prominent biomarker that has captured the spotlight is C-reactive protein (CRP), a key component in the inflammatory cascade. Functioning as an acute-phase reactant orchestrated by the liver in response to pro-inflammatory mediators, CRP levels exhibit a surge in scenarios of systemic inflammation and tissue damage.[8]

It binds to modified LDL cholesterol, a type of "bad" cholesterol contributing to plaque formation. These combined effects of CRP contribute to the instability of atherosclerotic plaques, making them more likely to burst and trigger cardiovascular events like heart attacks and strokes. Beyond its conventional role as an inflammation marker, CRP has been implicated in the underlying pathophysiology of atherosclerosis, contributing to processes like endothelial dysfunction, plaque destabilization, and thrombus formation, thereby enhancing susceptibility to adverse cardiovascular incidents such as AMI.[9] In a parallel development, the neutrophil to lymphocyte ratio (NLR), extracted from routine complete blood counts, has increasingly drawn attention as a probable surrogate indicator of systemic inflammation and immune dysregulation.[10] Elevated NLR values mirror an imbalance between pro-inflammatory neutrophils and anti-inflammatory lymphocytes, reflecting the body's response to physiological stressors and inflammatory triggers.[11] Owing to its simplicity and cost-effectiveness, NLR holds promise as an easily accessible tool for risk stratification and prognostication across various clinical scenarios, including AMI.[12] While prior studies have independently researched the prognostic significance of CRP and NLR in the context of AMI, the comparative effectiveness of these biomarkers and their alignment with in-hospital outcomes remain largely unexplored territories. Thus, this prospective observational study endeavors to bridge this existing gap by methodically assessing the prognostic implications of CRP vis-à-vis NLR and their correlation with inpatient outcomes among individuals presenting with AMI. This study aims to study the differing prognostic prowess of CRP and NLR, both in isolation and combined, in predicting short-term clinical outcomes like mortality, recurrent ischemic events, and major adverse cardiovascular episodes. Moreover, through an exploration of the potential synergistic effects of these biomarkers, this investigation aspires to refine current risk stratification models and facilitate the tailoring of individualized therapeutic approaches based on the patient's inflammatory profile. Ultimately, the findings through this study will help in increasing our comprehension of the intricate relationship between inflammation and cardiovascular maladies, potentially laying the groundwork for pioneering diagnostic techniques and therapeutic avenues aimed at reducing the burden of AMI and enhancing the long-term prognosis of individuals impacted by this formidable cardiac event.

With this background this study aimed to study the prognostic significance of C - reactive protein versus Neutrophil to Lymphocyte Ratio and their correlation with in-hospital outcomes in patients with AMI.

## MATERIALS AND METHODS

A hospital-based prospective observational study was conducted in the Department of General Medicine - in patients admitted to the Cardiac Care Unit at PES Institute of Medical Sciences, Kuppam from October 2022 to July 2024.. Study participants includes Patients diagnosed with AMI admitted to the Cardiac Care Unit, PES Institute of Medical Sciences. The sample size was calculated using the expected prevalence of 11.1%.[13] Considering an absolute allowable error of 6% and a confidence interval of 95%, the sample size was calculated as follows: n = Z21-α/2 x p(1-p) n= sample size z value for 95% CI=1.96, p=expected prevalence =11.1% =0.111 q=1-p = 0.889 d= precision = 0.06. Therefore 105 patients were enrolled in the study. Purposive sampling was carried out to enrol participants in the study until the sample size was achieved. Patients of age 18 years and above with AMI-diagnosed using AHA criteria(25)and admitted to the Cardiac Care unit, PES Institute of Medical Sciences, Kuppam within 24 hours were included in the study. Patient getting admitted to Cardiac Care Unit after 24 hrs of diagnosis of AMI, Patient who underwent treatment before presentation to the hospital, Recurrent Myocardial Infarction within 2 weeks and Known cases of chronic kidney disease, malignancies, systemic lupus erythematosus, chronic liver disease, and active infections were excluded.

### Study Procedure

After obtaining permission from the Institutional Research Committee (IRC) and Institutional Ethics Committee (IEC), the study was conducted in PES Institute of Medical Sciences and Research, Kuppam. On presentation of patients with AMI to the hospital, they were diagnosed using AHA criteria and initial investigations are done and treated as per recommended standard protocol. Study procedures were explained to the participant and written informed consent was taken after providing the patient information sheet. Patients fulfilling inclusion criteria were enrolled in the study. Semi-structured proforma was used to collect patient details such as socio-demographic details, personal history such as occupation, smoking and alcohol consumption, tobacco chewing history, and associated co morbid conditions such as hypertension, diabetes mellitus, ischemic heart disease, hypothyroidism, COPD, bronchial asthma. Other detailed clinical information was also collected. Investigations done were also noted. Blood samples were drawn at admission, on day 3 of admission, and sent for C-reactive protein levels, complete blood count. Complete blood counts were used to calculate the neutrophil-lymphocyte ratio. Patients were followed up during their hospital stay for in-hospital outcomes.

**Study Tools**

Following investigations were performed for the study participants using the defined tools- Complete Blood Cell Count using ABA Horiba Pentra XL 80 automated cell count analyzer, Hs Trop I using VIDAS kit, C-reactive protein using TULIP C-reactive protein estimation kit, Electrocardiography (ECG) and 2D Echocardiography

**Statistical Procedures**

Data were entered into the MS Excel 2021 version. Data cleaning was carried out and statistical analysis was carried out using SPSS software version 25.0. Continuous variables were presented as mean (standard deviation) or median (interquartile range) based on normality. Categorical variables were presented as frequency and percentage. Data were also tabulated and graphically represented. The observed difference between the groups was tested for statistical significance using the Independent t-test/ Mann-Whitney U test for continuous data and the Chi-square test with contingency tables for categorical data. A p-value<0.05 was considered statistically significant.

**Ethical Considerations**

The approval to conduct the study was sought from the Research monitoring committee and Institutional Ethics Committee (IEC), PES Institute of Medical Sciences and Research, Kuppam. Before collecting data, researchers explained the study's purpose to participants and obtained their informed consent. The freedom to withdraw from the study at any time during the interview was also explained before taking the informed consent. Data were analysed in aggregate and access to the collected data was limited only to me, my guide, and co-guides.

**RESULTS**

Table 1: Distribution of Socio-Demographic Factors and Habits

| Variable | | Frequency (n=105) | Percentage |
|---|---|---|---|
| Age | 31-50 years | 27 | 25.7 |
| | 51-70 years | 63 | 60.0 |
| | 71-90 years | 15 | 14.3 |
| Gender | Male | 79 | 75.2 |
| | Female | 26 | 24.8 |
| History of alcohol consumption | | 26 | 24.8 |
| History of smoking | | 38 | 36.2 |
| History of Tobacco Chewing | | 7 | 6.7 |

Of total, 60% (n=63) belonged to age group of 51-70 years, 75.2% (n=79) were males, 24.8% (n=26) reported history of alcohol consumption, 36.2% (n=38) had history of smoking and 6.7% (n-7) reported history of tobacco chewing.

Table 2: Distribution of Clinical Characteristics, Comorbidities

| Variable | Frequency (n=105) | Percentage |
|---|---|---|
| Chest pain | 81 | 77.1 |

| | | |
|---|---|---|
| Palpitations | 6 | 5.7 |
| Angina on exertion | 3 | 2.9 |
| Dyspnoea on exertion | 42 | 40 |
| Presyncope | 5 | 4.8 |
| Syncope | 0 | 0 |
| Orthopnea | 1 | 0.5 |
| PND | 1 | 0.5 |
| Hypertension | 60 | 57.1 |
| Diabetes Mellitus | 61 | 58.1 |
| Dyslipidaemia | 13 | 12.4 |
| Ischemic Heart Disease | 2 | 1.9 |
| COPD | 7 | 6.7 |
| Hypothyroidism | 1 | 0.9 |
| CVA | 2 | 1.9 |
| Any comorbidity | 80 | 76.2 |

Of total, 77.1% (n=81) reported chest pain, 40% (n=42) had dyspnoea on exertion, 5.7% (n=6) had palpitations, 2.9% (n=3) reported angina on exertion. Orthopnea and PND was reported by one participant each. Around three fourth, 76.2% (n=80) participants showed history of any comorbidity. Of total, 57.1% (n=60) had hypertension, 58.1% (n=61) had diabetes mellitus, 12.4% (n=13) showed dyslipidaemia, and 6.7% (n=7) had a history of COPD. 57.1% (n=60) had NSTEMI and 42.9% (n=45) had STEMI. Thrombolysis among the STEMI patients was reported among 17.8% (n=8). Of total, 45.7% (n=48) had AWMI wall involved and 24.8% (n=26) had IWMI wall involved

Table 3: Distribution of Type of MI, Wall Involved, ECG Findings, 2D ECHO Findings, Post MI Complications, Coronary Angiogram and In-Hospital Outcomes

| **Variable** | | | **Frequency (n=105)** | **Percentage** |
|---|---|---|---|---|
| Type of MI | NSTEMI | | 60 | 57.1 |
| | STEMI | | 45 | 42.9 |
| Wall involved | ALWMI | | 22 | 21.0 |
| | AWMI | | 48 | 45.7 |
| | IPWMI | | 9 | 8.6 |
| | IWMI | | 26 | 24.8 |
| ECG findings | Right bundle branch block | | 7 | 6.7 |
| | Left bundle branch block | | 6 | 5.7 |
| | Arrhythmias | | 3 | 2.9 |
| ECHO findings | Ejection Fraction (%) | <30 | 22 | 21.0 |
| | | 30-50 | 60 | 57.1 |
| | | >50 | 23 | 21.9 |
| | Regional Wall Motion Abnormalities (RWMA) | | 90 | 85.7 |
| | Pulmonary Arterial Hypertension (PAH) | | 25 | 23.8 |
| | Valvular Heart Disease | | 17 | 16.2 |
| Post Myocardial infarction complications | Recurrent Myocardial infarction (RE-MI) | | 7 | 6.7 |
| | Cardiogenic shock | | 12 | 11.4 |
| | Dressler's Syndrome | | 0 | 0 |
| Coronary Angiogram | DVD | | 37 | 35.2 |
| | SVD | | 48 | 45.7 |
| | TVD | | 20 | 19.1 |
| Duration of stay (days) | ≤7 | | 71 | 67.6 |
| | 8-14 | | 34 | 32.4 |
| Cardiogenic shock | | | 12 | 11.4 |
| Outcome | Expired | | 8 | 7.6 |

| | | | |
|---|---|---|---|
| | Recovered | 97 | 92.4 |

57.1% (n=60) had NSTEMI and 42.9% (n=45) had STEMI. Thrombolysis among the STEMI patients was reported among 17.8% (n=8). Of total, 45.7% (n=48) had AWMI wall involved and 24.8% (n=26) had IWMI wall involved. Of total, 6.7% (n=7) had RBBB, 5.7% (n=6) had LBBB and 2.9% (n=3) had arrhythmias. For 57.1% (n=60) participants, ejection fraction was between 30-50%. Of total, RWMA was found among 85.7% (n=90), PAH among 23.8% (n=25) and valvular heart disease among 16.2% (n=17). Of total, recurrent Myocardial infarction was observed among 6.7% (n=6), cardiogenic shock among 11.4% (n=12) and none of the study participants had Dressler's syndrome. Majority of the study participants (n=48, 45.7%) had Single Vessel Disease and 19.1% had Triple Vessel Disease. Around two third (67.6%, n=71) participants had hospital stay between 1-7 days and 32.4 % (n=34) had hospital stay between 8-14 days. Of total, 11.4% (n=12) experienced cardiogenic shock and 7.6% (n=8) deaths were reported in the study population.

Table 4: Comparison Of CRP Levels (1st Day And 3rd Day), NLR Levels (1st Day And 3rd Day) And BMI, Among the In-Hospital Outcomes of the Study Participants (N=105)

| Variable | Duration of stay (days) | | Cardiogenic shock | | Outcome | |
|---|---|---|---|---|---|---|
| | ≤7 Mean (SD) | 8-14 Mean (SD) | Yes Mean (SD) | No Mean (SD) | Expired Mean (SD) | Recovered Mean (SD) |
| **CPR day 1** | 25.1 (39.5) | 42.4 (57.5) | 91.7 (106.0) | 22.8 (23.5) | 130.9 (119.2) | 22.4 (20.1) |
| **P value** | 0.07 | | <0.001 | | <0.001 | |
| **CPR day 3** | 22.4 (37.3) | 38.4 (61.5) | 93.7 (105.6) | 19.0 (22.5) | 141.2 (109.5) | 18.2 (18.5) |
| **P value** | 0.10 | | <0.001 | | 0.001 | |
| **NLR day 1** | 4.6 (3.3) | 4.9 (2.5) | 5.4 (3.1) | 4.6 (3.1) | 6.0 (3.3) | 4.6 (3.0) |
| **P value** | 0.58 | | 0.41 | | 0.19 | |
| **NLR day 3** | 3.9 (2.1) | 4.4 (1.8) | 5.1 (2.4) | 3.9 (1.9) | 5.9 (2.4) | 3.9 (1.9) |
| **P value** | 0.28 | | 0.06 | | <0.001 | |
| **BMI** | 22.9 (2.9) | 26.4 (2.4) | 28.5 (2.3) | 23.5 (2.8) | 30 (1.6) | 23.6 (2.8) |
| **P value** | <0.001 | | <0.001 | | <0.001 | |
| **Type of Myocardial infarction** | | | | | | |
| **NSTEMI** | 41 (68.3) | 19 (31.7) | 4 (6.7) | 56 (93.3) | 3 (5) | 57 (95) |
| **STEMI** | 30 (66.7) | 15 (33.3) | 8 (17.8) | 37 (82.2) | 5 (11.1) | 40 (88.9) |
| **P value** | 0.85 | | 0.07 | | 0.243 | |

The mean (SD) CRP level among patients with hospital stay ≤7 days was 25.1 (39.5) mg/dL and in 8-14 days it was 42.4 (57.5). The mean (SD) CRP level among patients with cardiogenic shock was 91.7 (106.0) mg/dL and no cardiogenic shock was 22.8 (23.5) and this difference was statistically significant (p <0.001). The mean (SD) CRP level among patients who succumbed to illness was 130.9 (119.2) mg/dL and who recovered was 22.4 (20.1) and this difference was statistically significant (p <0.001).

The mean (SD) CRP level among patients with hospital stay ≤7 days was 22.4 (37.3) mg/dL and in 8-14 days it was 38.4 (61.5). The mean (SD) CRP level among patients with cardiogenic shock was 93.7 (105.6) mg/dL and without cardiogenic shock was 19 (22.5) and this difference was statistically significant (p <0.001). The mean (SD) CRP level among patients who succumbed to illness was 141.2 (109.5) mg/dL and who recovered was 18.2 (18.5) and this difference was statistically significant (p = 0.001). The mean (SD) NLR level among patients with hospital stay ≤7 days was 4.6 (3.3) and in 8-14 days it was 4.9 (2.5) and this difference was not statistically significant (p=0.58). The mean (SD) NLR level among patients with cardiogenic shock was 5.4 (3.1) and without cardiogenic shock was 4.6 (3.1) and this difference was not statistically significant (p=0.41). The mean (SD) NLR level among patients who succumbed to illness was 6.9 (3.3) and who recovered was 4.6 (3.0) and this difference was not statistically significant (p=0.19).

The mean (SD) NLR level among patients with hospital stay ≤7 days was 3.9 (2.1) and in 8-14 days it was 4.4 (1.8) and this difference was not statistically significant (p=0.28). The mean

(SD) NLR level among patients with cardiogenic shock was 5.1 (2.4) and without cardiogenic shock was 3.9 (1.9) and this difference was not statistically significant (p=0.06). The mean (SD) NLR level among patients who succumbed to illness was 5.9 (2.4) and who recovered was 3.9 (1.9) and this difference was statistically significant (p <0.001).

The mean (SD) BMI among patients with hospital stay ≤7 days was 22.9 (2.9) kg/m2 and in 8-14 days it was 26.4 (2.4) kg/m2 and this difference was statistically significant (p <0.001). The mean (SD) BMI among patients with cardiogenic shock was 28.5 (2.3) kg/m2 and without cardiogenic shock was 23.5 (2.8) kg/m2 and this difference was statistically significant (p <0.001). The mean (SD) BMI among patients who succumbed to illness was 30 (1.6) kg/m2 and in study participants who recovered was 23.6 (2.8) kg/m2 and this difference was statistically significant (p <0.001).

Among NSTEMI 31.7% (n=19) had hospital stay between 8-14 days and among STEMI 33.3% (n=15) had hospital stay between 8-14 days. Among NSTEMI 6.7% (n=4) had cardiogenic shock and among STEMI 17.8% (n=8) had cardiogenic shock. Among patients NSTEMI 5.0% (n=3) succumbed to illness whereas in study participants with STEMI this was 11.1% (n=5).

Table 5: Comparison of CRP, NLR and BMI Levels Among the NSTEMI and STEMI Participants (N=105)

| Variable | Type of Myocardial infarction | | P value |
|---|---|---|---|
| | NSTEMI Mean (SD) | STEMI Mean (SD) | |
| CRP Levels (1st Day) mg/dl | 19.6 (17.4) | 45.5 (65.7) | <0.001 |
| CRP Levels (3rd Day) mg/dl | 18.7 (31.1) | 39.4 (60.4) | 0.02 |
| NLR Levels (1st Day) | 4.0 (2.7) | 5.5 (3.3) | 0.01 |
| NLR Levels (3rd Day) | 3.6 (2.0) | 4.7 (1.9) | <0.001 |
| BMI (kg/m2) | 23.2 (3.0) | 25.2 (3.1) | <0.001 |

The mean (SD) CRP level at day 1 among patients with NSTEMI was 19.6 (17.4) mg/dL and in STEMI was 45.5 (65.7) and this difference was statistically significant (p <0.001). The mean (SD) CRP level at day 3 among patients with NSTEMI was 18.7 (31.1) mg/dL and in STEMI was 39.4 (60.4) and this difference was statistically significant (p=0.02). The mean (SD) NLR level at day 1 among patients with NSTEMI was 4.0 (2.7) and in STEMI was 5.5 (3.3) and this difference was statistically significant (p=0.01). The mean (SD) NLR level at day 3 among patients with NSTEMI was 3.6 (2.0) and in STEMI was 4.7 (1.9) and this difference was statistically significant (p<0.001). The mean (SD) BMI among patients with NSTEMI was 23.2 (3.0) kg/m2 and in STEMI was 25.2 (3.1) kg/m2 and this difference was statistically significant (p <0.001).

Table 6: Prognostic Comparison of 1st And 3rd Day CRP and NLR Levels for Predicting Cardiogenic Shock and Death with Optimal Cut-Off Points

| Variable | CRP day 1 | | CRD day 3 | | NLR day 1 | | NLR day 3 | |
|---|---|---|---|---|---|---|---|---|
| | Cardiogenic shock | Death | Cardiogenic shock | Death | Cardiogenic shock | Death | Cardiogenic shock | Death |
| AUC | 0.81 | 0.85 | 0.79 | 0.84 | 0.57 | 0.63 | 0.65 | 0.74 |
| 95% CI | 0.7-0.9 | 0.7-1.0 | 0.6-0.9 | 0.6-1.0 | 0.4-0.7 | 0.4-0.8 | 0.4-0.8 | 0.5-0.9 |
| Cut off point | >30 | >56 | >20 | >96 | >5.3 | >5.3 | >4.3 | >5.6 |
| Sensitivity (%) | 66.7 | 75.0 | 75.0 | 75.0 | 58.3 | 62.5 | 58.3 | 75.0 |
| Specificity (%) | 83.9 | 96.9 | 67.7 | 98.9 | 66.7 | 66.0 | 60.2 | 81.4 |

## DISCUSSION

The study aimed to investigate the prognostic significance of biomarkers, including the C-reactive protein and NLR, in patients with AMI. The study findings indicated that the C-reactive protein emerged as a strong predictor of in-

hospital mortality among patients with AMI. CRP exhibited high sensitivity (93.65%) and specificity (69.57%) in predicting in-hospital mortality, surpassing other biomarkers. Additionally, the combined elevation of NLR and CRP was significantly linked to an increased risk of adverse cardiac events among PCI AMI patients. These findings underscore the potential utility of biomarkers, particularly CRP and NLR, in risk stratification and prognosis assessment in patients with ACS and AMI, thereby facilitating informed clinical decision-making and optimizing patient management strategies.

In this study, a significant proportion of participants experienced symptoms related to AMI. Specifically, 77.1% (n=81) reported chest pain, 40% (n=42) had dyspnoea on exertion, 5.7% (n=6) experienced palpitations, and 2.9% (n=3) reported angina on exertion. Similar to this study, a study by Muhammad Ajmal Malik et al. among patients with AMI reported 93.1% of patients reported chest pain as the presenting complaint.[14] In this study, the second most commonly observed symptom after chest pain was dyspnoea on exertion, affecting 40% of participants, followed by palpitations. A study by Jasper Boeddinghaus et al. found that patients experiencing dyspnoea were more likely to have known cardiovascular risk factors and established coronary artery disease.[15] The participants in this study had a mean (SD) body mass index (BMI) of 24 (3.2) kg/m², which falls within the overweight category for Asian and South Asian populations,[16] suggesting a potential association between higher BMI and the risk of AMI in this population. This finding resonates with a study by Heidi Borgeraas et al. reported that compared with normal-weight subjects, obese men had an increased risk of AMI.[17]

In this study, a substantial proportion of participants, approximately three-fourths (76.2%, n=80), reported having one or more comorbidities. Among them, 57.1% (n=60) had hypertension, 58.1% (n=61) had diabetes mellitus, 12.4% (n=13) were diagnosed with dyslipidaemia, and 6.7% (n=7) had a history of COPD. This distribution highlights the common occurrence of hypertension and diabetes mellitus among individuals diagnosed with AMI in the study population, highlighting the importance of managing these conditions as part of comprehensive cardiovascular care. A large community study found that high blood pressure (hypertension) and diabetes were the most frequent health conditions (comorbidities) occurring together in AMI patients. One out of eight patients hospitalized for a heart attack had both high blood pressure and diabetes. The study also showed that about 5% of patients had a combination of three conditions: high blood pressure, diabetes, and heart failure.[18]

In this study, 57.1% (n=60) had NSTEMI, and 42.9% (n=45) had STEMI. Thrombolysis among the STEMI patients was reported among 17.8% (n=8). Of the total, 45.7% (n=48) had AWMI wall involved and 24.8% (n=26) had IWMI wall involved. The prevalence of NSTEMI versus STEMI varies across different studies and populations. For instance, a study by Ioannis Kanakakis et al. among patients with myocardial infarction in Greece reported a higher prevalence of NSTEMI. They found more patients presented with NSTEMI (56.8%) than with STEMI (43.2%).[19] Similar findings were reported by some other studies as well. In contrast, some studies reported a higher prevalence of STEMI. In a study conducted in Iran by Mehdi Sharafi, et al. the prevalence of NSTEMI and STEMI was reported, the prevalence of STEMI and non-STEMI was 31.60% and 11.80%, respectively.[20] Similarly, another study by María José Martínez et al. reported out of 4647 consecutive AMI patients admitted during the study period, 3407 were classified as STEMI and 1240 as NSTEMI. [21] These variations in prevalence could stem from differences in patient demographics, risk factors, and healthcare practices across regions.

In this study, 45.7% (n=48) showed involvement of the Anterior Wall Myocardial Infarction (AWMI), followed by 24.8% (n=26) displayed involvement of the Inferior Wall Myocardial Infarction (IWMI). A similar study conducted at a tertiary care centre in Central India by Pradeep P. Deshmukh et al. reported that anterior wall myocardial infarction (AWMI) was the most common presentation (82.9%).[22]

In this study, the electrocardiographic (ECG) findings revealed that 6.7% (n=7) were identified with Right Bundle Branch Block (RBBB), 5.7% (n=6) with Left Bundle Branch Block (LBBB), and 2.9% (n=3) with arrhythmias. A study by Li Xiang et al. reported that RBBB was linked to a significantly higher overall mortality rate among AMI patients. In this study, 2D Echo findings reported that for 57.1% (n=60) of participants, the ejection fraction was between 30-50%. In total, RWMA was found among 85.7% (n=90), PAH among 23.8% (n=25), and valvular heart disease

among 16.2% (n=17). Consistent with our findings, a study conducted by R S Horowitz et al. investigated the immediate diagnosis of AMI using two-dimensional echocardiography. They reported that 94% of patients clinically diagnosed with AMI exhibited regional wall motion abnormalities on the initial 2-D echo.[23] The low prevalence of post-MI complications in this study may be attributed to several factors. Firstly, advancements in medical care and reperfusion therapies may have contributed to reducing the incidence of these complications. Secondly, the study population may have included patients with milder forms of MI or fewer risk factors for complications. Another potential reason could be improved patient education and healthcare provider efforts to optimize secondary prevention strategies. Overall, while these complications remain a concern, their occurrence was relatively rare in this study population. Continued efforts in optimizing reperfusion strategies, vigilant patient monitoring, and prompt intervention are essential for further reducing the incidence and impact of post-MI complications.

In study, the duration of hospital stay varied among participants, with the majority (67.6%, n=71) experiencing a hospital stay ranging from 1 to 7 days. About one-third (32.4%, n=34) of participants had a longer hospitalization period, staying between 8 to 14 days. A study conducted Anusha G Bhat et al. reported that nearly half of the admissions (49.9%) had a short LOS of 3 days or fewer, while 47.3% experienced a longer LOS exceeding 3 days.[24] Several factors can influence the duration of hospital stay for individuals with AMI. Firstly, the severity of the MI and associated complications can impact the duration of hospitalization.

Regarding the incidence of cardiogenic shock among participants of this study, 11.4% (n=12) experienced this complication during their hospitalization. Factors contributing to the development of cardiogenic shock may include the extent of myocardial damage, the presence of pre-existing heart conditions, delayed presentation to medical care, or inadequate response to initial treatment measures.[25] In this study, 7.6% (n=8) of participants in this study population succumbed to the complications of AMI and associated conditions, resulting in mortality. The presence of certain biomarkers like troponin I and BNP were linked to higher mortality rates in ACS patients. Overall, the mortality rates in AMI patients in India reflect a complex interplay of demographic, clinical, and treatment-related factors.[26–30]

This study found that higher levels of a protein called CRP (measured on the first day) were linked to several negative outcomes in heart attack patients. These included longer hospital stays, a condition called cardiogenic shock, and a higher chance of death. All these connections were statistically significant, meaning they were very unlikely to be due to chance. The study also aligns with previous research by Lucci et al., which showed that high levels of another protein (hs-CRP) measured on admission can predict both short-term and long-term outcomes in heart attack patients.[31] Another similar study by Christian Stumpf et al. reported that C-reactive protein levels reached a peak after 48 h. The patients with peak CRP levels exceeding 47.5 mg/l experienced higher rates of one-year total mortality and HF-related mortality compared to those with CRP levels below this threshold. These findings highlight the potential significance of CRP levels (1st Day)as prognostic indicators for both overall mortality and HF-related outcomes in patients with STEMI.[32] A similar study by Badiger et al. showed that 45 out of 50 patients had elevated hs-CRP levels upon admission (1st Day), while the remaining 5 had minimal or lower levels. The study concluded that higher serum hs-CRP levels at the time of admission in patients with AMI are associated with a greater likelihood of developing complications during hospitalization.[33]

Another study by Singamaneni Manjusha et al. assessed CRP levels at day 0, day 3, and day 5. It reported higher CRP showed increased mortality. CRP >3.0 mg/dl with the highest mortality.[34] A similar study by Badiger et al. showed that over a 7-day follow-up period, 35 out of the 45 patients with elevated hs-CRP developed vascular complications such as left ventricular failure, cardiogenic shock, ventricular ectopy, and atrioventricular block.

In this study, the mean (SD) NLR level among patients with hospital stay ≤7 days was 4.6 (3.3) and in 8-14 days it was 4.9 (2.5). The mean (SD) NLR level among patients with cardiogenic shock was 5.4 (3.1) and in no cardiogenic shock was 4.6 (3.1). The mean (SD) NLR level among patients with mortality was 6.9 (3.3) and in no mortality was 4.6 (3.0) and these differences were not statistically significant. In line with this study, elevated NLR levels on the first day of sepsis diagnosis have been associated with increased mortality and longer hospital stays in other studies as well.

Lorente et al. found that non-survivors had higher NLR levels on the first day of sepsis compared to survivors, indicating a link to mortality.[35] Additionally, Ju et al. highlighted that dynamic changes in NLR levels, particularly when above 15%, were predictive of death in elderly patients with septic cardiogenic shock, emphasizing the importance of monitoring NLR trends.[36]

The study demonstrates the significance of inflammatory markers, particularly CRP, as predictors of adverse outcomes in patients with AMI. Elevated CRP levels on the first and third days following AMI were associated with longer hospital stays, cardiogenic shock, and mortality. These findings suggest that CRP could serve as a valuable prognostic indicator for identifying patients at higher risk of complications post-AMI. Moreover, the study highlights the importance of considering other clinical parameters, such as BMI, in assessing AMI prognosis. Higher BMI was also associated with adverse outcomes, highlighting the complex interplay between inflammation, metabolic factors, and cardiovascular health. The study also examined the NLR as a potential prognostic marker in AMI patients. While the NLR did not show significant associations with outcomes in this study, CRP emerged as a more reliable predictor, exhibiting better sensitivity and specificity in identifying patients at risk of cardiogenic shock and mortality. These findings contribute to the growing body of evidence supporting the role of inflammatory markers in risk stratification and prognostication in patients with AMI. Further research exploring the mechanistic links between inflammation, cardiovascular events, and metabolic factors could provide valuable insights for developing targeted therapeutic interventions to improve outcomes in this patient population.

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