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Significance of Neutrophil to Lymphocyte Ratio in Acute St-Segment Elevation Myocardial Infarction

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ABSTRACT

Background: Myocardial infarction remains a leading cause of global mortality, necessitating reliable prognostic markers. This study evaluates the neutrophil-to-lymphocyte ratio (NLR) as a predictor of in-hospital complications in acute ST-elevation myocardial infarction (STEMI) patients in Pakistan, where research on NLR is limited. **Objective:** To determine the proportion of STEMI patients with high NLR (≥4.50) and compare complication rates between high- and low-NLR groups. **Study Design:** Descriptive study. **Settings:** Faisalabad Institute of Cardiology, Faisalabad Pakistan. **Duration:** July 30, 2022 to January 30, 2023. **Methods:** 385 STEMI patients. NLR was calculated from admission blood samples, and complications (arrhythmias, cardiogenic shock, heart failure, re-infarction and mortality) were recorded. Statistical analysis used SPSS v25, with $p<0.05$ considered significant. **Results:** Mean age was 52.95±7.85 years (47% male, 53% female). Mean NLR was 4.22±0.85; 43.4% had high NLR. High NLR correlated with higher complication rates: arrhythmias (67.5% vs. 25.0%, p=0.000), cardiogenic shock (58.6% vs. 39.1%, p=0.001), heart failure (79.0% vs. 32.5%, p=0.001), and mortality (33.1% vs. 14.2%, p=0.037). No significant difference was observed in re-infarction rates. **Conclusion:** High NLR is associated with increased in-hospital complications in STEMI patients, supporting its role as a cost-effective prognostic marker. Routine NLR assessment could aid early risk stratification and improve outcomes in resource-limited settings.

Keywords: *Acute STEMI, NLR, Complications, Prognostic marker, Pakistan.*

INTRODUCTION

Cardiovascular disease (CVD) is still a huge and increasing problem in the developed world. By estimation, 17.9 million people perished due to CVD in 2019, which was 32% of the total deaths in the globe. Due to population growth and urbanization, prevalence of CVD has increased in Pakistan with an alarming rise in heart attacks across the country.[1] As a significant matter of consideration, this upward trend is attributed to modifiable risk factors like sedentary lifestyle, unhealthy eating patterns, smoking and high prevalence of diabetes mellitus.[2] Consequently, CVD has emerged as a leading cause of mortality in Pakistan.[3]

Acute Coronary Syndrome (ACS) is the most common and dramatic presentation of CVD, with its grave morbidity and mortality worldwide and greater impact on health care systems in low and middle income countries like Pakistan.[4] Nearly 70% of AMI fatal events are due thrombotic occlusion from atherosclerotic plaque.[5] Furthermore, the jump up in non-communicable diseases further highlights the need to explore the underlying pathophysiological mechanisms operating ACS in the Pakistani community.[6] Regardless of this thrust, effective screening programs are sparse, especially in rural areas where healthcare access is inadequate.

The most common and important driver of thrombosis is the rupture of atherosclerotic plaque with subsequent cascade of events leading to vessel occlusion. Initiation, progression and destabilization of atherosclerotic plaques involve inflammation.[7] Systemic inflammation is linked

with inflammation of the vessel walls. Lymphocytes and monocytes are found in the early phases of plaque formation while neutrophils have a role in acute plaque disruption and thrombotic occlusion. In response to inflammation bone marrow releases white blood cells especially neutrophils in the circulation.[8] The cardiac wound healing cascade begins with myocardial necrosis, initiating inflammation and leukocyte influx, and promotes scar formation in response to myocardial infarction. Neutrophil leukocytosis is the most prominent leukocytosis 24 hours post MI.[9] The neutrophil to lymphocyte ratio (NLR) is indicator of systemic inflammation and is a prognostic marker in patients with AMI. As compared to other inflammatory markers, NLR is an inexpensive, simple, readily available test that can be easily calculated.[10]

A study of 320 acute ST-elevation myocardial infarction (ASTEMI) patients at Rawalpindi Institute of Cardiology (RIC) by Gul U *et al*[11] included 158 (47.81%) low NLR patients and 162 (52.19%) high NLR patients; their cut-off was 4.50. 45.3% of patients (total of 145) have complications. Patients in the high NLR group also had a greater rate of complications (63.5% vs. 25.5%) and death (19.2% vs. 11.1%) when hospitalized. The NLR high group had a higher rate of cardiogenic shock (27.5% vs. 11.1%), heart failure (19.2% vs. 7.2%), arrhythmias (18 vs. 6.5%), and re-infarct/angina (9.6% vs. 2%).

Studies were done internationally evaluating if the neutrophil-to-lymphocyte ratio may be used to predict mortality in acute STEMI patients. We found very few studies done in Pakistan regarding NLR in acute STEMI patients after robust research. The purpose of this study is to determine whether NLR can be considered as a predictor of in-hospital complications in patients with acute STEMI. It will be recommended as a routine investigation to early treat these complications to reduce morbidity and in-hospital mortality in such patients if results are found significant.

METHODS

The descriptive design study was conducted at Faisalabad Institute of Cardiology (FIC) Faisalabad, Pakistan over six months, from July 30, 2022 to January 30, 2023. Study was approved (Ref No. 22-2021/DME/FIC/FSD Dated 19.11.2021) from institutional ethical review committee. With a prevalence of 52.19% [11] for a high NLR rate in Acute STEMI patients, using the WHO sample size calculator, with a 95% confidence level and 5% margin of error, we calculated that 385 would be our sample size by using raosoft calculator online. The sampling technique was consecutive non-probability, inclusion criteria were patients aged 30 to 70 years with acute STEMI presenting within 12 hours of symptoms onset. All patients underwent revascularization using intravenous streptokinase. Exclusion criteria included patients with inflammatory conditions, active infections, hepatic or renal failure, malignancy, or a history of myocardial infarction, coronary artery bypass surgery (CABG), percutaneous coronary intervention (PCI), or cardiomyopathy (CMP). Data was collected through a structured proforma, documenting demographics, medical history, and baseline investigations, including electrocardiogram (ECG) and complete blood count. NLR was calculated by dividing the absolute neutrophil count by the absolute lymphocyte count, with a cut-off point for division of 4.50[7]. Patients were divided into two groups: low NLR and high NLR. Acute STEMI treatment was provided according to hospital protocols, and complications such as arrhythmias, cardiogenic shock, heart failure, re-infarction, post-myocardial infarction angina and death were recorded. Data was entered into a specially designed proforma, and the rate of complications between the two groups was compared.

The data was entered into SPSS Version 25 and analyzed. Mean and standard deviation were used for continuous data like age, duration of symptoms and NLR. Frequencies and percentages were used for categorical data such as gender, comorbidities (DM, HTN, smoking, family history of IHD), arrhythmias, cardiogenic shock, re-infarction, heart failure and mortality. Analysis was carried out using a chi-square test. Stratification controlled used for effect modifiers such as age, gender and comorbidities. An analysis of their effect on outcome was performed using a post-stratification chi-square test. At P value < 0.05 (two-sided, the chi-square test) was regarded as statistically significant.

RESULTS

A total of 385 cases meeting the selection criteria were enrolled to assess the frequency of high NLR in patients with acute STEMI and compare the frequency of complications between those with low and high NLR. Descriptive statistics for patient age showed a mean of 52.95 ± 7.85 years, with a minimum age of 37 and a maximum of 64 years. Descriptive statistics for gender distribution revealed that 181 (47%) patients were male and 204 (53%) were female. Descriptive statistics for symptom duration showed a mean of 2.79 ± 1.11 days, with a minimum of 1.00 day and a maximum of 5.00 days. (Table 1)

Descriptive statistics for NLR indicated a mean NLR of 4.22 ± 0.85, with a minimum of 2.70 and a maximum of 5.60. The frequency of high and low NLR in acute STEMI patients revealed that 167 (43.4%) had high NLR, while 218 (56.6%) had low NLR. The frequency of complications in acute STEMI patients with low and high NLR were as follows: 337 (87.5%) had diabetes mellitus, 353 (91.7%)

had hypertension, 185 (48.1%) had arrhythmias, 125 (32.4%) had cardiac shock, no cases of re-infarction, 203 (52.7%) had heart failure, and 81 (21%) experienced mortality. The frequency of smoking among acute STEMI patients with low and high NLR was recorded in 78 (20.3%) cases. A family history of IHD was noted in 64 (16.6%) of the cases. (Table 1)

Patients with high NLR showed a higher incidence of complications, including diabetes mellitus (43.3% vs 56.7%, p=0.956), hypertension (43.9% vs 56.1%, p=0.484), arrhythmias (67.5% vs 25.0%, p=0.000), cardiogenic shock (58.6% vs 39.1%, p=0.001), heart failure (79% vs 32.5%, p= 0.001), and mortality (33.1% vs 14.2%, p=0.037). The differences in re-infarction rates between the two groups were not significant. (Table 2)

Patients with high NLR had higher CK-MB and Troponin T compared to low NLR group [(65.10 ± 30.25 vs. 29.69 ± 14.05), (2.12 ± 2.08 vs. 0.67 ± 1.42), respectively], which were considered statistically significant (P- value < 0.001 for both). On the other hand, EF and FS appeared more reduced in patients with high NLR compared to patients with low NLR (35.12 ± 12.05 vs. 43.26 ± 8.60), (23.35 ± 7.14 vs. 35.97 ± 6.16), respectively], which were also statistically significant (P-value < 0.001 for both) (Table 3).

Table 1: Characteristics of Study Participants, Including Demographics, Clinical Parameters, and Complications

Variables		Mean ± SD (Range)	No.	%
Age in years		52.95 ± 7.85 (37 to 64)		
Gender	Male	-	181	47%
	Female	-	204	53%
Duration of symptoms (days)		2.79 ± 1.11 (1 to 5)	-	-
NLR		4.22 ± 0.85 (2.70 to 5.60)	-	-
NLR	Low	-	167	43.4%
	High	-	218	56.6%
Smoking	Yes	-	78	20.3%
	No	-	307	79.7%
Family history of IHD	Yes	-	64	16.6%
	No	-	321	83.4%
Complications	Diabetes Mellitus	-	337	87.5
	Hypertension	-	353	91.7
	Arrhythmias	-	185	48.1
	Cardiac Shock	-	125	32.5
	Re-infarct	-	-	-
	Heart failure	-	203	52.7
	Mortality	-	81	21.0

Table 2: Comparison of the frequency of complications in patients of acute STEMI with low and high NLR

Complications		High NLR		Low NLR		P-value
		Number	%	Number	%	
Diabetes Mellitus	Yes	146	43.3	191	56.7	0.956
	No	21	43.8	27	56.3	
Hypertension	Yes	155	43.9	198	56.1	0.484
	No	12	37.5	20	62.5	
Arrhythmias	Yes	135	67.5	50	25	0.000
	No	32	17.3	168	84	
Cardiac Shock	Yes	98	58.6	27	39.1	0.001
	No	69	41.3	191	60.4	
Re-infarct	Yes	0	0	0	0	-
	No	167	43.4	218	56.6	
Heart failure	Yes	132	79.0	71	32.5	0.001
	No	35	20.9	147	67.4	
Mortality	Yes	56	33.5	31	14.2	0.037
	No	111	66.4	187	85.7	

Table (3): Distribution of parameters of myocardial damage and dysfunction in patients with low and high NLR.

Findings	Low NLR (n =218)	High NLR (n=167)	P-value
Mean CK-MB (± SD)	29.69 ± 14.05	65.10 ± 30.25	<0.001*
Mean Troponin T (± SD)	0.67 ± 1.42	2.12 ± 2.08	<0.001*
Mean EF (± SD)	43.26 ± 8.60	35.12 ± 12.05	<0.001*
Mean FS (± SD)	35.97 ± 6.16	23.35 ± 7.14	<0.001*

*CKMB (Creatine Kinase Myocardial Band) in U/L, Troponin T in ng/dl, EF (Ejection Fraction) in %, FS (Fractional Shortening) in %. * (Statistically significant).*

Stratification was adjusted for effect modifiers such as age, gender, and comorbidities. (Tables 4-6)

Table 4: Stratification of data for comparison of the frequency of complications in patients of acute STEMI with low and high NLR by Age (30-50 years)

Complications		High NLR		Low NLR		P Value
		Number	%	Number	%	
Diabetes Mellitus	Yes	49	44.1	62	55.9	0.420
	No	2	28.6	5	71.4	
Hypertension	Yes	50	45	61	55	0.111
	No	1	14.3	6	85.7	
Arrhythmias	Yes	12	17.9	55	82.1	0.000
	No	39	76.5	12	23.5	
Cardiac Shock	Yes	14	56	11	44	0.146
	No	37	39.8	56	60.2	
Re-infarct	Yes	0	0	0	0	-
	No	51	43.2	67	56.8	
Heart failure	Yes	13	59.1	9	40.9	0.096
	No	38	39.6	58	60.4	
Mortality	Yes	9	47.4	10	52.6	0.690
	No	42	42.4	57	57.6	

Table 5: Stratification of data for comparison of the frequency of complications in patients of acute STEMI with low and high NLR by age (51-70 years)

Complications		High NLR		Low NLR		P Value
		Number	%	Number	%	
Diabetes Mellitus	Yes	97	42.9	129	57.1	0.684
	No	19	46.3	22	53.7	
Hypertension	Yes	105	43.4	137	56.6	0.953
	No	11	44	14	56	
Arrhythmias	Yes	20	16.9	98	83.1	0.000
	No	96	64.4	53	35.6	
Cardiac Shock	Yes	28	63.6	16	36.4	0.003
	No	88	39.5	135	60.5	
Re-infarct	Yes	0	0	0	0	--
	No	116	43.4	151	56.6	
Heart failure	Yes	22	68.8	10	31.3	0.002
	No	94	40	141	60	
Mortality	Yes	19	63.3	11	36.7	0.020
	No	97	40.9	140	59.1	

Table 6: Stratification of data for comparison of the frequency of complications in patients of acute STEMI with low and high NLR by gender (male)

Complications		High NLR		Low NLR		P Value
		No. of patients	%	No. of patients	%	
Diabetes Mellitus	Yes	60	39.7	91	60.3	0.753
	No	11	36.7	19	63.3	
Hypertension	Yes	67	40.1	100	59.9	0.395
	No	4	28.6	10	71.4	
Arrhythmias	Yes	11	12	81	88	0.000
	No	60	67.4	29	32.6	
Cardiac Shock	Yes	17	58.6	12	41.4	0.020
	No	54	35.5	98	64.5	
Re-infarct	Yes	0	0	0	0	-
	No	71	39.2	110	60.8	
Heart failure	Yes	13	59.1	9	40.9	0.042
	No	58	36.5	101	63.5	
Mortality	Yes	12	54.5	10	45.5	0.116
	No	59	37.1	100	62.9	

A post-stratification chi-square test was applied to assess their impact on outcomes. A two-tailed p-value < 0.05 was considered statistically significant. (Table 7)

Table 7: Stratification of data for comparison of the frequency of complications in patients of acute STEMI with low and high NLR by gender (female)

Complications		High NLR		Low NLR		P Value
		No. of patients	%	No. of patients	%	
Diabetes Mellitus	Yes	86	46.2	100	53.8	0.449
	No	10	55.6	8	44.4	
Hypertension	Yes	88	47.3	98	52.7	0.816
	No	8	44.4	10	55.6	
Arrhythmias	Yes	21	22.6	72	77.4	0.000
	No	75	67.6	36	32.4	
Cardiac Shock	Yes	25	62.5	15	37.5	0.029
	No	71	43.3	93	56.7	
Re-infarct	Yes	0	0	0	0	-
	No	96	47.1	108	52.9	
Heart failure	Yes	22	68.8	10	31.3	0.007
	No	74	43	98	57	
Mortality	Yes	16	59.3	11	40.7	0.173
	No	80	45.2	97	54.8	

DISCUSSION

Myocardial infarction, a significant cause of in-hospital mortality and morbidity worldwide, is one of the sequel of coronary artery disease and is of significant importance.[12] In many conditions not due to known cardiovascular disease, including malignancy and infective pathology, NLR being a novel laboratory marker of systemic inflammation predicts prognosis.[13] In a population of patients with an admitting NLR above a median value, we demonstrated a strong independent relationship between the complication rate after acute myocardial infarction and the subsequent post-hospitalization period. A number of studies have investigated the predictive value of NLR in predicting mortality or complications in patients presenting with acute STEMI according to a broad international research.[14-17] Research on NLR in acute STEMI patients is very limited in Pakistan, and local data to validate its clinical utility is needed. Our study evaluated the role of NLR as a prognostic marker for in-hospital complications, aiming to incorporate NLR assessment into routine clinical practice to reduce morbidity and mortality.

In our study, the mean age was 52.95+7.85 years; 181 (47%) were male, and 204 (53%) were females. Mean NLR was 4.22+0.85 with a minimum of 2.70 and maximum of 5.60, and the frequency of High/Low NLR in patients of acute STEMI shows 167 (43.4%) high NLR and 218

(56.6%) had low NLR. In comparison studies by Dibya J. Sharma *et al*[18] and Rahman *et al*[19] have reported mean age of 58.2±6.92 years and 54.7 ± 12.4 years respectively with male predominance. These studies also observed comparable baseline characteristics and risk factors among such patients. The objective of present study was to investigate the relationship between the rate of complications in patients with acute STEMI and different neutrophil-to-lymphocyte ratios (NLR). Patients with high NLR were associated with higher percentages of complexity like diabetes mellitus (43.3 vs. 56.7 p=0.956), hypertension (43.9 vs 56.1 p=0.484), arrhythmias (67.5 vs. 25.0 p=0.000), cardiogenic shock (58.6 vs. 39.1 p=0.001), heart failure (79 vs 32.5%), and mortality (33.1% vs. 14.2%, p=0.037). The differences in re-infarction between the two groups were not applicable. These results indicate that high NLR may be predictive of complications in acute STEMI patients and that NLR may be a prognostic marker in these patients.

Gul U *et al*.[11] conducted a study in 320 acute STEMI patients at the Rawalpindi Institute of Cardiology (RIC), Pakistan in which 158 (47.81%) patients had low NLR, and 162 (52.19%) had high NLR with a cut-off of 4.50. A total of 145 (45.3) of patients had complications. Patients in the high NLR group also had a greater rate of complications (63.5% vs. 25.5%) and deaths (19.2% vs. 11.1%) when hospitalized. The NLR high group had a higher rate of cardiogenic shock (27.5% vs. 11.1%), heart failure (19.2% vs. 7.2%), arrhythmias (18 vs. 6.5%), and re-infarct/angina (9.6% vs. 2%). The findings of this study are in agreement with the results of our study in which outcomes were significant in patients with high NLR than those with low NLR with exception of re-infarction and post MI angina which were statistically non-significant among these two groups.

While the significance of NLR in acute coronary syndrome (ACS) is an ongoing area of research, previous studies have seen the relationship of NLR with cardiac biomarkers & resultant cardiac function,[20-21] success of thrombolysis,[22] infarct size and post MI cardiac complications.[11] In our study patients with high NLR had higher CK-MB and Troponin T compared to low NLR group [(65.10 ± 30.25 vs. 29.69 ± 14.05), (2.12 ± 2.08 vs. 0.67 ± 1.42), respectively], which were considered statistically significant (P- value < 0.001 for both). On the other hand, EF and FS appeared more reduced in patients with high NLR compared to patients with low NLR (35.12 ± 12.05 vs. 43.26 ± 8.60), (23.35 ± 7.14 vs. 35.97 ± 6.16) respectively, which were also statistically significant (P-value < 0.001 for both). Chen *et al*[21] did a study in 715 patients who underwent PCI within 72 hours of incidence to find correlation of NLR with cardiac biomarkers and parameters of cardiac function by measuring Creatine Kinase-MB (CK-MB), Lactate Dehydrogenase (LDH), Cardiac Troponin T (Trop-T), Ejection Fraction (EF) and Fractional Shortening (FS). They found a positive correlation with (CK-MB, Troponins and LDH) and a negative correlation with (EF and FS) with NLR values of > 2.76 and < 2.76 respectively. Similarly, in a study of 124 patients by Ayman Fuad Abdo Abdullah and Ganna Mohammed Hussein[22] with MI found that patients with high NLR had higher prevalence of diabetes mellitus, hyperlipidemia and smoking compared to the patients with low NLR. Likewise high NLR group had more elevated CK-MB and Troponins T, more reduced (EF) and (FS) than to low NLR group (p 0.001). High NLR also had poorer Killip class (p < 0.001) and were more prone to death inside the hospital compared to low NLR group (11.1% vs. 1.4%), (p=0.042). Cardiac biomarkers values correlate with the size of the infarct, resultant ventricular dysfunction and post MI clinical comes. Post MI prognosis depends on extent of infarct, residual left ventricle function whether patient underwent revascularization. Findings of poor Killip class and higher mortality seen in these studies with high values of cardiac enzymes and high NLR as predictors of infarct size and residual cardiac function with resulting post MI complications indirectly support the increased mortality and heart failure seen in our study patients with high NLR than those with low NLR.

Kraka G *et al*[23] studied 641 cases of acute STEMI. They divided the patients into four quartiles according to their NLR values. Quartile (percentile) ranges were defined as follows: the 25th percentile value was 3.95, the 50th percentile value was 5.95, and the 75th percentile value was 9.19. Subsequently, NLR classifications were determined, and assessments were grouped into four categories (Q1, Q2, Q3, and Q4). There were 160 patients each in Q1, Q3 and Q4 while there were 161 patients in Q2. There were 97 female and 544 male patients. Hypertension was seen in 261(40.7%, P value = 0.778) patients and 122 (19.01%, P value=0.763) patients were diabetic. In hospital mortality was, 0 (0%), 2 (1.2%), 4 (2.5%), 15 (9.4%) with P-value of 0.001 in Q1, Q2, Q3 and Q4 respectively. Ventricular arrhythmia like VT/VF occurred in, 5 (3.1%), 13 (8.1%), 11 (6.9%), 39 (24.4%) with P value = 0.001 in Q1, Q2, Q3 and Q4 respectively. Heart Failure was seen in, 0 (0%), 1 (0.6%), 2 (1.3%), 19 (11.9%) with P value= 0.001 in Q1, Q2, Q3 and Q4 respectively. Cardiogenic shock was present in, 0 (0%)2, (1.3%), 8 (5.0%), 28 (17.5%) with P value= 0.001 in Q1, Q2, Q3 and Q4. Atrial fibrillation was seen in, 1 (0.6%), 2 (1.2%), 3 (1.9%), 9 (5.6%) with P value= 0.014 in Q1,Q2, Q3 & Q4 respectively while re-infarction /unstable angina did not differ significantly among Q,Q2,Q3& Q4 with rates of , 3 (1.9%),4 (2.5%),3 (1.9%),8 (5.0%) with P value= 0.273 respectively. Higher NLR values were associated with a higher risk of unfavorable outcomes during

hospitalization. The results of above study are in agreement with the results of our study.

In a study by MS Rahman *et al*[19] regarding NLR as a predictor of in-hospital adverse outcomes it was seen that patients with high NLR had a higher incidence of conventional risk factors and in hospital complications (48.3% vs. 22.5%, p<0.001) in high NLR patients those with low NLR values. Arrhythmias (21.1% vs. 9.9%, p<0.041), heart failure (27.9% vs. 14.1%, p=0.024), cardiogenic shock (16.3% vs. 4.2%, p<0.011), death (6.8% vs. 2.8%, p=0.227), re-infarction / post MI angina (4.1% vs. 0.0% p=0.084) occurred more in high NLR group. These findings are similar to present study findings. Similarly, research by Siraj *et al*[24] in 232 patients presenting with acute STEMI reported mean high NLR in study population as 6.38±1.28. Patients with high NLR had a higher incidence of arrhythmias (82.6%) among non survivors and (33.92%) among survivors. Their mean high-NLR was 8.14. (p-value = <.00001). In-hospital mortality was 12% (n=23) being higher in patients with high NLR similar to the findings of present study. This suggests that NLR could serve as a reliable marker for predicting these complications in STEMI patients

Dibya J. Sharma Sr. *et al*[18] studied 110 patients of acute myocardial infarction, out of which 69.1% (n=76) were males and 30.1% patients were females (n=34). The mean age of the study population was 58.2±15.3 years. Patients were evaluated for the relationship of NLR with various outcome variables in STEMI. Among patients hospitalized with STEMI who had high NLR, had significantly elevated incidence of complications, including a higher acute left ventricular failure (42.8% vs. 35.9%; $p < 0.05$) as well as increased risk of mortality (66.7% vs. 33.3%; $p < 0.05$) compared to low NLR group. A total of 9.1% of patients had episodes of arrhythmias after the acute myocardial infarction. However, the incidence of arrhythmia was higher in high NLR group than in the low NLR group (7.6%), indicating a positive association between high NLR value and arrhythmias. Heart failure, was found to be significantly higher ($p < 0.05$) among the elevated NLR (42.77 ± 10.6) group as compared to the low NLR group (35.94 ± 7.03). The incidence of hypotension with systolic blood pressure (SBP) less than 90 mm Hg was more among patients with elevated NLR (17.4%) as compared to the patients who had low NLR. The results of this study are also in agreement with the results of our study.

Similar to our study, increased NLR and platelet lymphocyte ratio (PLR) was observed to link with more rate of cardiac complications in STEMI patients (OR 1.198 at 95% CI, p = 0.016) by Pashapour P *et al*.[25] Likewise, the significantly higher neutrophil count and NLR in patients with complications or mortality echo the results of Koza *et al*[26] who highlighted NLR as a predictor of mortality in acute STEMI. They found that higher NLR values were associated with worse outcomes, similar to present study's observations (e.g. acute left ventricular failure and death). The higher rates of complications like acute left ventricular failure (42.8% vs. 35.9%; $p < 0.05$) and mortality (66.7% vs. 33.3%; $p < 0.05$) among patients with high NLR in our study are also supported by the meta-analysis by Russu *et al*.[27] This analysis confirmed that elevated NLR is a reliable marker for adverse cardiac events and increased mortality in ASTEMI.

The findings of our study, in agreement with other studies, reveal that higher NLR in acute STEMI cases shows a significantly higher risk of complications like cardiogenic shock, heart failure, cardiac arrhythmias and mortality. This NLR technique can be used to identify and triage STEMI patients early when they first report to the emergency department. The patients presenting with acute STEMI having raised NLR may be managed accordingly to reduce the risk of adverse outcomes.

CONCLUSION

The results of our study indicated that 43.4% of patients had high NLR, which was associated with a higher incidence of complications, including arrhythmias, cardiac shock, heart failure, and mortality. These findings suggest a significant correlation between high NLR and adverse outcomes in acute STEMI patients, reinforcing the utility of NLR as a prognostic marker. Stratification for variables such as age, gender, and comorbidities was performed, and the results were statistically significant for most complications, reinforcing the importance of NLR in predicting in-hospital outcomes.

LIMITATIONS

Being a single centre study and sample size of 385 patients, needs further evaluation of our study findings with multicenter studies.

SUGGESTIONS / RECOMMENDATIONS

None.

CONFLICT OF INTEREST / DISCLOSURE

None.

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None.

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