

Original article:

Study of correlation between hematological parameters and ejection fraction in acute myocardial infarction

Dr Krupa Kumar, Dr S N Mahajan , Dr S R Varpe

Department of Medicine, Rural Medical College, Pravara Institute of Medical Sciences (DU) Loni

Corresponding author: Dr Krupa Kumar; Email: krupakumar38@gmail.com

ABSTRACT:

Introduction: Our aim was to study the correlation between hematological parameters and ejection fraction in the patients of acute myocardial infarction.

Methods: It is a cross sectional observational study where neutrophil percentage, neutrophil lymphocyte and platelet by lymphocyte ratio of 60 patients admitted in PRH Loni for acute myocardial infarction were obtained and 2D echo was done to find out their ejection fraction. Pearson's correlation was used to find if there is a significant correlation between these parameters and ejection fraction.

Results and Conclusion: It was found that neutrophilia and lymphocytopenia were significantly correlated with heart failure after acute myocardial infarction. While neutrophil by lymphocyte ratio and platelet by lymphocyte ratio did not have a significant correlation with heart failure, considering previous studies, we divided the patients into high NLR(Neutrophil by lymphocyte ratio) and low NLR(Neutrophil by lymphocyte ratio) groups and found that the high NLR(Neutrophil by lymphocyte ratio) groups had lower ejection fraction than low NLR(Neutrophil by lymphocyte ratio) groups.

Keywords: myocardial infarction, cardiovascular disease

INTRODUCTION:

Cardiovascular diseases is the leading cause of death in India with 21% of the deaths in 2010. Nearly 3 million deaths occur every year in India and has surpassed the mortality rates caused by communicable diseases. It is proposed by WHO that mortality by myocardial infarction will rise by 115% in men and 105% in females by 2020. While we are still dependant on 2D echo and angiography for prognosis of myocardial infarction, there has been persistent research going on with regards to the role of inflammatory markers in predicting the prognosis of an acute myocardial infarction. A lot of studies have focussed on serum CRP, serum uric acid and its correlation with complications in acute myocardial infarction. Recently there have been studies focussing on simple hematological parameters like total leukocyte count, neutrophil count, total lymphocyte count and neutrophil by lymphocyte ratio and their role in predicting the prognosis of various cardiovascular diseases. Our study is going to focus on the correlation between such hematological parameters and ejection fraction in cases of acute myocardial infarction.

If such a correlation exists, a simple hemogram may replace the need of a 2D echo and directly allow us to decide the need for angiography. There have been recent studies that have correlated neutrophilia and lymphopenia with higher incidence of complications and mortality in cases of acute myocardial infarction. Another new concept

that has emerged recently is that of neutrophil lymphocyte ratio which has been an indicator of poor prognosis in various cardiovascular diseases, gastrointestinal and gynaecological cancers. Higher neutrophil lymphocyte ratio has been associated with ventricular arrhythmias and complications during PCI. Higher neutrophil lymphocyte ratio has been associated with increased ventricular remodelling and poorer prognosis after PCI in patients of acute myocardial infarction. It is a correlation study between the ejection fraction and the hematological parameters like the neutrophil lymphocyte ratio and platelet lymphocyte ratio in sixty patients of PRH Loni from the period of September 2017 to September 2019.

MATERIALS AND METHODS:

Cases of acute Myocardial infarction admitted in PRH LONI were selected on the basis of clinical features (clinical features included typical retrosternal chest pain with radiation to other parts of the body, usually associated with sweating or palpitations, vomiting), along with one or more of the following:

- ECG changes: ECG showing ST elevation of more than 2 mm in v2 or v3 and more than 1mm in any other contiguous leads was diagnosed as MI.
- Elevated cardiac markers (CK MB/Cardiac enzymes/Trop T)
- Trop T was done if the onset of chest pain exceeded 4 hours. In the absence of Trop T the elevation in cardiac enzymes and CK-MB was used to diagnose MI and also differentiate NSTEMI from unstable angina. A semi auto analyser was used to analyze the blood sample drawn from the veins of the patients admitted for acute MI from September 2017 to September 2019. Patients' 2 D echo was done to observe the ejection fraction.

The desired hematological parameters, this is neutrophil percentage, lymphocyte percentage, N/L and P/L ratio were obtained in each of the ejection fraction categories and Pearsons test was used most of the times to find if there is a correlation between two variables and if this is significant. Software used for analysis is SSPS 21.

Results:

| Table1 : Pearson's correlation in between ejection fraction and neutrophil percentage | | | | |
|--|------------------------------|------------------------------|--------------|---------------------|
| Variables | | Pearson's Correlation | | |
| | | r | P | Significance |
| Ejection Fraction | Neutrophil percentage | -0.39 | 0.002 | Significant |

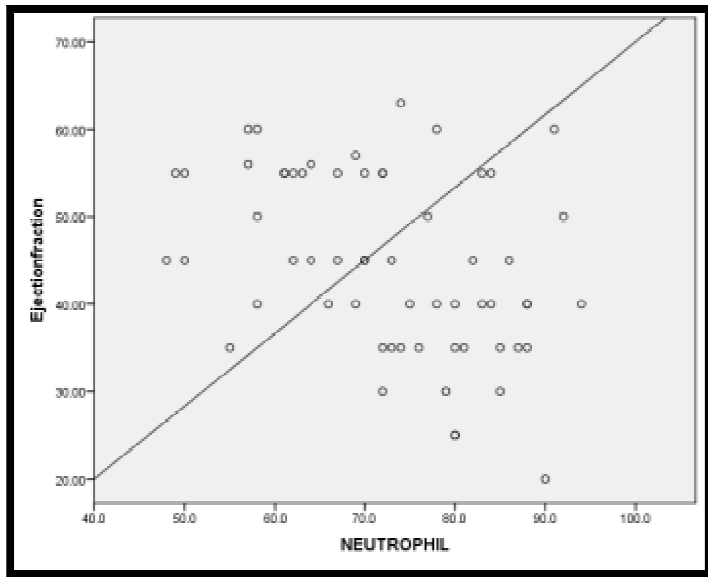
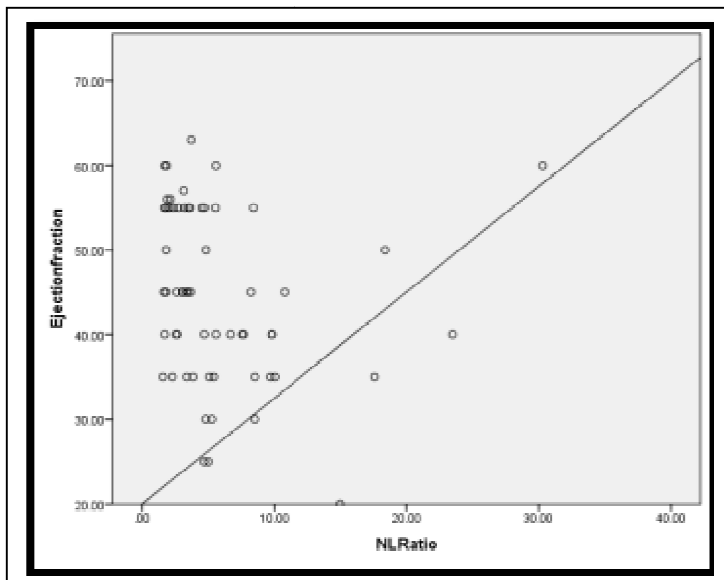
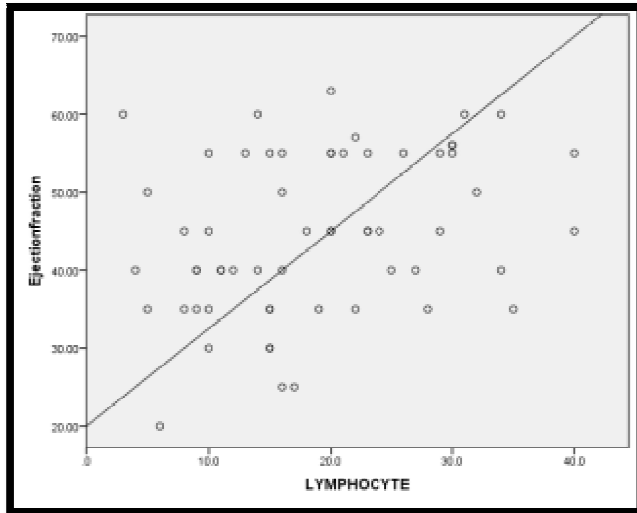


Table 2: Pearson's correlation in between ejection fraction and N/L ratio

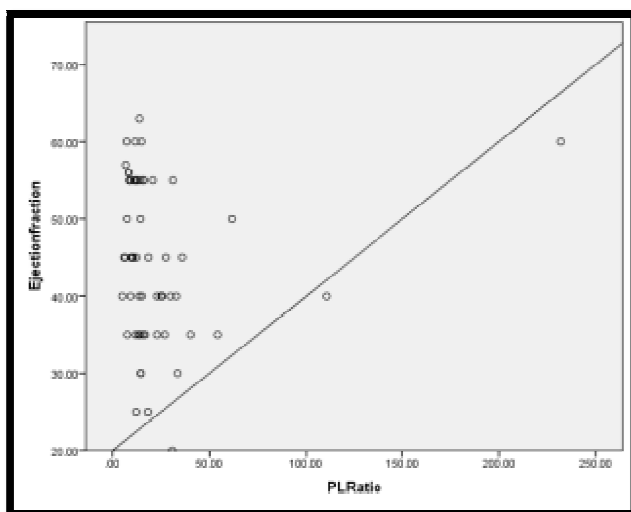
| Sr. No | Variables | | Pearson's Correlation | | |
|--------|-------------------|-----------|-----------------------|------|-----------------|
| | | | r | P | Significance |
| - | Ejection Fraction | N/L ratio | -0.15 | 0.23 | Non-significant |



| Sr. No | Variables | | Pearson’s Correlation | | |
|--------|-------------------|-----------------------|-----------------------|------|--------------|
| | | | r | P | Significance |
| - | Ejection Fraction | Lymphocyte percentage | 0.32 | 0.01 | Significant |



| Sr. No | Variables | | Pearson’s Correlation | | |
|--------|-------------------|-----------|-----------------------|------|-----------------|
| | | | r | P | Significance |
| - | Ejection Fraction | P/L ratio | 0.04 | 0.71 | Non-significant |



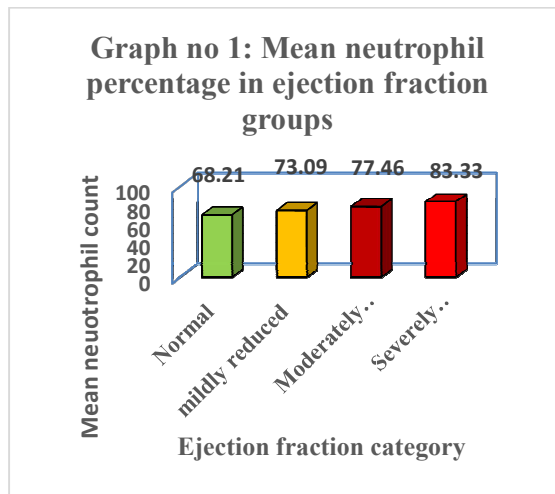
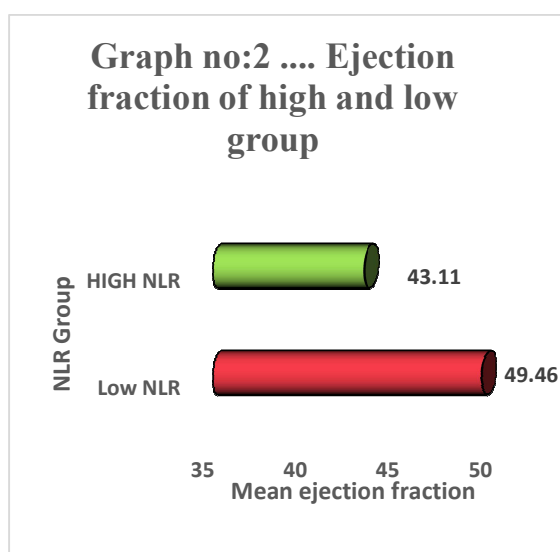


Table no 05: Comparison of mean neutrophil percentage with ejection fraction category

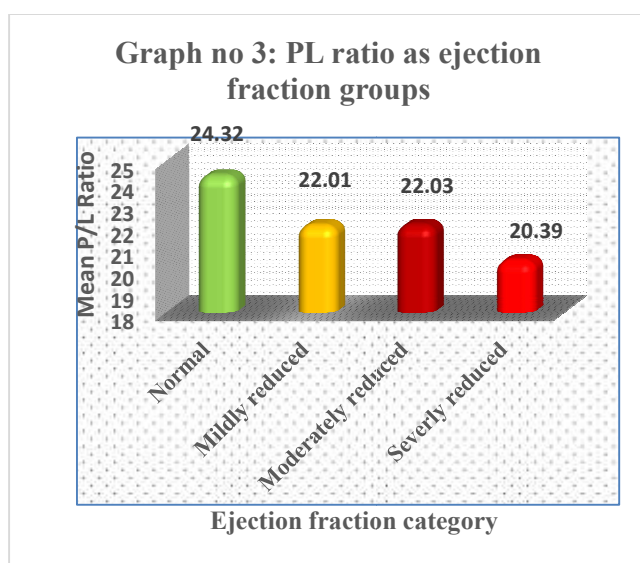
| Neutrophil | Normal | Mildly reduced ejection fraction | Moderately reduced ejection fraction | Severely reduced ejection fraction | ANOVA | |
|-----------------|---------------|----------------------------------|--------------------------------------|------------------------------------|-------|-------|
| | | | | | F | P |
| Mean± SD | 68.21 ± 11.95 | 73.09±12.52 | 77.46±8.82 | 83.33±5.77 | 2.81 | 0.04* |

Table no:6: Comparison of Ejection fraction of high and low group

| | Low NLR* (15) | High NLR# (45) | Mann Whitney U test |
|---------------------|---------------|----------------|---------------------|
| Mean EF ± SD | 49.46±8.73 | 43.11±10.37 | P:0.03 Significant |



| PL Ratio | Normal ejection fraction | Mildly ejection fraction | Moderately reduced ejection fraction | Severely reduced ejection fraction | ANOVA | |
|--------------------|--------------------------|--------------------------|--------------------------------------|------------------------------------|-------|-------|
| | | | | | F | P |
| Mean EF± SD | 24.32±46.70 | 22.01±22.36 | 22.03±13.38 | 20.39±9.54 | 0.02 | 0.99# |



DISCUSSION:

In our study, the mean neutrophil percentage and ejection fraction had strong correlation, in the absence of any other infections or hematological disorders. This correlation was significant statistically with a p value of 0.02 and r value of -0.32. This means that a higher neutrophil count could increase the chances of reduced ejection fraction in a patient of acute MI. In addition we did a Chi square test to find if there is an association between neutrophil percentage and ejection fraction. Again, a significant association was found with a p value of 0.004.

In a study conducted by Kyne et al at Harvard medical school, USA, in 1996 185 patients admitted for myocardial infarction in the month of September were studied. It was a cohort study in which neutrophilia was observed in 99.2% who developed heart failure as compared to 43% in those who did not develop heart failure. Here neutrophilia was considered if the neutrophil percentage was more than 65. In a study conducted at a hospital in Pakistan, a mean neutrophil count of more than 65/mm³ was associated with heart failure after myocardial infarction p value was 0.016. In our study the cutoff value is 68.21/mm³ with a p value of 0.04. There was a significant positive correlation between lymphocyte count and ejection fraction.

No such statistically significant correlation was found between neutrophil lymphocyte or platelet by lymphocyte ratio and ejection fraction. However we also found that just like previous studies, a neutrophil by

lymphocyte ratio of more than 2.76 had statistically significant chances of having reduced ejection fraction ($p=0.03$, by Mann Whitney's test). In the study by Chen Chen et al, only acute MI patients were included and studied for the correlation of neutrophil by lymphocyte ratio and ejection fraction. Here the p value was less than 0.0001 and r value -0.208. In contrast, our study had a p value of 0.23 and r value of -0.15. Although our study had a non significant correlation between N/L ratio and ejection fraction, just like our study, this study too had a significant association when comparing ejection fraction of patients with high NLR and low NLR, keeping the cutoff for NLR 2.76. Here, the low NLR group had a mean ejection fraction of 60.38 and high NLR group had mean ejection fraction of 57.2073 with a p value of 0.000 whereas our p value was 0.03. Thus though there was no correlation between neutrophil lymphocyte ratio and ejection fraction in patients of acute myocardial infarction, in our study, taking the cutoff for neutrophil by lymphocyte ratio as 2.76 like the previous study by Chen Chen et al, it was found that the ones with a high neutrophil by lymphocyte ratio had a significantly reduced ejection fraction than the ones with neutrophil by lymphocyte ratio below 2.76.

In our study we also compared a relatively new parameter, platelet by lymphocyte ratio in these 3 groups of mildly reduced, moderately reduced and severely reduced ejection fraction with the group with normal ejection fraction. Although the platelet by lymphocyte ratio decreased with increasing severity of heart failure, there was no significant correlation found (r value 0.04 p value 0.71).

CONCLUSION:

Neutrophilia has a strong negative correlation with ejection fraction. Thus a higher neutrophil percentage means a higher chance of heart failure after acute myocardial infarction. Also a neutrophil by lymphocyte ratio above 2.76 may be predictive of heart failure in acute MI patients.

REFERENCES:

1. Prognostic value of Neutrophil by lymphocyte ratio to predict prognostic outcomes in patients with STEMI by Punit Gupta et al volume 5, Issue 4, IJCMR, April 2018.
2. The prognostic value of total neutrophil count, neutrophil by lymphocyte ratio and left ventricular ejection fraction in predicting complications after STEMI. by Deepa Malik et al. Pgs 19-27, INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN BIOLOGY AND MEDICINE, Volume 2, Issue 11-2017.
3. Investigation of neutrophil by lymphocyte ratio and platelet by lymphocyte ratio in patients with compensatory heart failure by Yurtdas et al. JAREM 2018; 8(2):67-71.
4. Neutrophil to lymphocyte ratio as a predictor of myocardial damage and cardiac dysfunction in acute coronary syndrome patients by Chen Chen et al, Pg 192 to 199, www.imr-journal.com, 2018.
5. Neutrophil to lymphocyte ratio predicts left ventricular remodeling in patients with ST-elevation myocardial infarction after primary percutaneous coronary intervention by Abdurazzak et al, Korean Circ J 2016; 46(1):15-22.
6. Predictive value of Neutrophil to lymphocyte ratio in Outcomes of patients with Acute Coronary Syndrome; World Journal of Cardiovascular Diseases, 2018, 8, 265-275.