Original Article

NEUTROPHILS-TO-LYMPHOCYTES IN CORONARY ARTERY DISEASE: *A CROSS-SECTIONAL OBSERVATIONAL STUDY*

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Abstract

NLR was considered a marker for cardiac and non-cardiac inflammation. The study aims to determine the ratio of neutrophils to lymphocytes in persons with coronary artery disease to assess inflammation.A hospital's tertiary outpatient medical section Registration began in October 2019. They were given registration information when taken to Medicine. Patients who met the study's exclusion criteria couldn't enroll during registration. The study included 72 people.The data were looked at to see if neutrophils and lymphocytes are signs of inflammation in long-term coronary artery disease. 38 of the 72 participants had single vascular disease, 23 had double, and 11 had triple. 34 single vascular disease patients had NLR 2, 3 2,1-3, and 1 3. 23 patients with bilateral vascular disease had NLRs from 1-2 to 3. NLR > 3 in 11 patients with triple vessel disease. NLR for a single coronary vessel occlusion was 1.72 + 0.52, 2.36 + 0.75, and 3.72 + 0.67. (p 0.0001).2D echo, RWMA, and angiographic studies all showed NLRs were associated with CAD.So, there was a strong link between the neutrophil-to-lymphocyte ratio (NLR) and coronary artery disease.

Introduction

Inflammatory markers such as neutrophils, lymphocytes, and the neutrophil-to-lymphocyte ratio (NLR) have been linked to an increased risk of adverse clinical outcomes in patients who have had a myocardial infarction with ST elevation (STEMI)[1] or a myocardial infarction without ST elevation (N-STEMI).[2] Recent research has shed light on the role that inflammatory markers play in the onset and progression of atherosclerosis, and various biological markers of inflammation can accurately predict the risk of cardiovascular disease.[3] Due to the fact that it is an inflammatory condition, certain inflammatory indicators have been suggested for the evaluation of cardiovascular risk.

Classic markers of inflammation in cardiovascular disorders are frequently referred to as "inflammatory markers. Inflammatory markers.[4] NLR was thought to be a potential marker for determining inflammation in cardiac and non-cardiac disorders, as well as for predicting long-term mortality in patients with ST-segment elevation myocardial infarction who underwent percutaneous coronary intervention. These findings were published in the journal Circulation (STEMI). NLR has the potential to be employed as a cost-effective predictor of inflammation and cardiovascular problems due to the fact that the values for inflammatory markers may be easily obtained by regular blood count analysis.[5]So, we've decided to look at the ratio of neutrophils to lymphocytes in people with coronary artery disease.

Keywords: Inflammatory markers**,** ST-segment elevation myocardial infarction, coronary artery disease.

AIM

To investigate the relationship between neutrophils and lymphocytes as an indicator of inflammation in coronary artery disease by determining the ratio of neutrophils to lymphocytes in people who have coronary artery disease.

SOURCE OF SAMPLE:

The study was carried out at Krishna Hospital and Research Center's Department of Medicine for Outpatients.

INCLUSION CRITERIA

1. Age>18 years
2. Bothgender
3. Diagnosedwithcoronary arterydisease
4. Willingtoparticipate

EXCLUSION CRITERIA

1. Thepresenceofany activeorrecentinfections.
2. Patientswithotherhematopathology.
3. Patientswithsevereanaemia. (Hemoglobin<7g/dl)
4. PatientswithCerebrovascularAccident.

STUDY DESIGN: This was a cross-sectional study based on observations.

STUDY PERIOD: Patients were recruited for the study between the months of October 2019 and October 2021.

Material & Method

The outpatient medical section of a hospital that provides tertiary care October 2019 marked the beginning of the patient registration process. When they were brought into the Medicine section, they were given registration information. Patients who satisfied the requirements for being excluded from the study did not have the option to enroll in it throughout the registration process.Overall, there were 72 participants in the research project.

The primary purpose of this investigation was to investigate the effects of the neutrophils-to-lymphocytes ratio on chronic coronary artery disease by performing a coronary angiographic evaluation of cardiac functions (including LV systolic function, diastolic function, and resting RWMA).When participants registered for the study, baseline data were gathered on them, notably concerning sociodemographic factors, clinical findings, and another research. In order to explore neutrophils and lymphocytes as a potential inflammatory marker in long-standing coronary artery disease (also known as chronic disease), the data that was obtained was analyzed.

Data Collection

Using the normal protocol, each individual was examined. Before the trial began, participants gave written consent. Patients seen in Medicine who met the inclusion criteria were considered for the study. Interviews were done using a questionnaire containing questions regarding sociodemographic, addiction, the clinical profile, and other issues. The questionnaire also asked about past, present, and prior medical history. All patients were investigated using sputum, blood, cerebrospinal fluid, pleural fluid, ascitic fluid, and pus cultures.

CORONARYANGIOGRAPHY

Thefollowingparametersofcoronaryangiographicstudiesweretakenforconsideration:

1. Coronaryvesselsocclusion
2. Stenosisofvessels
3. Thrombosis
4. Aneurysmalenlargement ofcoronaryvessels.

2D ECHOCARDIOGRAPHY

On GE/Seimens echocardiography equipment with M-mode, Doppler, and 2D-echocardiography, the following left ventricular characteristics were studied: Left ventricular (LV) end systolic (ESD) and end diastolic (EDD) diameters are measured by M-mode, and end systolic and diastolic volumes by Simpson's biplane method. By using the biplane Simpson's method, we can find the LV stroke volume (SV), cardiac output (CO), cardiac index (CI), fractional shortening (FS), and ejection fraction (EF). The reference standards and formulae put up by the European Society.

STASTICAL ANALYSIS

Excel was used during the compilation of the data. IBM SPSS Statistics Version 21.0 and Openepi Version 2.3.1 were used throughout all of the statistical analyses. Descriptive statistics such as percentage, mean, range, and standard deviation were used to provide an explanation of the data. Chi square was used to analyse qualitative data, and student t was used to analyse quantitative data. A p-value greater than 0.05 was considered significant.

Result

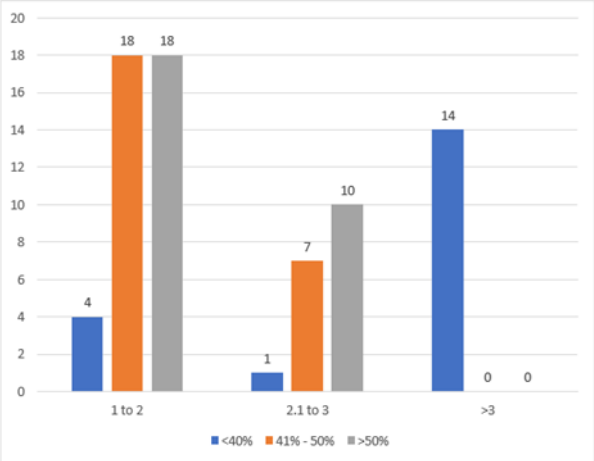
2DECHO FINDINGS

There was a total of 72 participants with coronary artery disease in this analysis. Out of 72 people, 28 had an ejection fraction in the left ventricle of greater than 50%; 25 had an ejection fraction between 41% and 50%; and 19 had an ejection fraction in the left ventricle of less than 40%. The current study found that the mean EF% was 46.65 and the standard deviation was (+11.3). Among the 19 patients with LVEF40, 4 had NLR 2, 1 had NLR 2, 1-3, and 14 had NLR >3. In a sample of 25 patients with LVEF between 41% and 50%, 18 patients had an NLR of 1-2 and 7 patients had an NLR of 2.1-3. There was a statistically significant difference between the NLRs of the 18 patients with LVEF > 50% and the NLRs of the 10 patients with NLRs between 2.1-3 ('p' 0.00001).

Table 1: Distribution of study population depending on left ventricular ejectionfraction (LVEF) and its association with NLR in study population of coronaryarterydisease.

NLR	LVEF <40%	LVEF 40%-50%	LVEF > 50%	Total	Mean LVEF ± SD	'p' value
1-2	4 (5.55%)	18 (25%)	18 (25%)	40	46.65 ±11.3	<0.00001
2.1-3	1 (1.38%)	7 (9.72%)	10 (13.88%)	18		
>3	14 (19.44%)	0	0	14		
Total	19 (26.38%)	25 (34.72%)	28 (38.88%)	72		

Graph 1: AssociationbetweenNLRandLeftventricularejectionfraction(LVEF)in a studypopulation having coronary arterydisease

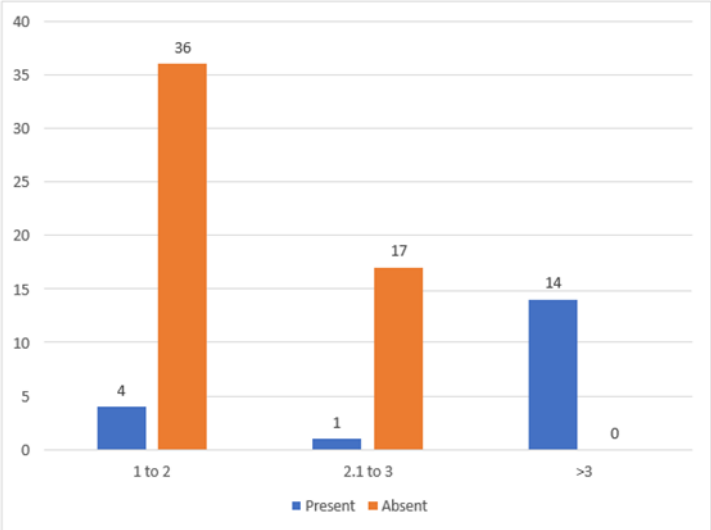


There was a total of 72 participants with coronary artery disease in this analysis. Regional wall motion abnormality (RWMA) was present in 19 of 72 participants, or 26.38 percent, while in 53 of the subjects it was not present at all (RWMA). Four of the 19 participants with resting regional wall motion abnormality (RWMA) had NLR values between 1-2, one had NLR values between 2.2-3, and fourteen had NLR values greater than 3; this difference was statistically significant ('p' 0.0001).

Table 2: Distribution of study population based on resting regional wall motionabnormality(RWMA)anditsassociationwithNLRinstudypopulationofcoronaryartery disease.

NLR	RWMA present	No RWMA	Total	'p' value
1-2	4 (5.55%)	36 (50%)	40	<0.0001
2.1-3	1 (1.38%)	17 (23.61%)	18	
>3	14 (19.44%)	0	14	
Total	19 (26.38%)	53 (73.62%)	72	

Graph 2:AssociationbetweenNLRandrestingregionalwallmotionabnormality(RWMA)ina studypopulationhaving coronary arterydisease.



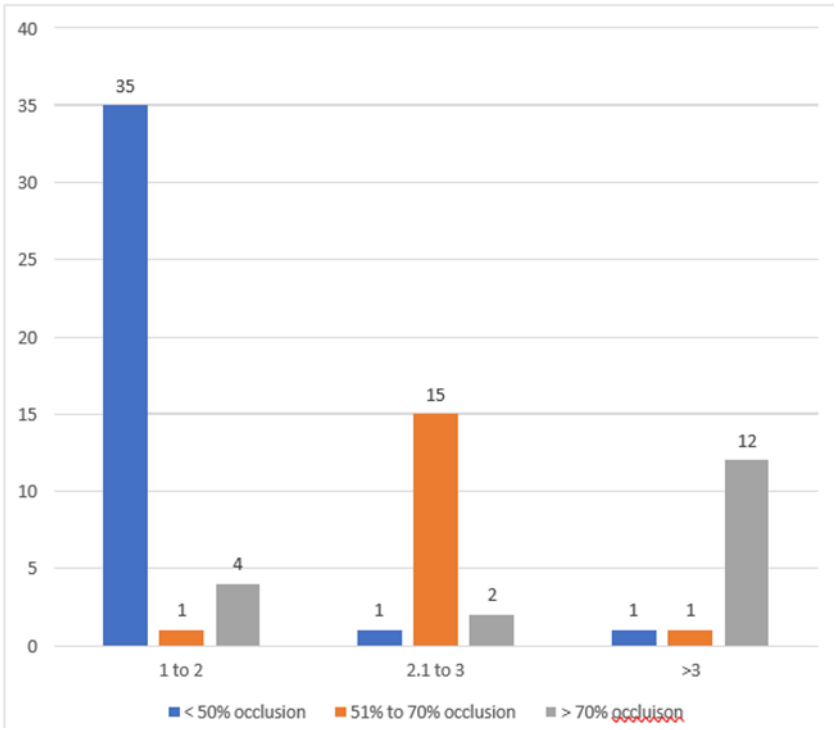
ANGIOGRAPHIC FINDINGS

This study includes 72 patients with coronary artery disease. 37 individuals had 50% blockage in any coronary artery, 17 had 50%–70% occlusion, and 18 had >70% occlusion. 37 patients with 50% blockage had NLR between 1 and 2, 1 between 2 and 3, and 1 above 3. 17 individuals with 50%–70% coronary artery blockage exhibited NLRs between 1-2, 2.1-3, and >3. 18 individuals with >70% blockage had NLRs of 1-2, 2.1-3, and >3. Subjects with 50% blockage had a mean NLR of 1.57 + 0.44, 50-70% had 2.24 + 0.23, and >70% had 3.52 + 0.72. In stable CHD patients, an increasing NLR ratio was associated with the severity of coronary artery stenosis (p 0.0001). This showed a statistically significant difference.

Table 3: Distribution of severity of occlusion of coronary arteries among thestudypopulationbasedoncoronaryangiographyanditsassociationwithNLR.

NLR	<50% occlusion	51% to 70% occlusion	>70% occlusion	Total	'p' value
1-2	35(48.61%)	1 (1.38%)	4 (5.55%)	40	<0.00001
2.1-3	1 (1.38%)	15 (2.83%)	2 (2.77%)	18	
>3	1 (1.38%)	1 (1.38%)	12(16.66%)	14	
Total	37(51.38%)	17(23.61%)	18 (25%)	72	
Mean NLR±SD	1.57±0.44	2.24±0.23	3.52±0.72		

Graph 3: AssociationbetweenNLRandseverityofcoronaryarteriesocclusionin a studypopulation having coronaryartery disease.

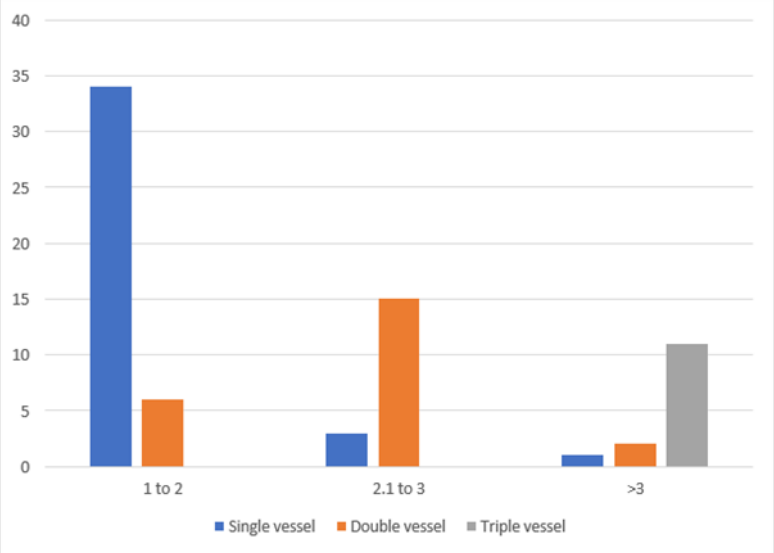


This study includes 72 patients with coronary artery disease. 38 of the 72 participants had single vessel illness, 23 had double vessel disease, and 11 had triple vessel disease. 34 single vascular disease patients had NLR between 1-2, 3 had NLR between 2.1-3, and 1 had NLR > 3. 23 patients with double vascular disease had NLRs between 1-2, 2.1-3, and >3. NLR > 3 was found in 11 triple vessel disease patients. The mean NLR for a single coronary vessel occlusion was 1.72 + 0.52, 2.36 + 0.75, and 3.72 + 0.67 (p 0.0001).

Table 4: Relationofnumberofcoronaryarteriesinvolvedoncoronaryangiographywith NLRratio.

NLR	Single vessel	Double vessel	Triple vessel	Total	'p' value
1-2	34 (47.22%)	6 (8.33%)	0	40	<0.00001
2-3	3 (4.16%)	15 (20.83%)	0	18	
>3	1 (1.38%)	2 (2.77%)	11 (15.27%)	14	
Total	38 (52.77%)	23(31.94%)	11(15.27%)	n= 72	
Mean NLR ±SD	1.72±0.52	2.36±0.75	3.72±0.67		

Graph 4: Relationofnumberofcoronaryarteriesinvolvedoncoronaryangiographywith NLRratio.



Discussion

The mean value of the LVEF was 46.65 (+11.3). The majority, 38.88%, had LVEF greater than or equal to 50%, followed by 34.72% who had LVEF in the range of 40% - 50%, and 26.38% who had LVEF less than or equal to 40%. According to research carried out by Kamal Sharma and colleagues, the average EF was 55.55 (plus 5.04). (61). The correlation between NLR and LVEF was shown to have a very high statistical significance (p 0.0001). The results of a study conducted by Kamal Sharma and colleagues showed that there was no statistical significance found between NLR and LVEF ('p' = 0.333). (61). In the current study, 26.38 percent of subjects had an anomaly in the impaired resting regional wall motion (RWMA). NLR and resting RWMA were found to have a highly significant statistical relationship (p less than 0.0001).

Thirty-eight participants (52.77 percent), twenty-three (31.94%), and eleven (15.27 percent) of the current study's participants had single-, double-, or triple-vessel disease, respectively. The correlation between NLR and coronary

artery involvement on a coronary angiogram was highly significant (p 0.0001). The results of the angiography showed that 51.38 percent of the individuals had occlusions of less than 50%, 23.61% had occlusions of between 50% and 70%, and 25% had occlusions of more than 70%. Subjects with occlusion 50% had a mean NLR of 1.57 (+0.44); those with occlusion between 50 and 70% had a mean NLR of 2.24 (+0.23); and those with occlusion 70% had a mean NLR of 3.52 (+0.72) (p 0.0001).According to the findings of the angiography study, the majority of the subjects had coronary artery disease, with 52.77% of them having single-vessel coronary artery disease, 31.94% having double-vessel coronary artery disease, and the remaining 15.27% having triple-vessel coronary artery disease.

The mean NLR for participants who had a single coronary artery occlusion was 1.72 (+0.52), whereas the mean NLR for subjects who had a double coronary vessel occlusion was 2.36 (+0.75), and the mean NLR for subjects who had a triple coronary vessel occlusion was 3.72 (+0.67). ($p<0.0001$).Misumida N et al. found that 44 people (62%) had a neutrophil-to-lymphocyte ratio (NLR) of 2.8 or lower. Patients with NLR 2.8 were usually older and had left main or 3 vessel disease.[6] As demonstrated by Song M et al.'s study and statistically confirmed by the NLR ratio, the vast majority of people had single-vessel illness. In the present investigation, we also found similar outcomes.[7]

Conclusion

The neutrophil-to-lymphocyte ratio (NLR) was strongly linked to coronary artery disease in this study. Neutrophil-to-lymphocyte ratio (NLR) is negatively correlated with left ventricular ejection fraction ($r = -0.56847$). The neutrophil-to-lymphocyte ratio is a marker for coronary artery disease severity.

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