Original Research Paper

General Surgery

COMPARISON OF NEUTROPHIL LYMPHOCYTE COUNT RATIO (NLCR)WITH HISTOPATHOLOGICAL FINDINGS IN ACUTE APPENDICITIS IN TERTIARY CARE CENTRE – A RETROSPECTIVE STUDY

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ABSTRACT

Background: Acute appendicitis, a sudden inflammation of the appendix, is a leading cause of abdominal pain requiring emergency surgery. However, pinpointing appendicitis can be tricky. While clinical symptoms and imaging techniques offer valuable clues, a definitive diagnosis often hinges on surgical exploration and subsequent histological examination of the appendix itself. The neutrophil-to-lymphocyte ratio (NLR), a simple and cost-effective blood test, has emerged as a potential candidate for this role. NLR is calculated by dividing the number of neutrophils, white blood cells that fight bacterial infections, by the number of lymphocytes, **Materials And Methods:** The study was approved by institutional ethical committee. Retrospective study having APPENDICITIS who have undergone EMERGENCY APPENDECTOMY. 60 study subjects are taken from the Department of General surgery, Sri Devaraj Urs Medical College over period of 6 Months (July 2023- December 2023). **Results:** There were 40 patients with acute appendicitis in this category (n=40), and the p-value (0.009) suggests a statistically significant difference in NLRC scores between this group and the reference group (likely healthy patients or a group with a different condition). Acute Suppurative Appendicitis: The NLRC score is 7.06 with a standard deviation of 4.09 (n=8). Acute Gangrenous Appendicitis: The NLRC score is 10.33 with a standard deviation of 5.29 (n=6). Acute Appendicitis with Peri-appendicitis: The NLRC score is 3.75 with a standard deviation of 2.08 (n=4). Acute on Chronic Appendicitis: The NLRC score is 5.00 with a standard deviation of 3.71 (n=10). **Conclusion:** In conclusion, this study suggests that NLR holds promise as a biomarker for diagnosing and potentially differentiating subtypes of acute appendicitis.

KEYWORDS : Appendicitis, NLCR (neutrophil-to-lymphocyte count ratio),

INTRODUCTION:

Acute appendicitis, a sudden inflammation of the appendix, is a leading cause of abdominal pain requiring emergency surgery. However, pinpointing appendicitis can be tricky. While clinical symptoms and imaging techniques offer valuable clues, a definitive diagnosis often hinges on surgical exploration and subsequent histological examination of the appendix itself. This dependence on surgery creates a need for more non-invasive and readily available tools to aid in accurate and timely diagnosis.[1]

The neutrophil-to-lymphocyte ratio (NLR), a simple and cost-effective blood test, has emerged as a potential candidate for this role. NLR is calculated by dividing the number of neutrophils, white blood cells that fight bacterial infections, by the number of lymphocytes, white blood cells involved in the immune response. [2] Studies suggest that NLR might be elevated in patients with appendicitis, potentially reflecting the body's inflammatory response to the inflamed appendix.[1]

This retrospective study, conducted at a tertiary care centre, aims to investigate the correlation between NLR and the severity of inflammation observed in the histological analysis of surgically removed appendices. [2]By comparing NLR values with the histopathological findings, we hope to determine the potential of NLR as a biomarker for diagnosing and classifying acute appendicitis.

This research holds significant value because:
- **Improved Diagnostic Accuracy:** A reliable NLR threshold could potentially improve the ability to differentiate appendicitis from other causes of abdominal pain, leading to more targeted treatment approaches.
- **Reduced Unnecessary Surgeries:** By identifying cases with low NLR suggestive of a low likelihood of appendicitis, NLR could help avoid unnecessary surgeries and their associated risks.

- **Enhanced Risk Stratification:** NLR might offer insights into the severity of appendicitis, allowing for better patient stratification and management.[2]

This study contributes to the ongoing exploration of NLR as a potential diagnostic and prognostic tool in acute appendicitis. By evaluating its correlation with histopathological findings, we can gain valuable insights into its effectiveness for improving patient care in this common surgical emergency.[3]

Nlcr Ratio:
- Marker of inflammation.
- Calculated from WBC count.
- Simple and inexpensive.
- Information regarding immune and inflammatory pathway.
- Potential marker to predict appendicitis and its severity.
- NLCR >3.5 sensitive marker with diagnostic accuracy.[4]

Objectives:
To determine and compare NEUTROPHIL: LYMPHOCYTE COUNT RATIO (NLCR) with HISTOPATHOLOGICAL findings in tertiary care centre.

Methodology:
Study design, sample size and source of data:
The study was approved by institutional ethical committee. Retrospective study having APPENDICITIS who have undergone EMERGENCY APPENDECTOMY. 60 study subjects are taken from the Department of General surgery, Sri Devaraj Urs Medical College over period of 6 Months (July 2023- December 2023).

Inclusion Criteria:
- All patients who underwent emergency appendectomy.

Exclusion Criteria:
- Interval appendicectomy

- Lacking Histopathological report
- Post chemotherapy and immunosuppressive status.

METHOD OF DATA COLLECTION:
After obtaining the ethical clearance for the retrospective study. Acute appendicitis confirmed clinically and by ultrasound examination. Data collected retrospectively from prospectively maintained hospital database (electronic/case sheets). Information was taken from medical record department. Collection of histopathological reports were done for conformation of acute appendicitis.

Complete blood count was done for the selected patients. Ratio of Neutrophils to Lymphocyte was taken (NLCR). All variables for calculating NLCR were recorded. Calculated using an electronic calculator. The investigator recorded the study calculation for each patient.

Statistical analysis:
After collecting, the data were compiled using Microsoft excel and analysis was done using SPSS software version 16. All continuous variables were represented as Mean and standard deviation and categorical variables were expressed percentages and proportions. The test of significance was one way ANOVA test. The tests were considered significant if p value was <0.05 for 95 Confidence intervals.

RESULTS:
The study comprised a single group of patients who have undergone Emergency appendectomy for Appendicitis. The mean age of all the cases were 26.97 ± 13.47 years. There was no significant difference in the age between two groups (p > 0.05). In the majority were males 38(63.33%) and females 22 (36.7%). The demographic characteristics are summarized in table 1.

Table 1. Comparison of baseline characteristics

DEMOGRAPHIC DATA	VALUES (N=60)	
Age (in years) (Mean ± Sd)	26.97 ± 13.47	
Gender N (%)	Males	38(63.33%)
	Females	22 (36.7%)

Out of 60 case take n of Emergency Appendectomy, there were 32 (53.3%) cases of Acute appendicitis; 8(13.3%) cases of Acute Suppurative appendicitis, 6(10%) cases of Acute Gangrenous Appendicitis; 4(6.7%) Acute Appendicitis with peri-appendicitis; and 10 (16.7%) cases of Acute on Chronic Appendicitis. Diagnostic difference of the number of cases considered in the study are summarized in Table 2.

Table 2: Diagnostic Classification Of The Study Population

DIAGNOSIS	FREQUENCY N (N=60)	PERCENTA GE (%)
ACUTE APPENDICITIS	32	53.3%
ACUTE SUPPURATIVE APPENDICITIS	8	13.3%
ACUTE GANGRENOUS APPENDICITIS	6	10%
ACUTE APPENDICITIS WITH PERIAPPENDICITIS	4	6.7%
ACUTE ON CHRONIC APPENDICITIS	10	16.7%

The signs and symptoms seen in patients that were admitted and underwent Emergency Appendectomy. Out of 60 patients, 60 (100%) of the cases presented with Right iliac fossa tenderness; 22(36%) of the cases presented with Rebound tenderness; 58(96.6%) of the cases presented with Anorexia; 50(83.3%) of the cases presented with Nausea; 40(66.6%) of the cases presented with Vomiting, 53(88.3%) of the cases presented with Migratory pain; and 29(48.3%) of the cases presented with fever. Signs and symptoms of the study population in the study is summarized in Table 3.

Table 3: Signs And Symptoms Of The Study Population

SIGNS & SYMPTOMS	FREQUENCY N (N=90)	PERCENTAG E (%)
RIGHT ILIAC FOSSA TENDERNESS	60	100%
REBOUND TENDERNESS	22	36.6%
ANOREXIA	58	96.6%
NAUSEA	50	83.3%
VOMITING	40	66.6%
MIGRATORY PAIN	53	88.3%
FEVER	29	48.3%

There is a total of 60 participants (n=60) of Emergency Appendectomy taken. NLCR scores (Mean ± sd): the average Neutrophil Lymphocyte Count Ratio (NLCR) scores for each diagnosis group. The subtypes of acute appendicitis, Acute Suppurative Appendicitis, Acute Gangrenous appendicitis, Acute appendicitis with peri-appendicitis, Acute on Chronic appendicitis were considered. Each subtype has its own average NLCR score, standard deviation, and p-value compared to the reference group. This table shows the statistical significance of the difference in NLCR scores between the diagnosis group and a reference group (likely healthy patients or a group with a different condition). A p-value less than 0.05 is generally considered statistically significant. The p-value (0.009) done using one way ANOVA test suggests a statistically significant difference in NLCR scores between this group and the reference group. Association between diagnostic subtypes and neutrophil lymphocyte count ratio (NLCR) scores of study population in the study is summarized in table 4.

Table 4: Association Between Diagnostic Subtypes And Neutrophil Lymphocyte Count Ratio (nlcr) Scores

DIAGNOSIS (N=60)	NLCR scores (Mean ± sd)	p Value
ACUTE APPENDICITIS (N=32)	4.12 ± 3.86	0.009*
ACUTE SUPPURATIVE APPENDICITIS (N=8)	7.06 ± 4.09	
ACUTE GANGRENOUS APPENDICITIS (N=6)	10.33 ± 5.29	
ACUTE APPENDICITIS WITH PERI-APPENDICITIS (N=4)	3.75 ± 2.08	
ACUTE ON CHRONIC APPENDICITIS (N= 10)	5.00 ± 3.71	

*p Value < 0.05 is considered statistically Significant

The NLRC score is 4.12 with a standard deviation of 3.86. This means that the average NLRC score for patients with acute appendicitis was 4.12, but there was a variation in scores among the patients in this group. There were 40 patients with acute appendicitis in this category (n=40), and the p-value (0.009) suggests a statistically significant difference in NLRC scores between this group and the reference group (likely healthy patients or a group with a different condition). Acute Suppurative Appendicitis: The NLRC score is 7.06 with a standard deviation of 4.09 (n=8). Acute Gangrenous Appendicitis: The NLRC score is 10.33 with a standard deviation of 5.29 (n=6). Acute Appendicitis with Peri-appendicitis: The NLRC score is 3.75 with a standard deviation of 2.08 (n=4). Acute on Chronic Appendicitis: The NLRC score is 5.00 with a standard deviation of 3.71 (n=10). Table 5: classification of appendicitis subtypes based on neutrophil lymphocyte count ratio (NLCR) score of study population in the study is summarized in table 5.

Table 5: Classification Of Appendicitis Subtypes Based On Neutrophils Lymphocyte Count Ratio (nlcr) Score

Diagnosis (N=60)	NLCR SCORES			
	<3.5	3.5 – 4.5	4.5 - 6	>6

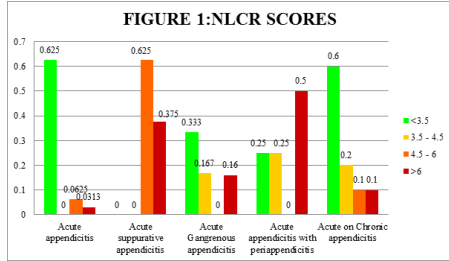|				
Acute Appendicitis (N=32)	20 (62.5%)	0 (0%)	2 (6.25%)	10 (3.13%)
Acute Suppurative Appendicitis (N=8)	0 (0%)	0 (0%)	5 (62.5%)	3 (37.5%)
Acute Gangrenous Appendicitis (N=6)	2 (33.3%)	1 (16.6%)	0 (0%)	3 (16%)
Acute Appendicitis with Peri-appendicitis (N=4)	1 (25%)	1 (25%)	0 (0%)	2 (50%)
Acute On Chronic Appendicitis (N= 10)	6 (60%)	2 (20%)	1 (10%)	1 (10%)

Figure 1. shows the NCLR score in Graph form

DISCUSSION:

Acute appendicitis, a sudden inflammation of the appendix, is a surgical emergency often presenting with a diagnostic challenge. While clinical symptoms and imaging studies offer clues, a definitive diagnosis frequently relies on surgery and subsequent analysis of the appendix itself. This dependence on surgery highlights the need for more accessible tools to aid in accurate and timely diagnosis.[5]

The neutrophil-to-lymphocyte count ratio (NLR) emerges as a potential candidate for this role. Neutrophils are a type of white blood cell that are part of the innate immune system and are the first responders to infection and inflammation.[5] Lymphocytes are another type of white blood cell that are part of the adaptive immune system and help to fight off specific infections. This simple and cost-effective blood test calculates the ratio of neutrophils, infection-fighting white blood cells, to lymphocytes, white blood cells involved in the immune response. Studies suggest that NLR might be elevated in patients with appendicitis, potentially reflecting the body's inflammatory response to the inflamed appendix.[6]

Elevated NLR often indicates inflammation or infection. In appendicitis, the inflamed appendix triggers an inflammatory response, potentially leading to a higher NLR.[6]

Studies, including those analyzing NLCR and its association with various appendicitis subtypes, demonstrate a correlation between elevated NLR and confirmed cases of appendicitis.[6,7] There might be a trend towards higher NLR scores in patients with more severe forms of appendicitis, suggesting a possible role in differentiating subtypes beyond simply diagnosing the presence of the condition.[7]

Unlike surgery or complex imaging techniques, NLR requires a simple blood test, making it a more accessible tool. A reliable NLR threshold could potentially improve the ability to differentiate appendicitis from other causes of abdominal pain, leading to more targeted treatment approaches.[7,8]

By identifying cases with low NLR suggestive of a low likelihood of appendicitis, NLR could help avoid unnecessary surgeries and their associated risks.

Reference range: A normal NLR is generally considered to be between 1 and 3. However, this range may vary depending on the laboratory and the patient's age.[8]
- An NLR greater than 3 may indicate the presence of inflammation or infection.
- An NLR less than 1 may indicate a weakened immune

system.

However, limitations exist:[8]
1. **Cut-off Value Uncertainty:** Without a definitive NLR cut-off value established in relation to a healthy reference group, interpreting NLR results for diagnosis can be challenging.
2. **Retrospective Studies:** Current research often relies on retrospective studies, which analyse existing data and cannot establish cause-and-effect relationships.
3. **Need for Validation:** Further research in larger prospective studies is needed to validate the findings from current studies and determine the optimal role of NLR in clinical practice.

Future research should focus on:[9]
- **Prospective Studies:** Conducting larger prospective studies to validate the findings on NLCR and appendicitis.
- **Comparison with Other Tools:** Comparing NLR with existing diagnostic modalities like imaging and clinical scoring systems to determine its relative effectiveness.
- **NLR Cut-off Value:** Establishing an optimal NLCR cut-off value for diagnosing appendicitis with high sensitivity and specificity.
- **NLR and Subtype Differentiation:** Investigating the potential of NLR in differentiating between various appendicitis subtypes in a prospective study design.
- **NLR as a Prognostic Tool:** Exploring the potential of NLR as a prognostic tool to predict the course of appendicitis and treatment outcomes.

While further research is necessary to solidify NLCR's role in diagnosing appendicitis, its potential is significant. NLR has the potential to become a valuable tool for improving diagnostic accuracy, reducing unnecessary surgeries, and potentially aiding in risk stratification for better patient management. As research continues to explore NLCR and its applications, it might become a game-changer in the world of appendicitis diagnosis.[9,10]

RESULTS:

In conclusion, this study suggests that NLR holds promise as a biomarker for diagnosing and potentially differentiating subtypes of acute appendicitis. Further research is needed to validate these findings and establish the optimal role of NLR in clinical practice.

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