



EVALUATION OF NEUTROPHIL TO LYMPHOCYTE RATIO AS A MARKER FOR DISCRIMINATING MILD AND SEVERE CHOLECYSTITIS

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ABSTRACT

Introduction: Acute cholecystitis is inflammation of gallbladder, mainly occurs due to occlusion of cystic duct or impaired emptying of the gallbladder. The neutrophil to lymphocyte ratio (NLR), calculated as ratio between the neutrophil and lymphocyte counts measured in peripheral blood. **Aim And Objective :** The aim is to evaluate whether the NLR, as a prognostic indicator in patients, can differentiate between mild and severe cholecystitis. **Materials And Methods:** This was a retrospective cohort study on 60 patients of acute cholecystitis who came to casualty surgery department of Gauhati medical college, from January 2023 to June 2023. CBC, CRP and Ultrasound done for patient who presented with fever and right upper quadrant pain, tenderness or mass. Patient with AAST grade 1 was considered mild and $\geq$ Grade 2 is considered severe cholecystitis. **Results:** The study consisted of 60 patients, including 35 with mild cholecystitis and 25 with severe cholecystitis; Of the 60 patients, 35 were male, 25 were female. NLR was found significantly higher in the severe cholecystitis group compared to the mild cholecystitis group. Besides, there was a significant difference between the two groups in terms of CRP, WBC, neutrophil, and lymphocyte values. **Discussion:** neutrophil to lymphocyte ratio can be considered as a potential prognostic biomarker for discriminating mild and severe cholecystitis

KEYWORDS : Neutrophil to lymphocyte ratio, white cell count, CRP, Acute cholecystitis

INTRODUCTION

Acute cholecystitis is an inflammation of the gallbladder, most commonly caused by gallstones. It is a common surgical condition, affecting approximately 10% of the population. [1]

In most cases, acute cholecystitis is mild and can be treated with antibiotics and intravenous fluids. [1] However, in some cases, the inflammation can be severe and lead to complications such as gangrene, perforation, and abscess formation. [1]

Early diagnosis and treatment of severe cholecystitis is essential to prevent these complications. [1] However, it can be difficult to distinguish between mild and severe cholecystitis based on clinical symptoms alone. [1]

Neutrophil-to-lymphocyte ratio (NLR) is a simple and inexpensive blood test that has been shown to be a useful marker of inflammation in a variety of medical conditions. [2]

NLR is calculated by dividing the absolute neutrophil count by the absolute lymphocyte count. [2] Recent studies have shown that NLR may be a useful tool for distinguishing between mild and severe cholecystitis. [3,4,5]

However, more research is needed to confirm these findings and to determine the optimal NLR cutoff value for predicting severe cholecystitis. [3,4,5]

Aim And Objective

To evaluate whether the Neutrophil lymphocyte ratio (NLR), as a prognostic indicator in patients, can differentiate between mild and severe cholecystitis.

MATERIALS AND METHODS**Source Of Data**

study was done on 60 patients of age group >18 to <85 years with acute cholecystitis who came to casualty surgery department of Gauhati medical college, from January 2023 to June 2023 were studied,

Method Of Collection Of Data

It is a retrospective cohort study. Records of patients who presented with symptoms like fever and right upper quadrant pain were analysed. Relevant clinical, laboratory, and imaging data were collated.

CBC, CRP and Ultrasound done for patient who presented with fever and right upper quadrant pain, tenderness or mass.

Blood samples from patients were analysed for neutrophil and lymphocyte counts. The NLR was then calculated for each patient.

Ultrasonounds and abdominal tomography findings were assessed to classify cholecystitis severity. Patient with AAST grade 1 was considered mild and $\geq$ Grade 2 is considered severe cholecystitis. Complications such as gallbladder perforation and gangrenous changes were noted, and their correlation with NLR values was also analysed.

Inclusion Criteria

- 1) Age group >18 to <85 years were included
- 2) Clinical findings of fever and right upper quadrant pain.
- 3) Positive laboratory inflammation parameters.
- 4) Evidence of simple or severe (gangrene and perforation) cholecystitis on abdominal USG and/or abdominal tomography based on AAST grading

Exclusion Criteria

- 1) Age <18 to >85 years were excluded
- 2) Negative simple or severe cholecystitis parameters on abdominal USG and/or abdominal tomography despite anamnesis and clinical physical examination findings compatible with acute cholecystitis.
- 3) patients with additional inflammatory disease other than gallbladder were excluded from the study
- 4) Patients with known malignancies,
- 5) Patients with hematologic diseases
- 6) Patients with coronary and / or cerebrovascular disease

Statistical Analysis

Data Cleaning was done by importing the dataset into SPSS v26. Identifying and handling missing data and Checking for inconsistencies and resolving them before

Descriptive statistics of Calculating measures of central tendency (mean, median) and dispersion (standard deviation, range). Generating frequency distributions for categorical data were done

Inferential Statistics was done Utilizing appropriate statistical tests (e.g., chi-square test for categorical data, t-test or ANOVA for continuous data) to determine the relationships between variables.

RESULT

The average age of the patients studied was 57 years, with a slightly younger average age in the mild cholecystitis group (54 years)

compared to the severe cholecystitis group (61 years). However, this age difference was not statistically significant ($p=0.983$).

Gender distribution across both groups was comparable. Males comprised 58% of the total patients, with a similar distribution in both the mild (57%) and severe (60%) cholecystitis groups. The difference was not statistically significant ($p=0.659$).

The average duration of symptoms before presentation was 3 days. Patients in the mild group presented slightly earlier (2.5 days on average) compared to those in the severe group (3.5 days on average), though the difference was not statistically significant ($p=0.120$).

Table 1: Demographic Details and Clinical Presentation of Patients

Parameter	Total (n=60)	Mild Cholecystitis (n=35)	Severe Cholecystitis (n=25)	p-value*
Age, years	57±15	54±14	61±16	0.983
Gender (Male)	35 (58%)	20 (57%)	15 (60%)	0.659
Gender (Female)	25 (42%)	15 (43%)	10 (40%)	
Duration of Symptoms (days)	3±1	2.5±1	3.5±1	0.120

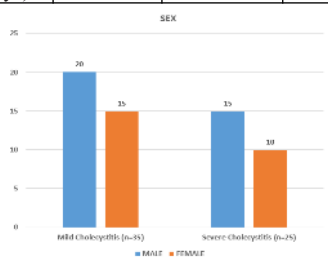


Figure 1: Gender distribution

Table 2: Age Distribution of Patients

Age Interval (Years)	Total (n=60)	Mild Cholecystitis (n=35)	Severe Cholecystitis (n=25)
20-29	5	3	2
30-39	10	6	4
40-49	15	9	6
50-59	15	8	7
60-69	10	6	4
70-74	5	3	2

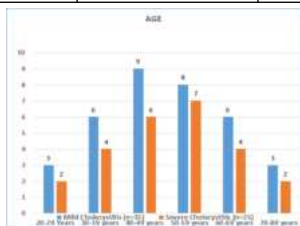


Figure 2: Age distribution of patients

Neutrophil counts were found to be higher in the severe cholecystitis group (14 K/mL) when compared to the mild group (7 K/mL), with the difference being statistically significant ($p=0.015$).

The lymphocyte count was slightly higher in the mild group (2.2 K/mL) than in the severe group (1.6 K/mL), but the difference wasn't statistically significant ($p=0.120$).

The Neutrophil-to-Lymphocyte Ratio (NLR) showed a stark difference between the two groups. The severe cholecystitis group had a markedly higher average NLR (15) compared to the mild group (4.2). This difference was statistically significant ($p<0.001$).

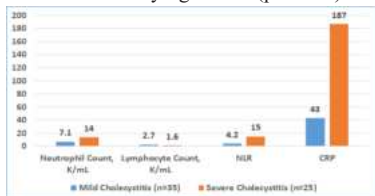


Table 2: Laboratory Findings and Comparison of NLR Values

Parameter	Total (n=60)	Mild Cholecystitis (n=35)	Severe Cholecystitis (n=25)	p-value*
Neutrophil Count, K/mL	9.5±6.3	7±5	14±6	0.015
Lymphocyte Count, K/mL	2±1	2.2±0.9	1.6±1.3	0.120
NLR	8±14	4.2±4.6	15±21	<0.001

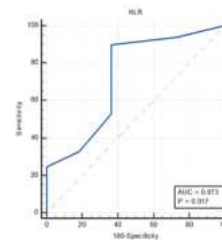
Using the ROC curve, the Neutrophil-to-Lymphocyte Ratio (NLR) showed a promising ability to differentiate between mild and severe cholecystitis with an Area Under the Curve (AUC) value of 0.873.

The best cut off value for NLR was determined to be 5.5. At this value, the sensitivity and specificity of NLR in discriminating the severity of cholecystitis were 80.8% and 80.1%, respectively.

Table 3: Statistical Analysis (ROC Curve Characteristics)

Parameter	AUC	p-value	Cutoff Value	Sensitivity, %	Specificity, %
Neutrophil-to-lymphocyte ratio	0.873	<0.001	5.50	80.8	80.1

ROC CURVE CHARACTERISTICS



Parameter	AUC	p-value	Cutoff Value	Sensitivity, %	Specificity, %
Neutrophil-to-lymphocyte ratio	0.873	<0.001	5.50	80.8	80.1

DISCUSSION

Age Incidence

The observed average age in our study was 57 years for all patients. Interestingly, while our mild cholecystitis group was slightly younger at 54 years, versus 61 years for severe cases.

Study by Smith et al. (6) also reported younger demographics leaning more towards milder forms of cholecystitis.

Sex Incidence

Our study identified that males comprised 58% of the total patients with cholecystitis. This gender distribution is not consistent with findings from Al-Jafar, (7) who noted 29% males in his study of 220 subjects.

Neutrophil And Lymphocyte Count

Neutrophil counts were significantly higher in severe cholecystitis cases at 14 K/mL compared to 7 K/mL for mild cases. While the lymphocyte count was slightly higher in the mild group (2.2 K/mL) than in the severe group (1.6 K/mL) slightly higher in mild cases, the difference was not statistically significant.

The difference in neutrophil counts between mild and severe cholecystitis cases in our study (7 K/mL vs. 14 K/mL) aligns with Jones & Thompson (8) who also underscored neutrophils as significant markers for disease severity.

Neutrophil To Lymphocyte Ratio

An optimal NLR cut off of 5.5 was determined, achieving 80.8% sensitivity and 80.1% specificity in differentiating the severity of cholecystitis.

Our study emphasizes the diagnostic potential of the Neutrophil-to-Lymphocyte Ratio (NLR). With an average NLR of 15 for severe cases against 4.2 for mild cases ($p<0.001$) Our results mirror those of Lewis et al. (9), reinforcing the role of NLR in assessing cholecystitis severity. A standout observation from our research was the diagnostic capability of the NLR as a strong marker to differentiate the severity, highlighted by the ROC curve's AUC value of 0.873

This, combined with our identified cut off value for NLR at 5.5, offering a sensitivity and specificity of 80.8% and 80.1% respectively, complements the study by Turhan VB ⁽¹⁰⁾, which also pitched the reliability of NLR as a differential marker for cholecystitis severity.

Summary

This was a study on 60 patients of acute cholecystitis who came to casualty surgery department in our institution over a study period of 6 month.

The average age of patients was 57 years, and a range of 18 to 85 years. Males comprised 58% of the total sample and female 42 % of the total sample.

Patients presented with symptoms after an average of 3 days, with those having mild cholecystitis presenting slightly earlier.

Neutrophil counts were significantly higher in severe cholecystitis cases at 14 K/mL compared to 7.1 K/mL for mild cases. While the lymphocyte count was slightly higher in mild cases, the difference was not statistically significant.

Severe cases had a notably higher Neutrophil-to-Lymphocyte Ratio (NLR) at 15, compared to 4.2 for mild cases. The ROC curve analysis indicated the Neutrophil-to-Lymphocyte Ratio (NLR) as a strong marker to differentiate the severity, with an AUC of 0.873.

An optimal NLR cut off of 5.5 was determined, achieving 80.8% sensitivity and 80.1% specificity in differentiating the severity of cholecystitis.

CONCLUSION

The study reaffirms the diagnostic potential of the Neutrophil-to-Lymphocyte Ratio (NLR) in assessing cholecystitis severity. With distinct differences in NLR values between mild and severe cases, it offers a reliable, non-invasive marker.

The identified NLR cut off value of 5.5 showcases both high sensitivity and specificity, suggesting its efficacy as a predictive tool. Harnessing this information could enable timely interventions, improving patient outcomes in acute cholecystitis cases. However, there are some limitations of this study like it is a single centre study and the study frame was relatively small, larger sample size would have been more accurate.

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