



## Original Research Article

# PREOPERATIVE NEUTROPHIL-LYMPHOCYTE RATIO AS A PREDICTOR OF OPERATIVE DIFFICULTY AND POSTOPERATIVE OUTCOMES IN OPEN CHOLECYSTECTOMY: A RETROSPECTIVE STUDY

Manu Singh<sup>1</sup>, Bheeni Bharti<sup>2</sup>, Rahul Dhariwal<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of Anaesthesia, Kalyan Singh Government Medical College, Bulandshahr, Uttar Pradesh, India

<sup>2</sup>Assistant Professor, Department of Pathology, Mahatma Vidur Autonomous State Medical College, Bijnor, Uttar Pradesh, India

<sup>3</sup>Senior Resident, Department of Anaesthesia, Mahatma Vidur Autonomous State Medical College, Bijnor, Uttar Pradesh, India

Received : 10/01/2026  
Received in revised form : 01/03/2026  
Accepted : 18/03/2026

### Corresponding Author:

**Dr. Manu Singh,**  
Assistant Professor, Department of Anaesthesia, Kalyan Singh Government Medical College, Bulandshahr, Uttar Pradesh, India.  
Email: manusingh2106@gmail.com

DOI: 10.70034/ijmedph.2026.2.6

Source of Support: Nil,  
Conflict of Interest: None declared

Int J Med Pub Health  
2026; 16 (2); 33-35

### ABSTRACT

**Background:** Gallstone disease is a common gastrointestinal condition affecting a large proportion of adults worldwide. Although laparoscopic cholecystectomy is widely accepted as the standard treatment, open cholecystectomy remains essential in complicated cases. Identifying predictors of surgical difficulty and postoperative complications is therefore clinically important. The objective is to evaluate the association between preoperative neutrophil-lymphocyte ratio (NLR) and surgical outcomes in patients undergoing open cholecystectomy.

**Materials and Methods:** A retrospective observational study was conducted in the Department of Anesthesia Kalyan Singh Government Medical College Bulandshahr, Uttar Pradesh, India from August 2024 to August 2025. Eighty patients undergoing open cholecystectomy were included. Patients were divided into two groups based on preoperative NLR values: NLR <3 and NLR ≥3. Operative time, difficult dissection, postoperative complications, and duration of hospital stay were recorded.

**Results:** Patients with elevated NLR (≥3) had longer operative time (80 vs 55 minutes), higher incidence of difficult dissection (35% vs 10%), higher surgical site infection rates (18% vs 4%), and prolonged hospital stay (6 vs 3 days).

**Conclusion:** Preoperative NLR is a simple and inexpensive biomarker that may help predict operative difficulty and postoperative complications in open cholecystectomy.

**Keywords:** Neutrophil-lymphocyte ratio, gallstone disease, open cholecystectomy, inflammation, surgical outcomes.

## INTRODUCTION

Gallstone disease represents one of the most common hepatobiliary disorders worldwide and affects approximately 10–15% of the adult population. The prevalence increases with age and is associated with several risk factors including female gender, obesity, metabolic syndrome, and dietary habits. Although many individuals with gallstones remain asymptomatic, a considerable proportion develop complications such as acute cholecystitis, gallbladder empyema, gallbladder perforation, and biliary pancreatitis.<sup>[1-5]</sup>

Cholecystectomy remains the definitive treatment for symptomatic gallbladder disease. Laparoscopic

cholecystectomy has become the gold standard procedure due to its minimally invasive nature, shorter hospital stay, and faster recovery. However, open cholecystectomy continues to play an important role in complicated gallbladder disease. Conditions such as dense adhesions, severe inflammation, distorted anatomy, empyema gallbladder, or gangrenous cholecystitis may require open surgical intervention.<sup>[6-10]</sup>

Inflammation is a central mechanism in gallbladder pathology. Acute inflammation leads to gallbladder wall edema, thickening, and adhesions around Calot's triangle, which can increase the difficulty of surgical dissection. Predicting operative difficulty before

surgery is therefore an important component of preoperative evaluation.<sup>[11-15]</sup>

Various laboratory markers have been studied to assess inflammatory status in surgical patients. Among these markers, the neutrophil-lymphocyte ratio (NLR) has gained increasing attention in recent years. NLR is calculated from routine complete blood count parameters and reflects the balance between neutrophil-mediated inflammatory response and lymphocyte-mediated immune regulation.<sup>[16-20]</sup>

Neutrophils play a key role in the acute inflammatory process, while lymphocytes are involved in immune regulation. Elevated neutrophil counts combined with reduced lymphocyte counts may indicate increased systemic inflammation and physiological stress. Therefore, the NLR has emerged as a simple indicator of inflammatory burden.

Previous studies have demonstrated that elevated NLR is associated with poor outcomes in several medical and surgical conditions including cardiovascular disease, malignancy, and gastrointestinal surgery. In the context of gallbladder disease, elevated NLR may reflect severe inflammation and may therefore predict difficult cholecystectomy and postoperative complications.

Despite growing interest in this biomarker, limited studies have specifically evaluated the role of NLR in predicting outcomes in open cholecystectomy. The present study was therefore conducted to assess the relationship between preoperative neutrophil-lymphocyte ratio and surgical outcomes in patients undergoing open gallbladder surgery.

## MATERIALS AND METHODS

This retrospective observational study was conducted in the Department of Anesthesia Kalyan Singh Government Medical College Bulandshahr, Uttar Pradesh, India. The study period extended from August 2024 to August 2025.

A total of 80 patients undergoing open cholecystectomy for gallbladder disease were included. Patients aged between 18 and 70 years with confirmed gallbladder pathology were eligible for inclusion. Patients with malignancy, chronic inflammatory diseases, hematological disorders, or those receiving immunosuppressive therapy were excluded.

Preoperative laboratory investigations including neutrophil count and lymphocyte count were recorded. The neutrophil-lymphocyte ratio was calculated as neutrophil count divided by lymphocyte count.

### Patients were divided into two groups:

Group A: NLR <3

Group B: NLR ≥3

Outcome variables included operative time, difficult dissection, surgical site infection, bile leak, and duration of hospital stay. Continuous variables were expressed as mean ± standard deviation, and categorical variables were analyzed using chi-square test. A p-value less than 0.05 was considered statistically significant.

## RESULTS

**Table 1: Operative Time**

| Group  | Operative Time | Minutes |
|--------|----------------|---------|
| NLR <3 | 55             | Minutes |
| NLR ≥3 | 80             | Minutes |

**Table 2: Difficult Dissection**

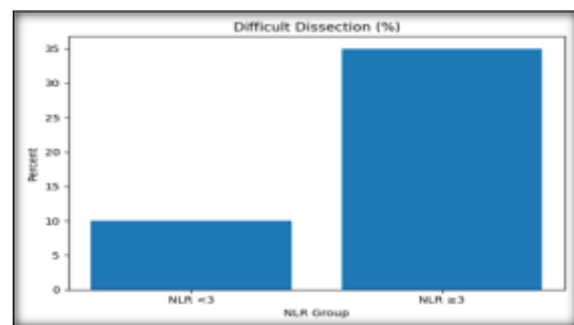
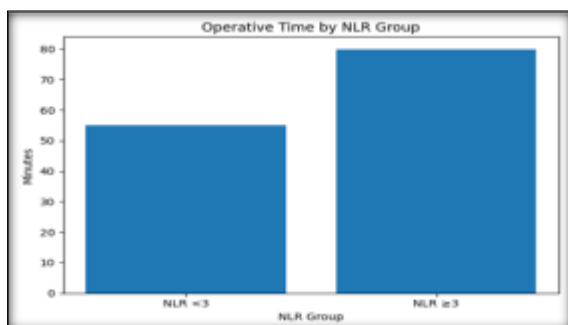
| Group  | Difficult Dissection | Percent |
|--------|----------------------|---------|
| NLR <3 | 10                   | Percent |
| NLR ≥3 | 35                   | Percent |

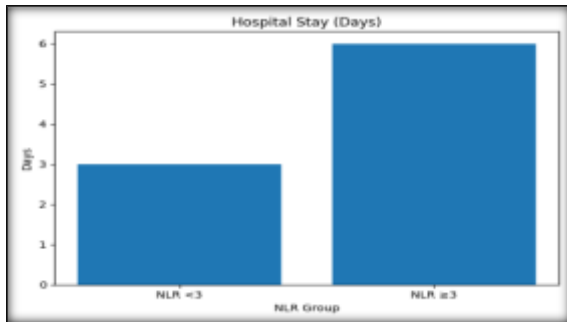
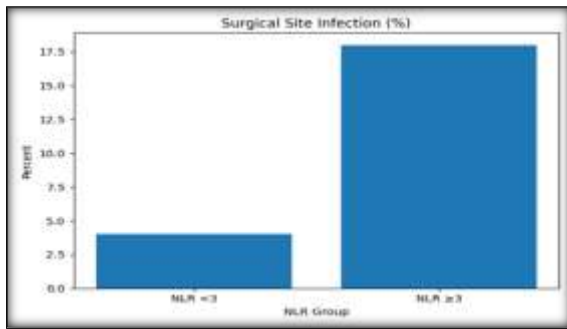
**Table 3: Surgical Site Infection**

| Group  | Surgical Site Infection | Percent |
|--------|-------------------------|---------|
| NLR <3 | 4                       | Percent |
| NLR ≥3 | 18                      | Percent |

**Table 4: Hospital Stay**

| Group  | Hospital Stay | Days |
|--------|---------------|------|
| NLR <3 | 3             | Days |
| NLR ≥3 | 6             | Days |





**Figure 1: Gall Bladder with Inflammation**



**Figure 2: Adhesion in Calot's Triangle**



**Figure 3: Open Cholecystectomy With Dissection**

## DISCUSSION

The present study demonstrated a significant association between elevated preoperative neutrophil-lymphocyte ratio and adverse surgical outcomes in open cholecystectomy. Patients with higher NLR values experienced longer operative time, increased rate of difficult dissection, and higher incidence of postoperative complications.

These findings support the concept that systemic inflammatory markers can provide useful prognostic information before surgery. In gallbladder disease, severe inflammation may cause tissue edema, adhesions, and distortion of anatomical planes, making dissection more technically demanding.

NLR has been widely studied as a marker of systemic inflammation in various clinical settings. Because it can be obtained from routine blood investigations, it represents a convenient and cost-effective biomarker. Surgeons may therefore use NLR as part of preoperative risk assessment when planning gallbladder surgery.

## CONCLUSION

The neutrophil-lymphocyte ratio is a simple, inexpensive, and readily available biomarker that correlates with operative difficulty and postoperative complications in patients undergoing open cholecystectomy. Routine evaluation of NLR may assist surgeons in identifying high-risk patients and planning appropriate perioperative management.

## REFERENCES

1. Zahorec R. Ratio of neutrophil to lymphocyte counts as a simple parameter of systemic inflammation.
2. Walsh SR et al. Neutrophil-lymphocyte ratio as a prognostic factor in surgery.
3. Forget P et al. What is the normal value of NLR?
4. Templeton AJ et al. Prognostic role of NLR in solid tumors.
5. Azab B et al. Usefulness of NLR in predicting complications.
6. Gibson PH et al. Neutrophil-lymphocyte ratio and outcomes in surgery.
7. Gupta A et al. Predictive markers in gallbladder disease.
8. Kwon YS et al. Role of inflammatory markers in acute cholecystitis.
9. Tokuda Y et al. Inflammatory biomarkers in surgical prognosis.
10. Liu X et al. Systemic inflammatory markers and surgical outcomes.
11. McCarthy GM et al. NLR as predictor of postoperative complications.
12. Hwang SY et al. Clinical significance of NLR.
13. Balta S et al. NLR in systemic inflammation.
14. Imtiaz F et al. NLR as inflammatory marker.
15. Wang D et al. Prognostic value of NLR.
16. Lee SK et al. NLR in gastrointestinal surgery.
17. Chen Y et al. Predictive markers in abdominal surgery.
18. Park JS et al. Inflammatory biomarkers in gallbladder disease.
19. Sharma A et al. Surgical outcomes in gallbladder disease.
20. Singh R et al. Predictors of difficult cholecystectomy.