

### **Clinical significance of nlr(neutrophil lymphocyte ratio) and plr(platelet lymphocyte ratio) in predicting post operative complication in major abdominal surgery**

#### **Abstract**

##### **Background:**

The Expression Major abdominal surgery is defined as a lengthy surgical procedure that lasts more than 30 minutes. Gastrectomy, Pancreatectomy, Hepatectomy, Colectomy, Small Bowel Resection, Tumor Resection, And Laparoscopic Gastrointestinal Operations are among the procedures covered. The term "abdominal tumour resection" refers to a wide range of procedures used to remove benign and malignant intraabdominal tumours. There Is A Greater Tendency Of Systemic Inflammatory Reaction When The Abdomen Organs Are Exposed To The External Environment For A Long Period Of Time. As a result, the goal of this research was to concentrate on the clinical significance of the neutrophil lymphocyte ratio and platelet lymphocyte ratio in patients undergoing major abdominal surgery.

This review included a total of 15 studies conducted between 2000 and 2021. The influence of Clinical Importance Of The Neutrophil Lymphocyte Ratio and Platelet Lymphocyte Ratio In Patients Undergoing Major Abdominal Surgery has been reviewed collectively.

##### **Results:**

15 studies were included in this review were included. The present study evaluated the value of nlr and PLR as predictive markers of post operative complications in major abdominal surgeries. . In the current study, we investigated the value of nlr and PLR for predicting post operative complications in patients undergoing major abdominal surgeries.

##### **Conclusions:**

In Cases Of Major Abdominal Surgeries, The nlr and Plr Ratio Is An Important Inflammatory Predictive Value In Assessing Post-Operative Morbidity. The platelet/lymphocyte ratio (PLR) and the neutrophil/lymphocyte ratio (NLR) are two affordable, reproducible, and quantitative measures of systemic inflammation.

**Keywords :** Surgery, neutrophilia, prediction

## **Introduction:**

Major abdominal surgeries are those that require more than 30 minutes, are conducted under general anaesthesia, and need at least a six-day stay in the hospital.<sup>(1)</sup> Major abdominal surgery included operations on the gastrointestinal system such as esophagectomy, gastrectomy, pancreatectomy, hepatectomy, colectomy, small bowel resection, tumour resection, and laparoscopic gastrointestinal surgeries. The term "abdominal tumour resection" refers to a number of procedures used to remove benign and malignant intraabdominal tumours. Small bowel and colon resections are included in laparoscopic gastrointestinal resections. These procedures were closely linked to a red blood cell (RBC) transfusion.<sup>(2)</sup>

These procedures were closely linked to a red blood cell (RBC) transfusion. The biological goal of this response is to repair cellular damage produced by a stimulant, clear up cellular debris and foreign bodies, and contain bacteria and/or stimulants to prevent harmful effects on the body. Inflammation can be caused by a variety of viral or noninfectious processes, but the response is always the same. White blood cells (WBCs) are important in the development of inflammation. Any stimulant that activates leukocytes leads these cells to secrete key mediators that are involved in the inflammatory process.<sup>(3)</sup> Most important inflammatory factors are not easy to approach before surgery and some tools are only used for research. Systemic inflammatory response is a key factor in cancer development but there are indicators based on inflammation which measure for different type of cancer.<sup>(3,4)</sup>

Systemic inflammation status are revealed through simple and widely available markers like preoperative platelet to lymphocyte ratio (PLR) and neutrophil to lymphocyte ratio (NLR). There is formation of platelet clots around tumor, and clearance of tumor cell impaired NK cell mediated due to attenuation of perioperative anticoagulation after surgery. (4) Furthermore, neutrophils can promote tumour growth by inhibiting lymphocyte and other immune cell activities. Patients' inflammatory and immunological responses to malignant tumours may be exhibited in peripheral blood cells, which are important for predicting therapy responsiveness and clinical outcomes in cancer patients. Therefore, the

importance of the systemic inflammatory response in the advancement of cancer has been recognised and it is supported.<sup>(5)</sup>

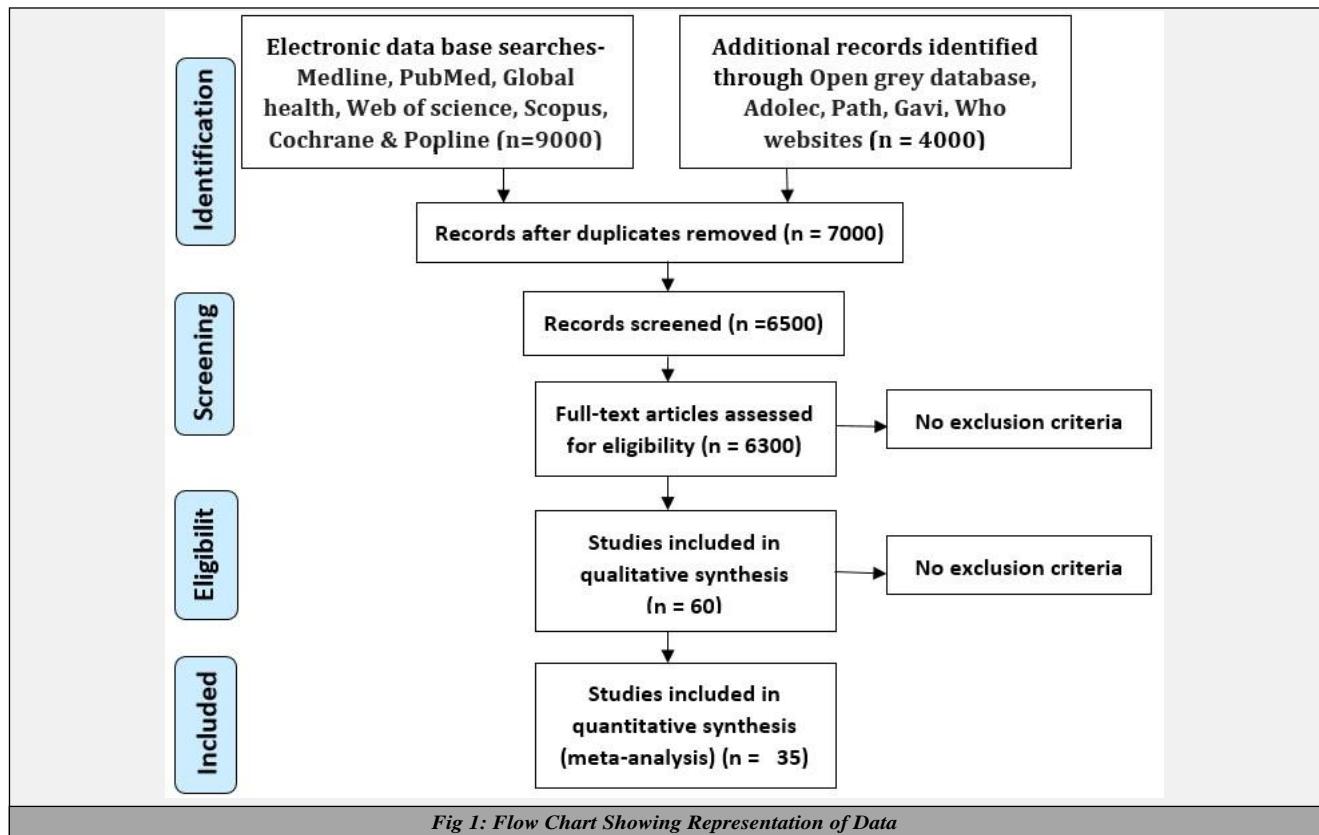
In this study, we aim to investigate the clinical importance of preoperative and postoperative NLR and PLR as independent parameters of morbidity and development of surgical or non-surgical complications in major abdominal surgery.

### **Method:**

The Preferred Reporting Items for Systematic Review guidelines were followed when conducting this analysis. The following databases were used to conduct an electronic search: Springer Nature 2018; Pubmed January 2021; Cochrane Database of Systematic Reviews November 2018-2021; and Pubmed January 2021. (Data presented earlier was expected to be included in full publications.) "Complications," "neutrophils," "lymphocytes," and "postoperative" were among the search terms used. To confirm the sensitivity of the search method, citation lists of retrieved papers were thoroughly checked.

### Data extraction

Using Excel 2021, two authors extracted data into separate sheets. Disagreements in article selection and data extraction were resolved through conversation. There was no precise date set for publishing. Deduplication was done both automatically and manually.



### Discussion:

Platelets, lymphocytes, and neutrophils are all easily detectable on a regular blood count, and each plays a critical role in the inflammatory and anti-inflammatory processes, immunological response, and coagulation status. These are linked to cancer progression and prognosis in a variety of solid tumours. Neutrophils may come into direct contact with circulating tumour cells, function as reservoirs for circulating vascular endothelial growth factor, and aid metastasis in the inflammatory response to cancer.<sup>(6)</sup> Lymphocytes are important tumour suppressors because they induce cytotoxic cell death and produce cytokines that impede cancer cell proliferation and spread. Increased NLR, which can be produced by lymphocytopenia or a high neutrophil count, can result in a suboptimal immune response to cancer and an increased risk of recurrence. In the inflammatory reaction, platelets may release thrombotic and suspected tumour growth factors, accelerating endothelial cell development and promoting cancer progression. Low preoperative LMR was a major predictor of poor prognosis in a variety of malignancies. The patient's nutritional and immunological condition are reflected in PNI, which is determined using blood albumin

levels and peripheral lymphocyte counts.<sup>(4-6)</sup>

The leukocytes' physiological reaction to stress is an increase in neutrophil count and a reduction in lymphocyte count. Despite modern surgical methods and preventive perioperative medication, surgery stimulates an immediate inflammatory process over a stress reaction, and some major consequences such as surgical site infection, sepsis, and multiple organ failure may emerge in the early postoperative period.<sup>(4)</sup> Some biomarkers can assist the clinician track the patient by partially estimating the reaction. The neutrophil/lymphocyte ratio (NLR) and the platelet/lymphocyte ratio (PLR) are two inexpensive, repeatable, and quantitative indicators of systemic inflammation.<sup>(5,6)</sup> NLR has been proposed as a basic biological indicator for evaluating cancer outcomes and classifying the risk of mortality after severe cardiac events.<sup>(7,8)</sup> Inflammatory indicators are now being studied for their predictive value in a variety of malignancies. In various cancer types, NLR was found to be linked to a poor prognosis and overall survival.<sup>(9)</sup> Numerous studies have found a link between NLR, PLR, and prognosis, particularly in colorectal malignancies.

Platelets promote tumour growth by promoting angiogenesis, enhancing microvascular permeability, and aiding cancer cell extravasation. Inflammation and immune system activation have anticancer properties. They also play a function in cancer carcinogenesis and development. The neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) are two simple and effective inflammatory and immune markers. Finding reliable biomarkers to detect patients at risk of relapse or metastases, as well as providing individualised treatment, could enhance clinical results.<sup>(8)</sup>

### **Neutrophil lymphocyte ratio**

- **Minkyong Song et al** showed that NLR has the potential to affect inflammatory/immune processes that influence the development of cardiac and cerebrovascular diseases, as well as the negative consequences of these diseases.<sup>(10)</sup>
- **Makal G B et al** showed that Neutrophils generate inflammatory mediators that lead to blood vessel wall degradation, but lymphocytes may help to prevent atherosclerosis. NLR has also been linked to atherosclerosis progression and increased mortality in people with a variety of cardiovascular diseases.

Neutrophils has been shown to promote tumour development through various mechanisms, whereas lymphocytes are required for cancer cell elimination.<sup>(11)</sup>

- **Arnoud J et al** proved that Increased NLR, which can be produced by lymphocytopenia or a increase in neutrophil count, can result in a suboptimal immune response to cancer and an increased risk of repetition. As a result, NLR has been identified as a useful inflammatory-based divining parameter in solid tumour. Previous research has linked an increased NLR to poor post-diagnosis survival for a variety of malignancies.<sup>(12)</sup>
- **Song Y. et al** proved that as a predictor of prognosis, the preoperative NLR outperformed the LMR, PLR, and PNI, and could be used to supplement the present TNM staging method in Colorectal cancer. NLR may used as an extra mark depend on the current tumor staging system.<sup>(13)</sup>
- **Xia L et al** evaluated that clinical importance of NLR, PLR in speculating surgical morbidity and diagnosis in rectal cancer patients was verified in this investigation. However, only a high NLR level was found to be an impartial risk factor for DFS.<sup>(14)</sup>
- **Jones H. G. et al** proved that, a pre-operative NLR of less than 4 was a strong negative interpreter for septic post-operative sequelae in patients undergoing rectal cancer surgery. For these patients, it can be used as a predictor and prognostic factor. Major post-operative septic problems were predicted by NLR and PLR, with NLR seems to be a more specific predictor than PLR.<sup>(15)</sup>
- **Templeton A. J. et al** have undertook the meta analysis of 100 studies including 40559 patients with solid tumors to evaluate the prognostic effect of NLR. They recognised that In many solid tumours, a high NLR is linked to a poor prognosis. The NLR is a simple and inexpensive biomarker, and its use in conjunction with existing prognostic scores for clinical decision-making needs further study.<sup>(16)</sup>
- **Watanab J. et al** proved that after a pancreaticoduodenectomy for pancreatic cancer, NLR was useful predictor of postoperative problems.<sup>(17)</sup>

## **Platelet lymphocyte ratio**

**Watanab J. et al** evaluated the Platelet Lymphocyte ratio as a multivariate analysis as a marker of prognosis for pancreatic ductal adenocarcinoma having patients with resection. They have studied perioperative outcomes of PLR and NLR. The conclusion from the study was that in pancreaticoduodenectomy for pancreatic cancer, the preoperative PLR was the most useful prognostic indication. Our findings emphasise the necessity of taking into account the level of invasive surgery that patients experience and examining the effectiveness of predictive prognostic indicators in patients who have had a pancreaticoduodenectomy for pancreatic cancer.<sup>(18)</sup>

**Smith et al.** found that the PLR was proven to be an independent predictive factor in pancreatic cancer after pancreaticoduodenectomy and evaluation of the PLR was become important factor.<sup>(19)</sup>

**Kenichi I. et al** showed that In the multivariable analysis, a low preoperative PLR was revealed as an independent risk factor for postoperative problems. A lower PLR also indicates a lower TLC (compromised cell-mediated immunity and malnutrition) as well as a higher platelet count (inflammation and high thrombophilic diathesis).

Furthermore, regardless of age, BMI, operating technique, or illness stage, a low preoperative PLR was linked to an increased incidence of postoperative problems, demonstrating that the preoperative PLR can be used in a variety of therapeutic contexts.<sup>(20)</sup>

**SevketBalta&CegizOzturk** showed that a increased value of PLR shows the inflammation, atherosclerosis and platelet activation.<sup>(21)</sup>

**Murat Yüksel** observed that PLR has a significant positive connection with neutrophil count, indicating that the body is in an inflammatory state. Healthy persons with high platelet counts have a higher risk of thrombotic problems, according to research. Circulating platelets may play a role in the production of atheromatous plaques and their consequences.<sup>(22)</sup>

## **Inflammation:**

Inflammation can be caused by a variety of viral or noninfectious processes, but the reaction is always the similar. White blood cells (WBCs) are important in the development of inflammation. Physiological response of the leukocytes against stress is an increase in platelet count and a decrease in lymphocyte count.<sup>(6,7)</sup>

The platelet-lymphocyte ratio (PLR) is a new inflammatory measure that could be used to predict inflammation and death in a variety of disorders. Although the PLR is simple to compute and generally available, it can be influenced by a variety of inflammatory diseases.<sup>(3,8)</sup>

**Jones H. G. et al** found out that Neutrophils, lymphocytes, monocytes, platelets, and acute-phase proteins, including albumin in the peripheral blood, are all involved in the inflammatory response. However, the exact mechanisms underlying the link between these inflammatory biomarkers and CRC prognosis remain unknown. There could be a number of reasons for this.<sup>(23)</sup>

**Xia L.J. et al** showed the importance of the systemic inflammatory response in the advancement of cancer has long been recognised and supported. Independent of the TNM staging system, inflammation-related measures that assess the systemic inflammatory response have been found to have prognostic relevance.<sup>(24)</sup>

**Chan J.C. & Chan et al** discussed in their study that A collection of inflammatory markers that has been extensively explored is derived from portions of the commonly available and affordable complete blood count (CBC).<sup>(25)</sup>

World Cancer research fund International found that inflammation is created through chronic pancreatitis, which is a risk factor for pancreatic cancer.

## Conclusion

The inflammatory markers NLR and PLR are independent prognostic factors for predicting early and late postoperative complications in patients undergoing major abdominal surgeries.

NLR is a better predictor for early postoperative complications as compared to PLR that is a better prognostic indicator for late postoperative complications in patients undergoing major abdominal surgeries.

Minimum of literature to compare present study, in terms of “comparison of clinical significance of neutrophil lymphocyte ratio(nlr) and platelet lymphocyte ratio (plr) in predicting postoperative complications in patients undergoing major abdominal surgery

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