# Advances in Peripheral Blood Parameter Ratios in IBD

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**Abstract:** In recent years, studies have found that the ratio of neutrophil to lymphocyte ratio, platelet to lymphocyte ratio, lymphocyte to monocyte ratio, CRP to albumin ratio, and other comprehensive indicators derived from peripheral blood parameters are valuable for the evaluation and differential diagnosis of disease activity. This article provides an overview of the use of ratios of several peripheral blood parameters in the diagnosis of inflammatory bowel disease activity.

*Keywords*: biomarkers, ulcerative colitis, Crohn's disease, inflammatory bowel disease, CRP/ALB

## 1. Introduction

Inflammatory bowel disease (IBD) mainly includes Crohn's disease (CD) and ulcerative colitis (UC) refers to a group of nonspecific chronic inflammatory diseases of the gastrointestinal tract of unknown etiology, the disease mainly affects the ileum, colon, and rectum[1]. The prevalence of IBD has increased substantially in many regions, hospitalization rates in industrialized countries, in particular, are rising rapidly, and the burden on the global healthcare system is increasing [2,3], therefore, the prevention and control of IBD and research should be strengthened. At present, the pathogenesis of IBD is not fully understood, and it is generally believed to be related to genetic, environmental, and immune factors, and is characterized by an abnormal immune response in the intestinal mucosa[4]. It is mainly based on the comprehensive analysis of the patient's clinical manifestations, laboratory examinations, imaging examinations, endoscopic examinations, and histopathological manifestations, and the diagnosis is made based on excluding infectious and other non-infectious colitis[5] including Crohn's disease and ulcerative colitis, are chronic, progressive, immune-mediated diseases of adults and children that have no cure. IBD can cause significant morbidity and lead to complications such as strictures, fistulas, infections, and cancer. In children, IBD can also result in growth impairment and pubertal delays. IBD is highly heterogenous, with severity ranging from mild to severe and symptoms ranging from mild to debilitating. Delay in IBD diagnosis, especially in Crohn's disease, is common and associated with adverse outcomes. Early diagnosis and prompt institution of treatment are the cornerstones for improving outcomes and maximizing health. Early diagnosis requires a low threshold of suspicion and red flags to guide early specialist referral at the primary provider level. Although the armamentarium of IBD medications is growing, many patients will not respond to treatment, and the selection of first-line therapy is critical. Risk stratification of disease severity, based on clinical, demographic, and serologic markers, can help guide selection of first-line therapy. Clinical decision support tools, genomics, and other biomarkers of response to therapy and risk of adverse events are the future of personalized medicine. After starting appropriate therapy, it is important to confirm remission using objective end points (treat to target. IBD is lifelong and prone to recurrence, so it is particularly important to monitor the disease and determine the activity of the disease for the diagnosis and treatment of the disease. At present, the monitoring of IBD is still mainly based on endoscopic and biopsy histopathological examination. Endoscopy is highly invasive and expensive, As a result, patient compliance is poor. Blood laboratory tests are noninvasive, simple, economical, and reproducible, and are considered auxiliary diagnostic indicators for IBD[6]. At present, the commonly used laboratory indicators are CRP and ESR, but some studies have reported CRP and ESR ESR In a subset of patients, it is not possible to distinguish between active and remission, and sensitivity and specificity for judging disease activity are poor[7]and to investigate the predictive value of CRP levels for disease outcome.\nMETHODS: CRP was measured at diagnosis and after 1 and 5 years in patients diagnosed with IBD in south-eastern Norway. After 5 years, 454 patients with ulcerative colitis and 200 with Crohn's disease were alive and provided sufficient data for analysis.\nRESULTS: Patients with Crohn's disease had a stronger CRP response than did those with ulcerative colitis. In patients with ulcerative colitis, CRP levels at diagnosis increased with increasing extent of disease. No differences in CRP levels at diagnosis were found between subgroups of patients with Crohn's disease as defined according to the Vienna classification. In patients with ulcerative colitis with extensive colitis, CRP levels above 23 mg/l at diagnosis predicted an increased risk of surgery (odds ratio (ORWe still need to explore biomarkers that are more specific and sensitive. In recent years, more and more studies have found that the ratio of peripheral blood parameters is also

helpful in the diagnosis of disease, and these ratios are readily available and strongly correlated with disease activity [8–12]. The purpose of this article is to review the application of several peripheral blood parameter ratios in the diagnosis and treatment of inflammatory bowel disease in recent years and to provide a reference for the diagnosis, monitoring, evaluation, and treatment of inflammatory bowel disease, and prediction of prognosis.

# 2. Ratio of peripheral blood parameters

Neutrophils are important effector cells of the body's immunity, lymphocytes, platelets, monocytes, and other components play an important role in inflammatory response and immune regulation, and the ratio of peripheral blood parameters is also easy to calculate from the patient's blood routine and other neutrophil/lymphocyte ratio (NLR), platelet/lymphocyte ratio (PLR), lymphocyte/monocyte ratio (LMR) and C-reactive protein/albumin Ratio (CAR), and other inflammatory markers are of great value in predicting the activity of IBD.

## 2.1 NLR (neutrophil/lymphocyte Ratio)

NLR was first used in diseases including rheumatoid arthritis and cardiovascular disease, malignant tumors, and other diseases to predict disease outcome[13]In recent years, several studies have found that NLR has clinical application value in the assessment of disease activity in IBD patients. The site of neutrophil inflammation appears first, associated with an exacerbation of IBD inflammation, Lymphocytes decrease when mucosal tissue is damaged[14], Recent research has shown that, NLR plays an important role in determining the activity of IBD.

Pinar and Acarturk carried out N. separately in Adults and Children, It was found that NLR levels were significantly higher in patients with active IBD compared with remission[15,16], Gao et al.'s study found that the cutoff value of NLR is 2.13fl, which isolates IBD patients from healthy people with a specificity of 0.81[17]. Nishida's study of UC patients found that the cutoff value of NLR was 4.488, which can distinguish whether treatment with infliximab is effective [18].

NLR is a reliable inflammatory marker that reflects disease status and assesses IBD activity by distinguishing IBD patients from control groups, distinguishing active and inactive disease, and predicting clinical outcomes.

## 2.2 PLR (platelet/lymphocyte Ratio)

Platelets are best known for their role in hemostasis, but a growing body of research supports their important role as an inflammatory amplifier in chronic inflammatory conditions, PLT activation is high in patients with IBD when they are active, hypercoagulability is associated with an inflammatory state of the intestine[19].

Lorenzo followed up with 88 patients with IBD and showed that the value of PLR correlated with clinical remission and mucosal healing at the end of follow-up, It can be used as an early predictor of response to anti-TNF therapy[20]. Jeong's retrospective study of 48 UC patients found that UC could be distinguished from healthy people when the cutoff value of PLR was 179.8.and may reflect the condition of the intestinal mucosa[12].

As with NLR, PLR increases with increasing disease activity severity in IBD patients and is readily available, and more studies are needed to find more applications of PLR in IBD.

## 2.3 LMR (lymphocyte/monocyte Ratio)

LMR has previously been associated with disease activity in rheumatoid arthritis and acute coronary syndromes[21], In IBD, Monocyte activation and innate immunodeficiency are involved in the occurrence and development of IBD, and monocyte-derived monocytic phagocytes, especially macrophages, are essential for maintaining gastrointestinal homeostasis[22].

A previous prospective study of 73 patients with UC versus 141 patients with CD showed that low LMR identified disease activity in patients with UC, but there is no difference in differentiating CD disease activity [23], another study concluded the same as the study, A monocyte count > 860 and an L/M value of < 1.6 predicts the activity of UC[24], and the study compared LMR with ESR and CRP, LMR was found to have slightly higher sensitivity and specificity for predicting disease activity.

L/M ratios are good biomarkers for UC and they can assist clinicians in managing UC at follow-up.

## 2.4 CAR (C-reactive protein/albumin Ratio)

CRP/ALB is also a new inflammatory marker, which is a composite marker of CRP and ALB It can reflect the patient's inflammation and nutritional status.

The study by Chen showed that when the cutoff values of CRP/ALB were 0.18 and 0.43, The sensitivity and specificity of UC and CD activity were 67.8% and 75.8%, respectively, and the specificity was 86.7% and 92.0%, respectively. [8], compared to CBC, CRP/ALB has a higher ability to discriminate IBD activities. Zhou's study found that CRP/ALB was

associated with CD Mucosal healing is associated and may be more likely than alone CRP or WHITE More accurate reflection CD The mucosal healing situation passes ROCK The analysis shows that CRP/ALB The area under the curve is 0.87, the sensitivity is: 91.1%with a specificity of 76.5%[9], in which CRP/ALB is the most appropriate marker for assessing mucosal healing in CD among serological optimization markers.

The results of multiple studies have shown that the CRP/ALB level in patients with active IBD is significantly higher than that in patients with inactive IBD, and CRP/ALB has high application value for IBD, but there are few related studies A large amount of clinical data is needed to support it.

## 3. Conclusions

In summary, the clinical value of the ratio of peripheral blood parameters such as NLR, PLR, LMR, and CAR in IBD has been confirmed, and the ratio of peripheral blood parameters is a ratio rather than an absolute value, so it will not be affected by factors such as dehydration or fluid retention. The advantage of lower cost is that it better reflects inflammatory changes in the body, and the combination of other non-invasive markers may be a more useful predictor of disease activity. In the future, multi-center, large-sample studies, and further analysis and validation are needed to apply more novel biomarkers to clinical practice, to improve the diagnostic rate of IBD.

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