RESEARCH ARTICLE

Correlation of NLR and D-dimer Levels with Clinical Severity of COVID-19 and Determination of Cut-off Values at a Hospital in Cirebon

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Abstract

Inflammation and coagulation markers play a crucial role in assessing the systemic involvement of COVID-19. Early identification of disease severity through neutrophil-lymphocyte ratio (NLR) and D-dimer levels can aid physicians in promptly identifying potentially severe cases and determining appropriate treatment strategies. This study explored the relationship between NLR, D-dimer levels, and clinical severity in COVID-19 patients. This retrospective cross-sectional study reviewed 237 medical records of adult COVID-19 patients treated at Permata Cirebon Hospital from July to October 2021. The seriousness of COVID-19 served as the outcome variable, while NLR and D-dimer values were considered independent variables. Correlation analysis examined the relationship between NLR, D-dimer, and COVID-19 severity. Receiver operating characteristic (ROC) curve analysis was employed to establish the cut-off values. The majority of COVID-19 patients exhibited moderate disease severity. Male gender, advanced age, and comorbidities such as diabetes, hypertension, CVD, and stroke were associated with a higher likelihood of severe disease. A significant positive correlation was found between NLR and disease severity, as well as between D-dimer and disease severity. Notably, the correlation between D-dimer and disease severity was more substantial than that of NLR. Furthermore, the cut-off values obtained from the ROC analysis were 3.79 for NLR (sensitivity=68.8%, specificity=68.1%) and 1,110 for D-dimer (sensitivity=79.2%, specificity=87.5%). The study revealed a significant positive correlation between the severity of NLR, D-dimer levels, and COVID-19. Therefore, NLR and D-dimer can serve as prognostic markers for COVID-19 patients.

Keywords: COVID-19, cut-off, D-dimer, NLR, severity

Introduction

Clinical symptoms of COVID-19 are categorized as asymptomatic, mild, moderate, severe, and critical.[1] Patients of advanced age (>65 years), smokers, patients with hypertension, diabetes, cardiovascular disease, chronic obstructive pulmonary disease, and malignancies are at higher risk for more severe disease progression and mortality when infected with COVID-19.[2] COVID-19 may also cause complications in the hematologic and neurologic systems.[3,4] Changes in the hematologic system include lymphopenia, elevated inflammatory markers, and hypercoagulopathy.[3–5]

COVID-19 spreads rapidly and has a relatively high mortality rate. Therefore, one of the keys to reducing the mortality rate of COVID-19 is early detection of COVID-19 severity. Several previous studies have found that several inflammatory and coagulation parameters, including neutrophil-lymphocyte ratio,[4,6] C-reactive protein, lactate dehydrogenase,[7] D-dimer,[8] and ferritin, have predictive value and are associated with COVID-19 severity, increased risk of intensive care unit (ICU) admission, and mortality.[3,5,7,8]

The neutrophil-lymphocyte ratio (NLR) indicates impaired cell-mediated immunity associated with systemic inflammation.[9] NLR is essential in determining the inflammatory status in COVID-19 patients and is more sensitive than neutrophils or lymphocytes alone. NLR values are markedly increased in COVID-19 patients with severe symptoms. This increase is due to dysregulated expression of inflammatory cytokines.[6,9,10] An exaggerated inflammatory response is characterized by a cytokine storm that can lead to systemic inflammatory syndrome. Inflammation-triggered viruses increase NLR, which then triggers the progression of