

# Using the Neutrophil: Lymphocyte Ratio as a Biomarker for Sepsis: Which Cutoff is Best?

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## ABSTRACT

This study sought to evaluate the performance of the neutrophil-to-lymphocyte ratio (NLCR) using cutoff values of 9, 10, 11, and 12 as an independent biomarker for sepsis. To date, no such biomarker has been identified. The NLCR has been studied as a biomarker but only in terms of the cutoff value of 10. This study hypothesized that a different cutoff value would demonstrate better clinical performance. This retrospective study examined 146 participants who presented with 2 or more symptoms of systemic inflammatory response syndrome (SIRS) and were not otherwise immunocompromised. Seventy-nine participants were septic, based on Sepsis-2 criteria (SIRS with positive blood cultures), and the remaining 67 were not septic (SIRS with negative blood cultures). The median NLCR was calculated for each group and evaluated in terms of sensitivity, specificity, positive and negative predictive values (PPV and NPV), and positive and negative likelihood ratios (PLR and NLR) for each cutoff value. The median NLCR was significantly higher in the septic group (15.2) than the non-septic group (9.9) ( $P < 0.01$ ). As the cutoff value increased,

the corresponding specificity also increased (47%–61.2%), but the sensitivity and NPV decreased. The PPV was virtually unchanged between cutoff values (64.5%–65.4%). The sensitivity for each cutoff value was below 82% (63.6%–81.0%), and no cutoff demonstrated a specificity value greater than 62%. Additionally, the PLR ranged between 1.55 and 1.64, and the NLR values ranged between 0.40 and 0.59. As such, this study showed that the NLCR is not an ideal independent biomarker for the identification of sepsis. The use of the NLCR as an independent biomarker, as hypothesized in this study, would result in underdiagnosis of septic patients and overuse of antibiotic therapy in SIRS patients.

**ABBREVIATIONS:** NLCR - neutrophil to lymphocyte ratio, NLR - negative likelihood ration, NPV - negative predictive value, PLR - positive likelihood ratio, PPV - positive predictive value, SIRS - systemic inflammatory response syndrome.

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