

Conditional sensitivity and specificity of tuberculous pleurisy criteria by the inflammation status: a simulation study

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I. Introduction

- Traditionally, Adenine deaminase (ADA) and lymphocyte/ neutrophil (L/N) ratio was used for diagnosing tuberculous effusion. The diagnostic performances by those biomarkers could be could vary according to the conditional subgroup whose suspected diagnosis differs from the general population.
- Our earlier work found that when applying the deep learning method, several tuberculosis effusions were misdiagnosed as bacterial infections. This study demonstrated that high inflammatory tuberculous effusions have distinct characteristics that explain why tuberculous effusion was misdiagnosed as bacterial infections.

II. Methods

- All pleural effusion cases were extracted from the Asan Medical Center Dataware house, and all thoracentesis procedures were performed between 2009 and 2019.
- The diagnostic cut-off using pleural ADA of 50 U/L and L/N ratio of 0.75 (general criteria) was used to evaluate the diagnostic metrics (sensitivity and specificity) in each quantile group. (Figure 1-A,C,E)
- The diagnostic value of the biomarker was examined using a generalized linear model for the ADA only model and the ADA with L/N ratio model. The dataset was split randomly at 3:7 for training and testing to calculate the AUROC. (Figure 1-B,D,F)
- The diagnostic metrics were evaluated in five quantile subgroups according to the inflammatory lab (serum CRP, WBC, LD).

III. Result

- The fourth and fifth (highest) WBC groups had a lower sensitivity (median: 59% and 33%, respectively) compared with the other three groups (Figure 1). Additionally, the first CRP group (lowest) and fifth group (highest) exhibited low sensitivity (median: 56% and 45%, respectively). It shows that current ADA and L/N ratio criteria weakly detect high inflammatory tuberculous effusions. (Figure 1)
- In contrast to typical lymphocyte-dominant tuberculous effusion, neutrophilic-dominant tuberculous effusion was more common when serum WBC and CRP levels increased. ($p < 0.001$, respectively, Figure 2-A, C).
- A higher serum WBC was related to an increase in mean pleural ADA and ADA distribution in non-tuberculous effusion ($p < 0.001$), as was observed in the CRP group. (Figure 2)

Figure 1

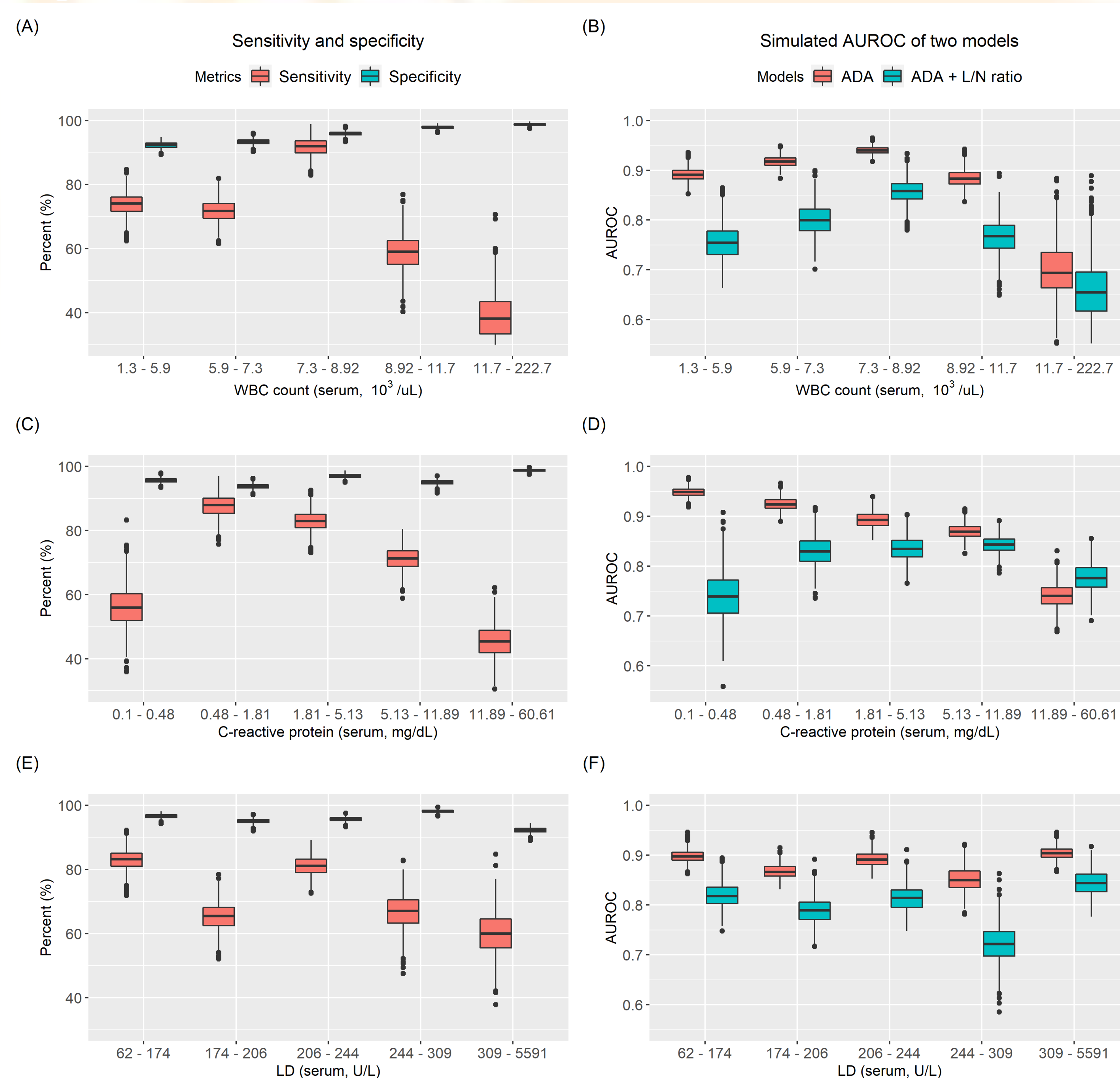
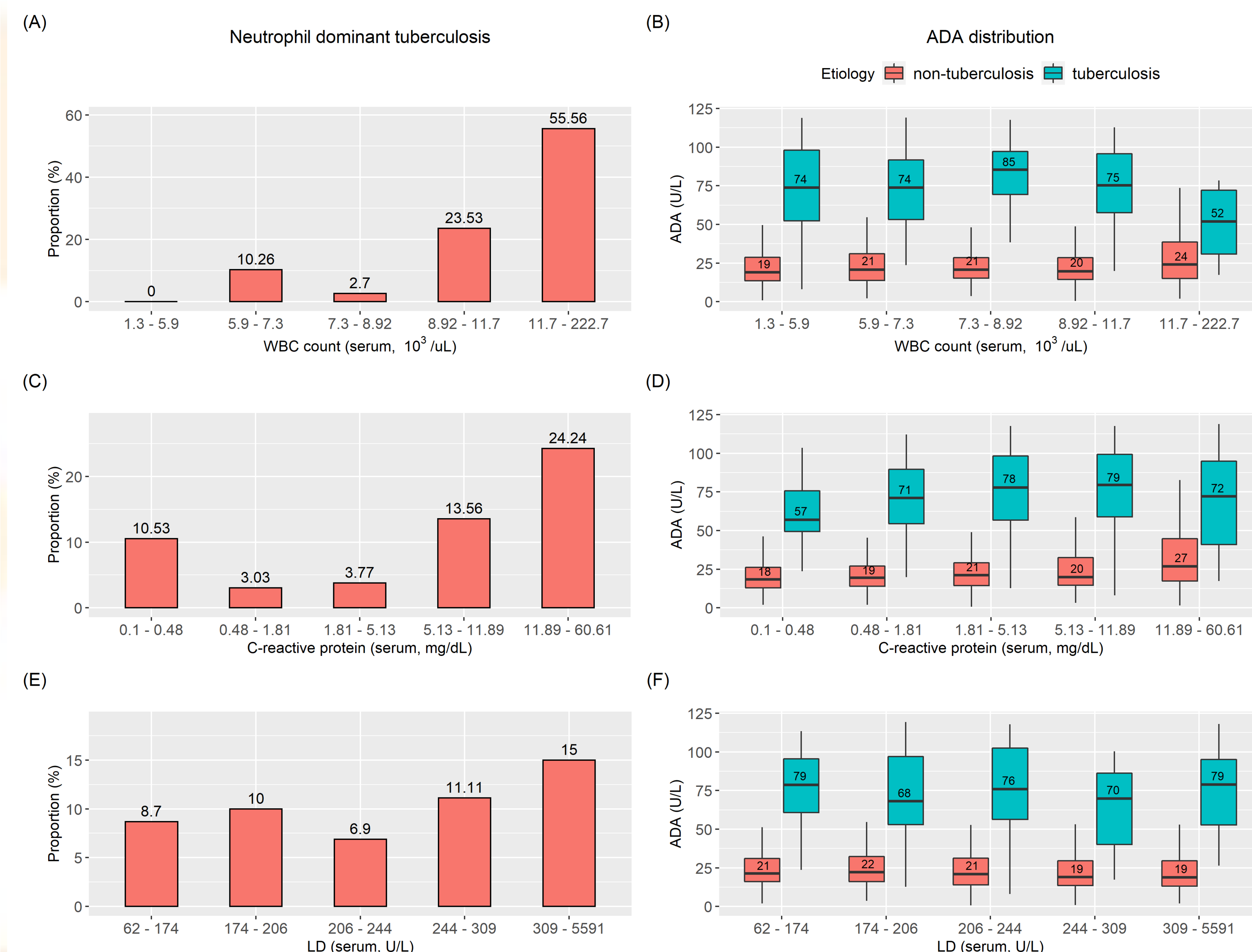


Figure 2



IV. Conclusion

- Inflammatory status defined by WBC and CRP affects the sensitivity of ADA and L/N ratio criteria for tuberculous effusion.
- Clinicians should consider the false-negative cases of tuberculous effusion, especially in high-inflammatory cases, and readjust the cut-off level of ADA and age according to inflammatory levels.