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Establishment and Validation of a Risk Score for the Early Prediction of COVID-19 Severity

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ABSTRACT

Background and Aims: Coronavirus disease 2019 is characterized by a spectrum of clinical severity ranging from asymptomatic to severe or even critical forms requiring intensive care services. In a previous published work, we have identified six biological abnormalities as potential risk markers independently related to the severity: Elevated urea nitrogen, elevated CRP, decreased natremia, decreased albumin, elevated LDH and elevated neutrophil to lymphocyte ratio. For a clinical convenience, this study aimed to establish a score system to identify high-risk individuals open admission, to validate this score in a separate cohort, but also to test its accuracy in the prediction of in-hospital mortality.

Methods: In this is retrospective, single-center, cohort study, data from 330 SARS-CoV-2 infected patients, who were admitted at the University Hospital of Blida, Algeria, were used to establish a risk score system to predict progression toward severity. Then, the same score was tested to predict mortality in the same cohort. In a second stage, data from 240 additional COVID-19 patients were used to validate this score. Accuracy of the score was measured by the area under the receiver operating characteristic curve (AUC).

Results: In the establishment cohort, a stepwise increase in the incidence of both severity and mortality was observed with the increment of the risk score ($p<0.0001$). Conversely, a progressive decrease in the average survival duration was noted with the increment of the risk score ($p_{ANOVA}<0.0001$). A similar trend was confirmed when analyzing this association in the validation cohort ($p<0.0001$). The AUC in the validation cohort was 0.74 [0.66-0.82] and 0.90 [0.87-0.94], $p<0.0001$, respectively for severity and mortality prediction.

Conclusion: This study provides a useful risk score based on biological routine parameters assessed at the time of admission, which has proven its effectiveness in predicting both severity and short-term mortality of COVID-19.

Keywords: COVID-19, Risk score, Biomarkers, Severe COVID-19, Short-term mortality

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