# Hematological, inflammatory, and novel biomarkers assessment as an eminent strategy for clinical management of COVID-19

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## Abstract

Background: Different biomarkers have been suggested as novel biomarkers of coronavirus disease 2019 (COVID-19) theragnosis. With the aim of having a better clinical management of COVID-19, we decided to determine the relationship between hematological, inflammatory, and novel biomarkers with severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) immunoglobulin (Ig)M and IgG antibodies.

Methods: Blood samples from 127 confirmed COVID-19 patients aged 11-84 years old were collected and tested for SARS-CoV-2 IgM and IgG antibodies alongside with hematological, inflammatory, and novel biomarkers. The Spearman correlation test was utilized to analyze the correlation between these biomarkers with SARS-CoV-2 IgM and IgG antibodies.

Results: The SARS-CoV-2 IgM antibody significantly correlated with erythrocyte sedimentation rate (ESR) ($r = 0.329$, $p = 0.000$), C-reactive protein (CRP) ($r = 0.459$, $p = 0.000$), interleukin (IL)-6 ($r = 0.345$, $p = 0.000$), IL-8 ($r = 0.263$, $p = 0.003$), neutrophil to lymphocyte ratio (NLR) ($r = 0.182$, $p = 0.040$), derived NLR (dNLR) ($r = 0.197$, $p = 0.026$), neutrophil to monocyte ratio (NMR) ($r = 0.184$, $p = 0.038$), and CRP to lymphocyte ratio (CLR) ($r = 0.495$, $p = 0.000$). Also, we find significant correlation between SARS-CoV-2 IgG antibody with hemoglobin (Hb) ($r = -0.257$, $p = 0.004$), hematocrit (Hct) ($r = -0.227$, $p = 0.010$), mean corpuscular Hb concentration (MCHC) ($r = -0.212$, $p = 0.017$), lymphocyte count ($r = -0.211$, $p = 0.017$), platelet count ($r = 0.179$, $p = 0.044$), ESR ($r = 0.461$, $p = 0.000$), CRP ($r = 0.344$, $p = 0.000$), IL-6 ($r = 0.178$, $p = 0.046$), IL-8 ($r = 0.237$, $p = 0.007$), platelet to lymphocyte ratio (PLR) ($r = 0.295$, $p = 0.001$), and CLR ($r = 0.376$, $p = 0.000$).

Conclusion: Hematological biomarkers (Hb, Hct, MCHC, lymphocyte count, and platelet count), inflammatory biomarkers (ESR, CRP, IL-6, and IL-8), and novel biomarkers (dNLR, NLR, NMR, PLR, and CLR) are valuable indicators for clinical management of COVID-19.

Keywords: COVID-19, SARS-CoV-2, Hematological biomarkers, Inflammatory biomarkers, Novel biomarkers