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Longitudinal Profile of Antibody Response to SARS-CoV-2 in Patients with Covid-19 in a Setting from Sub–Saharan Africa: A Prospective Longitudinal Study

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Abstract : Background: Serological testing for SARS-CoV-2 plays an important role in epidemiological studies, in aiding the diagnosis of COVID-19 and assess vaccine responses. Little is known about the dynamics of SARS-CoV-2 serology in African settings. Here, we aimed to characterize the longitudinal antibody response profile to SARS-CoV-2 in Ethiopia. Methods: In this prospective study, a total of 102 PCR-confirmed COVID-19 patients were enrolled. We obtained 802 plasma samples collected serially. SARS-CoV-2 antibodies were determined using four lateral flow immune assays (LFIAs) and an electrochemiluminescent immunoassay. We determined longitudinal antibody response to SARS-CoV-2 as well as seroconversion dynamics. Results: Serological positivity rate ranged between 12%-91%, depending on timing after symptom onset. There was no difference in the positivity rate between severe and non-severe COVID-19 cases. The specificity ranged between 90%-97%. Agreement between different assays ranged between 84%-92%. The estimated positive predictive value (PPV) for IgM or IgG in a scenario with seroprevalence at 5% varies from 33% to 58%. Nonetheless, when the population seroprevalence increases to 25% and 50%, there is a corresponding increase in the estimated PPVs. The estimated negative-predictive value (NPV) in a low seroprevalence scenario (5%) is high (>99%). However, the estimated NPV in a high seroprevalence scenario (50%) for IgM or IgG is reduced significantly from 80% to 85%. Overall, 28/102 (27.5%) seroconverted by one or more assays tested within a median time of 11 (IQR: 9–15) days post symptom onset. The median seroconversion time among symptomatic cases tended to be shorter when compared to asymptomatic patients [9 (IQR: 6–11) vs. 15 (IQR: 13–21) days; p = 0.002]. Overall, seroconversion reached 100% 5.5 weeks after the onset of symptoms. Notably, of the remaining 74 COVID-19 patients included in the cohort, 64 (62.8%) were positive for antibodies at the time of enrollment, and 10 (9.8%) patients failed to mount a detectable antibody response by any of the assays tested during follow-up. Conclusions: Longitudinal assessment of antibody response in African COVID-19 patients revealed heterogeneous responses. This underscores the need for a comprehensive evaluation of serum assays before implementation. Factors associated with failure to seroconvert need further research.

Keywords : COVID-19, antibody, rapid diagnostic tests, ethiopia
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