Low CD4 T-cell count attenuates immunogenicity of COVID-19 vaccines in people with HIV: A Systematic Review and Meta-Analysis

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Background: People with HIV (PWHIV) are at greater risk of morbidity and mortality following COVID-19 than the general population. This systematic review and meta-analysis aims to explore the immunogenicity of COVID-19 vaccines in PWHIV compared to controls.

Methods: A systematic search of EMBASE, Medline and relevant conference databases until June 16th 2022, was conducted to identify studies comparing immunogenicity (SARS-CoV-2 spike-IgG seroconversion, SARS-CoV-2 neutralisation responses, and SARS-CoV-2-specific T-cell responses) in PWHIV versus controls, and to compare responses in PWHIV with low (<350 cells/μL) and high (>350 cells/μL) CD4 counts. Meta-analysis of seroconversion and neutralization responses was conducted. This study was registered on PROSPERO: CRD42022340626.

Results: Twenty-seven studies were eligible, including 4,451 PWHIV and 5984 controls. PWHIV were less likely to seroconvert following a primary vaccine schedule (RR 0.97, 95% CI 0.95-0.99), and less likely to elicit neutralization responses (RR 0.95, 95% CI 0.91-0.99). Participants with CD4 <350 were less likely to seroconvert when compared with PWHIV with CD4 >350 (RR 0.91, 95% CI 0.83-0.99). In PWHIV receipt of a non-mRNA vaccine was associated with 14% reduction in seroconversion (RR 0.86, 95% CI 0.77-0.96) compared to those receiving an mRNA vaccine. Seven studies reported on T-cell responses. Although measured outcomes were heterogeneous, four studies reported lower responses in PWHIV than controls.

Conclusion: PWHIV experience poorer seroconversion and neutralization responses following a primary COVID-19 vaccination than controls. Non-mRNA vaccines and low CD4-count are associated with poorer responses. PWHIV should be prioritized for mRNA COVID-19 vaccines, especially with CD4 count <350 cells/μL. Further well-designed studies are warranted to investigate vaccine boosting strategies in different CD4 T-cell count strata among PWHIV, and the role of contemporary bivalent vaccines.