The impact of HIV on the B-cell responses to SARS-CoV-2 in COVID-19-confirmed cases

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1. Introduction

- The impact of coinfection of severe acute respiratory syndrome coronavirus (SARS-CoV-2) in people with human immunodeficiency virus (PWH) is incompletely understood.
- Previous studies have shown that HIV-infected individuals are more likely to develop severe outcome relative to HIV uninfected individuals [1-2].
- However, the B-cell response against SARS-CoV-2, including antibody production in PWH is not well characterized.
- More studies investigating the anti-SARS-CoV-2 antibody responses can pave the way for an improved understanding of the immune response and immunization against SARS-CoV-2 in PWH.
- Studying the anti-SARS-CoV-2 antibody responses in PWH is of great relevance for developing countries given the low vaccination levels and continued circulation of variants of concern.

Hypothesis

We hypothesize a change in anti-SARS-CoV-2 IgG subclass ratio/trend between HIV-positive and HIV-negative participants and a link between the disease severity and antigen-specific IgG subclasses.

2. Study Aim

- To measure and evaluate the avidity of anti-SARS-CoV-2 IgG subclasses (IgG1, IgG2, IgG3 and IgG4) in both HIV-positive and HIV-negative patients hospitalized with coronavirus disease in 2019 Durban, South Africa, during the second SARS-CoV-2 infection wave dominated by the Beta (B.1.351) variant.
- To characterize SARS-CoV-2 disease severity and stage of illness relative to anti-SARS-CoV-2 IgG subclasses.
- To decipher the mechanism of Fc-mediated effector functions of anti-SARS-CoV-2 IgG subclasses.

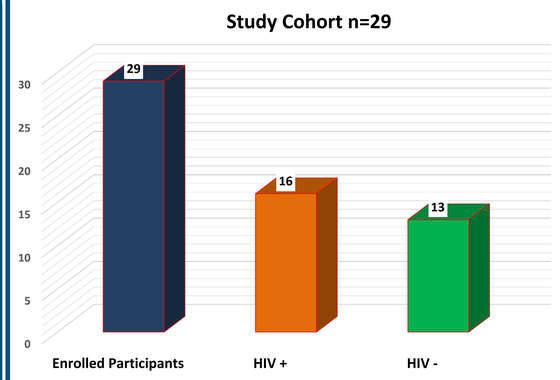

Figure 1. Characteristics of the study cohort

4. Methods

Enzyme-linked immunosorbent assay (ELISA)

Plasma IgG subclasses levels will be evaluated at 1-, 7-, 14, and 28-days post-enrolment and at 6 months using ELISA.

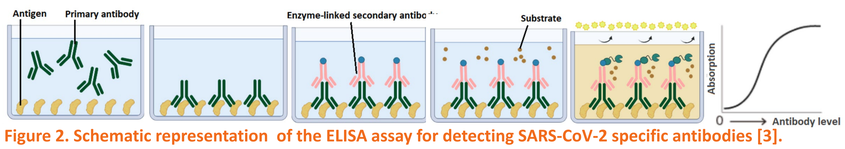

Figure 2. Schematic representation of the ELISA assay for detecting SARS-CoV-2 specific antibodies [3].

Antibody-dependent cellular phagocytosis (ADCP)

The level of ADCP was evaluated as previously described by Ackerman and colleagues [6].

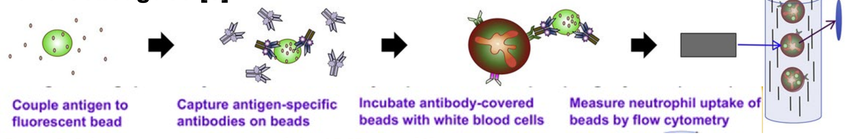

Figure 3. Schematic representation of the ADCP assay [4]

$$Phagoscore = \frac{\mathrm{gMFI}(\mathrm{bead}^{+}\ \mathrm{neutrophils}) \times (\%\mathrm{bead}^{+}\ \mathrm{neutrophils\ of\ total\ neutrophils})}{10,000}$$

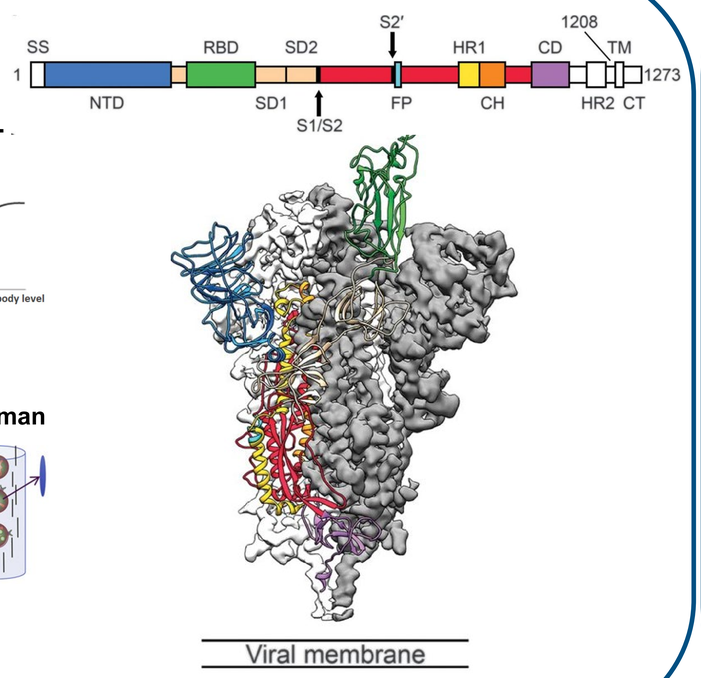

Figure 4. schematic of 2019-nCoV S primary structure colored by domain [5]

5. Results and Discussions

- The level and avidity of SARS-CoV-2 binding antibodies in PWH can be indicative of disease severity and vaccine efficacy.
- Previous studies, reported a reduced Beta variant neutralization in viremic PWH [1-2].
- However, the level of SARS-CoV-2 neutralizing antibodies may not indicate the resolution or favorable disease outcome. It rather indicate the abundance of viral antigens driving the neutralizing antibody response.
- This study focus on measuring the anti-SARS-CoV-2 level and avidity of anti-SARS-CoV-2 IgG subclasses in PWH and further investigate its correlation with disease severity.
- Among the different IgG subclasses, a specific class can enhance neutralization potency and Fc effector function, which is yet to be determined.

6. References

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