Distinct Absence of Post-Boost S-IgG Surge in Sub-Saharan African COVID-19 Vaccinee Responses

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MRC/UVRI and LSHTM Uganda Research Unit

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BACKGROUND

- We examined a subset of Ugandan vaccinees for the profile of antibody dynamics elicited after COVID-19 vaccination, aiming to determine if vaccine responses in Sub-Saharan Africa (SSA) exhibit unique attributes, filling crucial gaps in global datasets. Based on the genetic and prevalent serological cross-reactivities, we hypothesised that COVID-19 vaccine responses in SSA might display distinctive profiles from other geographies, highlighting the need for region-specific data to guide local vaccination strategies.

METHODS

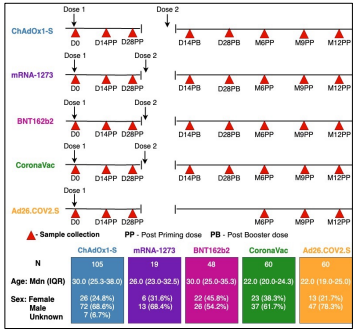


Fig 1: Timeline of vaccination and bleeds for each vaccine

- Blood specimens were collected from 292 recipients of one of six COVID-19 vaccines, including Pfizer's BNT162b2, AstraZeneca's ChAdox1-S, Moderna's mRNA 1273, Janssen's Ad26.CoV2.S, and Sinovac's Coronavac, Fig 1.
- Antibody responses were examined with a validated in-house ELISA to quantify concentrations and optical densities (ODs) of SARS-CoV-2-specific IgG, IgM, and IgA binding antibodies.
- Optical density cut-off points (S-IgG: 0.432, S-IgM: 0.459, S-IgA: 0.226, N-IgG: 0.454, N-IgM: 0.089) were used to classify specimen seropositivity across time.
- Statistical analyses included box plots, diverging bar graphs, and the Wilcoxon test with a Bonferroni correction for multiple analyses.

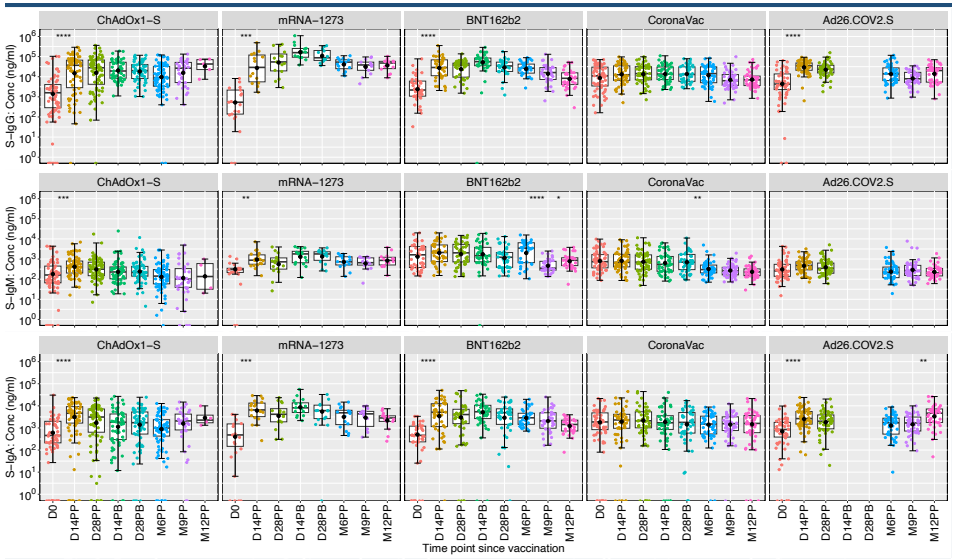


Fig 2: Boxplots comparing S-directed antibody concentrations in all participants to the five vaccines over time showing medians (horizontal lines), means (solid black circles) and quartiles (top and bottom of box)

CONCLUSIONS

- Strong S-IgG responses to the COVID-19 vaccines were observed in the SSA demographic, indicating robust immune activation in this population.
- The absence of a post-boost surge in antibody levels challenges global vaccination norms, prompting a reassessment of booster dose scheduling in the SSA demographic.

Stable S-IgG and S-IgA responses post-booster dose suggest prolonged protection with potential implications for delaying booster schedules, offering hope for regions facing logistical hurdles in vaccination efforts.

The sustained stability of IgG levels following post-COVID-19 vaccination in SSA populations may stem from a complex interplay of genetic diversity, environmental influences, and unique epidemiological factors specific to the region. Such persistence could be linked to prolonged immune activation, potentially facilitated by prior exposure to related pathogens, thereby priming the immune system.

Understanding these factors is crucial for optimising vaccination strategies in SSA populations.

RESULTS

- The results revealed a remarkable surge in antibody responses from day 0 to day 14 post-primary dose administration for ChAdOx1-S, mRNA-1273, BNT162b2, and Ad26.COV2.S, in both S-IgG and S-IgA. However, there was no discernible statistical difference in antibody responses between day 0 and 14 days post-primary dose among recipients of CoronaVac. After the booster dose, no significant change in antibody concentrations was observed across all vaccine types (Fig 2).
- The Coronavac vaccinees had the highest frequency of pre-existing spike-directed seropositivity at baseline(Fig 3).
- Higher fold changes in S-IgG and S-IgA levels were consistently observed following the prime dose across all vaccines, excluding CoronaVac (Fig 4), possibly due prior priming from its higher level of preexisting baseline cross-reactivity. Notably, this heightened response was evident even when analyzing only baseline S-IgG seronegative specimens (Fig 5). However, after the second dose, these marked increases were notably absent across all vaccine types.

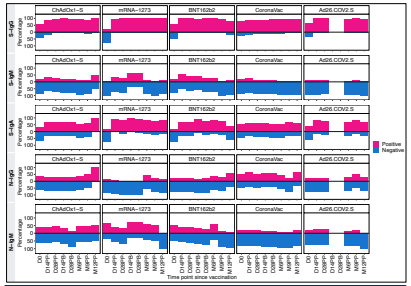


Fig 3: Antibody seroconversion at the different time points

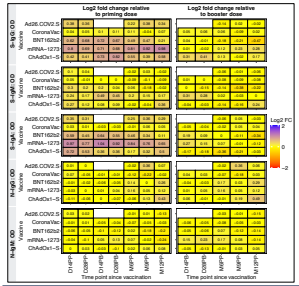


Fig 4: Heatmaps displaying the log2 fold change in antibody concentrations relative to priming and booster doses

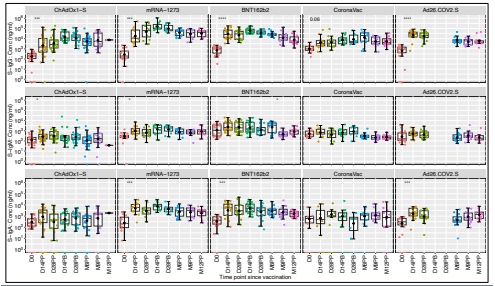


Fig 5: Boxplots comparing S-directed concentration antibody responses of various vaccines over time in subjects with baseline S-IgG- serostatus

ADDITIONAL KEY INFORMATION

CROI 2024; Denver, Colorado
COVID-19 Vaccines; Poster Session C3, 2:30-4:00 pm,
Jennifer Serwanga

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