Poster: 1941

NATIONAL CENTER FOR EMERGING AND ZOONOTIC INFECTIOUS DISEASES

Describing The Immune Response Kinetics To mRNA COVID-19 Vaccines Among Previously SARS-CoV-2–Infected And –Uninfected Nursing Home Residents, A Prospective Longitudinal Observational Cohort Evaluation—Georgia, October 2020 – September 2021

Zeshan Chisty, MPH; M. Haile, MPH; J. DaSilva, MA; H. Houston; S. Le; D. Li, MPH; R. Overton, MPH; M. Arons, MSc, RN; A. Schuh, PhD, MPH; C. Tsang, MPH; D. Selenic, MD, MPH; J. Clemente, MPH; J. Bugrysheva, PhD; A. Branch, PHD; N. Thornburg, PhD; M. Epperson, PhD; M. Rasheed, PhD; C. Bohannon, PhD; M. Stuckey, PhD, MPH; L.C. McDonald, MD; A. Brown; PhD, MPH; P. Kutty, MD, MPH

Centers for Disease Control and Prevention, Atlanta, GA, USA

BACKGROUND

- Congregate settings such as nursing homes (NH) have been disproportionately affected by the coronavirus disease 2019 (COVID-19) pandemic.
- Vaccination is a key strategy to prevent COVID-19 morbidity and mortality in NH residents. Due to age-related immunosenescence and multiple comorbid conditions, NH residents may not mount an adequate immune response to COVID-19 vaccines.

OBJECTIVE

To describe post-COVID-19 vaccination [primary series and first booster] immune responses and occurrence of new infection or reinfection in NH residents with/without evidence of prior SARS-CoV-2 infection.

METHODS

- Longitudinal prospective cohort of 37 NH residents from 3 NHs in Atlanta, GA.
- Descriptive statistics were used to describe the trajectories of anti-spike (anti-S), anti-receptor binding domain (anti-RBD), and anti-nucleocapsid (anti-N) IgG titer levels.
- Interviews, chart abstractions, and specimens [blood and anterior nasal swabs (ANs)] were collected at baseline and monthly visits.
  - ANs underwent molecular (RT-PCR) and BinaxNOW™ antigen testing.
  - Blood specimens underwent Quantitative Meso Scale Discovery platform testing for anti-S and anti-N antibodies.
  - In a subset (n=13), S-specific memory B cells (MBCs) were enumerated using ELISpot assay.
- This evaluation period followed participants from 9—15 months post-second COVID-19 vaccine dose.

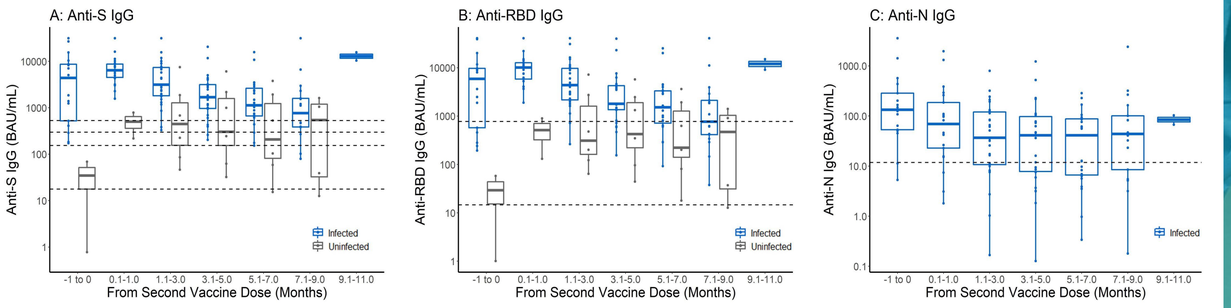
RESULTS

- At enrollment (n=37), the median age was 70.5 years; 54% female, 57% White Non-Hispanic, 79% had ≥3 comorbidities, and 30 (81%) had prior SARS-CoV-2 infection.
  - 28 (76%) received Pfizer-BioNTech and 9 (24%) Moderna homologous vaccine.
- **From the second COVID-19 vaccine dose to the first booster (n=37) [Figures 1A to 1C]:**
  - Among those infected (n=30), the median anti-S IgG titers peaked 0.1-1.0 months post second dose (median 6,433 BAU/ml, Q1 4,505 BAU/ml, Q3 8,755 BAU/ml), then showed a steady decline. Median anti-N titers remained above the detection threshold.
  - Among those uninfected (n=7), the peak anti-S IgG median was observed at 0.1-1.0 months after second dose (median 504 BAU/ml, Q1 361 BAU/ml, Q3 647 BAU/ml).
  - Figures 2A to 2C represents the immune responses of the 25 participants who received the first booster.
  - During the period of evaluation, 4 participants became reinfected, and 3 experienced their first infections during the period between the primary series and the first booster dose.
- **From the first booster to the end of the current evaluation period (n=25) [Figures 3A to 3C]:**
  - Among the infected participants (n=19), the peak anti-S IgG was seen 0-1.0 months post first booster (median 6,814 BAU/ml, Q1 3,757 BAU/ml, Q3 19,749 BAU/ml). Median anti-N titers remained near the detection threshold.
  - Among the reinfected (n=4), the anti-S IgG titer peaked from 0-1.0 months post first booster (median 15,640 BAU/ml, Q1 8,775 BAU/ml, Q3 22,504 BAU/ml). The anti-N median remained above the detection threshold.
  - Among the uninfected (n=2), the anti-S IgG titer increased from 0-1.0 months post-first booster (peak = 5,983 BAU/ml).
- In a subset of 13 participants (10 infected, 3 uninfected), in whom MBCs were detected and quantified, a decline was observed from post-second dose to the first booster, with an increase observed post-first booster (Figure 4).
- Age, sex, and comorbidities had no appreciable impact on anti-S IgG titer.

Key Findings

Data from a nursing home convenience cohort suggest that any SARS-CoV-2 infection had a pronounced immunomodulatory enhancing effect on the magnitude and duration of the humoral and cellular immune responses after the primary series and first booster of COVID-19 vaccine.

Figures 1A to 1C. Antibody Responses from mRNA COVID-19 Vaccine Second Dose to Pre-booster among 37 Nursing Home Residents



Note:
A SARS-CoV-2 infected participant was defined as a participant with documented infection in the electronic health record or confirmed by laboratory testing: RT-PCR, BinaxNOW, presence of anti-N.

A reinfected SARS-CoV-2 participant was defined as a participant with documented infection in the electronic health record or confirmed by laboratory testing: RT-PCR, BinaxNOW, a 4-fold increase in anti-N 90 days after the prior infection.

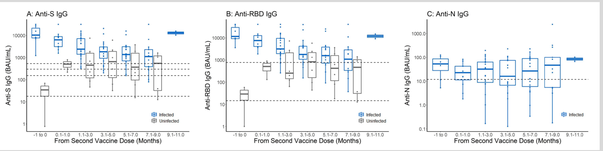
An uninfected participant was defined as having none of the above.

As more data has become available, we are now presenting data from Oct 2020 through the preliminary findings dated March 2022.

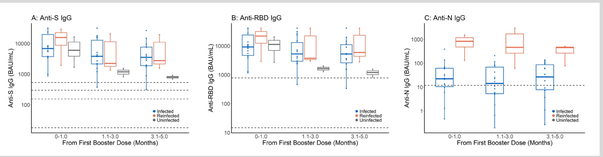
Scan Here To View The Poster In The App

RESULTS CONTINUED

Figures 2A to 2C. Antibody Responses from mRNA COVID-19 Vaccine Second Dose to Pre-booster among 25 participants having received their first booster dose

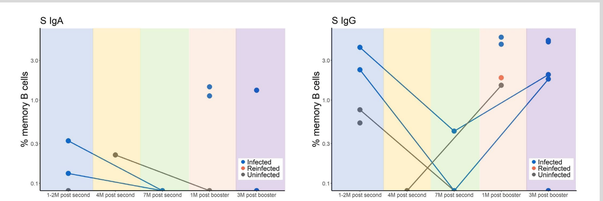


Figures 3A to 3C. Antibody Responses from post-first mRNA COVID-19 Vaccine booster dose among 25 participants having received the first booster dose



Figures 1, 2, and 3. Median boxplot distributions showing Anti-S, Anti-RBD, and Anti-N specific IgG responses. Values are depicted in BAU/mL based on WHO standard. (A) Dashed lines from top to bottom indicate reference threshold values for Pfizer VE (530 BAU/mL, 95%), Moderna VE (298 BAU/mL, 90%), wild type virus VE (154 BAU/mL, 95%), and detection of Anti-S IgG seropositivity (17.66 BAU/mL). (B) Dashed lines from top to bottom indicate reference threshold values for Moderna VE (775 BAU/mL, 90%) and detection of anti-RBD IgG seropositivity (14.64 BAU/mL). (C) Dashed line indicates reference threshold value for detection of Anti-N IgG seropositivity (11.8 BAU/mL).

Figure 4. Percentage of S-specific IgA and IgG Memory B cells among 13 participants



CONCLUSIONS

- In this NH convenience cohort, any SARS-CoV-2 infection had a pronounced immunomodulatory enhancing effect on the magnitude and duration of the humoral and cellular immune responses after the primary series and first booster.
- The decline of anti-S IgG antibodies post-second dose and rise after the first booster supported the COVID-19 ACIP recommendations in NH residents (ref: ACIP COVID-19 Vaccine Recommendations).
- The low counts of S-specific memory B cells indicated immunosenescence, irrespective of infection status, in this high-risk population and support the need for repeated boosters.

CONTACT INFO

Zeshan Chisty, MPH
zchisty@cdc.gov