Duration of Seroprevalence Among Individuals Previously Infected with SARS-CoV-2 and their Household Contacts

Jonathan Altamirano,[1] MS, Marcela Lopez,[1] BA, Leanne X. Chun,[1] BBiomed, Grace K-Y. Tam,[1] BS, India Robinson,[1] BS, Nuzhat J. Shaikh,[1] MBBS, Sean Leary,[1] BS, Yuan J. Carrington,[1] BA, BBA, Frank Zhou,[1] BS, Emma Stainton,[1] BS, Alondra A. Aguilar, [1] BA, Makeda L. Robinson,[3] MD, PhD, Rasika Behl,[1] MPH, Rosita Thiessen,[1] CCRP, Prasanthi Govindarajan,[2] MBBS, MAS, Andra L. Blomkalns,[2] MD, MBA, Benjamin A. Pinsky,[4] MD, PhD, Yvonne Maldonado,[1] MD

[1] Department of Pediatrics, Stanford University School of Medicine; [2] Department of Emergency Medicine, Stanford University School of Medicine; [3]Department of Medicine, Stanford University School of Medicine; [4] Department of Pathology, Stanford University School of Medicine

INTRODUCTION

The COVID-19 pandemic is a major global health crisis leading to over 618 million cases and over 6.6 million deaths worldwide, as of October 2022. Serological tests directed against SARS-CoV-2 can provide information about the timing of infection and immunity against the virus. However, the kinetics of the host immune response to SARS-CoV-2 remain poorly understood. We conducted a study with two key aims:

1) **to describe the duration of seropositivity in SARS-CoV-2 cases.**
2) **to identify subpopulations with different durations of antibody responses.**

METHODS

In this prospective cohort study, we enrolled 103 SARS-CoV-2 patients from the San Francisco Bay Area between March 2020 - August 2022. Potential participants were eligible if they had been diagnosed with SARS-CoV-2 within the past 7 days via reverse transcription polymerase chain reaction (RT-PCR). Participants' household contacts were also invited to participate in order to capture incident cases of SARS-CoV-2.

FIGURE 1: Venous blood collection kit. Each kit includes one 4.5mL BD Vacutainer® PST™ Gel and Lithium Heparin tube and two or three 8mL BD Vacutainer® CPT™ (Sodium Citrate) tubes.

Participants were asked to provide blood samples at three time points: at baseline within 2 weeks of the index's diagnosis of COVID-19, and at one- and three-months post-enrollment. Participants willing to provide additional longitudinal samples returned for venous blood collection at six-, nine- and twelve- months post-enrollment.

Samples were tested for the presence of IgG antibodies against SARS-CoV-2 spike protein via an FDA EUA approved ELISA.

Information collected on the individual level included age, sex, vaccination status, symptomatology, and comorbidities. Kaplan-Meier curves were generated to visually represent the duration of seroprevalence by these different factors.

RESULTS

Table 1. Demographics	
Variables	Cases (n=103), n (%)
Gender	
Women	58 (56.31)
Men	45 (43.69)
Age in years (Median, IQR)	47.0 (30.0 – 58.0)
Symptomatic Status	
Asymptomatic	22 (21.36)
Symptomatic	81 (78.64)
Vaccination	
Unvaccinated Prior to Enrollment	69 (66.99)
Vaccinated Prior to Enrollment	34 (33.01)
Chronic Disease	
No Chronic Disease	65 (63.11)
Reported Chronic Disease	38 (36.89)
Days of Follow-Up (Median, IQR)	109 (93 – 210)
IgG Duration Post-Infection in Days (Median, IQR)	114 (41 - 172)

TABLE 1: Demographics

IgG Over Time

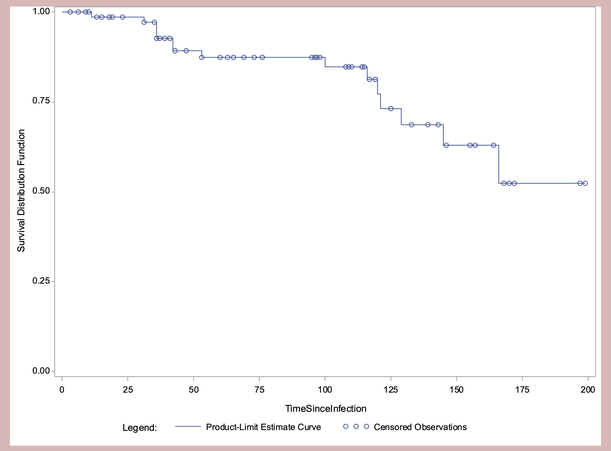

FIGURE 2a. Kaplan-Meier curve of seropositivity over time.

IgG Over Time by Vaccination Status

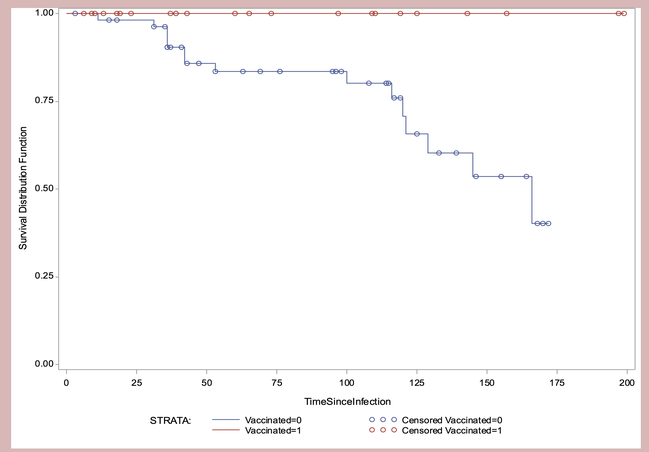

FIGURE 2b. Kaplan-Meier curves comparing seropositivity over time by vaccination status.

To date, we have analyzed 340 serologic samples from 103 SARS-CoV-2 cases, including 103 baseline samples, 101 one-month samples, 94 three-month samples, 30 six-month samples, and 12 nine-month samples. Participant details can be found in **Table 1**.

Median IgG duration post-infection was 114 days (interquartile range 41-172 days.) 58 (56.3%) cases were women, and median age was 47 years. 81 (78.6%) were symptomatic, and only a third was vaccinated prior to enrollment (n=34, 33.0%).

Individuals who were fully vaccinated prior to COVID-19 infection show longer antibody duration than people who were not vaccinated. Median antibody duration for unvaccinated cases was 71 days (IQR = 36 - 121 days); all individuals who were vaccinated prior to infection still had antibody response as far as 200 days post-infection. (**Figure 2b.**)

Symptomatic cases of COVID-19 (not graphed here) showed a slower decline in antibody response when compared to asymptomatic cases (116 days [IQR = 42 - 129 days] vs. 36 [IQR = 31 - 36 days] respectively).

CONCLUSION

Our study demonstrated differences in seroprevalence by vaccination and symptom status. These results support findings from the CDC, which identified increased protection against SARS-CoV-2 reinfection in vaccinated individuals when compared to unvaccinated SARS-CoV-2 cases.

As we transition away from universal masking policies, **identifying differences in seroprevalence in various demographic groups can provide insight into longitudinal immune responses post-infection. Individuals at risk for short seropositivity duration could serve as unique targets for intervention in the case of future outbreaks**.

As the factors identified here (symptom and vaccination status) are likely interconnected, next steps include the use of Cox proportional hazard regressions to further analyze antibody duration.

Corresponding author:
leannexc@stanford.edu