Efficacy of natural immunity against reinfection with SARS-CoV-2 B.1351 variant

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BACKGROUND

- Reinfections with emerging SARS-CoV-2 variants are a serious concern.
- This study estimated the efficacy of immunity induced by natural infection against reinfection with B.1.351 and B.1.1.7 variants.

METHODS

- Two retrospective matched cohort studies conducted in Qatar from March 8-April 21
- We assessed reinfections in the national cohort of individuals with a prior PCR-confirmed infection and the national cohort of antibody-positive individuals, matching each in a 1:1 ratio by demographic characteristics to the national cohort of antibody-negative individuals.
- Incidence risks (using Kaplan-Meier estimator), incidence rates, and efficacy of natural infection against reinfection were estimated.

RESULTS

- In the study comparing 44,821 individuals with a prior PCR-confirmed infection to antibody-negative individuals, efficacy of natural infection against reinfection was (Figure 1 & Table 1):
  - 92.3% (95% CI: 90.3-93.8%) for B.1.351
  - 97.6% (95% CI: 95.7-98.7%) for B.1.1.7
  - 87.9% (95% CI: 84.7-90.5%) for unidentified variants (mostly suspected B.1.351 cases based on weekly sequencing analysis).
- In the second study, comparing 20,406 antibody-positive to antibody-negative individuals, efficacy of natural infection against reinfection was (Figure 1 & Table 1):
  - 86.4% (95% CI: 82.5-89.5%) for B.1.351
  - 96.4% (95% CI: 92.1-98.3%) for B.1.1.7
  - 83.1% (95% CI: 77.2-87.5%) for unidentified variants.
- Additional analyses and sensitivity analyses 1) adjusting for differences in testing frequency across cohorts, 2) factoring all PCR-testing in the matched-cohorts stratified by calendar week and using the Mantel-Haenszel approach, to additionally adjust for the varying phase of the epidemic, and 3) applying the Fine-Gray model, confirmed these results.

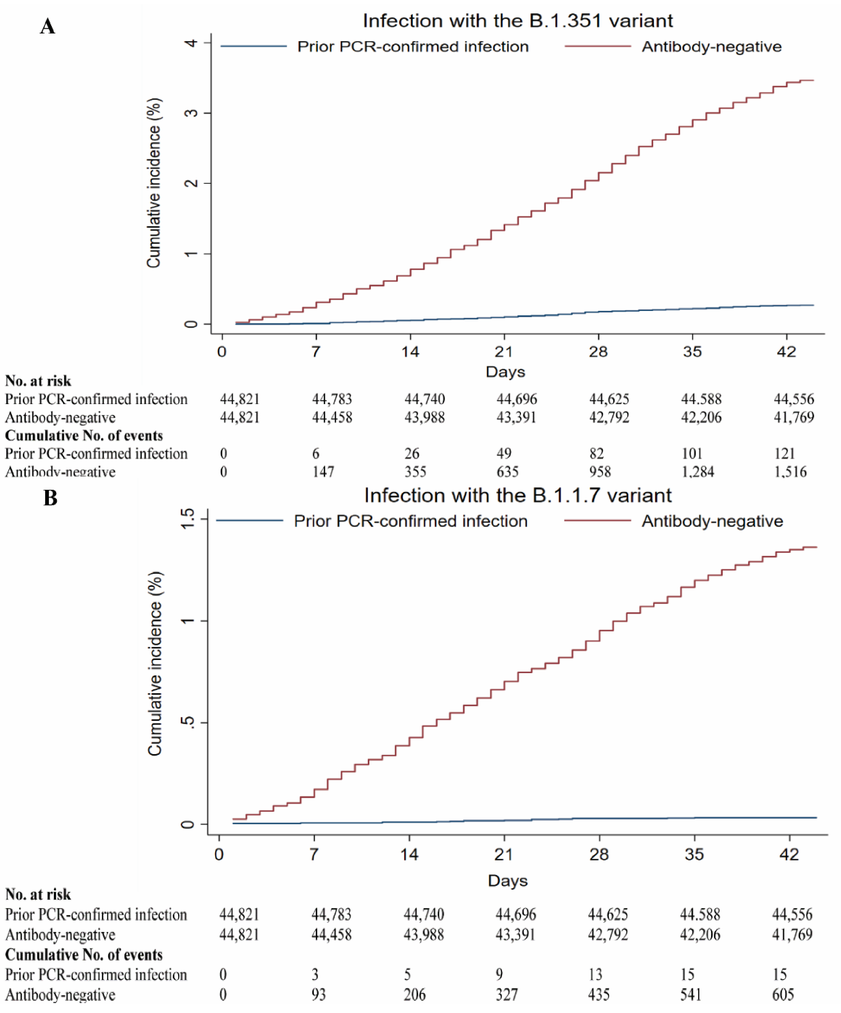
Table 1. Incidence rate and efficacy of prior infection against reinfection with A) the B.1.351 variant, B) the B.1.1.7 variant, and C) variants of unknown status in the two matched cohort studies.

Measure	Follow-up time (person-weeks)	B.1.351 variant	B.1.1.7 variant	Variants of unknown status*
Incidence rate				
Incidence rate per 10,000 person-weeks (95% CI)				
Prior PCR-confirmed infection vs. antibody-negative				
Cohort of individuals with a prior PCR-confirmed infection (n: 44,821)	280,835.1	4.34 (3.64-5.19)	0.53 (0.32-0.89)	4.49 (3.77-5.34)
Cohort of antibody-negative individuals (n: 44,821)	271,813.9	56.25 (53.50-59.14)	22.44 (20.73-24.30)	37.12 (34.90-39.48)
Antibody-positive vs. antibody-negative				
Cohort of antibody-positive individuals (n: 20,485)	128,082.6	8.82 (7.34-10.61)	0.70 (0.37-1.35)	6.71 (5.44-8.29)
Cohort of antibody-negative individuals (n: 20,485)	123,834.3	65.09 (60.75-69.74)	19.38 (17.08-21.99)	39.73 (36.37-43.40)
Efficacy				
Efficacy of infection against reinfection in % (95% CI)				
Individuals with a prior PCR-confirmed infection		92.3 (90.3-93.8)	97.6 (95.7-98.7)	87.9 (84.7-90.5)
Antibody-positive individuals		86.4 (82.5-89.5)	96.4 (92.1-98.3)	83.1 (77.2-87.5)

CONCLUSIONS

- Natural infection with SARS-CoV-2 induces robust protection of 80-90% against reinfection with B.1.351 even a year after the primary infection, but lower than that against B.1.1.7.

Figure 1. Kaplan-Meier curves showing the cumulative risk (incidence) of documented SARS-CoV-2 reinfection with A) the B.1.351 variant and B) the B.1.1.7 variant in the cohort of individuals with a prior PCR-confirmed infection compared to documented infection in the matched cohort of antibody-negative individuals. Cohorts were matched by age, sex, and nationality. Follow-up extended from March 8 to April 21, 2021.



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