Antibody Response of BNT162b2 and CoronaVac Platforms in Recovered Individuals Previously Infected by COVID-19 against SARS-CoV-2 Wild Type and Delta Variant

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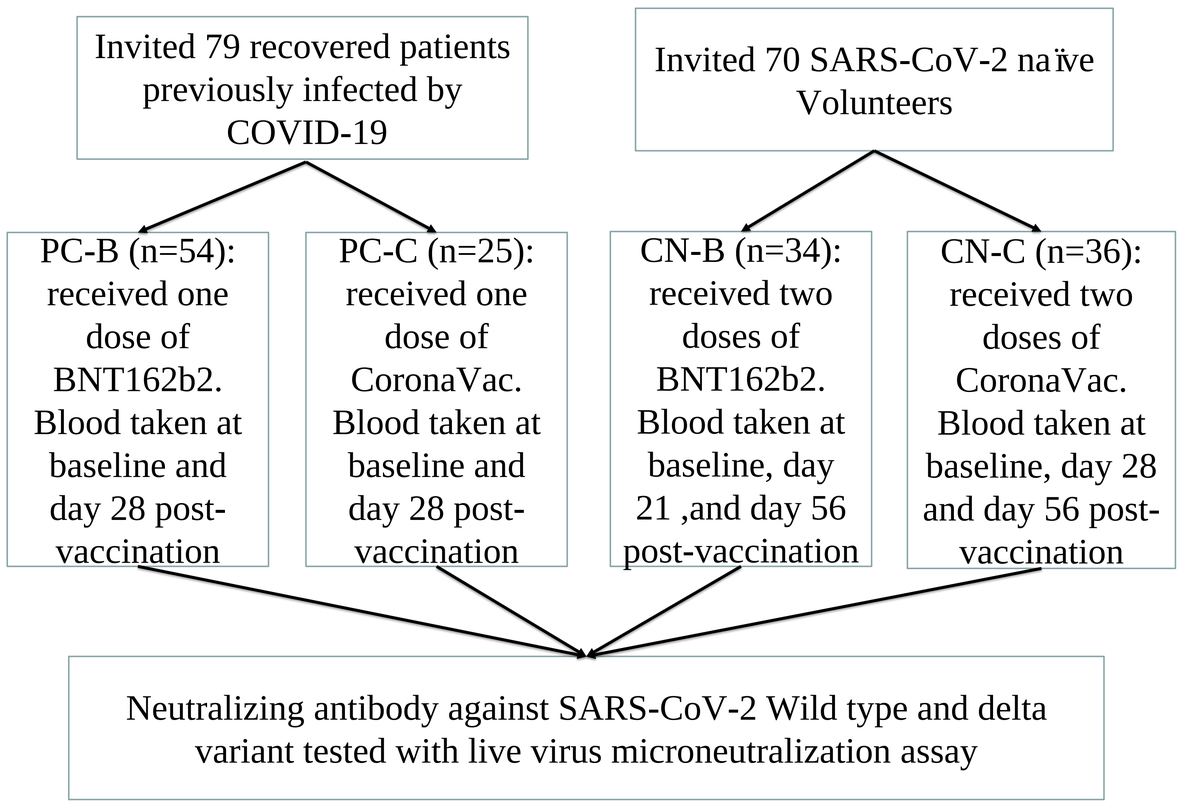
Abstract: In the study, we aimed to investigate whether vaccine platform and time of vaccination affect immunogenicity against the SARS-CoV-2 wild type (WT) and delta variant (DV). Convalescent patients infected by COVID-19 were recruited and received one booster dose of the BNT162b2 (PC-B) or CoronaVac (PC-C) vaccines, while SARS-CoV-2 naïve subjects received two doses of the BNT162b2 (CN-B) or CoronaVac (CN-C) vaccines. The neutralizing antibody in sera against the WT and DV was determined with live virus neutralization assay (vMN). In the PC-B group, the BNT162b2 vaccine enhanced antibody response against WT and DV, with 22.3-fold and 20.4-fold increases, respectively. The PC-C group also showed 1.8-fold and 2.2-fold increases for WT and DV, respectively, after receiving the CoronaVac vaccine. There was a 10.6-fold increase in GMT in the CN-B group and a 1.3-fold increase in the CN-C group against DV after full vaccination. In both the PC-B and PC-C groups, there was no difference between GMT against WT and DV after vaccination. Subjects in the CN-B and CN-C groups showed inferior GMT against DV compared with GMT against WT after vaccination. In this study, one booster shot effectively enhanced the pre-existing neutralizing activity against WT and DV in recovered subjects.

Introduction: COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. Vaccines are still the primary method used to control COVID-19. COVID-19 vaccines approved for clinical use include mRNA vaccines (BNT162b2), viral vector-based vac-cines (ChAdOx1), inactivated virus vaccines (CoronaVac), and subunit protein vaccines (NVX-CoV2373) [2,3]. In the present study, we aim to evaluate the boosting effect on the antibody levels of recovered patients previously infected by COVID-19 with different vaccine platforms.

Methodology:



Results:

1. Baseline characteristics of participants.

Table 1. Baseline characteristics of subjects receiving COVID-19 vaccines.

	PC-B (*n* = 54)	CN-B (*n* = 34)	PC-C (*n* = 25)	CN-C (*n* = 36)
Age (years)	50.5 (23–80)	50 (18–68)	55 (21–73)	61 (20–76)
Female	19 (35.2%)	22 (64.7%)	7 (28%)	22 (61.1%)
Male	35 (64.8%)	12 (35.3%)	18 (72%)	14 (38.9%)
Severity of COVID-19				
Severe	5 (9.3%)	N/A	4 (16%)	N/A
Mild	49 (90.7%)	N/A	21 (84%)	N/A
Comorbidities	13 (24.1%)	8 (23.5%)	11 (44%)	17 (47.2%)

Data are median age (range) or *n* (%); PC-B: recovered individuals previously infected by COVID-19 receiving BNT162b2; PC-C: recovered individuals previously infected by COVID-19 receiving CoronaVac; CN-B: SARS-CoV-2 naïve individuals receiving BNT162b2; CN-C: SARS-CoV-2 naïve individuals receiving CoronaVac. Comorbidities: hypertension (HT), ischemic heart diseases (IHD), diabetes mellitus (DM), stroke, chronic heart failure (CHF), malignancy, asthma, chronic obstructive pulmonary disease (COPD), and thyroid diseases. N/A: not applicable.

2. Immunogenicity of COVID-19 vaccines in recovered subjects and healthy subjects.

Table 2. Immunogenicity of COVID-19 vaccines in recovered subjects and SARS-CoV-2-naïve subjects.

	PC-B (*n* = 54)	CN-B (*n* = 34)	PC-C (*n* = 25)	CN-C (*n* = 36)
Wild type				
Baseline				
GMT	32.2 (24.8–41.6)	5 (5–5)	32.9 (24.7–44.0)	5 (5–5)
Post primer dose				
GMT		11.5 (14.3–9.3)		5.5 (5.0–6.1)
GMT fold increase value		2.3 (1.9–2.9)		1.1 (1.0–1.2)
Post booster dose				
GMT	718.4 (513.2–1005.7)	81.6 (60.4–110.3)	59.0 (43.1–80.8)	12.1 (9.9–14.9)
GMT fold increase value	22.3 (16.2–30.8)	16.3 (12.1–22.1)	1.8 (1.2–2.6)	2.4 (2.0–3.0)
Delta variant				
Baseline				
GMT	37.5 (28.4–49.6)	5 (5–5)	32.9 (23.3–46.6)	5 (5–5)
Post primer dose				
GMT		6.9 (5.8–8.2)		5.9 (5.0–7.0)
GMT fold increase value		1.4 (1.2–1.6)		1.2 (1.0–1.4)
Post booster dose				
GMT	766.0 (528.1–1111.0)	53.2 (39.0–72.5)	71.6 (51.0–100.5)	6.6 (5.5–7.8)
GMT fold increase value	20.4 (14.8–28.1)	10.6 (7.8–14.5)	2.2 (1.4–3.3)	1.3 (1.1–1.6)

Data are GMT values (95% CI); PC-B: recovered individuals previously infected by COVID-19 receiving BNT162b2; PC-C: recovered individuals previously infected by COVID-19 receiving CoronaVac; CN-B: SARS-CoV-2 naïve individuals receiving BNT162b2; CN-C: SARS-CoV-2 naïve individuals receiving CoronaVac; post primer dose: serum collected on day 28 (CN-C) or day 21 (CN-B) post first dose of vaccine. Post booster dose: serum collected on day 56 (CN-C and CN-B) or on day 28 (PC-B and PC-C) post first dose of vaccine.

Conclusion:

1. One BNT162b2 or CoronaVac vaccine booster dose could enhance the pre-existing antibody response in recovered patients against WT and DV effectively
2. For SARS-CoV-2 naïve individuals, two doses of BNT162b2 protects against DV, but for individuals who received two doses of CoronaVac, protection against DV is minimal; therefore, an additional mRNA booster dose should be considered to enhance their neutralizing antibody response against SARS-CoV-2 variants.
3. This study could provide useful information about the time of vaccination in recovered individuals previously infected by COVID-19.

Reference

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