Neutralization potential of Covishield vaccinated individuals against B.1.617.1

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Abstract:

Covishield comprises the larger proportion in the vaccination program in India. Hence, it is of utmost importance to understand neutralizing capability of vaccine against the B.1.617.1 variant which is considered to responsible for surge of the cases in India. The neutralizing-antibody (NAb) titer against B.1.167.1 and prototype B.1 variant (D614G) was determined of the vaccine sera (4 weeks after second dose) of COVID-19 naïve subjects (n=43) and COVID-19 recovered subjects (n=18). The results demonstrated that sera of COVID-19 recovered subjects (n=18) who received two doses of Covishield have higher NAb response compared to the COVID-19 naive with a significant difference ($p<0.0001$) in NAb titer against B.1 and B.1.617.1 In-spite of reduction in the neutralizing titer against B.1.617.1 variant; Covishield vaccine-induced antibodies are likely to be protective to limit the severity and mortality of the disease in the vaccinated individuals.

Text

Multiple severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) variants have emerged and reported from different countries worldwide[1]. Studies are being conducted on these newly emerging SARS-CoV-2 variants to understand their impact on the efficacy of the currently available COVID-19 vaccines.[1] Many of the studies have reported reduced neutralization capabilities of multiple vaccines viz., mRNA-1273, NVX-CoV2373, BNT162b2, BBIBP-CorV, and ChAdOx1-nCoV19 against different variants B.1.1.7, B.1.351 and B.1.1.28 P1.[1-2] Recently, new SARS-CoV-2 variant, B.1.617.1, B.1.617.2 and B.1.617.3 with specific deleterious mutations have been reported from India[3-4], which has been associated with increase in the number of SARS-CoV-2 cases especially in Maharashtra state[3]. This variant has been shown to have higher transmissibility and pathogenicity in hamster model and has raised serious concern pertaining to the national COVID-19 vaccination program in India and other countries[3,5]. Till date, over 170 million doses of vaccine have been administered to Indian citizens with two approved vaccines- Covishield (Astrazeneca-Oxford) and Covaxin™ (BBV152)[6]. Recently, we have demonstrated the neutralizing efficacy of Covaxin™ against B.1.617.1, B.1.1.7, B.1.1.28.2 and variants.[4,7,8] Coviesheild comprises the larger proportion in the vaccination program in India. Hence, it is of utmost importance to understand neutralizing capability of Covishield vaccine against the B.1.617.1 variant in view of the severity of the second wave.

We have evaluated neutralizing capability of the Covishield vaccine using sera obtained from COVID-19 naïve subjects (n=43) and COVID-19 positive recovered subjects (n=18) 4 weeks after the second dose.

The neutralizing-antibody (NAb) titer against B.1.167.1 and prototype B.1 variant (D614G) was determined for both the categories of sera. Of the sera obtained from COVID-19 naïve subjects, 23.25% samples (n=10) didn't show any NAb titer against both the variants. 27.90% of the samples (n=12) showed NAb titer only with B.1. A total of 21 serum specimens (48.83%) elicited NAb titers against both B.1 and B.1.617.1 variants. The geometrical mean titer (GMT) along with standard deviation of Covishield vaccinee sera against B.1 and B.1.617.1 were 42.92±3.8 (95% CI: 40.21-128.5; n=43) and 21.92±4.42 (95% CI: 24.4-62.64; n=43) respectively.

The results demonstrated that sera of COVID-19 positive recovered subjects (n=18, red color) who received two doses of Covishield have higher antibody response compared to the subjects with COVID-19 naive (n=43, green color) with a significant difference ($p < 0.0001$) in NAb titer against B.1 (triangle) and B.1.617.1 (square) variants (Figure 1 A and 1B). An increase in the GMT of the sera of COVID-19 recovered cases with vaccination (29.5 fold) compared to COVID-19 naïve vaccinees (23.5 fold) was observed against B.1 and B.1.617.1 respectively. This indicates that COVID-19 recovered cases who received 2 doses of vaccine had a better immune response in comparison to COVID-19 naive subjects who receivd 2 doses vaccine.

A pair-wise comparison using Wilcoxon matched-pairs signed-rank test demonstrated a significant two-fold reduction (p-value<0.0001) in the neutralization titer of B.1.617.1 compared to B.1 variant in the COVID-19 naïve vacinees (Figure 1 C). Further, we also determined the IgG titer against S1-RBD and observed a non significant difference between COVID-19 recovered cases administered with 2 dose of vaccine and COVID-19 naive vaccinated cases (Figure 1D).

Inspite of reduction in the neutralizing titer against B.1.617.1 variant; Covishield vaccine-induced antibodies are likely to be protective to limit the severity and mortality of the disease in the vaccinated individuals.

Ethical approval

The study was approved by the Institutional Biosafety Committee and Institutional Human Ethics Committee of ICMR-NIV, Pune, India. under project 'Propagation of new SRS-CoV-2 variantisolate and characterization in cell culture and animal model.

Author Contributions

PDY and PA contributed to study design, data analysis, interpretation and writing and critical review. GNS, GRD, DYP,RRS, AMS, DAN and SK contributed to data collection, interpretation, writing and critical review. NG, SP, and BB contributed to the critical review and finalization of the paper.

Conflicts of Interest

Authors do not have a conflict of interest among themselves.

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Figure Legend

Figure 1: Neutralization of B.1.617.1 variant: Comparison of NAb titer between COVID-19 naïve cases (green, n=43) and COVID-19 recovered cases (red, n=18) administered with 2 doses of vaccine (sera collected 28 days after the second dose) against B.1 **(A)** and B.1.617.1 **(B)**. A two-tailed pair-wise comparison was performed using the Mann-Whitney test and **** represent p-value <0.001.

C) Scatter plot depicting the neutralization activity of the COVID-19 naïve cases (n=43) vaccinated with two doses of Covishield vaccine (sera collected 28 days after the second dose) against the prototype B.1 (D614G) (green, triangle) and B.1.617.1 (green, square). A neutralization reduction factor of 1.94 was observed between the B.1 (D614G) and B.1.617.1 variant. A two-tailed pair-wise comparison was performed using the Wilcoxon matched-pairs signed-rank test with a p-value of 0.05. **** represent p-value <0.001 and **p value=0.0038, ns= non-significant p-value.

(D) A comparison of IgG antibody titer against RBD protein between COVID-19 naïve cases (n=43) and COVID-19 recovered cases (n=18) administered with 2 doses of vaccine. A two-tailed pair-wise comparison was performed using the Mann-Whitney test and ns= non-significant p-value.