

Rapid Communication

Neutralization of VUI B.1.1.28 P2 variant with sera of COVID-19 recovered cases and recipients of Covaxin an inactivated COVID-19 vaccine

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The emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) variants with mutations in the spike protein region lead to growing concerns about the efficacy of the currently available coronavirus disease 2019 (COVID-19) vaccines or neutralizing capability of the sera of individuals infected naturally with the earlier circulating strains. Although some of the vaccines seem to be effective against B.1.1.7 variant, their efficacy against B.1.351 variant has been demonstrated to be less efficacious.^{1–4} Earlier we have reported COVID-19 cases infected with the SARS-CoV-2 variant B.1.1.7 and its effectiveness in Covaxin (BBV152) vaccinees.^{5,6} A SARS-CoV-2 vaccine that used an inactivation platform has been reported to be 50.7% efficacious from Brazil, where the VUI B.1.1.28.2 variant is more prevalent (NCT0445659).⁷ Similarly, Brazil variant P2 lineage (B.1.1.28.2) virus isolated from international travellers travelled to India from abroad was used to determine the neutralization activity with sera of Covaxin vaccine recipients and recovered COVID-19 cases.

In this study, we determined the IgG immune response and neutralizing activity of the 19 convalescent sera specimens obtained from the recovered cases of COVID-19 and confirmed for B.1.1.7 (UK) (n = 2), B.1.351 (South Africa) (n = 2), B.1.1.28.2 (n = 2), B1 lineage (n = 13) (15–113 days post positive test). The data were compared with 42 participants immunized with an inactivated COVID-19 vaccine, Covaxin (BBV152) as part of phase II clinical trial (2 months post the second dose).⁸ Neutralizing antibody (NAb) titres of all the serum specimens were evaluated against B.1.1.28.2 variant using

plaque reduction neutralization test (PRNT50).⁵ Neutralization activity of B.1.1.28.2 was compared to prototype D614G variant as Covaxin vaccine has been developed using D614G variant.

The geometric mean titre (GMT) of an IgG titre for S1-RBD and N protein ELISA (In house assays developed with prototype Wuhan-Hu-1 strain) was observed to be 794.8 and 4627, respectively, for the SARS-CoV-2 recovered individuals. Covaxin vaccine recipients showed a GMT IgG titre of 2250 with S1-RBD and 3099 with the N protein compared, the former being significantly high compared to natural SARS-CoV-2 infection (Figure 1A). The geometric mean titre (GMT) of the neutralizing antibodies (NAb) of the sera with natural SARS-CoV-2 infection and Covaxin vaccine recipients for the prototype D614G strain was 120.1 and 337.5. In the B.1.1.28.2 variant, the GMT for individuals with natural SARS-CoV-2 infection was observed to be 109.2, while that of Covaxin vaccine recipient was found to be 175.7.

This study shows that the two-dose Covaxin vaccine regimen significantly boosted the IgG titre and neutralizing efficacy against both the variants compared to that seen with natural SARS-CoV-2 infection. A two-tailed Wilcoxon paired signed-ranks test demonstrated a significant difference between prototype D614G strain and B.1.1.28.2 variant (Figure 1B). Results confirm 1.92 and 1.09 fold reductions in the neutralizing titre against B.1.1.28.2 variant in comparison with prototype D614G variant with sera of Covaxin vaccine recipients and natural SARS-CoV-2 infection, respectively.

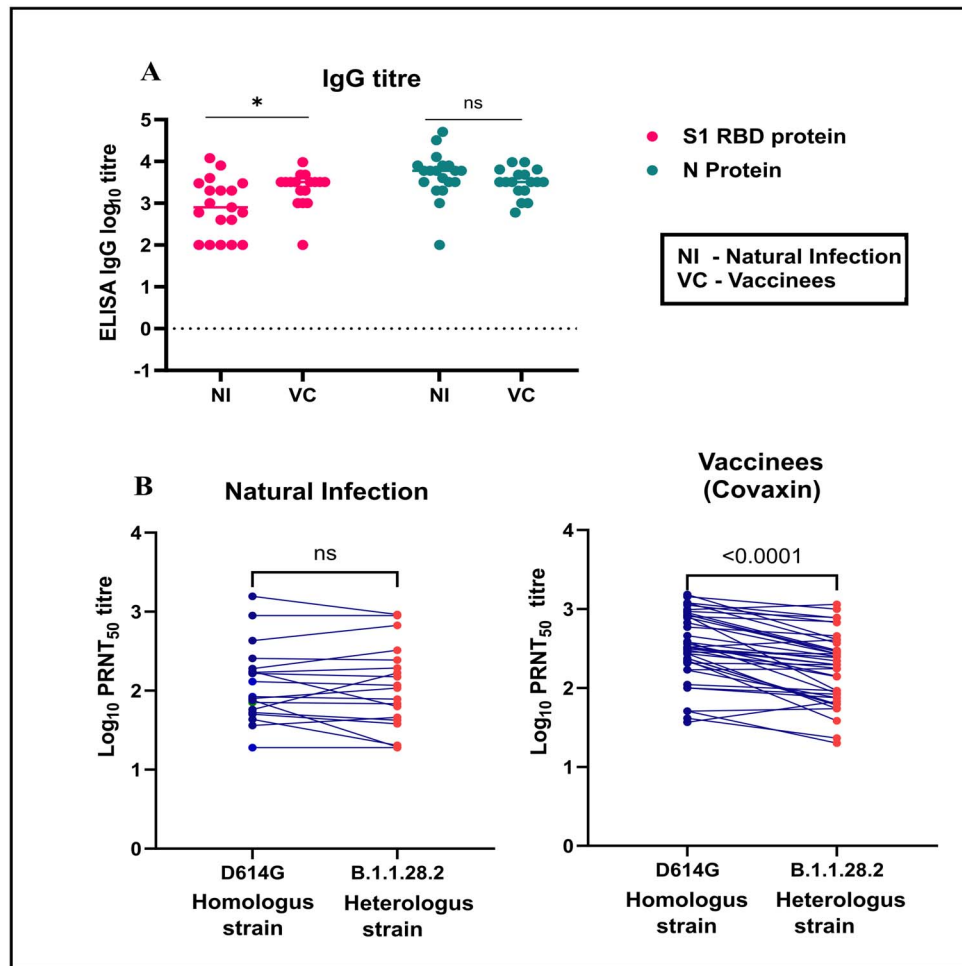


Figure 1. IgG response and neutralizing activity post-natural SARS-CoV-2 infection and Covaxin vaccine recipients: Panel A depicts the results of S1-RBD protein (pink circles) and N protein (blue circles) based SARS-CoV-2 IgG ELISA to determine the IgG titre in sera of naturally infected individuals ($n = 19$) and Covaxin vaccine recipients ($n = 42$). Mann–Whitney test was used for the comparison. Panel B shows the results of the plaque reduction neutralization test to assess neutralization activity of the prototype virus D614G (blue circles) with VUI B.1.1.28 P2 variant (red circles) with sera of naturally infected individuals ($n = 19$) and Covaxin vaccine recipients ($n = 42$). The natural SARS-CoV-2 Infection had two samples each from B.1.1.28.2, B.1.351 and B.1.17 and 13 of B1 lineage. Wilcoxon matched-pairs signed-rank test was used to compare the significance. A significant reduction was observed in the samples of the Covaxin vaccinees, whereas a non-significant change was observed in the cases with natural SARS-CoV-2 Infection.

The robust neutralizing capability of vaccine's sera was reported earlier for B.1.1.7, reported in earlier studies and again supported by VUI B.1.1.28.2 as well.⁵ Findings from another inactivated vaccine recently reported no neutralization of B.1.1.28.1, albeit sera samples assessed were 5 months post the second dose.⁷ This study further corroborates recent findings indicating high levels of cross-reactivity in sera collected from variant infected individuals.

Author Contributions

P.D.Y., R.E. and P.A. contributed to study design, data collection, data analysis, interpretation and writing and critical review. G.S. and D.Y.P. contributed to data collection, interpretation, writing and critical review. N.G., S.P., V.K.M. and B.B. contributed to critical review and finalization of the paper.

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Ethical approval

The study is approved by the Institutional Biosafety Committee and Institutional Human Ethics Committee of ICMR-NIV, Pune, India.

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Conflicts of Interest

Authors do not have conflict of interest.

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