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RESEARCH ARTICLE

CORRELATION OF SARS-CoV-2 IgG ANTIBODY TITRES AND VACCINE SCHEDULE IN HEALTHCARE WORKERS

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ABSTRACT

Background: Antibody titres following COVID-19 vaccination are known to decline over time. **Objective:** To evaluate the correlation between SARS-CoV-2 IgG titres and the vaccination schedule among healthcare workers (HCWs). **Methods:** This cross sectional study included HCWs who had received either Covishield or Covaxin. SARS-CoV-2 IgG titres were measured using enzyme linked immunsorbent assay (ELISA). **Results:** A total of 182 HCWs were enrolled [mean age: 33.38 ± 7.13 years; 131 (72.0%) female]. Of these, 115 received Covishield and 67 received Covaxin. The mean IgG titre was 1.2814 ± 0.736. A significant negative correlation was observed between IgG titres and the number of days since the second vaccine dose ($r = –0.724$, $p< 0.001$). **Conclusion:** SARS-CoV-2 IgG titres decline with increasing time since the second

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INTRODUCTION

The SARS-CoV-2 pandemic has been an unprecedented global public health emergency, prompting urgent mass vaccination campaigns worldwide. In India, two vaccines-ChAdOx1 nCoV-19 (Covishield) and BBV152 (Covaxin) were deployed under the national program (1,2), particularly among healthcare workers who face heightened occupational exposure risk. Following full vaccination, IgG titre to SARS-CoV-2 spike protein is a key marker of vaccine induced immunity (3,4) and a potential correlate of protection. Emerging evidence demonstrates that vaccine induced IgG titres decline substantially over time. Multiple literature reviews and cohort studies in HCWs consistently report a marked reduction within 3-6 months after vaccination, in both seronegative (previously uninfected) and seropositive individuals. In some reports, IgG and neutralizing antibody levels decrease by as much as 80-90%. The rate of antibody decay is influenced by several factors, including vaccine type, prior SARS-CoV-2 infection, age, sex, and revaccination schedule. Booster doses have been shown to restore humoral immunity effectively across serological subgroups, with heterologous booster regimens in some studies providing broader and more durable protection than homologous series. Longitudinal modeling of antibody kinetics reveals a biphasic decay pattern, an initial rapid decline followed by slower waning, along with variation by age group and infection history. These observations underscore the importance of timely booster administration to maintain adequate protection, especially among HCWs. Against this backdrop, we conducted a cross sectional study involving 182 HCWs to assess SARS-CoV-2 IgG titres ≥14 days after receiving the second dose of Covishield or Covaxin, and to evaluate the correlation between antibody levels and the time elapsed since vaccination. This work aims to quantify the decay in humoral response within our cohort, compare it with global trends, and provide evidence to guide booster dose strategies under the Indian national vaccination program.

METHODOLOGY

Study design and setting: This cross sectional observational study was conducted at PMSSY Super Speciality Hospital,

Bangalore Medical College and Research Institute (BMCRI), Karnataka, India, between January and May 2022.

Participants: The study included healthcare workers aged ≥18 years who were ≥14 days postsecond dose of either ChAdOx1 nCoV-19 (Covishield) or BBV152 (Covaxin).

Data collection: Information on demographics, vaccination details, and prior history of SARS-CoV-2 infection was obtained from participants. Serum SARS-CoV-2 IgG titres were measured using the COVID Kawach IgG Microlisa kit (J. Mitra & Co. Pvt. Ltd., India), which detects antibodies against the spike protein.

Statistical analysis: Data were analyzed using IBM SPSS Statistics version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. Pearson's correlation coefficient was used to assess the relationship between IgG titres and the number of days elapsed since the second vaccine dose. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 182 healthcare workers participated in the study. The mean age was 33.38 ± 7.13 years, and the majority were female (72.0%). Participant demographics are presented in Table 1.

Participants: The study included healthcare workers aged ≥18 years who were ≥14 days post second dose of either ChAdOx1 nCoV-19 (Covishield) or BBV152 (Covaxin).

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RESULTS

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Table 1: Participant demographics (N=182).

VARIABLE	VALUE
Mean age (SD)	33.38(7.13)
Female n(%)	131(72.0%)
Male n(%)	51(28.0%)

Regarding vaccination status, 115 participants (63.2%) had received Covishield, while 67 (36.8%) had received Covaxin (Table 2, Figure 1).

Table 2: Vaccine distribution

VACCINE	n	%
Covishield	115	63.2%
Covaxin	67	36.8%

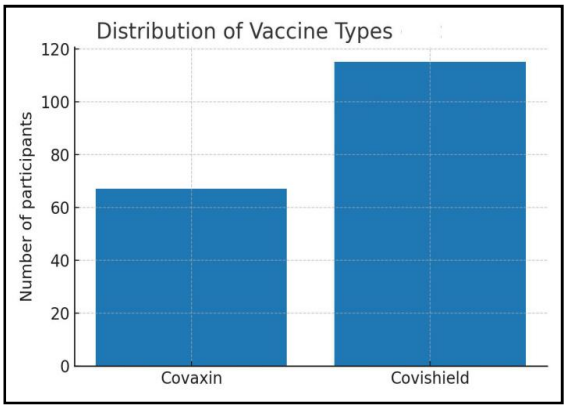

Figure 1: Distribution of vaccine type among participants

The mean SARS-CoV-2 IgG titre in the cohort was 1.2814 ± 0.736, with 162 participants (89.0%) testing positive for antibodies above the assay cutoff value of 0.299 (Table 3).

Table 3: Antibody titres

VARIABLE	VALUE
Mean IgG titre(SD)	1.2814(0.736)
Titre positive(>0.299), n(%)	162(89.0%)
Cut off	0.299
Assay	COVID Kawach IgG Microlisa (J.Mitra & Co.)

A strong, statistically significant negative correlation was observed between IgG titre and the number of days since the second vaccine dose ($r = –0.724$, $p = 7.3216 \times 10^{-31}$), as shown in Table 4 and visualized in Figure 2.

Table 4: Correlation between IgG titres and days since second vaccine dose

VARIABLE PAIR	PEARSON r	p-VALUE
Titre vs days since dose 2	-0.724	7.3216×10^{-31}

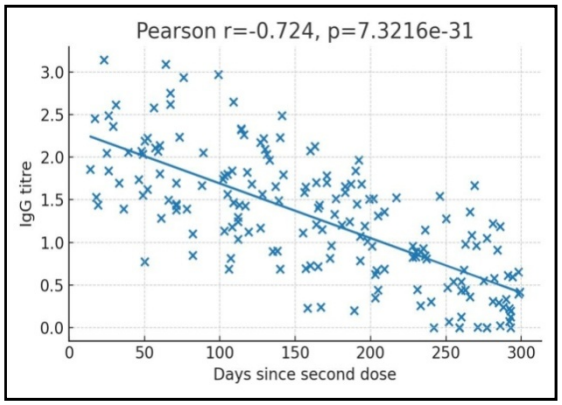

Figure 2. Scatter plot showing correlation between IgG titres and days since second vaccine dose ($r = –0.724$, $p = 7.3216 \times 10^{-31}$).

When analyzed by professional designation, antibody positivity rates were 87.2% in doctors, 93.2% in nurses, and 85.2% in other staff categories (Table 5**,** Figure 3).

Table 5: Antibody positivity by professional designation

DESIGNATION	TITRE POSITIVITY (n)	TOTAL(n)	POSITIVE(%)
Doctor	41	47	87.2%
Nurse	69	74	93.2%
Other	52	61	85.2%

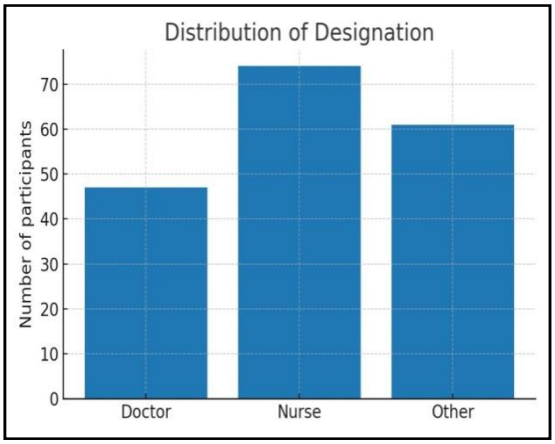

Figure 3. Professional designation distribution among participants

DISCUSSION

Our study demonstrates a strong inverse correlation ($r = -0.724$**,** $p < 0.001$) between SARS-CoV-2 IgG titres and the time elapsed since the second vaccine dose, underscoring the phenomenon of waning immunity among healthcare workers. These findings are consistent with multiple international observations from vaccine recipients. For example, a Belgian study reported that anti-spike IgG and neutralizing antibody levels declined by approximately 90% over six months following BNT162b2 vaccination, with similar trends across both seronegative and seropositive groups. Additionally, broader literature reviews confirm that antibody levels decay over time in HCWs, supporting the implementation of booster doses to sustain protection (1, 5,6,7). Beyond temporal decline, antibody kinetics are influenced by individual factors. Prior SARS-CoV-2 infection is associated with higher peak titres and more sustained levels over time, as demonstrated in both European cohorts and modelling studies. Older age and male sex have also been linked to faster antibody decay; however, the relatively young mean age (~33 years) and female predominance in our cohort may have attenuated these effects. Vaccine platform may also contribute to differences in the magnitude and duration of the humoral response, viral vector vaccines such as Covishield versus inactivated vaccines such as Covaxin, though this requires further investigation.

Our findings reinforce the utility of booster doses. Studies of BNT162b2 boosters in HCWs show near universal post booster seroconversion, with antibody titres increasing more than 30- to 40-fold regardless of age, sex, or prior serostatus. Booster strategies, including heterologous regimens, have been shown to enhance antibody durability and may improve cross variant protection, an important consideration in light of emerging SARS-CoV-2 variants. Overall, our results support booster dose policies in comparable low and middle income country settings such as India, where protecting HCWs is critical to maintaining health system resilience. Future directions include longitudinal monitoring of antibody titres post booster, evaluation of T-cell and neutralizing antibody responses, and assessment of vaccine effectiveness against new variants. These observations reaffirm that antibody titres can serve as correlates of protection (3,4).

CONCLUSION

This study demonstrates a significant decline in SARS-CoV-2 IgG titres with increasing time since the second dose of Covishield or Covaxin among healthcare workers, highlighting the phenomenon of waning vaccine induced immunity. The strong inverse correlation observed ($r = -0.724$, $p < 0.001$) aligns with global evidence and reinforces the rationale for timely booster administration to sustain protective antibody levels in highrisk groups. In the context of India's healthcare system, prioritizing boosters for HCWs is essential to ensure workforce protection and resilience against evolving SARS-CoV-2 variants. Further longitudinal studies incorporating cellular and neutralizing antibody responses are warranted to optimize booster strategies.

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