

CORRELATION OF COVID-19 ANTIBODY TITRE WITH VACCINATION AND CLINICAL PARAMETERS

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ABSTRACT

To assess the antibody titre in 40 individuals after the completion of two doses of Covishield (ChAdOx1-Ncov) and Covaxin (BBV-152) and other clinical parameters. A cross sectional study was performed at Blood and Component bank, Jawaharlal Nehru Medical College, AMU, Aligarh on 40 individuals and the antibody titres were measured after two complete doses of vaccination using chemiluminescence assay. The Covid-19 antibody titre was the highest in individuals above 44 years of age. The antibody titre was higher in the males than females. The titre of Covid antibody was the highest after 16-30 days of complete vaccination. The titre levels after Covaxin administration was found to be comparable after Covishield administration. The common side effects with Covaxin were mild fever and headache, dizziness, mild pain at injection site with focal petechial rashes but the adverse effects with Covishield were more marked with moderate myalgia, high grade fever and moderate to intense injection site pain with swelling. The antibody titres were significant irrespective of the age group, gender, type of vaccine administered and none of the vaccines had life threatening adverse effects.

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INTRODUCTION

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) emerged in China in late December 2019, causing coronavirus disease 2019 (COVID-19). The virus has rapidly spread across the world, resulting in a worldwide pandemic that has lasted through this moment (1). This novel coronavirus, SARS-CoV-2, is a member of the Beta coronavirus genus in the Coronaviridae family (2). Four main structural proteins make up the SARS-CoV-2 virion: nucleocapsid proteins surround the positive strand RNA genome, membrane proteins connect the membrane to the nucleocapsid, envelope proteins facilitate budding and detachment from the host cell, and spike proteins are involved in host receptor binding (3). SARS-CoV-2 targets the ACE2 receptor located on the surface of the host cells (4-7).

Although many therapeutic compounds and drugs have been suggested and repurposed in the fight against COVID-19, they remained as supportive treatment options (8-9). The process of administering a vaccine to allow the immune system to create

protection against an infection is known as vaccination. Vaccines aid in the prevention of illness from incurable conditions by stimulating the body's adaptive immunity (10). Vaccination elicited a more robust immune reaction than natural infection. In India mainly two vaccines are being used Covaxin is an inactivated viral vaccine. This vaccine is developed with whole-virion inactivated vero cell-derived technology. Covishield has been prepared by a chimpanzee adenovirus – ChAdOx1 – and has been modified to enable it to carry the COVID-19 spike protein into the human cells.

Rise in anti-spike antibody was significantly higher in Covishield (10-11). Both vaccine recipients had similar mild to moderate adverse events and none had severe side effects. Combined results of both vaccines showed 95.0% seropositivity to anti-spike antibody 21-36 days after the second completed dose (11). Seropositivity rates were higher in Covishield recipients compared to Covaxin in the SARS-CoV-2 (11).

The aims and objectives of the present study was to assess the antibody titres after two complete doses of

Covaxin and Covishield vaccines and to correlate the Covid 19 antibody titre levels with various clinical parameters such as age, gender, duration after the second dose and type of vaccine.

MATERIALS AND METHODS

A cross-sectional study was performed in 40 individuals, who had received two doses of Covid-19 vaccines, regardless of their nationalities, ethnicities, occupations and places of residence at Blood and Component Bank, Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh.

3ml blood was collected in BD Vacutainer serum separation venous blood collection tubes and centrifuged at 2500 rpm for 10 minutes. After centrifugation, the supernatant serum layer was isolated and heat inactivated in a 56°C water bath for 45 minutes to disable any infectious SARS-CoV-2 virus. Serum was thereafter stored at -80°C.

The IgG antibody against SARSCoV-2 in plasma samples was tested using Chemiluminescence kits according to manufacturer's instructions; CoV-2 based on a recombinant nucleoprotein. The positive control were patients who had recovered from Covid 19 infection and subsequently developed antibodies to it and the negative control were candidates who did not receive any vaccine.

RESULTS

The antibody titres in the age group between 18-30 years was $4.56-13.9 \pm 2.1$. The age group 30-44 years had antibody levels of $7.07-11.2 \pm 2.9$ whereas the maximum antibody titre was seen in the age group of >44 years, i.e., $10.2-19.7 \pm 1.8$ (Table 1).

The antibody titre levels in males ranged from $6.04-19.7 \pm 1.29$ and in females, the titres ranged from $4.56-13.7 \pm 1.66$ (Table 2).

The antibody titre after 15 days was $4.57-10.4 \pm 1.46$ and after 16-30 days of vaccination, it showed a peak value of $13.1-19.7 \pm 1.65$. After 45 days of vaccination, the antibody titre ranged from $6.04-11.2 \pm 1.10$ (Table 3).

Both the administered vaccines showed significant levels of antibody titres but Covaxin administration led to slightly higher antibody levels in our cases of study. The antibody titre attained with Covaxin was $6.04-19.7 \pm 3.42$ whereas it was $4.56-17.2 \pm 3.16$ after Covishield administration (Table 4).

The most common side effects with Covaxin was mild frontal headache and fever, dizziness and mild myalgia with focal petechial rashes whereas the side effects after Covishield administration was more marked with moderate myalgia, high grade fever and moderate to intense injection site pain with swelling (Table 5).

Age (In years)	No. of cases	Covid Antibody Titre (Range±SD)
18-30	16	$4.56-13.9 \pm 2.2$
31-44	18	$7.07-11.2 \pm 2.9$
>44	06	$10.2-19.7 \pm 1.8$
Total	40	

Table 1: Correlation of age and Covid antibody titre

Gender	No. of cases	Covid Antibody Titre (Range±SD)
Male	22	$6.04-19.7 \pm 1.29$
Female	18	$4.56-13.7 \pm 1.66$
Total	40	

Table 2: Correlation of gender and Covid antibody titre

Duration from last vaccination	No. of cases	Covid antibody Titre (Range±SD)
15 days	14	$4.56-10.4 \pm 1.46$
16-30 days	14	$13.1-19.7 \pm 1.65$
>45 days	12	$6.04-11.2 (\pm 1.10)$
Total	40	

Table 3: Correlation of duration from the last vaccination and Covid antibody titre

Type of vaccine	No. of cases	Covid antibody titre (Range±SD)
Covaxin	22	$6.04-19.7 \pm 3.42$
Covishield	18	$4.56-17.2 \pm 3.16$
Total	40	

Table 4: Correlation of type of vaccine administered with Covid antibody levels

Type of vaccine administered	No. of cases	Common Side Effects
Covaxin	22	Mild frontal headache, dizziness, mild fever, mild myalgia, cough, shortness of breath, mild injection site pain, petechial rashes
Covishield	18	Moderate myalgia, high grade fever, moderate to intense injection site pain with swelling
Total	40	

Table 5: Correlation of type of vaccine administered with side effects

DISCUSSION

Serological responses in people vaccinated against SARS-CoV-2 is critical in assessing the effectiveness of the induced immunity, which can subsequently inform public health decisions. Following SARS-CoV-2 infection, there is an expansion of B and T cells directed at various antigens in the virus, especially the receptor binding domain of the highly immunogenic spike protein.

In this study we found that the vaccines generated an immunogenic response in all the age groups which was satisfactory to confer protection against covid 19. As far as the gender is considered there was higher immunogenic response in males as compared to females. The immunogenic response was variable with the duration of vaccination, maximum being between 16-30 days. With both Covishield and Covaxin, there was satisfactory immunogenic response in our study. Forgacs et al conducted a study and concluded SARS-CoV-2 vaccine elicited antibodies in immunologically naïve and pre-immune humans (12). Gajanan et al concluded Inactivated Covid-19 vaccine BBV152/Covaxin effectively neutralizes SARS-CoV-2 (13).

According to Awadhesh et al the humoral antibody response after 2 doses of SARS-CoV2 vaccine Covishield and Covaxin in Indian health-care workers showed approximately 95.0% seropositivity to anti-spike antibody, 21-36 days after the second completed dose (14). Seropositivity rate was slightly higher in Covishield recipients and presence of comorbidities and the type of vaccine received were independent predictors of antibody response after the second dose in their study (14).

With Covaxin side effects were milder with low grade fever, myalgia, headache, dizziness, whereas it was marked with Covishield with high grade fever, myalgia, restlessness as observed in our study. According to Swetha et al post Covid-19 vaccine, the most common post-vaccination side effects were fatigue, injection site pain and swelling, headache, sleepiness and laziness, chills, myalgia, joint pain (10).

CONCLUSION

The Covid-19 antibody titres post vaccination were significant irrespective of the age

group, gender, type of vaccine administered and none of the vaccines had life threatening adverse effects.

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