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COMPARISON OF SINOPHARM VS SINOVAC COVID-19 VACCINES IN TERMS OF EFFICACY AND REQUIREMENT COMPATIBILITY

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Abstract:
The ongoing COVID-19 pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has resulted in significant death and morbidity rates around the globe. SARS-CoV-2 infection has been linked to 43.3 million confirmed cases worldwide, killing 1.15 million people. Physical separation, quarantine, and isolation were successful in minimizing the number of individuals who became sick during the epidemic, but the lack of immunity in the community makes them vulnerable to further waves of SARS-CoV-2 infection. Elderly persons (those 60 and older) and those with pre-existing medical problems are particularly vulnerable.
Material and Methods: In this observation study, people who were vaccinated with sinopharm vaccine and sinovac vaccine were included to see the response of vaccine in the body. The aim of the study was to compare the rise in the antibody level after 2 doses of two different COVID-19 vaccines i.e sinopharm and sinovac. Initially, in this pilot study, 40 people were included randomly from our health care team, after proper informed consent regarding the study. All the details regarding the study were shared and written informed consent was taken.
Results: Among total 40 people were involved, male were 21 of 40 (52.5%) and female were 19 of 40 (47.5%). Most of the individuals were doctors (26 of 40, 65%). Mean age, weight, height and body mass index (BMI) are also shown below.
Conclusion: This study was to report the response of people of Pakistan toward sinopharm and sinoVac vaccines in terms of COVID antibody level. Response of the body was around 40 to 50% for sinopharm and 50 to 70 percent towards CoronaVac vaccine. Further data collection is being done to improve sample size and better outcome.
Keywords: Efficacy Levels, Sinopharm, Sinovac, Vaccine Comparison.

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INTRODUCTION:

The ongoing COVID-19 pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has resulted in significant death and morbidity rates around the globe. 1 SARS-CoV-2 infection has been linked to 43.3 million confirmed cases worldwide, killing 1.15 million people. 2 Physical separation, quarantine, and isolation were successful in minimizing the number of individuals who became sick during the epidemic, but the lack of immunity in the community makes them vulnerable to further waves of SARS-CoV-2 infection. Elderly persons (those 60 and older) and those with pre-existing medical problems are particularly vulnerable.3,4

Due to the lack of a viable therapy for COVID-19, researchers have moved quickly to create vaccinations that could combat the condition. There have been more than 198 COVID-19 vaccines developed since the pandemic began, with many more in preclinical or clinical testing stages.[5]

Frenetic attempts to produce a vaccine have resulted in numerous candidate vaccines, generated from various platforms and proceeding to the clinical assessment stage, including inactivated vaccines, live viral vaccines, recombinant protein vaccines, vectored vaccinations and DNA or RNA vaccines.[6,7,8]

Because little is known about the nature of protective immune responses to COVID-19 and which vaccination methods will be most successful, developing many vaccine platforms and tactics concurrently is critical. CoronaVac (Sinovac Life Sciences, Beijing, China) is an inactivated vaccine candidate against COVID-19 that has demonstrated good immunogenicity in mice, rats, and nonhuman primates with vaccine-induced neutralising antibodies to SARS-CoV-2 and has the potential to neutralise ten representative strains of SARS-CoV-2.[9]

Currently, many vaccines that have entered the clinical trial phase were developed based on the S protein, and the data indicate that the S protein is the most mutated part of the SARS CoV 2 virus. Increasing evidence also shows that some COVID-19 vaccines are less effective in protecting against variants .[10]

The aim of this study was to compare the rise in the antibody level after 2 doses of two different COVID-19 vaccines i.e sinopharm and sinovac, to access the response of these vaccines in our population. This data will help vaccine manufacturers regarding updating vaccines in time to deal with viral mutations. Otherwise, the efficacy of the COVID-19 vaccine may be affected.

MATERIAL AND METHODS:

In this observation study, people who were vaccinated with sinopharm vaccine and sinovac vaccine were included to see the response of vaccine in the body. Initially, in this pilot study, 40 people were included randomly from our health care team, after proper informed consent regarding the study. All the details regarding the study were shared and written informed consent was taken.

Healthcare workers of age 18 to 60 years of either gender, who gave consent regarding the study and were willing for vaccination were included. Individuals were either given sinopharm vaccine or sinovac vaccine. The objective of the study was to quantify the amounts of antibody produced in response to 2 doses of sinopharm and sinoVac vaccines among our local Pakistani population.

Dates of 1st and 2nd dose of vaccines were documented along with Age in Years, Occupation, Socio-Economic status, Weight (kg), Height (ft), BMI, Pregnancy, Lactating Mother, any history of Traveling, any history of Contact, cousin marriage, No of Children, COVID antibody level before the vaccination, after first dose and after 2nd dose. Seroconversion or significant rise in antibodies level was defined as an increase in post-vaccination titer of four-fold or more from the baseline. All of those enrolled were asked regarding the history of smoking, hypertension, diabetes, asthma, COPD, tuberculosis, hepatitis B or C, immune-compromised status.

Data was entered in SPSS 20 and analyzed. Mean and standard deviation was calculated for quantitative continuous variables and percentage was calculated as categorical variables. Data was stratified for age, gender, history of contact, and type of vaccine, and post stratification chi square test was applied. p-value of less than 0.05 was marked as significant. The results were presented in the form of graphs and tables.

RESULTS:

In this descriptive study, individuals from the health care department were enrolled before getting vaccinated in Pakistan, after written informed consent. Baseline antibody level was accessed and was either given sinopharm vaccine or sinovac vaccine, randomly. Patients with sinopharm group were grouped into group SP and sinoVac group were grouped into group SV.

Details of the demographic variables are shown in the table no. 1. Among total 40 people were involved, male were 21 of 40 (52.5%) and female were 19 of 40 (47.5%). Most of the individuals were doctors (26 of 40, 65%). Mean age, weight, height and body mass index (BMI) are shown in the table no. 2.

Table 1 showing the demographic qualitative variables noted in the study

	Variable	N	%
Gender	Male	21	52.5%
	Female	19	47.5%
Profession	Doctors	26	65%
	Nurse	10	25%
	Lab Tech	1	2.5%
	Resident Surgeon	1	2.5%
	Ward Attendant	1	2.5%
	CPN	1	2.5%
Socioeconomic Status	Well Settled	30	75%
	Middle Family	10	25%
History of travel		1	2.6%
History of contact with COVID		4	11.1%
history of Smoking		1	2.6%

Table 2 showing the quantitative variables noted in the study

	Mean	SD
Age in years	35.32	5.45
Weight (kg)	78.13	17.9
Height in cm	165.93	7.79
BMI	28.4	7.1
Antibodies level after 1st dose	7.47	9.62
Antibodies level after 2nd dose	9.92	11.3

Table no. 3 showing percentage of vaccinated people showing seroconversion after 1st dose of both vaccines (2 x 2 table)

Type of Vaccine	Seroconversion after 1st dose		
	Yes (%)	No	Total
SinoPharm	9 (36.4%)	13	23
SinoVac	10 (61.1%)	8	17
Total	19 (47.5%)	21	40

Chi square value … P value . 0.11 (non-significant)

Table no. 4 showing percentage of vaccinated people showing seroconversion after 2nd dose of both vaccines (2 x 2 table)

Type of Vaccine	Seroconversion after 2nd dose		
	Yes (%)	No	Total
SinoPharm	12 (54.5%)	10	22
SinoVac	7 (72.2%)	11`	18
Total	19 (47.5%)	21	40

Chi square test , P value . 0.25 (non-significant)

Table no. 1 showing the percentage of people vaccinated with sinopharm and sinovac who showed seroconversion (four times the increase in the COVID antibodies in the serum after 2 weeks of vaccination). It shows that out of total 40 people enrolled in the study, 19 (47.5%) showed seroconversion; 8 (36%) were vaccinated with sinopharm and 11 (61.1%) were vaccinated with sinoVac.

After 2 weeks of 2nd dose, which was given after 21 days in sinopharm group and 28 days after the 1st dose in sinoVac group, 2 in the sinoVac group and 4 in the sinopharm group, who didn't show significant rise in antibodies initially after 1st dose, showed significant rise in the antibodies 2 weeks after 2nd dose. After 2nd dose, out of total 40 people 22 showed seroconversion, with 12 (54.5%) in sinopharm group and 13 of 18 (72.2%).

DISCUSSION:

Sinopharm and CoronaVac (sinoVac) is an inactivated Chinese vaccine available in Pakistan. Majority of the population was vaccinated with these two vaccines in the last 5 months. Almost all the health care workers were also vaccinated with one of these two vaccines, as these were only available in Pakistan in Nov, 2020. As COVID virus has changed and many variants have affected people worldwide, response of these vaccines in the body should be studied, with long follow-up. Multiple studies are under way, aim of our study was to determine the rise of COVID antibodies in the body after 1st and 2nd dose of sinopharm and sinovac vaccines. And its correlations with various factors like age, gender, BMI and co-morbidities.

In a trial, a total of 1166 participants were enrolled in phase 1 and phase 2 trials. The incidence of adverse reactions between day 0 and 14 was around 30% of the patients and 8% in the placebo. In phase 1, the seroconversion on day 0 and 14 was noted in 46% and 0% in the placebo. The seroconversion in phase 2

was 90.7% (n = 88 of 97) in the 1.5 μg group, 98.0% (n = 96 of 98) in the 3 μg, and 99.0% (n = 97 of 98) in the 6 μg. There were no detectable antibody response in placebo, of neutralizing antibodies being 92%, and 3% (n = 2) in the placebo from after 14 days. After 2nd dose it was 97% and 0% in the placebo.11 Our study showed that out of total 40 people enrolled in the study, 19 (47.5%) showed seroconversion after 2 weeks of first dose; 8 (36%) were vaccinated with sinopharm and 11 (61.1%) were vaccinated with sinoVac. After 2nd dose, out of total 40 people 22 showed seroconversion, with 12 (54.5%) in sinopharm group and 13 of 18 (72.2%).

Interestingly, in another study, Wu et al. reported a higher incidence of adverse events after sinovac (20% in trial group and 21% in the placebo after 28 days). Pain at the injection site was commonly encountered.12

A randomized, double-blind, placebo-controlled, trial was done in China. In phase 1, healthy people aged 18–80 years, who were negative for serum-specific IgM/IgG antibodies against SARS-CoV-2 at the time of screening, were separated into two age groups (18–59 years and ≥60 years) and randomly assigned to receive vaccine or placebo double dose. In phase 2, healthy adults (aged 18–59 years) were randomly assigned to receive vaccine or placebo on a single-dose schedule of 8 μg on day 0 or on a two-dose schedule of 4 μg on days 0 and 14, 0 and 21, or 0 and 28. Participants within each cohort were randomly assigned by stratified block randomization (block size eight) and allocated (3:1) to receive vaccine or placebo. Participants, researchers and result assessors were hidden from their group allocation. Safety and tolerability were the main results. The second result was immunogenicity, as the neutralising antibody responses to SARS-CoV-2 infection. Phase 1 consisted of 192 students who were registered and randomly vaccinated for both age groups[18 to 59 years and <60 years of age>] or placebo (mean age 53.7 years [SD 15.6]). There was at least one adverse response in 42 (29 percent) of 144 vaccination recipients within the first seven days following injection. The most often replicated systematic adverse response was a fever (18 to 59 years, The intensity of all adverse responses was mild to moderate. Within 28 days after immunization, no major adverse event was recorded. In the 18–59-year-old group, the neutralized mean geometric antibody titers were greater than the placebo group at day 42. In Phase 2, 448 individuals (mean age 41.7, SD 9.9) were registered and allocated randomly with the same schedule to receive vaccination or placebo. In 76 (23 percent) of 336 vaccination recipients, at least one

adverse effect was observed over the first seven days. All additional side effects were moderately or mildly severe. Fever was the most frequent systemic adverse effect. On day 28, the neutralizing titers of the neutralizing antibody were substantially higher in days 4 μg 0 and 21. BBIBP-CorV, the inactivated vaccination for SARS-CoV-2 is safe and tolerated at all dosages tested. On day 42 in all vaccination recipients humoral responses to sARS-CoV-2 were elicited. Day 0 and Day 21 two-dose vaccination vaccine produced more neutralization than the single dosage of antibody titers. 13 Our study showed that out of total 40 people enrolled in the study, 19 (47.5%) showed seroconversion after 2 weeks of first dose; 8 (36%) were vaccinated with sinopharm and 11 (61.1%) were vaccinated with sinoVac. After 2nd dose, out of total 40 people 22 showed seroconversion, with 12 (54.5%) in sinopharm group and 13 of 18 (72.2%).

Sinopharm Vaccine was immunogenic and strong humoral reactions were quickly elicited. COVID-19 poses a very high risk of serious conditions and mortality in individuals aged 60 and older and in patients with pre-existing respiratory or cardiovascular illness.14 Xia, et al reported in the trial, included patients over 60 years of age and older, they wanted to investigate the safety and tolerability of sinopharm vaccine. The seroconvertion rate of 100% was higher in the 18-59 year old group than in the 60 year old group. After the first Vaccination Dosage, almost 75% of vaccine beneficiaries aged 18-59 are seroconverted within 2 weeks.13

Twenty out of 22 SARS COV2 vaccination double-dose patients were contagious. Those 20 have been vaccinated with Sinopharm against SARS COV 2, while others have been directly contacted, but with other kinds of vaccines they were vaccinated against SARS COV 2. Of the 26 Sinopharm vaccine individual dosage recipients, 23 had become infected. The others did not contact the contaminated source directly. The primary source of transmission was social gathering. Headache and chest discomfort were modest to the illness. Of 20 vaccine cases, only one was infected with the lung and needed hospitalization. Of the 23 single-dose vaccines cases 10 instances, lung infections had taken place in hospitals. All non-vaccinated family members were sick, three were hospitalized, one of them dead owing to complications of diabetes mellitus. Partial protection against SARS COV 2 infection is provided by Sinopharm. This might be related to the absence of its ability to identify recent changes in the protein structure of spike(S) viral protein.15 Our study showed that out of total 40 people enrolled in the

study, 19 (47.5%) showed seroconversion after 2 weeks of first dose; 8 (36%) were vaccinated with sinopharm and 11 (61.1%) were vaccinated with sinoVac.

As the delta variant of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has contributed to a surge in cases in India and has now been detected across the globe, including a notable increase in cases in the Pakistan, studies should be done to determine the incidence of COVID delta variant, antibody level of people vaccinated with various vaccines. Also to see the response of vaccines among various populations against this delta variant.

CONCLUSION:
This study was to report the response of people of Pakistan toward sinopharm and sinoVac vaccines in terms of COVID antibody level. Response of the body was around 40 to 50% for sinopharm and 50 to 70 percent towards CoronaVac vaccine. Further data collection is being done to improve sample size and better outcome.

Limitation of study:
The outcomes of this study are interpreted only over a short period of time. The lack of safety and immunogenicity tests in children and adolescents is also a drawback of our investigation.

Competing inerests disclaimer:
Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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