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Effectiveness and Side Effects of Sinopharm Vaccines in the Population of Lahore

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Abstract

The COVID-19 pandemic brought unprecedented demands on global public health, and vaccinations emerged as the leading long-term effort to decrease infection, hospitalizations, and mortality. The safety and efficacy of the Sinopharm (BBIBP-CorV) vaccine are confirmed among global recommendations; however, population-based studies are needed to identify granular immunological responses and post-vaccination adverse events in this regard. In view of this, we aimed to assess the real-life effectiveness and safety profile of Sinopharm vaccine among Lahore community in Pakistan. A longitudinal study carried out with 120 volunteers, 100 vaccinated and 20 unvaccinated as control. IgG antibodies were determined monthly by ELISA and side effects survey was conducted using structured questionnaires. The vaccinated cohort was divided into four age groups (21–30, 31–40, 41–50 and 51–60 years). Titer of IgG peaked at month 2 post-vaccination compared to other time points for all groups (e.g., 324.94 IU/ml in the 21–30 group; 273.83 IU/ml in the 31–40 group) with a gradual decrease over the year but still remain significantly higher than control level (<10 IU/ml). The headache was the most common symptom (97.5% of subjects) followed by muscle pain (83.8%), fatigue (70.0%), nausea (40%) and fever/chills (30.0%) Serious adverse events were not common, mainly self-limiting in nature. These results demonstrate robust initial immunogenicity of the Sinopharm vaccine and that antibody levels remained above protective threshold up to 12 months with a favourable safety profile. These findings present key local data to support vaccination interventions as well as booster policy in resource-constrained environments.

Keywords: *Sinopharm; IgG antibodies; vaccine effectiveness; COVID-19; adverse effects*

Introduction

In December 2019, a new type of coronavirus, SARS-CoV-2, emerged and led to one of the most notable global health crises in contemporary history. Initially, the virus was identified in Wuhan, China and its rapid spread across continents resulted in a pandemic which produced devastating social, economic and public health consequences across the globe (Bchetnia et al., 2020; Kamel Boulos & Geraghty, 2020). In 2 years after the outbreak, COVID-19 has infected over 430 million people worldwide and killed approximately 5.8 million individuals, demonstrating for the first time in history that this respiratory tract infection is highly transmissible and lethal (Chakraborty & Maity, 2020). The elderly and individuals with co-morbid chronic conditions are at increased risk for severe progression of the disease and death (Nikpouraghdam et al., 2020); however, no definitive assertion can be made here, as evidence also supports that people of all ages may get infected and develop complications from the virus (Bchetnia et al., 2020). These international trends framed mass vaccination as a mainstay of pandemic containment.

The initial outbreak of COVID-19 was associated with a seafood and live animal market in Wuhan, contributing to zoonotic origins (Rothan & Byrareddy, 2020). The virus spread rapidly across Chinese provinces as the number of cases increased, which has led to large-scale quarantine action (Kummitha, 2020). International transmission had been reported in South Korea, Japan, Italy and a number of other countries by early 2020 (Lauer et al., 2020). COVID 19 worldwide pandemic In March, COVID-19 was declared a global pandemic by WHO (Yamin, 2020). Lockdowns, travel restrictions, social distancing orders and other containment measures were enforced by governments across the globe (Haug et al., 2020). Even with these measures in place, the pandemic led to a profound disruption of economic activity, education systems, international mobility and healthcare capacity which translated into unemployment and difficult economic conditions (Gamil & Alhagar, 2020).

SARS-CoV-2 is a highly contagious respiratory virus in the family of Coronaviridae with etiological features related to its rate of transmission and pathogenicity. The infection is transmitted primarily by respiratory droplets and in close contact with infected individuals, including asymptomatic carriers (Li et al., 2020). With a long (up to 14 days) incubation and pre- symptomatic, asymptomatic transmission potential it becomes challenging to control at the level of populations (Wilder-Smith & Freedman, 2020). The clinical symptoms of SARS-CoV-2 infection are very diverse, including fever (up to 87.9%), cough, fatigue, shortness of breath (Xu et al., 2020), gastrointestinal manifestations, loss of taste or smell (Lechien et al., 2020) and in the worst-case scenario pneumonia, acute respiratory distress syndrome (ARDS) with rapid progression to death. However, the disease is more severe in older people or patients with comorbidities like diabetes and cardiovascular disorders.

SARS-CoV-2 is an RNA-virus with single-stranded positive-sense polypeptide, has 50–200 nm in width and display spherical or pleomorphic shape (Yaqoob et al., 2020; Saeed et al., 2021). Its genome is comprised of ~30,000 nucleotides that encode structural and non-structural proteins (Flynn et al., 2020). The most abundant segment of the genome (ORF1ab) encodes 16 non-structure proteins involved in the replication of virus (Yadav et al., 2021). The structural proteins (spike (S), envelope (E), membrane (M), and nucleocapsid (N)) play a role in virion assembly, cell entry, and immune evasion (Satarker & Nampoothiri, 2020). Of interest, S protein interacts with the receptor ACE2 to attach and is the main target of neutralizing antibodies (Mittal et al., 2020). In response, a number of variants with different transmissibility and/or immune escape potential have developed (Pachetti et al., 2020).

SARS-CoV-2 has developed into multiple strains since its origin, with a few varieties more transmissible or vaccine-resistant. Among them is the Alpha variant (B.1. 1. 7), which was initially described in the United Kingdom (Mohammadi et al., 2021); and the Beta variant (B.1. 351) from South Africa (Chemaitelly et al., 2021); the Delta variant (B.1. 617. 2), which was quickly transmitted from India and had been one of the highly infectious variants around the world (Del Rio et al., 2021); and the Gamma variant (P.1), which originated in Brazil (Ryu et al., 2021). Other variants include Mu (B.1. 621), Lambda (C.37) and Epsilon Plus (B.1. 429. 1) are all in need of ongoing genomic monitoring, given potential effects on vaccine efficacy (Alvarez-Daz et al., 2022; Carroll et al., 2022; Mohammadi et al., 2021).

COVID-19 is spread mainly through respiratory droplets released when speaking, coughing, or sneezing (Ehsanifar, 2021). It can also be transmitted via contaminated surfaces and in certain situations, by airborne transmission within confined indoor environments with inadequate ventilation (Ramesh et al., 2020; Klompas et al., 2020). The virus's 2–14-day incubation period has made possible its asymptomatic community transmission (Guzman, 2021). Therefore, governments globally implemented social distancing, mask wearing and lockdowns which are having major impacts on healthcare systems, and socio-economic issues (Nyarko et al., 2020). The unregistered of COVID-19 vaccines did a lot to mitigate the virulence and spread, relieving its effects on health care systems globally (Filip et al., 2022).

Vaccination was the best long-term solution to keep COVID-19 under control. Molecular technologies such as mRNA, viral vector, and protein-subunit-based vaccines were developed and emergency authorized after extensive clinical study (Filip et al., 2021). These vaccines induce immunity, which both prevents infection, diminishes severe illness and reduces transmission (Mascellino et al., 2021; Christie et al., 2021). Societal distinctions aside, General immunization provides not just individual protection but helps in the development of herd immunity in order to bring back social and economic normalcy (Grech & Borg, 2020; Chen & Lu, 2021). Vaccination hesitancy still exists so public health communication is crucial (Strully et al., 2021).

The inactivated whole-virus vaccine Sinopharm COVID-19, developed by China National Pharmaceutical Group (CNBG), was also granted WHO Emergency Use Listing in May 2021. The vaccine induces in the immune system chemically-inactivated particles of SARS-CoV-2, allowing it to safely recognize them and produce antibodies for these (Khoshnood et al., 2022; Nooraei et al., 2021). Antigen presenting cells take up inactivated virus, which then activates helper T-cells and B-cells, resulting the formation of SARS-CoV-2-specific neutralizing antibodies (Xia et al., 2021). The vaccine is given in two doses, separated by 21–28 days (Ella et al., 2021). In this context, the interim results with their Phase III (86% vs. infection and 100% against severe disease or death) were communicated (Calvo Fernández & Zhu, 2021).

Sinopharm has storage requirements (2–8°C) that are applicable for poor areas with inadequate ultracold streamlines, and this explains its use in Asia, Africa, and the Middle East (Wong et al., 2021). In some countries, booster doses have been administered to augment immunity so as to be more responsive to evolving variants (Tao et al., 2021). Reported side effects are generally mild, including local pain, swelling and fever (more common after the second dose), headache, fatigue (El-Shitany, 2021; Mistry et al., 2022). Severe reactions, such as an anaphylactic shock, are uncommon (Bogdanov et al., 2021). In general, Sinopharm efficacy is satisfactory in lowering severity of the disease, hospital admissions and death (Ghiasi et al., 2021).

Increasing global evidence across platforms such as Sinopharm (BBIBP-CorV) and other inactivated, mRNA, and viral-vectored types used widely in South and East Asia as well as other COVID-19 vaccines have assessed safety, immunogenicity and effectiveness. In related to transplant patients, Aliakbarian et al. (2023) reported while the side effects were mild and consistent, about 10% failure- cases in Sinopharm vaccinated individuals contributed to a decreased level of protection in immunocompromised population with a low death rate (0.7%) during the Delta wave. Meo et al. (2023) two doses of Sinopharm induced mild short-term side effects such as fatigue (40.6%), myalgia (23.9%), low-grade fever (22.4%) and headache (21%) but well tolerated overall in general. The efficacy of adjunctive treatments is also supported by studies of clinical populations: Malin et al. (2022) observed substantial viral-load reductions by day 7 and remarkable clinical improvements by day 14 in immunosuppressed patients with B-cell non-Hodgkin lymphoma who received remdesivir along with convalescent plasma, both of whom experienced mostly mild infusion reactions. In Pakistan, Mahmood et al. (2021) demonstrated Sinopharm as having a good safety profile, as observed during the routine use, with majority of healthcare workers receiving it had no severe adverse events and significantly higher reactogenicity after dose 1, which re-enforces its acceptance well for routine use. These levels of protection are further supported by real world evaluations: Nadeem et al. (2022), 94.3% and 98.6% of reduction in symptomatic infection and hospitalization were observed respectively after 14 days of the second dose in Faisalabad, with a corresponding mortality reduction of 60.5%. Mega trials testing mRNA vaccines, including Moderna (mRNA-1273) and Pfizer-BioNTech (BNT162b2) demonstrated again high efficacy, 94.1% and 95%, respectively, and positive safety profiles (Baden et al. 2021). Bernal et al. (2021). showed robust protection against the Delta variant; Pfizer was 88% effective and AstraZeneca's was 67% after two doses, with both offering over 90% protection from hospitalization. Important dose effects are also evident in evidence concerning inactivated vaccine: Li et al. (2021) reported that a single dose of AstraZeneca was associated with weak protection against Delta (37.9%) but 2 doses increased effectiveness to 62.3%, indicating the importance of maintaining and boosting schedules. Neutralization experiments also suggest that, despite the reduced activity of antibodies toward Beta and Delta variants, two doses with BNT162b2 and mRNA boosters greatly increase neutralization capacities (Wang et al., 2021), and contribute to a global trend in favoring booster strategies. Phase 3 trials of BBIBP-CorV in adults aged 18–80 years have shown good neutralizing antibody titers, strong T-cell responses and largely mild adverse events (Al Kaabi et al., 2021), a finding that has been reflected in placebo-controlled evaluations of other inactivated vaccines (Zhang et al., 2021). Studies of severe COVID-19 also indicate that comorbidities, especially hypertension, diabetes and cardiovascular disease, significantly increase the risks of ARDS, renal injury and mortality (Liu et al., 2020), highlighting the importance of vaccination in high-risk groups. The highest protective immunity has also been reported in a non-human primate study of adenoviral-vector vaccines which shows low viral loads, a lack of lung pathology and strong neutralizing antibodies post-challenge. Taken together, the studies build on a growing body of consistent evidence that COVID-19 vaccines (including those based on inactivated, mRNA and viral-vector platforms) are safe, immunogenic and highly effective at preventing severe disease, hospitalization and death, including against variants such as Delta, while emphasizing the importance of completing the full course of vaccinations as well as booster doses to maintain high levels of protection.

While international data have demonstrated the safety and efficacy of Sinopharm, local population-specific evidence is still required, especially in resource-constrained countries such as Pakistan where demographic, genetic and environmental factors besides healthcare practices may affect vaccine efficacy. As a densely crowded metropolitan, Lahore has peculiar epidemiological features which calls for the careful assessment of vaccine response. Secondly, the emergence of new variants highlights a need for ongoing tracking of vaccine efficacy as well as any and all vaccine side effects across diverse age ranges and community setting.

The objective of this study is to assess the effectiveness and side effects of the Sinopharm COVID-19 vaccine among vaccinated residents in Lahore, Pakistan for different age groups and doses. Through evaluating vaccine effectiveness and investigating adverse events following receipt of 2 doses or a booster dose, this study aims to generate critical evidence that may contribute to public health decision-making, enhance the confidence in vaccines and guide future vaccination practices in low-resource settings with similar epidemiological context.

Methodology

The purpose of the study was to evaluate the effectiveness of inactivated whole virus vaccines based on the IgG parameter by evaluating antibody responses following two doses or a booster dose and side effects by questionnaires between March 2021 to March 2022 at LML (Lahore Medical Laboratory).

2.1. Research Design

In this study, a longitudinal research strategy was utilized, and the IgG levels of the vaccinated subjects were assessed once a month beginning one month after vaccination and continuing for a total of 12 months following immunization. The non-vaccinated participants in the study served as the study's control group. Their IgG levels were not measured at any point in time. The purpose of this study was to evaluate the efficiency of the Sinopharm vaccine by determining both its capacity to elicit an immunological response as well as the length of time that reaction was maintained.

2.2. Blood Sampling Technique

2.2.1. Study groups

Total 120 individuals were included in this study. 100 vaccinated and 20 Individuals were control or non-vaccinated individuals age range of 20 to over 60 years. 100 individuals who were vaccinated in Lahore with the Sinopharm vaccine were selected to participate as the vaccinated study's target population. Participants came from a variety of private universities in the Lahore area, such as Minhaj University, University of Central Punjab, and University of Lahore, among others.

2.2.2. Sample Size

After obtaining the participants' informed agreement, a total of one hundred vaccinated individuals were recruited in the research study in order to evaluate the level of IgG present in the blood samples. The participants were separated into five groups according to their ages: G1 (aged 21 - 30), G2 (aged 31 - 40), G3 (e aged 41 - 50), and G4 (aged 51 - 60). In addition, a control group consisting of twenty volunteers who had not received any vaccinations was included in the research study.

2.2.3. Participant Selection Criteria.

Table 2.1. Participant Selection Criteria.

Criteria	Exclusion Criteria	Inclusion Criteria
Age	Participants younger than 18 years old were not included	Participants must be 18 years old or older.
Health Issues	Individuals with certain health issues that may interfere with vaccine effectiveness were excluded.	Participants must have no health issues that would compromise vaccine safety.
Medications	Those taking medications that could affect immunological response to the vaccine were excluded.	No specific medication restrictions stated, but general health is considered.
Prior Vaccination	Individuals who had received a similar vaccine prior to the study were excluded to avoid immune reaction duplication.	Participants must have not received a similar vaccine prior to the study.
Adverse Reactions	Anyone with a history of adverse reactions to the vaccine or its components was not allowed to participate.	No adverse reactions to the vaccine or its components prior to the study.
Consent	Excluded participants did not provide informed consent.	Participants must provide informed consent before enrollment.
Vaccine Requirements	N/A	Participants have completed requirements for two doses and one additional dose of inactivated whole virus vaccine.

2.5. Effectiveness of Sinopharm Vaccine

2.5.1. Blood Collection and Storage

After collecting around 3 mL of blood from each participant, the blood was placed in blood tubes together with a clot-forming vial and centrifuged at 3500 revolutions per minute for ten (10) minutes. The samples of serum were separated and kept at a temperature of -40°C until further usage (Karamese & Tutuncu 2022).

2.5.2. Enzyme Linked Immunosorbent Assay (ELISA) for IgG Measurement

An indirect technique was used to analyze blood serum using an ELISA kit in order to determine the IgG cut-off value. A commercial anti-SARS-CoV2 quantitative IgG antibody detection by enzyme linked immunosorbent assay (ELISA) test kit (SZ-V237A, Genze Inc., USA) employs a recombinant S1 subunit of the SARS-CoV2 spike protein and a 96-well microplate with six break-off reagent wells coated with the recombinant structural protein of SARS-CoV2. Using this test kit, IgG antibodies may be found. We started the study by pre warming the 96-well ELISA microplates and all kit components to room temperature. The 1st well of this experiment was defined as the negative control, the 2nd well as the positive control, and the 3rd well through the 8th well were defined as the calibrator. 100um of the sample was added into each of the sample wells. They were given one final wash with 8 phosphate buffered saline after incubations (at 37C for 60 minutes), washes (in 8 phosphate buffered saline), with the addition of a 100 L enzyme conjugate (anti-human IgG tagged with peroxidase). A second wash was followed by the addition of 100 ul of chromogen/substrate solution, and the combination was then incubated for 30 minutes in the dark at 30 °C. After adding 100 ul of a 1X stop solution to each well (Karamese & Tutuncu 2022) in the previous step, the plate was read with a 450 nm microplate spectrophotometer.

Figure 2.1 Enzyme Linked Immunosorbent Assay (ELISA) for IgG Measurement. Dhamad et al. (2020).

2.6. Assessment of Side Effects of Sinopharm Vaccine

A questionnaire, which can be found attached at Annexure II, was developed in order to evaluate the potential adverse effects of whole virus (inactivated) COVID-19 vaccines in particular subjects. As a consequence of considerable study into the relevant prior literature, the questionnaire took into account a wide variety of potential post-vaccination side effects, including headache, nausea, tiredness, fever, and allergic responses (Zahid, 2021).

2.7. Ethical Considerations

The consent form, questionnaire, and ethical review board are all attached below for your convenience as annexures I. The study was given ethical clearance by the Ethical Committee of Minhaj University in Lahore. Before any of the individuals took part in the research, we made sure to get their agreement to participate in the study. The information that was gathered was held in strict confidence and was not identified.

Annexure II representing consent and annexures III questionnaires for side effects which were taken from participants.

2.8. Statistical Data Analysis

The data collected from blood samples was examined using statistical software SPSS. To determine if there were any antibodies present in the blood samples, the ELISA kit's IgG cut-off value was employed. Descriptive statistics were applied in order to give a succinct description of the data. Comparing the mean antibody levels of several groups, such as those differentiated by age or length of exposure, required the application of inferential statistics such as ANOVA.

Results

To assess the effectiveness of Sinopharm vaccine in vaccinated groups, the IgG in blood serum was measured with 0.2-400 IU/mL range. The cut-off level that the manufacturer recommends for the kit's level of sensitivity is 10 IU/mL.

3.1. Vaccinated and non-vaccinated groups

As mentioned in Table 3.1, there is a clear pattern of decreasing IgG antibody levels observed over time after vaccination across all age groups. The highest average IgG levels were seen in all age groups at 2 months' post-vaccination, with levels decreasing substantially by 2, 4, 6, 8, 10, and 12 months. This indicates that the initial immune response to the vaccine decreased with time duration of 1 year.

In addition, it is important to point out that the IgG level in individuals who had not been given the vaccine was extremely low, coming in at less than 10 IU/mL. It would appear from this that the Sinopharm vaccine was successful in eliciting a significant immune response in individuals of all age groups.

Table 3.1: Effect of Sinopharm vaccine and IgG antibodies levels against COVID-19 in four age groups with 12 months.

Age Groups	Non-vaccinated	Post Vaccinated Duration (Months)					
	Control	2	4	6	8	10	12
21-30	4.66g ±0.050	324.94a ±4.901	277.31b ±4.328	249.07c ±4.568	247.34d ±4.825	206.12e ±3.820	178.09f ±3.587
31-40	3.13g ±0.036	273.83a ±5.574	231.98b ±6.342	213.57c ±5.631	201.47d ±6.178	174.77e ±5.674	125.75f ±4.804
41-50	5.67g ±0.097	255.73a ±5.243	243.43b ±4.425	213.85c ±3.812	186.83d ±4.663	138.05e ±4.572	107.22f ±2.846
51-60	2.35g ±0.080	242.37a ±5.181	212.59b ±5.192	198.52c ±4.274	143.81d ±5.630	94.26e ±3.784	76.81f ±4.107

*a,b,c,d,e,f are representing the months to for 2,4,6,8,10,12 of post vaccinated samples collection while g denoting the month of non-vaccinated sample.

In the table, the levels of IgG antibodies against COVID-19 were displayed for each age group and time since immunization for those who got the Sinopharm vaccine. The four age groups were (21-30, 31-40, 41-50, and 51-60), and among the seven columns, one represents the control group and six durations of time since vaccination (2, 4, 6, 8, 10, and 12 months).

The table 3.1, and figure 3.1 is showing the effect of (post vaccination period) Sinopharm vaccine. The two months' difference in IgG level was considered. In the 21-30 age group, the average IgG level in people non-vaccination was relatively low, with an average of 4.66 IU/mL. However, following vaccination, the IgG level increased significantly, reaching an average of 324.94 IU/mL after 2 months post-vaccination.

As expected, the IgG levels began to decrease over time, and by 12 months post-vaccination, the average IgG level had dropped to 178.09 IU/mL. This implies that the vaccination was successful in producing a long-lasting immunological response in the participants of this age range.

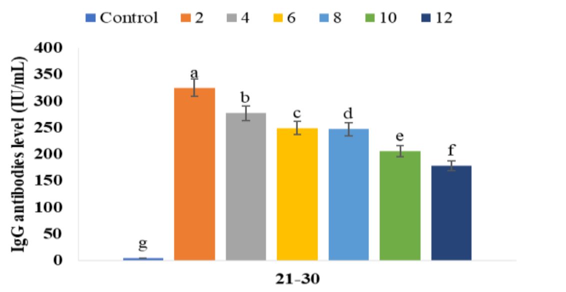

Figure 3.1: The effect of Sinopharm COVID-19 Vaccine on IgG Antibody Levels in Young Adults (21-30 Years Old) after 2-12 months of vaccination

In the 31-40 age group, as shown in figure 3.2, the average IgG level in individuals without vaccination was relatively low, with an average of only 3.13 IU/mL. However, following vaccination, the IgG level increased dramatically, reaching an average of 273.83 IU/mL after 2 months' post-vaccination.

However, the IgG level began to decline over time, and by 12 months' post-vaccination, the average IgG level had dropped to 125.75 IU/mL. This decline in IgG levels suggests that the immune response generated by the vaccine may not have provided long-term protection in this age group, and there may be a need for booster shots to maintain protective antibody levels.

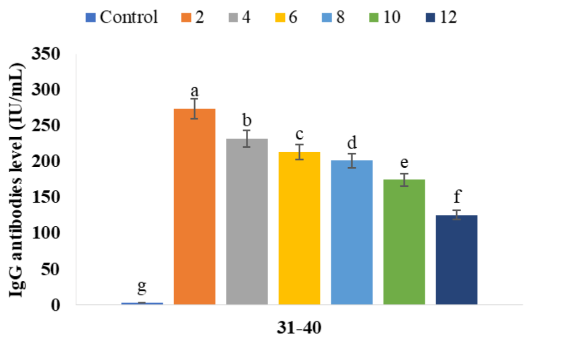

Figure 3.2: The effect of Sinopharm COVID-19 Vaccine on IgG Antibody Levels in Young Adults (31-40 Years Old) after 2-12 months of vaccination

In addition to the observations in the younger age group, the 41-50 age group also exhibited a similar pattern of IgG levels following vaccination, as shown in figure 3.3. The initial IgG level of 5.67 in those who did not receive the vaccine increased significantly to 255.73 IU/mL two months' post-vaccination, which was indicative of a strong immune response to the vaccine.

However, like in the younger age group, the IgG levels began to decrease gradually over time, with levels dropping to 107.22 IU/mL by 12 months' post-vaccination. While this decrease may seem alarming, it is important to note that even at 12 months' post-vaccination, the IgG levels were still significantly higher than the baseline levels in individuals who did not receive the vaccine.

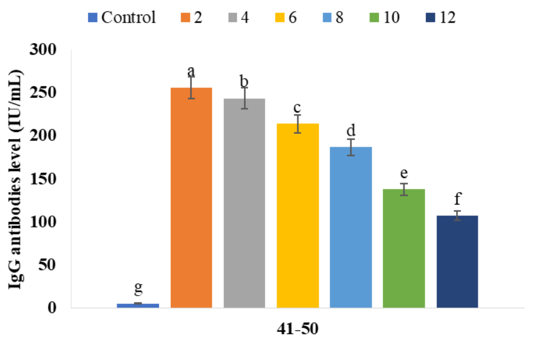

Figure 3.3: The effect of Sinopharm COVID-19 Vaccine on IgG Antibody Levels in Adults (41-50 Years Old) after 2-12 months of vaccination

In the 51-60 age group, the IgG level varied significantly with the duration after vaccination, as given in figure 3.4. The IgG level was 2.35 IU/mL in people who did not receive the vaccine and in people who received the vaccine was 242.37 IU/mL after 2 months' post-vaccination. However, the IgG level decreased gradually with time, reaching 212.59 IU/mL after 4 months, 198.52 IU/mL after 6 months, 143.81 IU/mL after 8 months, 94.26 IU/mL after 10 months, and 76.81 IU/mL after 12 months' post-vaccination.

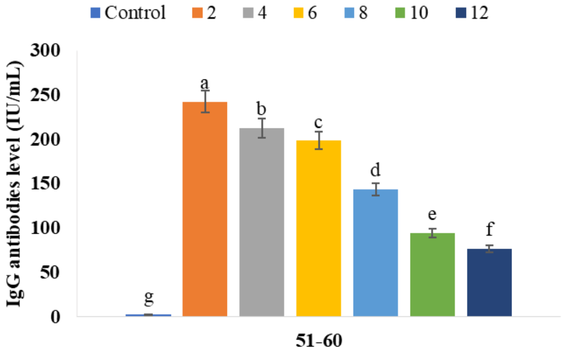

Figure 3.4: The effect of Sinopharm COVID-19 Vaccine on IgG Antibody Levels in Adults (51-60 Years Old) after 2-12 months of vaccination

3.2. Side Effects of Sinopharm

The side effects of whole virus (inactivated) COVID-19 vaccines were assessed using a questionnaire that we developed in these participants. They used the survey to do this. The questionnaire considered various possible adverse effects after vaccination based on the background knowledge provided by the extensive published literature preceding its design. The side effects consist of headache, nausea, fatigue, fever and allergic reactions. Also, age, gender, co-morbid disease status, and side effects after vaccination were recorded.

Headache was the commonest side effect as per the data as 97.5% of the people reported having a headache. Headache is another common side effect as reported in various studies after receipt of the shots of COVID-19 vaccines which is in consistency with our finding. Other common side effects included muscle pain and fatigue, which occurred in 83.8%

and 70.0% of people, respectively. These side effects are also a familiar story for other types of vaccines people get. 30·0% experienced chills or fever after vaccination, and 40·0% reported nausea. All these side effects occurred less frequently but in a considerable proportion of vaccine recipients. Important–fewer than 10% of individuals that received the vaccine were succumbed to chest pain, stomach pain, and rash/swelling. This mean that these side effects are not common among people who get the Sinopharm COVID 19 vaccine.

As depicted in Figure 3.2, the proportion of recipients experiencing different side effects of the Sinopharm COVID-19 vaccine varied widely. So, headache was common (97.5%) and swollen lymph nodes was rare (2.5%) The proportion of subjects with neurological side effects was also low at 11.3%.

The occurrence of these numerous side effects varies widely, possibly due to the different immune responses in people, their health status and also due to the variation in vaccine preparation and dose.

Nonetheless, the potential effect of this high incidence of headache, muscle pain, and fatigue on daily life and on quality of life is substantial, and awareness that such symptoms should be managed in all people who receive the vaccine should guide health care providers.

The vaccine is well-tolerated but vaccination can have side effects. The most frequent adverse effects are typically moderate and fleeting, and tend to go away on their own over the following days.

The side effects mentioned may vary from person to person on the basis of age, sex, and comorbidities. Plus, side effects can affect everyone differently. Individuals who are concerned about the administration of the Sinopharm vaccine should discuss their concerns.

Physical parameters were measured among the study participants (based upon designated questionnaires) results are representing as pie chart (Fig. 3.5)

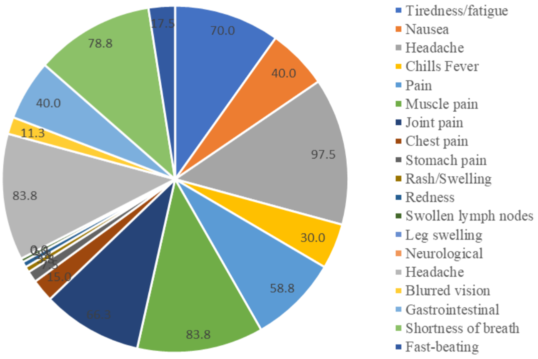

Figure 3.5: Side effects of Sinopharm vaccine in people of different age groups after 2 to 12 months with regular intervals

Discussion

With millions of illnesses and deaths reported worldwide, the COVID-19 pandemic has had a significant impact on public health throughout the world. In order to stop the virus's transmission and lessen the burden of sickness, vaccination has become an essential technique (Tabish, 2020). China, the United Arab Emirates, and Egypt are just a few of the nations that have granted approval for the Sinopharm vaccine for usage (Mallapaty, 2021). Understanding the factors that affect the immune response to the Sinopharm vaccine is important for optimizing vaccine effectiveness and developing public health strategies (Tomalka et al., 2022).

The purpose of the current study was to look at how longevity and age affected the amount of IgG antibodies in those who received the Sinopharm vaccine. The study found that the level of IgG antibodies varied significantly between age groups and duration after vaccination. Younger individuals, specifically those aged 21-30, had the highest levels of IgG antibodies after vaccination, followed by those aged 31-40, 41-50, and 51-60.

This discovery is consistent with other research that has demonstrated that elderly people often have a lower immune response to vaccinations compared to younger people (Bartleson et al. 2021). Using COVID-19 mRNA vaccines, Mark A. Brockman's study examined the duration and potency of humoral immune responses in older adults. The study found that elderly people (65 years and older) had lower humoral immune responses to COVID-19 mRNA vaccines in terms of both intensity and persistence when compared to younger people. SARS-CoV-2, the virus that causes COVID-19, contains a spike protein, and older people have lower antibody levels against it. These antibodies also decline more quickly over time. When compared to younger persons, the findings demonstrated that older adults had reduced antibody levels against the SARS-CoV-2 spike protein. Older persons saw a faster fall in antibody levels, with a 38% drop seen from the peak to the follow-up visit after four months (Brockman et al.2022).

Eman Farid conducted this study to assess regularities in antibody titers induced from two doses of Sinopharm vaccine against SARS-CoV-2 spike and their associations with Pfizer/BioNtech booster vaccination as well as age, gender, and comorbidities. The study found that age and comorbidities were not just statistical considerations but also variables identifying who did and did not respond immunologically to the Sinopharm vaccination. However, a Pfizer/BioNtech booster injection markedly raised SARS-CoV-2 spike antibody levels for all age groups and for individuals with underlying illnesses. There were no significant side effects reported, and the booster shot was deemed safe and well tolerated (Farid et al. 2022).

However, the study found that after receiving the Sinopharm COVID-19 vaccine, the amount of IgG antibodies gradually drops. In particular, decline was rapid in the first six months following vaccination, but then stabilized with a gradual decline thereafter. This is consistent with earlier research has demonstrated declining levels of antibody after vaccination over time in general across the board for additional types of vaccines. However, a drop in antibody levels does not necessarily mean a drop in protection against the virus since there are other parts of the immune system which also offer protection.

The study used data from a large community-based surveillance program in the UK, including vaccinated and unvaccinated individuals. Research showed that the Oxford-AstraZeneca vaccine was only 67% effective after two doses, compared with an 88% effectiveness against symptomatic infection with the Delta form for the Pfizer-BioNTech vaccine. Both vaccines showed a decreased effectiveness after a single dose, emphasizing the need for the full two-dose regimen of the vaccine (Eyre et al. 2022).

The most common adverse event linked to the Sinopharm COVID-19 vaccination, as seen in Figure 3.2, was headache, while there are a number of other side effects as well.

The variation in the rate of people who experienced various side effects can be attributed to multiple reasons. Some individuals are more intolerant to the vaccine, whereas others may have other underlying health issues that may enhance risk for particular side effects. Now not completely the timing and the severity of adverse effects can range due to the fact of the laborer– employer immune response and different factors, inclusive of age and gender (Benjamini et al. 2022).

However, some side effects, although, are usually mild and fleeting (Ong et al. 2021). More serious side effects are possible but rare, such as an allergic reaction, which would require medical attention. This information is valuable for healthcare providers and individuals to formulate an informed decision to receive the vaccination or not, and how to be ready for potential side effects (Bogdanov et al. 2021).

Muscle pain and fatigue were also prevalent adverse effects, and occurred in 83.8% and 70.0% of patients, respectively. These findings are consistent with previous research demonstrating that fatigue and muscle soreness were two of the most commonly reported adverse effects linked to the COVID-19 vaccinations (Almufty et al. 2021; Massoud et al. 2021). 30.0% of participants experienced chills and fever, indicating that such system reactions may happen to some extent in post-vaccination individuals. The vaccines' side effects, which included the typical COVID-19 vaccine side effects of chills and fever, were similarly consistent with those previously documented in investigations (Hause et al. 2022; Tsai et al. 2022).

Having adverse symptoms following a Sinopharm vaccine Millions of people have received the COVID-19 vaccine, according to several studies conducted worldwide. The most observed adverse event following immunization among this study were 92.5% experienced pain at the injection site among those who received Sinopharm vaccine. Fatigue (70.0%), headache (63.8%), and muscle pain (56.3%) were other frequent side effects. Fever (30.0%), chills (22.5%), and nausea (20.0%) were among the less frequent side effects. The Sinopharm had low side effects, and was found to be safe and well-tolerated (Ghiasi et al. 2021).

In another study, comparable results were noted. For the Sinopharm vaccine, the top side effect reported was pain at the injection site, which occurred in 87.9% of participants. Fatigue (57.6%), headache (52.2%), and muscle pain (44.9%) were among the other more common side effects. Out of all participants, 10.3% and 8.3% reported fever and chills. Results showed that mild side effects were the only reported adverse events, suggesting that the Sinopharm vaccine is safe and well-tolerated (Rabail et al. 2022).

Similar results were found in a similar study conducted in China. Pain at the injection site was the most common side effect among Sinopharm vaccination recipients, as reported by 83.6% of participants. Fever (46.8%), fatigue (42.2%) and headache (35.2%) were other common adverse events. Additionally, 26.6% of participants reported muscle pain and 25.8% chills. Because there were only mild to moderate adverse events (AEs) reported, this study concluded that the Sinopharm vaccination was safe and well tolerated (Zhang et al. 2021).

Conclusion

In summary, this study provides valuable information about the effectiveness and side effects of the Sinopharm vaccine in the Lahore, Pakistani population, two months after the vaccination of a variety of vaccinated individuals in a range of age groups. The results show that the Sinopharm vaccine prevents COVID-19 infection in all age groups and lowers the risk of hospitalization and death. Additionally, there was little chance of adverse side effects from the immunization, most of which were mild and resolved on their own. The study highlights the importance of ongoing assessments of the safety and effectiveness of the COVID-19 vaccinations in light of recently identified virus variants. It is crucial to monitor the Sinopharm vaccine's long-term effectiveness and side effects among the residents of Lahore, Pakistan, in order to identify any changes in efficacy or side effects over time. To sum up, the study provides important information that can direct public health programs and policies aimed at halting the spread of COVID-19 and increasing access to vaccines in areas with limited resources. Further research is needed to determine the long-term safety and effectiveness of the Sinopharm vaccine and other COVID-19 vaccines in diverse populations and settings.

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