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Covid-19 Vaccines Side Effects in Iraq

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Abstract:

- **Background:** The "Severe Acute Respiratory Syndrome Coronavirus 2" (SARS-CoV-2) disease has resulted in a worldwide challenging and dangerous pandemic, COVID-19 vaccines have been preventing serious morbidities and mortality associated with the infection. However, in addition to these findings, some unusual adverse effects have been reported. Vaccine side effects are common. They demonstrate that immunizations are effective, and that the immune system is responding. For assessing the safety of the vaccine, side effects and adverse events are fundamental.
- **Objective:** To evaluate side effects of corona virus vaccines.
- **Method:** A prospective cohort study using a pre-organized questionnaire encompassing, demographic, general health, the status of SARS-CoV-2 infection, vaccination, associated adverse events, breakthrough infections and their IgG anti-spike antibody titers; in a population comprising 200 individuals aged 18 and above who received 2 doses of one of covid-19 vaccines.
- **Results:** The responses of 200 individuals were analyzed statistically. Revealing that most utilized vaccine in the population was the Pfeizer- BioNtech vaccine. Side effects were generally subtle, in all three vaccines, with no serious adeverse events. Oxford-AstraZeneca vaccine however, showed fiercer side effects compared to the other two vaccines. Several side effects were more prevalent in male gender, but there was no noteworthy correlation with other factors.
- **Conclusion:** COVID-19 vaccinations appear to be safe. Although adverse events are rare on a worldwide scale, a large proportion of the world's population will be exposed to these vaccines. for this reason, their safety and tolerance must be carefully evaluated. More research is needed, however, to investigate the vaccines' long-term efficacy and safety, as well as the effect of dose, age, and general health condition on protective efficacy.

Keywords: SARS-COV-2, COVID-19, COVID-19 vaccines, COVID-19 Vaccines side effects.

INTRODUCTION

The novel corona virus infection started spreading in Wuhan/ China, by the end of December 2019. On February 11th, 2020, the World Health Organization formally designated this disease as coronavirus disease 2019 (COVID-19). The International Committee on Virus Taxonomy called the new coronavirus severe acute respiratory syndrome coronavirus 2 at the same time (SARS-CoV-2) [1]. COVID-19 has caused significant impact and challenges in more than 200 nations and regions of the world since its emergence. To date, more than 300,000,000 cases have been confirmed around the world, with over 5,000,000 deaths [2]. SARS-CoV-2 is a member of the Coronaviridae family, which is part of the Nidovirales order [3]. Corona viruses are enveloped, positive-sense, single- stranded RNA (+ssRNA) viruses. Distinguished by spike projections on their surface [4]. COVID-19 is mostly transmitted through respiratory droplets, but direct human-to-human contact and fecal-to-oral transmission may also be involved [5]. Coronaviruses found to infect humans, other mammals, and birds [6].

The coronavirus S protein binds specifically to the cellular entry receptor - angiotensin converting enzyme 2 - in the early stages of infection (ACE2) that plays a key role in antibody neutralization [7][8] The similarity between SARS-COV and SARS- COV-2 viruses were helpful in vaccine development against SARS-CoV-2 with thehelp of previously researched protective immune response against SARS-CoV. Hence, many vaccines developing platforms containing target antigen commonly target the S protein [9].

Since the onset of the COVID-19 pandemic, many vaccines for the prevention of coronavirus illness 2019 (COVID-19) have been developed. So far, four vaccinations have been approved by international organizations such as the European Medicines Agency (EMA). Two are DNA vaccines: ChAdOx1 nCov-19 (Oxford-AstraZeneca) and Ad26.COV2.S (Jhonson and Jhonson’s janssen) and two are mRNA vaccines : BNT162b2 (Pfeizer- BioNtech) and

mRNA-1273 (Moderna). The delivery of the vaccines has been linked to a significant reduction in SARS- CoV-2 infections and fatalities [18][19].

Adverse reactions that could lead to a long-term health issue are extremely rare afterany vaccination, including COVID-19 vaccination. If an adverse reaction occurs, itusually occurs within six weeks of getting the vaccination dose. The side effects from the second shot may be more severe than those from the first shot. These side effects are common indicators of immunity, and they should subside within a few days. The most common side effects were fever, headache, weariness, and soreness at the injection site, with the majorityof side effects being mild to moderate [20].

MATERIALS AND METHODS

This is a prospective cohort study. Randomly collecting 200 individuals who met the inclusion criteria, from different governorates of Iraq. Which were vaccinated with two doses ofcorona virus vaccines, since March 2021 (the beginning of the vaccination campaign), untilJanuary 2022.

Inclusion Criteria

- Fully vaccinated individuals with two doses of covid-19 vaccines
- Age above 17 years of both genders
- With or without chronic illnesses and risk factors
- Side effects after the second dose of the vaccines

Exclusion Criteria

- Non vaccinated or non-fully vaccinated individuals
- Persons infected after the 1st dose
- Persons infected before 20 days from the second dose
- Age younger than 17

Materials Questionnaire

All 200 individuals were followed up for side effects after receiving the second doseof the vaccines. Each individual had either a direct or a phone call interview using an organized questionnaire, that included personal information (age, gender, occupation), information about time and date of receiving the vaccine, common vaccine side effects, and any unusual events if experienced. IgG titers and details about re-infection with covid-19 if present.

Ethical Considerations

This study was ethically approved by the college of medicine – university of Sulaimani ethical committee. Verbal consent was obtained from all participants.

Statistical Analysis

The Statistical Package for Social Science (SPSS) (version 23) software program for statistical analysis was used to statistically analyze qualitative and quantitative data. Chi-square and T-test was used for assessing correlations. Data is presented in both percentages, frequencies, tables and graphs.

RESULTS

Demographic characteristics and chronic conditions among participants, the mean ± SD of age of our study population was 35.52 ± 12.28. with minimum age 17 years and maximum age 76 years.

(Table 1): summaries the demographic characteristic of the patients, and it shows that 56.5 % of the participants were male gender 43.5 % were female. 4.5% had hypertension 1% had ischemic heart disease. 3% had Diabetes mellitus. Other miscellaneous diseases were present such as asthma, 1% and renal diseases also 1%. 45.5% had a BMI within normal range, 35.5% were overweight, 19% were obese.

(Table 2): shows the age groups. Majority of the participants (41.5%) were between 26 and 35 years of age. While the ages between 66-75 years, presented the minoritygroup of (1%).

(Table 3): shows the occupation of the participants. 38.5% of the participants werefrom the health care sector.

Table:1: Demographical characteristic of the participants

		Frequency	Percent
Gender	Male	113	56.5
	Female	87	43.5
Chronic illnesses	Hypertension	9	4.5
	IHD	2	1.0
	DM	6	3.0
	Asthma	2	1.0
BMI groups	Normal weight	91	45.5
	Overweight	71	35.5
	Obese	38	19.0

IHD = Ischemic Heart Disease, DM = Diabetes Mellitus.

Table:2: Age groups of participants

Age groups	Frequency	Percent
17 - 25 years old	39	19.5
26 - 35 years old	83	41.5
36 - 45 years old	32	16.0
46 - 55 years old	31	15.5
56 - 65 years old	13	6.5
66 -75 years old	2	1.0
Total	200	100.0

Table:3: Different occupations of participants

		Frequency	Percent
Occupation	Barber	1	.5
	Business	29	12.5
	Dentist	2	1.0
	Doctor	53	26.5
	Earner	2	1.0
	Employee	20	10.0
	Engineer	9	4.5
	Graduate	1	.5
	Housewife	13	6.5
	Laboratory Technician	13	6.5
	Military	4	2.0
	Nurse	3	1.5
	Pharmacist	6	3.0
	University Teacher	3	1.5
	Retired	6	3.0
	Security	2	1.0
	Student	18	9.0
	Teacher	15	7.5
	Total	200	100.0

1.1. Distribution of vaccines

As manifested in (figure 1); concerning the distribution of each type of vaccine among the 200 participants, the Pfizer-BioNTech vaccine was the prevailing vaccine(75%). Ranking second was the Sinopharm vaccine (19%), and then the least utilizedwas the Oxford-AstraZeneca vaccine (6%).

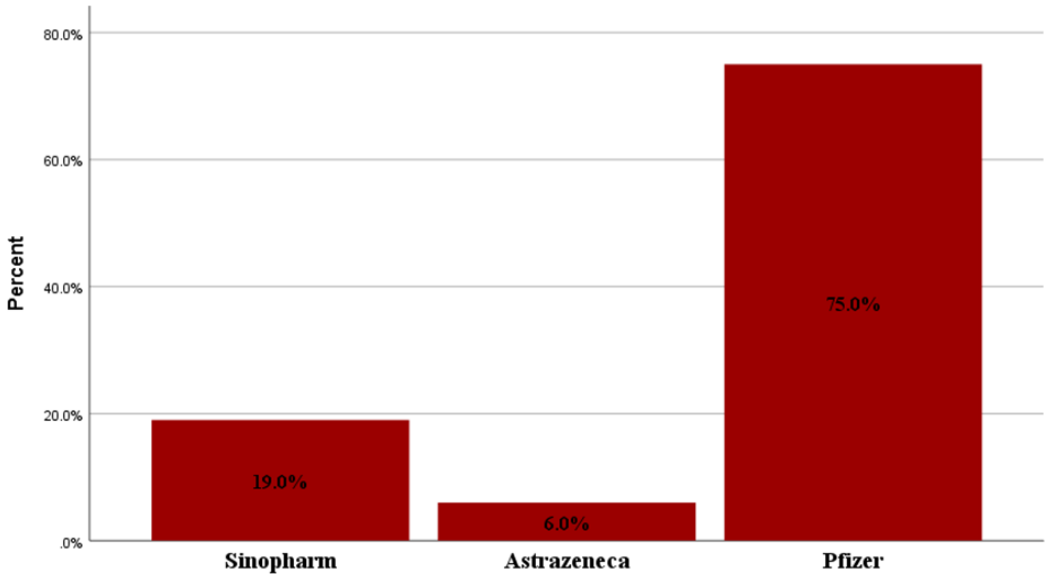

Figure:1: Distribution of types of vaccine

1.2. Side effects after two doses of vaccination

(Table 4a) describes the distribution of the common side effect after the vaccinationsin general. 83% experienced pain at the site of injection, other local symptoms like limb numbness, redness and swelling were less evident (18.5%, 7.5% and 9% respectively). Malaise and myalgia were the second most common side effect beingexistent in 44.5% of the participants. Fever was present in 41.5% of cases. Runny nose cough shortness of breath and diarrhea were present in 2% to 4.5%. headache in 3.5%. miscellaneous symptoms such as alteration in smell sensation, anemia, chest pain, dizziness, drowsiness, Insomnia, Mood change/depression, nausea, nausea/vomitingand sleepiness were evident in 0.5 to 1% (table 4b).

For these encountered side effects, to relieve symptoms; 23% of the participants needed bed rest,19.5% used analgesia and 1% were admitted to hospital (table 4c).

Table:4a: Distribution of the common side effect after the vaccinations

Side effects	Frequency	Percent
local pain	166	83.0
L. numbness	37	18.5
L. redness	15	7.5
L. swelling	18	9.0
fever	83	41.5
Rigor	9	4.5
malaise myalgia	89	44.5
runny nose	7	3.5
cough	8	4.0
diarrhea	4	2.0
throat congestion	8	4.0
SOB	7	3.5
headache	7	3.5

L. numbness = Limb numbness, L. redness = Limb redness, L. swelling = Limb swelling, SOB=Shortness of breath

Table:4b: Miscellaneous symptoms

Side effects	frequency	Percentage
alteration in smell sensation	1	0.5
Anemia	1	0.5
chest pain	1	0.5
Dizziness	1	0.5
Drowsiness	1	0.5
Insomnia	2	1.0
Mood change/depression	1	0.5
Nausea	1	0.5
nausea/vomiting	1	0.5
Sleepiness	1	0.5

Table:4c: Extra measures in participants experiencing post vaccine side effects

Extra measures	frequency	percentage
bedrest	46	23.0
analgesia	39	19.5
Hospital admission	2	1.0

Comparing between each of the vaccines -in specific- regarding the side effects; as shown in (table 5) there was a significant difference in participants who have received the Oxford-AstraZeneca vaccine being more likely to have experienced local limb pain, fever, malaise/myalgia, cough and the need for bedrest. While the Pfeizer-BioNtech vaccine showing significant difference only in limb numbness.

Table:5: Frequency and association of side effects with each vaccine

Side effects	Type of vaccines			P. value
	Sinopharm	AstraZeneca	Pfizer	
local pain	26	11	129	0.02
	68.40%	91.70%	86.00%	
L. numbness	1	2	34	0.01
	2.60%	16.70%	22.70%	
L. redness	1	0	14	0.22
	2.60%	0.00%	9.30%	
L. swelling	1	0	17	0.13
	2.60%	0.00%	11.30%	
fever	3	8	72	<0.001
	7.90%	66.70%	48.00%	
rigor	0	0	9	0.20
	0.00%	0.00%	6.10%	
Malaise/myalgia	8	9	72	0.001
	21.10%	75.00%	48.00%	
runny nose	0	1	6	0.31
	0.00%	8.30%	4.00%	
cough	0	2	6	0.03
	0.00%	16.70%	4.00%	
diarrhea	0	0	4	0.50
	0.00%	0.00%	2.70%	
throat congestion	0	0	8	0.24
	0.00%	0.00%	5.30%	

SOB	**0**	**0**	**7**	**0.29**
	0.00%	**0.00%**	**4.70%**	
bedrest	**6**	**7**	**33**	**0.008**
	15.80%	**58.30%**	**22.00%**	

L. numbness = Limbnumbness, L. redness = Limb redness, L. swelling = Limb swelling, SOB = Shortness of breath

(Table 6) below; is describing the duration of symptoms and IgG antibody titers. The mean duration of symptoms was 32.32 hours. and the mean IgG titers was 28.87 IU. minimum symptom duration was zero hours maximum duration was 120 hours (5 days). Minimum IgG antibody titer was zero while maximum was 300.

P. value indicates no significant correlation between the two population samples.

Table:6: Duration of symptom and IgG antibody titers

		Duration of symptoms /hrs.	**IgG ab titer/IU**	
N	**Valid**	**200**	**200**	**p. value = 0.2**
	Missing	**0**	**0**	
Mean		**32.32**	**28.87**	
Median		**24.00**	**27.96**	
Standard Deviation		**25.293**	**29.410**	
Minimum		**0**	**0**	
Maximum		**120**	**300**	

There was not any significant correlation between body mass index and type or severity of side effects as described in (table 7).

Table:7: Correlation between BMI groups and side effect

Side Effects	BMI groups			p value
	Normal weight	Overweight	Obese	
local pain	77	56	33	0.49
	84.60%	78.90%	86.80%	
L. numbness	21	12	4	0.22
	23.10%	16.90%	10.50%	
L. redness	8	2	5	0.12
	8.80%	2.80%	13.20%	
L. swelling	9	4	5	0.39
	9.90%	5.60%	13.20%	
fever	41	31	11	0.21
	45.10%	43.70%	28.90%	
rigor	4	2	3	0.49
	4.40%	2.90%	7.90%	
malaise/myalgia	37	35	17	0.54
	40.70%	49.30%	44.70%	
runny nose	5	1	1	0.35
	5.50%	1.40%	2.60%	
cough	4	3	1	0.89
	4.40%	4.20%	2.60%	
diarrhea	3	0	1	0.31
	3.30%	0.00%	2.60%	
throat congestion	3	1	4	0.06
	3.30%	1.40%	10.50%	
SOB	2	4	1	0.47
	2.20%	5.60%	2.60%	
bedrest	15	21	10	0.12
	16.50%	29.60%	26.30%	

L. numbness = Limb numbness, L. redness = Limb redness, L. swelling = Limb swelling,

SOB=Shortness of breath

Regarding gender correlation with the side effects post vaccination. Limb swelling, diarrhea, throat congestion malaise and myalgia had significant association with gender; all of them being more predominant in male gender as described in (table 8).

Table:8: Gender association with side effects post vaccination.

Side Effects	Male	Female	p value
local pain	92	74	0.49
	55.40%	44.60%	
L. numbness	18	19	0.28
	48.60%	51.40%	
L. redness	5	10	0.06
	33.30%	66.70%	
L. swelling	6	12	0.03
	33.30%	66.70%	
Fever	41	42	0.08
	49.40%	50.60%	
Rigor	3	6	0.16
	33.30%	66.70%	
Malaise (myalgia)	43	46	0.03
	48.30%	51.70%	
runny nose	2	5	0.12
	28.60%	71.40%	
Cough	3	5	0.26
	37.50%	62.50%	
Diarrhea	0	4	0.02
	0.00%	100.00%	
throat congestion	1	7	0.02
	12.50%	87.50%	
SOB	2	5	0.12
	28.60%	71.40%	

L. numbness = Limb numbness, L. redness = Limb redness, L. swelling = Limb swelling, SOB=Shortness of breath

There was no significant association between age groups and side effects after vaccination as shown in (table 9).

Table:9*:* Age association with side effects after vaccination.

Age groups / Side effects	17 - 25 years old	26 - 35 years old	36 - 45 years old	46 - 55 years old	56 - 65 years old	66 -75 years old	p value
local pain	31	66	29	29	10	1	0.24
	18.70%	39.80%	17.50%	17.50%	6.00%	0.60%	
L. numbness	7	10	10	6	4	0	0.18
	18.90%	27.00%	27.00%	16.20%	10.80%	0.00%	
L. redness	2	8	4	1	0	0	0.54
	13.30%	53.30%	26.70%	6.70%	0.00%	0.00%	
L. swelling	4	6	3	4	1	0	0.94
	22.20%	33.30%	16.70%	22.20%	5.60%	0.00%	
fever	19	37	11	12	4	0	0.55
	22.90%	44.60%	13.30%	14.50%	4.80%	0.00%	
rigor	1	4	4	0	0	0	0.18
	11.10%	44.40%	44.40%	0.00%	0.00%	0.00%	
Malaise(myalgia)	15	40	15	13	6	0	0.73
	16.90%	44.90%	16.90%	14.60%	6.70%	0.00%	
runny nose	1	4	1	0	1	0	0.78
	14.30%	57.10%	14.30%	0.00%	14.30%	0.00%	
cough	1	6	1	0	0	0	0.48
	12.50%	75.00%	12.50%	0.00%	0.00%	0.00%	
diarrhea	1	1	0	2	0	0	0.49
	25.00%	25.00%	0.00%	50.00%	0.00%	0.00%	
throat congestion	1	5	1	1	0	0	0.87
	12.50%	62.50%	12.50%	12.50%	0.00%	0.00%	
SOB	2	4	1	0	0	0	0.78
	28.60%	57.10%	14.30%	0.00%	0.00%	0.00%	

L. numbness = Limb numbness, L. redness = Limb redness, L. swelling = Limb swelling, SOB=Shortness of breath

DISCUSSION

In our study most of the cases (75%) have received the Pfizer-BioNTech vaccine, and the least used vaccine was the Oxford-AstraZeneca (6%). Although the Sinopharm vaccine was the first vaccine available in Iraq, The Pfizer-BioNTech vaccine has been in high demand despite the challenge of transporting and storing it at below-freezing temperatures because studies show it to be 95% effective at preventing symptomatic COVID-19 [21]. The Oxford-AstraZeneca vaccine had been distributed in dozens of nations, but its usage is now being restricted in some locales after it was connected to rare adverse events especially blood clot incidents [22].

The survey shows that 83% of our study participants experienced local pain at the site of injection, being the most common covid19 vaccinations side effect, followed by malaise and myalgia and ranking third was fever. This was in consistence with another study undertaken by Hatmal et al., 2022 in which the most two common side effects post covid-19 vaccinations (Pfeizer-BioNtech, Oxford-AstraZeneca, Sinopharm) were malaise and pain at the site of injection then headache and fever, in a total of 10,064 participants from 19 Arab countries who were included in the study [23]. Nevertheless, these proportions were different according to the type of vaccine, where for example: participants who received the Oxford- AstraZeneca vaccine tended to experience more side effects, and needed bed rest more than the utilizers of the other two vaccines. On the other hand, Sinopharm vaccine showed fewer side effects and less need for bed rest. This result was similar to a retrospective cross-sectional study conducted in Iraq by Almufty et al., 2021 and another study conducted

among Jordanian healthcare workers by Abu-Hammad et al., which showed that Oxford-AstraZeneca vaccine was the prevalent vaccine regarding side effects followed by Pfizer-BioNTech vaccine and finally Sinopharm vaccine [24][25]. The inflammatory response to vaccination causes a condition known as vaccine reactogenicity, which can have both local and systemic signs. Numerous variables, including the characteristics of the host (such as age,

gender, and others), the type of vaccination, its composition, the delivery route, and many more, affect how reactogenic a substance is [26].

The most prominent side effect following the three vaccines especially Oxford- AstraZeneca was local limb pain. Pfizer-BioNTech recipients beside having local pain, had experienced numbness as well at the site of injection more than the other two vaccines. Systemic side effects like fever, malaise, myalgia and cough were the dominant more in recipients of Oxford-AstraZeneca vaccine ranking second was recipients of Pfizer- BioNTech vaccine. Those who received Sinopharm vaccine experienced much fewer symptoms. This was comparable to a study performed by Aga et al., 2021 which established that more people who received Pfizer and AstraZeneca vaccines had local site reactions than those who received the Sinopharm vaccine. With AstraZeneca and Pfizer vaccinations, systemic events were more frequent; symptoms included exhaustion, body aches, headaches, muscle aches, fever, and gastrointestinal side effects [27]. Similar to recently published studies' findings, after receiving the COVID-

19 vaccine, the most frequent adverse effects were fatigue, pain and swelling at the injection site, headache, drowsiness and lethargy, chills, myalgia, joint pain, and fever [28][29][30][31][32]. However, only two of

these studies specifically examined the AstraZeneca vaccine, with the majority assessing the post-vaccination side effects of the Pfizer-BioNTech and Moderna vaccines [33][34]. As shown in (table 10) below:

Table:10*:* List of studies that assessed the side effects that occurred following COVID-19vaccination.

Study ID [Reference]	Country	Study Population	Sample Size	Vaccine Type (*n*)
El-Shitany et al., 2021	Saudi Arabia	General inhabitants	455	Pfizer-BioNTech
Riad et al., 2021	Czech Republic	Healthcare workers	877	Pfizer–BioNTech
Kadali et al., 2021a	United States	Healthcare workers	1116	Moderna
Kadali et al., 2021b	United States	Healthcare workers	1245	Pfizer–BioNTech
Jayadevan et al., 2021	India	Healthcare workers	5396	Covishield (5128), Covaxin (180), Pfizer–BioNTech (44), and Sinopharm (44)
Menni et al., 2021	United Kingdom	General inhabitants	627,383	Pfizer-BioNTech (282,103) and AstraZeneca (345,280)
Chapin-Bardales et al., 2021	United States	General inhabitants	3,643,918	Pfizer-BioNTech (1,659,724) and Moderna (1,984,194)

n=number of individuals who received the vaccine; Covishield, AstraZeneca vaccine manufactured by Serum Institute, India.

The long-term immune response and the early inflammatory response are unrelated.There is no proof, according to science, that those who experience more pronounced vaccine side effects are better protected against COVID-19 A heightened innate immune response won't aid the adaptive response, contrary to popular belief [35]. In our study, the duration of side effects experienced after vaccination showed no correlation with the level of anti- spike IgG antibody titer. Clinical trials on Pfizer BioNTech (BNT162) revealed that, despite 90% of recipients establishing protectionto the virus, although 50% of vaccine recipients did not experience any side effects[34].

According to centers of disease control and many studies conducted worldwide, rare symptoms are reported around the globe, such as anaphylaxis, thrombosis and thrombocytopenia, Guillain barre syndrome, myocarditis, pericarditis [36][23][21][27]. In our study there were no serious adverse events.

Our study revealed that the side effects were more frequent in males especially limb swelling, diarrhea, throat congestion malaise and myalgia. Whereas in regards to body mass index, age and chronic illnesses; there were no correlation any and null. This was in contrary to what was conveyed in a study done by Iguacel et al., 2021 with most side effects being more predominant in female gender and younger age groups while a non-overweight status was associated with a higher risk of fever ≥38°, vomiting, diarrhea and chills compared to those overweight [37].

Other studies reported less adverse events in males and those aged over 55 years [34][38][39]

CONCLUSION and RECOMMENDATION

Side effects from vaccination are common and indicate that the immune system is reacting.

Severe adverse reactions to vaccines, on the other hand, might be harmful and causeconcern.

Questions about COVID-19 vaccination side effects and consequences may overshadow judgments about their benefits.

In general, the vaccinations' short-term side effects were mainly lenient and short- lived.

This basic finding should be investigated further in future studies, such as a comparison to long-term protection against other strains, as well as prospective clinical trials to investigate the effect of a booster vaccine against breakthrough infection.

Conflicts of Interest: The authors declare no conflict of interest in this paper.

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Ethical Considerations: This study was ethically approved by the college of medicine – university of Sulaimani ethical committee.Verbal consent was obtained from all participants.

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