

## Post-vaccination (COVID-19) impacts in healthcare personnel

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**Abstract:** The COVID-19 pandemic has brought attention back to its spread in medical staff. A survey-based study was conducted to combine general information related to COVID-19 exposures, acceptances, vaccines received, and side effects. The majority (62.3%) of healthcare professionals had acquired COVID-19 infection from hospital environment (51.5%) mainly who treated (64%) COVID-19 patients. 54% healthcare respondents expressed 'high acceptance' towards COVID-19 vaccines. 88% received COVID-19 vaccination. The majority of healthcare personnel received SinoPharm (65%). 82.3% did not acquire COVID-19 post-vaccination. 38% mild side effects were observed from vaccination. Following were the general side-effects: myalgia (18.2%), the feeling of sickness (16%), fever (15.6%), dizziness (7.8%), joint pain (7.4%), chills (4.8%), and flu (4.8%). Following were the common neurological side-effects reported: headache (18.2%), fatigue (16.5%), muscle pain (16%), numbness/tingling (3%), and migraine (2.6%). Nausea and diarrhoea were reported in only 3.5% of respondents. Bad taste was reported in only 3% of respondents. The 1.7% reported rash and itching. The majority of the healthcare professionals did not report significant side effects related to neurological, gastroenterological, skin and oral categories. To assess the vaccines' potential for substantial and long-term or chronic effects, more study with a larger sample size and a longer follow-up time is required.

**Keywords:** SinoPharm, COVID-19 vaccines, healthcare professionals, myalgia, headache, fever, muscle.

### INTRODUCTION

The cases of Coronavirus infection (COVID-19) are still rising. There have been 20.6 million infective cases out of which 351,690 have died. The implementation of vaccines could help to lower the spread of the pandemic. The pandemic of COVID-19 has refocused attention on infectious disease transmission in hospital settings. The goal of this study was to assess possible adverse effects from different COVID-19 vaccines in Pakistani healthcare professionals. The COVID-19 vaccine's side effects are important in determining public faith in the vaccine and its acceptance. Therefore, we also assessed the acceptance and hesitancy of COVID-19 vaccination. Coronavirus is a new human beta coronavirus that has caused over two million fatalities and impacted over a hundred million people globally. Because all of the proposed medicines were shown to be unstable and have adverse effects, the demand for a vaccination arose quickly (Doroftei *et al.*, 2021). To slow the spread of the disease, medical professionals in Europe, America, Asia, and South Africa hastened the development of pandemic vaccinations. Sinopharm, Pfizer-BioNtech COVID-19 vaccine, Moderna, Oxford-Astra Zeneca, Johnson & Johnson, Gamaleya and other vaccines were developed

(Chigevenga 2021). Many questions about the vaccinations' effectiveness and safety arose as a result of this unprecedented vaccine development effort (Hatmal *et al.*, 2021). Acceptance of the COVID-19 vaccine in France is influenced by a variety of factors, including the properties of new vaccines and the country's immunization plan (Schwarzinger *et al.*, 2021). While the immune system is active, it can cause temporary swelling in lymph nodes, such as those under the arm. Headache, fatigue, and fever are signs that the immune system is working overtime, which is a common side effect of vaccines. Vaccine studies have yielded overall positive results, demonstrating that the COVID-19 vaccine is both safe and effective (Sherman *et al.* 2021). Kose *et al.*, (2021) from Turkey studied the status of COVID-19 vaccination acceptance amongst healthcare professionals and reported that around 68% of them stated that they should be vaccinated. The hesitancy for immunization against any disease is a major problem that depolarizes people supporting the efforts of immunization and those against it (Kwok *et al.*, 2020). In 19 countries, a survey showed the varying degree of willingness/acceptance of people for COVID-19 vaccination. Acceptance was as high as 90% in China to as low as 55% in Russia (Lazarus *et al.*, 2021). A study was conducted by Papagiannis *et al.*, (2021) reported a good (78%) acceptance rate. Injection site pain, headaches, muscle soreness and chills

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were commonly reported after the vaccination of COVID-19. People who took two doses had a greater rate of adverse effects overall.

## MATERIALS AND METHODS

A survey-based study was conducted to collect general information related to COVID-19 exposures, acceptance of COVID-19 vaccination, and side effects reported by the respondents. The respondents were national/international Pakistani healthcare personnel such as a physician, surgeons, dentists, medical/nursing students, pharmacists, physiotherapists, paramedical staff, and medical researchers. Information was gathered through a pre-designed Google form from May-June 2021. Following general and demographic information was gathered: Age, gender, residential location (urban/suburban/rural), healthcare category and sector, and overall physical health. Following information was gathered for COVID-19 exposure: Positive for COVID-19, severity of COVID-19, attended/treated COVID-19 patients, COVID-19 source of exposure. Following information was gathered regarding COVID-19 vaccination: Acceptance of vaccines, hesitancy for COVID-19 vaccination, COVID-19 vaccine received, number of shots received, which vaccine received, acquired COVID-19 after vaccination, intensity of side effects, and duration of side effects in days. Post-vaccination side effects were gathered in five categories: localized, general; neurological, gastroenterological, oral and skin.

## STATISTICAL ANALYSIS

All data was processed in SPSS version 25 for graphs, frequencies and percentages.

## RESULTS

### Background Information

Table 1 describes the demographic and general information from 231 healthcare respondents. Most of the respondents were male (55%) physicians (43.3%) from urban areas (89%) and working in public sector hospitals (76.2%). The majority of respondents (40%) were from the age groups of 25-35 years. 35% marked their physical health as 'excellent'.

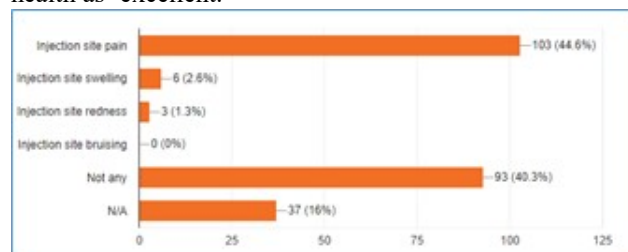


Fig. 1: Post-vaccination side effects observed (Localized).

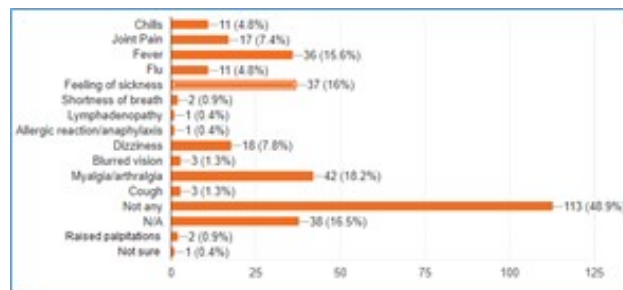


Fig. 2: Post-vaccination side effects observed (General)

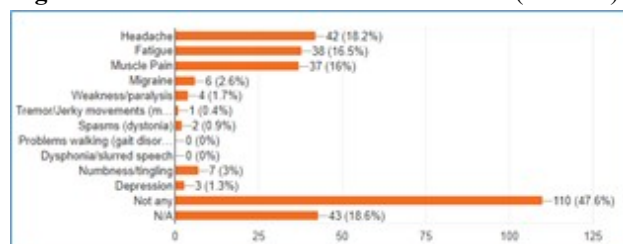


Fig. 3: Post-vaccination side effects observed (Neurological)

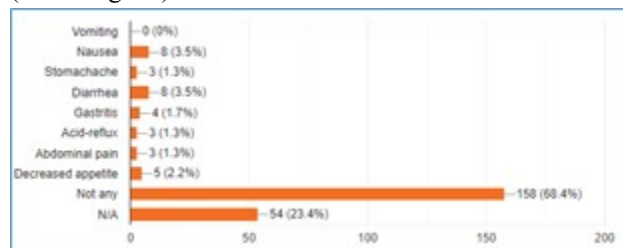


Fig. 4: Post-vaccination side effects observed (Gastroenterological)

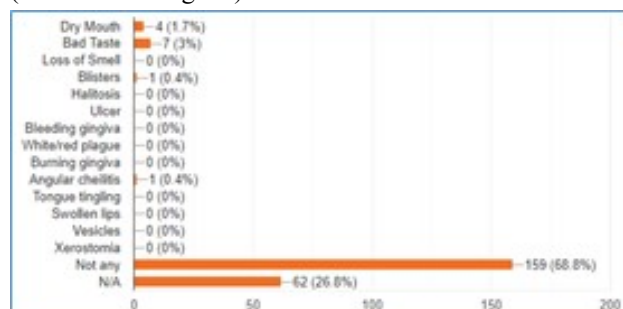


Fig. 5: Post-vaccination side effects observed (Oral)

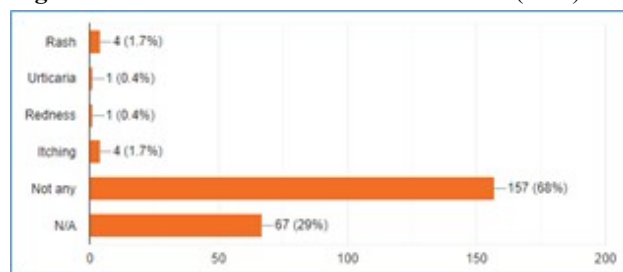


Fig. 6: Post-vaccination side effects observed (Skin)

### Information on COVID-19 Infection

Most of the healthcare respondents (62.3%) were positive for COVID-19 infection. The majority of physicians (64%) attended or treated COVID-19 patients. The

hospital environment was the commonest source of exposure (51.5%) for COVID-19.

### Acceptance & Hesitation of COVID-19 Vaccines

The majority of healthcare respondents (54%) expressed 'high acceptance' towards COVID-19 vaccines and 77.5% showed less hesitancy for the vaccination. The majority (88%) received COVID-19 vaccination in two doses (70%). The majority of healthcare personnel received SinoPharm (65%), Pfizer BioNTech (9.5%), and SinoVac (7%). 82.3% did not acquire COVID-19 post-vaccination. Mostly reported no side effects (52.4%). See table 2.

### Post-Vaccination Side-Effects Reported

Some side-effects were observed but mostly (38%) in the mild condition which was mostly (43.3%) settled in 1-3 days. See table 3.

### Localized Side-Effects

The most common localized side-effect was the 'injection site pain (44.6%), while 40% did not report any such side-effect. See fig. 1 for detail on other less-reported side-effects.

### General Side-Effects

The majority of respondents (49%) did not report any 'general' side effects. However, the following were the common general side-effects: myalgia/arthralgia (18.2%), feeling of sickness (16%), fever (15.6%), dizziness (7.8%), joint-pain (7.4%), chills (4.8%), and flu (4.8%). See fig. 2 for detail on other less-reported side-effects.

### Neurological Side-Effects

The majority of respondents (47.6%) did not report any neurological side-effect. However, following were the common side-effects reported: headache (18.2%), fatigue (16.5%), muscle pain (16%), numbness/tingling (3%), and migraine (2.6%). See fig. 3 for detail on other less-reported side-effects.

### Gastroenterological Side-Effects

The majority of respondents (68.4%) did not report any gastroenterological side-effect. Nausea and diarrhea were reported in only 3.5% of respondents. See fig. 4 for other less-reported side-effects.

### Oral Side-Effects

The majority of respondents (68.8%) did not report any oral side-effect. Bad taste was reported in only 3% of respondents. See fig. 5 for detail on other less-reported side-effects.

### Skin Side-Effects

The majority of respondents (68%) did not report any skin side effects. 1.7% reported rash and itching. Fig. 6 for detail on other less-reported side-effects.

**Table 1:** Demographics (n=231)

Parameters	Sub-Parameters	Frequencies (n, %)
Residential Area	Urban	205(88.7%)
	Suburban	18(7.8%)
	Rural	8(3.5%)
Healthcare Domain	Physician	100(43.3%)
	Surgeon	74(32%)
	Dentist	3(1.3%)
	Medical/Nursing Student	18(7.8%)
	Pharmacist	1(0.4%)
	Physiotherapist	8(3.5%)
	OT Attendant (Paramedic)	1(0.4%)
	Ward Attendant (Paramedic)	-
	Laboratory Personnel	2(0.9%)
	Medical Researcher/Scientist	5(2.2%)
	Not Working	4(1.7%)
	Self-Employed	1(0.4%)
	Other	14(6.1%)
Age Groups (Years)	<25	34(14.7%)
	25-35	92(39.8%)
	36-45	82(35.5%)
	46-55	14(6.1%)
	56-65	7(3%)
	66-75	3(0.9%)
	75+	0

## DISCUSSION

COVID-19 will only be suppressed if herd immunity develops, either as a result of an effective vaccination or because the population has been infected and has developed resistance to reinfection (Chung *et al.*, 2020). Hospital staff is usually infected more with COVID-19 as compared to other professions. Therefore, there is a strong need to evaluate the acceptances, implications, and adverse effects observed from COVID-19 vaccinations in all healthcare professionals. The objective of this study was to see if various COVID-19 vaccinations had any negative side effects, especially among Pakistani physicians and surgeons.

**Table 2:** Information on COVID-19 Vaccination (n=231)

Parameters	Sub-Parameters	Frequencies (n, %)
Trust on COVID-19 Vaccination	Low Acceptance	19(8.2%)
	Middle Acceptance	69(29.9%)
	High Acceptance	124(53.7%)
	No Acceptance	3(1.3%)
	Prefer Not to Answer	16(6.9%)
Hesitancy for COVID-19 Vaccination	Yes	40(17.3%)
	No	179(77.5%)
	Prefer Not to Answer	12(5.2%)
COVID-19 Vaccination Received	Yes	203(87.9%)
	No	28(12.1%)
Number of Shots Received	1	43(18.6%)
	2	161(69.7%)
	N/A	27(11.7%)
Vaccination Name	Sinopharm	150(64.9%)
	AZD1222, Oxford AstraZeneca	9(3.9%)

Parameters	Sub-Parameters	Frequencies (n. %)
Vaccination Name	Novavax	-
	CoronaVac	1(0.4%)
	CanSino	2(0.5%)
	BNT162b2, Pfizer BioNTech	22(9.5%)
	Sputnik V, Gamaleya	2(0.9%)
	Ad26.COV Johnson & Johnson	-
	SinoVac	17(7%)
	Other	3(1.3%)
	Not Any	26(11.3%)
Acquired COVID-19 After Vaccination	Yes	11(4.8%)
	No	190(82.3%)
	Not Sure	9(3.9%)
	N/A	21(9.1%)
Intensity of Side-Effects (Post-Vaccination)	Mild	88(38.1%)
	Moderate	19(8.2%)
	Severe	3(1.3%)
	N/A	121(52.4%)
Duration of Side-Effects (days)	1-3	100(43.3%)
	7-14	12(5.2%)
	14-30	3(1.3%)
	>30	3(1.3%)
	N/A	113(48.9%)

We also looked into COVID-19 vaccine acceptability and apprehension. COVID-19 infection was acquired by the majority of healthcare workers from hospital environment. COVID-19 vaccinations were deemed 'highly acceptable' by the majority of our Pakistani healthcare professionals. COVID-19 vaccine was received by the majority of Pakistani healthcare professionals. SinoPharm was given to the majority of our Pakistani healthcare individuals. Sinopharm, a state-owned company, is currently developing two distinct SARS-CoV-2 vaccines, both of which are based on an inactivated version of the virus. Sinovac, a Beijing-based pharmaceutical company, produced a third vaccine called CoronaVac. It's also based on an inactivated SARS-CoV-2 strain (Baraniuk 2021). The worldwide pandemic of coronavirus has prompted the extensive study, development and application of messenger RNA (mRNA) vaccines. Although mRNA vaccine technology is young compared to the lengthy history of traditional vaccinations against major pathogen proteins, it has been tested on numerous viruses over the last three decades, including influenza, rabies, CMV (cytomegalovirus) and Zika. COVID-19 mRNA vaccines that have been authorized by the FDA include mRNA that, when injected into the body, direct human cells to generate spike protein- a harmless surface protein specific to the SARS-CoV-2 virus. This spike protein is identified by the body as an antigen, eliciting an immune response that includes the creation of T-lymphocytes and B-lymphocytes that are specifically designed to eliminate this antigen, allowing for future protection against the same infection. The COVID-19 vaccine developed by Pfizer and BioNTech was the first to be approved by the FDA (Hiller *et al.*, 2021). It was expected that only half of adults in the

United States were expected to adopt COVID-19 immunizations (Salmon *et al.*, 2021). We found through the current study that the COVID-19 was not acquired in 82.3% of those who were vaccinated. No severe side effects were observed in the majority of healthcare workers. Myalgia/arthralgia, feeling unwell, fever, dizziness, joint pain, chills, and flu were the frequent general adverse effects. The majority of our responders said they had no neurological adverse effects. Headache, tiredness, muscular soreness, numbness/ tingling and migraine were reported in few people. The majority of our responders said they had no gastroenterological adverse effects. Only a few of our responders said they had nausea or diarrhea. The majority of our responders reported they had no oral side effects. Few of our respondents said they had a bad taste in their mouths. The majority of our responders reported they had no skin adverse effects. A rash and itching were experienced by very few of the medical workers. After receiving the first dose of the Pfizer - COVID-19 vaccine, a patient developed Guillain-Barre Syndrome (GBS) (Waheed *et al.*, 2021). El-Shitany *et al.*, (2021) from Saudi Arabia reported the adverse effects of the Pfizer-BioNTech COVID-19 vaccine. Injection site discomfort, headaches, flu-like symptoms, fever, and exhaustion were the most frequent complaints. A rapid heartbeat, whole-body pains, trouble breathing, joint discomfort, cold and sleepiness were among the less frequent adverse effects. Bell's palsy and lymph node enlargement and discomfort were the rare adverse effects. Dizziness, headaches, discomfort, muscular spasms, myalgia and paresthesias were the most prevalent neurological symptoms, which are predicted to occur as acute, temporary side effects of the vaccine. Tremor, diplopia, tinnitus, dysphonia, convulsions, and herpes zoster recurrence have all been documented in rare occurrences. A few cases of stroke, Guillain-Barré syndrome (GBS), facial palsy, transverse myelitis, and acute disseminated encephalomyelitis were also reported (ADEM). In a study using the Sinovac and Sinopharm vaccines, 68% of subjects experienced headaches after immunization, and 60% developed myalgia (Finsterer and Scorza, 2021). According to Abu-Hammad *et al.*, (2020), a small percentage of subjects had gastrointestinal side effects (nausea, vomiting, diarrhea), respiratory side effects (dyspnea), ear complaints, face discomfort, drowsiness, and diuresis. Shortness of breath, chest or chronic stomach discomfort, leg swelling, severe headache, impaired vision and skin bruising appeared after a few days. Inactive components such as egg protein, gelatin, formaldehyde, thimerosal, or neomycin, which contribute to particular IgE-mediated acute responses, may be the source of allergic reactions to vaccinations not ascribed to the active vaccine itself. Excipients are innocuous chemicals added to vaccines to enhance stability, increase solubility, improve absorption, alter palatability, or produce a unique look, according to the European Medicines Agency (EMA). Excipients can

induce a wide range of clinical allergic responses, from skin irritation to life-threatening systemic reactions (Saeed *et al.*, 2021).

The Centers for Disease Control and Prevention (CDC) lists discomfort, swelling, and redness as typical side effects. In Jordan, 18-31% of individuals reported no side effects from vaccination. People who were 45 years and reported the following systemic negative effects after the first dosage: fatigue (52%), myalgia (44%), headache (42%), and fever (35%) mostly from vaccine AstraZeneca (Abu-Hammad *et al.*, 2021). It was anticipated that reinfection can occur in people who have antibodies to SARS-CoV-2 infection. The findings of Abu-Raddad *et al.*, (2021) from Qatar suggested that whether produced by spontaneous infection or vaccination, induced SARS-CoV-2 immunity is effective against infection and can last for at least 6-7 months. They found that up to 40% of people exhibited epidemiological indications of reinfection as confirmed through viral genome sequencing. It is also mentioned that the natural infection was shown to be 95.2% effective against reinfection. Primary infections were more severe than reinfections. In Romania, Doroftei *et al.*, (2021) reported that except for Oxford–AstraZeneca (81%), three (Pfizer–BioNTech, Moderna, and Sputnik V) of the eleven vaccinations exhibited effectiveness >90%. Moderna, Sputnik V, and Oxford–AstraZeneca, relieve severe adverse effects, whilst Pfizer–BioNTech did not. There were a few exceptions in which individuals acquired severe reinfection or died. It may be inferred that the mentioned vaccines are effective and safe, regardless of age or gender, and that the recipients tolerate them well (Doroftei *et al.*, 2021). Jeskowiak *et al.* (2021) mentioned that having previously been exposed to COVID-19 influenced the development of more severe side effects following the first dose of the COVID-19 vaccination. Feng *et al.*, (2020) reported that 8% of people experienced one or more moderate side effects, but none of them experienced severe instances. Those who have a history of immunological deficiency were more likely to experience adverse effects (Feng *et al.*, 2020). Hiller *et al.*, (2021) presented cases of three individuals who experienced lymphadenopathy after receiving the first dose of the Pfizer-BioNTech. Pormohammad *et al.*, (2021) expressed that after the first and second doses, the adenovirus-vectored and mRNA-based COVID-19 vaccines had the best effectiveness. The vaccinations based on mRNA showed more adverse effects. According to seroprevalence studies, the number of persons having antibodies against SARS-CoV-2 is many times larger than the fast-increasing number of confirmed cases. Previous infection and seropositivity might not always protect you from being infected again. SARS-CoV-2 reinfection has been documented in people who have previously been infected with the virus, as well as in those who have antibodies against it. Although antibodies produced by the

initial infection are often protective, they do not ensure effective SARS-CoV-2 neutralization or protection against future infections. Such findings might be useful in improving mass immunization techniques (Letizia *et al.*, 2021).

## CONCLUSION

Majority did not identify any severe adverse effects in the neurological, gastroenterological, cutaneous, or oral categories. Overall, 38% mild side effects were observed from vaccination. To boost public trust in vaccines, more independent research on vaccination safety is urgently needed. Vaccines are one of the most promising if they can be created effectively. While such remedies are now being developed technologically, a significant societal gap still exists. Vaccination uptake, particularly universal vaccine adoption, is a social enterprise that necessitates the study of human variables.

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