

Assessing COVID-19 Vaccine Side Effects: A Comparative Study of Partial and Fully Vaccinated Population in Lahore, Pakistan

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ABSTRACT

Background: Vaccines provide immunity to minimize disease progression by enhancing adaptive immunity in the body, with mild to moderate side effects after immunization.

Aim: To evaluate the side effects of COVID-19 immunization among partially and fully vaccinated participants in Lahore.

Study design: The randomized survey-based study was conducted at Minhaj University Lahore, Pakistan, from October 1st to December 31st, 2022.

Methods: Utilizing a questionnaire to collect data on the side effects experienced by participants after receiving the COVID-19 vaccine. Participants were aged 16-65 age who had received either partial or full doses of COVID-19 vaccine, representing the population of Punjab, Pakistan.

Result: Data revealed that 90.1% of respondents received a full vaccine, whereas 9.8% received a partial/single dose respectively. However, in fully vaccinated participants 41.1% developed fever and fatigue symptoms, 14.1% nausea and sneezing, 11.3% GIT disturbance, 10.5% rigors, and 7.4% shortness of breath. However, in partially immunized participants, 58.9% developed fever, 44.6% soreness, 19.6 nausea, 57.1% fatigue, 55.3% sneezing, 39.2% GIT disturbance, 39.2% rigors, and 32.1% shortness of breath respectively. The mean value of the percentage of partially vaccinated people was around 40.3 in comparison to the fully vaccinated people which was 22.6. The study found that partially vaccinated individuals experienced significantly higher side effects ($p=0.019$) than fully vaccinated individuals, and most participants experienced minor to moderate side effects after partial and full COVID-19 vaccinations.

Practical implication: The findings of this study underscore the importance of developing single-dose vaccines with reduced side effects and enhanced immune response, providing valuable insights for future vaccine research and development efforts.

Conclusion: The results emphasize to researchers to give greater consideration to the development of single-dose vaccines with fewer side effects and with more improved immune response.

Keywords: COVID-19 vaccination, side effects, Partially vaccination, Fully vaccination, Immunity, survey

INTRODUCTION

Coronavirus (CoV) is a RNA virus with a single strand, which falls under the Coronaviridae family, that is not new to the world¹. Nonetheless, it became a global concern after the emergence of Severe Acute Respiratory Syndrome of Coronavirus-2 (SARS-CoV-2) as an epidemic in late 2019 in Wuhan, China. Although, the epidemic manifested itself with severe symptoms of illness in the positive cases², it reshaped itself as a pandemic SARS-CoV-2 outbreak and was termed as Coronavirus disease 2019 (Covid-19) by the WHO during the start of 2020, March 11³.

The COVID-19 pandemic has been prone to drastic recession impacts on Global Economies⁴, moreover the risk of current COVID-19 outbreaks leads to the commotion in World Economic and social life until an effective administration regime of vaccines worldwide. According to the FDA "broad spectrum vaccine efficacy" is defined as the capacity to prevent the transmission of the virus from an infected person to a susceptible individual. Further, it should be effective in reducing the advancement of the disease while minimizing the use of intensive care resources⁵. The FDA has set a minimum requirement of 50% effectiveness for vaccines⁶.

Uptil now about 19 varied COVID-19 vaccines have been enlisted and approved by WHO which were employed at a mass scale globally.⁽⁷⁾ Due to the low vaccine acceptance, and acute adverse effects of some COVID-19 vaccines, the world encounters huge challenges i.e. marked Scale-up manufacturing and Cold chain logistics⁸. Adverse drug reactions (ADRs) like muscle cramps, fever, nausea, GIT problems and flu are the common countries, startling figures of post-vaccine alleged cases started to

consequences of vaccines and medicines used for its control, which can be a serious life threat. In Europe and the neighbouring pour in which involve serious health-related issues like CVS, GIT, CNS and blood coagulation^{9,10,11}. Subsequently, COVID-19 vaccine-related concerns have obscured the views about its benefits and hence predisposed the decision to accept or reject the vaccine jabs. It shows a predominant relevance for those with prior experience of adverse effects or more likely to be affected in the future.

To date around 6000 to 7000 individuals who received COVID-19 vaccines in Pakistan have reported experiencing mild to moderate symptoms like diarrhoea, fatigue, headache, chills, and nausea¹². Additionally, some individuals aged 16-60 years, experienced thrombocytopenia along with the rare events of thrombosis¹³ following immunizations with Pfizer-BioNTech, Moderna, Sinopharm (China), Sputnik V (Russia), Cansino, and the Vaxzevria¹⁴. Thus, keeping in view the current COVID-19 vaccination concerns, the data related to COVID-19 post-vaccination adverse effects in final jabbed personnel were collected, and a consensus was established.

Therefore, in this study data was collected from both male and female aged 16-65 years, that belongs to the various socioeconomic setups in Pakistan. Moreover, the side effects ratio for post-COVID-19 vaccination between partially immunized people and fully immunized people has been taken into consideration. The rationale of this research study was to compare the side effects ratio of Covid-19 vaccines in the respondents who received partial and full immunization.

Also, the prevalence rate depicts the awareness of Covid-19 vaccine in the general population. Moreover, this research can be helpful for Health clinicians, Immunologists, and vaccine creators to comprehend the side effects ratios and prevalence rates in partial and fully jabbed participants of the study.

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MATERIALS AND METHOD

The survey based study was carried out in the School of Biochemistry, Minhaj University Lahore, Pakistan from 1st October to 31st December 2022. The Ethical approval was received from the School of Biochemistry Ethical Committee (Ref:MUL/BIOCHEM/245/2022). For this randomized study, the participants of study have filled the performa in written consent form and google link was also created (https://docs.google.com/forms/d/e/1FAIpQLSfqWLvUgO1b9XjYtBQnstyGCLvIaRv573PJw8Rs48fUxFjjA/viewform?usp=sf_link) and disseminated via Web link to social media platform like WhatsApp working groups and via email to friends and family. The respondents filled out the consent form/ performa and submitted it online. We validated the survey questionnaires according to previous research work that mentioned prevalent adverse effects of Covid-19 vaccine^{14,15}. To avoid breaching identities, the study participant's credentials were kept anonymous and confidential. The inclusive criteria of our study included participants aged between 16-65 years with partial and full immunization history, moreover, the exclusion criteria covered those without any prior COVID-19 vaccine jab. Moreover, to avoid any discrepancies about the Vaccine Label we avoid any related point in the questionnaire.

Within the three-month survey, a total of 566 participants submitted their consent online. The final results of the filled forms about the post COVID-19 jab effects were included in this study. Afterward, the collected data was analyzed in terms of frequencies, percentages, mean value of percentage, and statistically significant p-values <0.05 were intended via t-test analysis.

RESULTS

The general parameters of 566 people with mixed socioeconomic status participated for this study via web link survey (https://docs.google.com/forms/d/e/1FAIpQLSfqWLvUgO1b9XjYtBQnstyGCLvIaRv573PJw8Rs48fUxFjjA/viewform?usp=sf_link) were presented in the Table 1. Out of 566 participants, 90.1% participants were fully vaccinated (1st and 2nd dose) and 9.89% participants were partially vaccinated (only single/1st dose) (Table 1)

Table 1: General Parameters

Age	Frequency	%age	
16-30	508	89.75	
31-45	52	9.18	
46-60	6	1.06	
61-75	0	0	
Gender			
Male	198	34.98	
Female	368	65.01	
Co-morbidities	Category	Frequency	%age
Diabetes	Yes	20	3.53
	No	546	96.46
Hypertension	Yes	28	4.94
	No	504	89.04
	May be	33	5.83
Asthma	Yes	18	3.18
	No	532	93.99
	May be	16	2.82
Status of Vaccinated People			
Fully vaccinated	510	90.1	
Vaccinated with only 1st dose	56	9.89	

Most of the fully vaccinated participants were revealed to suffer from post-vaccination symptoms which predominately included muscle pain 55.6% (284/510), fever 41.1% (210/510), and fatigue 41.1% (210/510) the highest ratio as compared to the other symptoms. Moreover, only a few participants experienced heart-related problems 5.0% (26/510) and shortness of breath 7.4% (38/510) as shown in Table 2. Whereas, the frequency of

respondents that received partial and full jabs of vaccine with (Yes/No) consent was shown in Figure 1. The significant finding in partially immunized individuals revealed to have more severe side effects with higher percentage values, including 58.9% (33/56) participants who suffered fever, 57.1% (32/56) participants who experienced muscle discomfort, and 57.1% (32/56) participants who experienced fatigue. Subsequently, sneezing rates were markedly higher in partially vaccinated people by 55.3% (31/56) as compared to fully vaccinated people 14.1% (72/510). In addition to that, the ratio of GIT disturbance 39.2% (22/56) and shortness of breath 32.1% (18/56) were markedly higher in the partially vaccinated people as compared to the fully vaccinated people as revealed in Table 2. Moreover, the frequency of participants with both partial and full vaccine dose consent (Yes/No) was shown in Figure 2.

Figure1: Frequency of side effects in fully vaccinated people

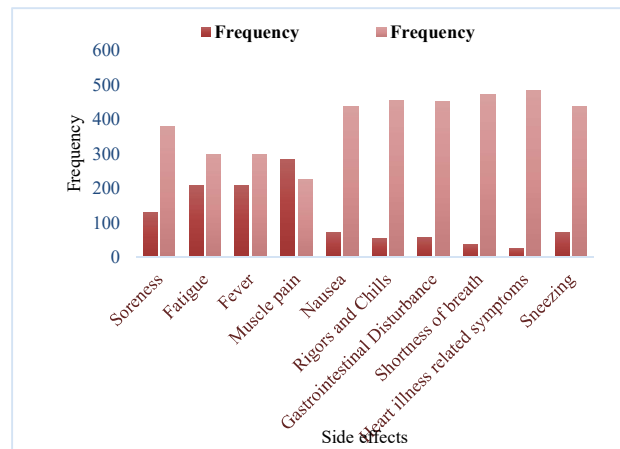


Figure 2: Frequency of side effects in (single/1st dose) vaccinated people

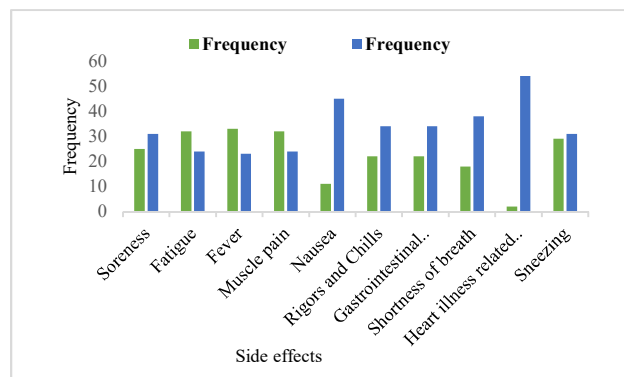


Table 2: Comparison of frequent post COVID-19 vaccination reported side effects in terms of percentages

Symptoms	% of side effects in fully vaccinated people	% of side effects in 1st dose vaccinated people
Muscle pain	55.6	57.1
Fatigue	41.1	57.1
Fever	41.1	58.9
Soreness	25.4	44.6
Nausea	14.1	19.6
Sneezing	14.1	55.3
GIT Disturbance	11.3	39.2
Rigors and Chills	10.5	39.2
Shortness of breath	7.4	32.1
Heart illness related problem	5.0	3.5

Table 3: Mean and P-value (t-test analysis) of the percentage of adverse effects

	Category	Mean %	P-Value%
Side effects after 1st dose of vaccination	Yes	40.3	0.019
Side effects after fully vaccination	Yes	22.6	

DISCUSSION

To cope with the COVID-19 pandemic health-related concerns, it is important to introduce an effective vaccination against the disease. However, adverse side effects of any COVID-19 vaccine are frequent that prove a decent immune response¹⁶. Moreover, people after vaccination i.e. (single and full dose) may encounter severe, moderate, mild, and no adverse side effects¹⁷. A similar study concluded that individuals who had previously contracted COVID-19 had experienced more adverse effects as compared to post-vaccinated ones. Thus, 895 individual's data revealed a robust correlation between prior COVID-19 and vaccine adverse effects¹⁸. The findings of this study suggested that adverse side effects of various COVID-19 vaccine types were common and presented with a variety of symptoms in different age, gender, and ethnic groups of the participants. A random sampling size of 566 participants included in this study revealed that approximately all of them have contracted diverse types of COVID-19 vaccine side effects. In the current study, female respondents between age limit of 16-30 showed more interest in this study, mainly because of being literate and aware of the deleterious impact of the disease spread.

In this study, the most prevalent post-vaccination side effects revealed in partially vaccinated participants were fever (58.9%), soreness (44.64%), fatigue (57.14%), and muscle pain (57.14%) respectively. Reynolds et al¹⁹ reported that fully vaccinated individuals who encountered breakthrough infections exhibited milder symptoms compared to those who were partially or not vaccinated. Additionally, only a small percentage of fully vaccinated participants reported moderate or severe symptoms, while nearly a quarter of them had no symptoms at all.

The prevailing side effects in fully vaccinated individuals were almost the same as in partially vaccinated but with a minute difference. The persistent side effects in fully vaccinated individuals include fever (41.17%), soreness (25.49%), and fatigue (41.17%) respectively. The adverse side effects mean of the percentage values were as high as noticed in partially vaccinated individuals that is 40.35 as compared to 22.62 value for fully vaccinated ones.

A similar research study by Kadali RAK, 2021²⁰ also presented identical symptoms post COVID-19 vaccine regime that including headache, light headedness, myalgia, leg pain, joint pain, fever with or without chills, sore throat, flu-like symptoms, decreased sleep quality, brain fogging.

It is worth noting that this spectrum of adverse effects was observed in both national and international contexts.

Nevertheless, a clinical trial conducted in the UK used AstraZeneca post-vaccination side effects includes feeling feverish (51%), fatigue (70%), headache (68%), and muscle ache (60%) respectively²¹. Moreover, a study was conducted by Mulligan MJ, 2020²² employed BioNTech-Pfizer vaccine trials in the United States. In this study, the following percentages of participants reported post-vaccination symptoms: fatigue (83.3%), headache (100%), localized pain (100%), muscle ache (58.3%) and feeling feverish (66.7%) after receiving the COVID-19 vaccine. A research conducted by (Abbas et al., 2021) reported the most prevalent post-vaccination side effects that includes fatigue/malaise in 45.4% (93/205) participants, followed by headache/migraine in 39.5% (81/205) respectively¹⁵.

The adversative side effects of COVID-19 vaccination are somehow frequent which signifies the vitality of the immune system. However it is evident from his study that there is a significant level of skepticism in the general population regarding

Covid-19 vaccine. This scepticism poses a challenge to achieving herd immunity through vaccine.⁽²³⁾ Subsequently, the population was skeptical over widespread adoption of 2nd dose of vaccines mainly because of adverse effects that were encountered after 1st dose of Covid-19 Vaccine. The minimal side effects observed in fully vaccinated participants, as reported in our study, can contribute to reducing people's apprehensions about receiving the second dose of vaccines.

Limitations of the study: The study has limitations, notably the very small sample size. With such a limited sample, it is challenging to draw definitive conclusions about overall adverse effects of COVID-19 vaccinations. Furthermore, these study results only pertain to patients inoculated with various vaccines, making it difficult to evaluate the specific adverse effects of individual vaccines. However, for a comprehensive insight of COVID-19 vaccine side effects, large sample-sized and multinuclear studies are required at a broader scale.

CONCLUSION

The current research study concluded that a prevalent number of participants received both doses of vaccines, out of which the majority of individuals experienced mild to moderate post-vaccination side effects. However the ratio of side effects revealed a high number in partially vaccinated participants in comparison to fully vaccinated ones which made participants reluctant to receive the 2nd dose of vaccine.

The findings of this study will help researchers to pay more attention to the development of single-dose vaccines with fewer side effects and with more improved immune response. Moreover, this effective direct-to-patient research approach can be employed to gather information that may not be readily accessible through most real-world data sources. It can be used effectively to study adverse events and access the effectiveness of medical products.

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H.N. Shehzadi and H.I. Butt designed the research, written and proofread the manuscript, M. Murtaza, S. Abbas, H.M. Azeem and H.Khawar collected the data and conduct analysis. H.N. Shehzadi, M. Akram and M.M.Zaheer contributed to the data analysis and proofreading of the manuscript. All authors agree to be responsible for all aspects of their research work.

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Statement of Data Availability: The data that supports the findings of this study are available from the corresponding author and at URL (https://docs.google.com/forms/d/e/1FAIpQLSfqWLvUgO1b9XjYtBQnстыGICILviaRv573PJw8Rs48fUxXfjA/viewform?usp=sf_link).

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