ORIGINAL ARTICLE

Analysis of COVID-19 vaccine type and adverse effects following complete vaccination

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ABSTRACT

Backgrounds: Immunization is one of the most successful and cost-effective health interventions to prevent infectious diseases. The launch of the COVID-19 vaccine rollout in December 2020 was a landmark for overcoming this pandemic crisis. It is therefore very important to get most of the population vaccinated as definitive cure still does not exist and people must take all required doses on time as required to reach full immunity. To find the association between COVID-19 vaccine type and adverse effects following complete vaccination.

Material and Methods: This Cross-sectional study was conducted in Sharif Medical and Dental College, Lahore over a period of one year from January 2022 to January 2023 on a total of 100 individuals. All participants irrespective of their age and gender were included in the study. Participants with any other systemic illness or those on medication for other illnesses were excluded from the study. Data was collected using a pre-validated questionnaire

Results: The association between the type of vaccine and post-vaccination symptom were significant for fever (p=0.018) and cough (p=0.015).

Conclusion: Fever and cough were most prevalent among individuals who received Sinovac. Most of the symptoms were more prevalent in Sinovac recipients as compared to Sinopharm. Post-vaccination COVID-19 infection was also more prevalent in those who received Sinovac.

Keywords: COVID-19 infection, COVID-19 vaccination, Side effects

BACKGROUND

COVID 19 or mostly known as Corona virus pandemic was first detected in Wuhang, China in December 2019 and later spread to more than 150 countries, leaving people economically and socially devastated.[1] WHO declared it a pandemic in January 2020. COVID-19 caused by SARS-CoV-2 is the deadliest communicable healthcare outbreak of the 21st century effecting 500 million people leaving 6.2 million dead as of April 17,2022.[1]

Immunization is one of the most successful and cost-effective health interventions to prevent infectious diseases.[2] The launch of the COVID-19 vaccine rollout in December 2020 was a landmark for overcoming this pandemic crisis. All Covid19 vaccines are approved by WHO after clinical trials and are proven to be effective and safe.[3] It is therefore very important to get most of the population vaccinated as definitive cure still does not exist and people must take all required doses on time as required to reach full immunity.[4]

Pakistan has a population of 184,404,791 out of which 136,187,729 (73.9%) have received their first dose of vaccine and 124,721,404 (67.6%) second dose. Currently available vaccines in Pakistan are Pfizer, Moderna, Astra Zeneca, Sinovac and Sinopharm, and Sputnik[5]. Any available vaccine can be used as a booster dose[6]. Following inoculation with the Sinopharm or Sinovac vaccines, individuals may experience a spectrum of side effects, ranging from mild to moderate in intensity[7]. These symptoms typically manifest within a few hours to days after vaccination and subside spontaneously within a short duration.[8] Now, turning to Sinopharm and its associated adverse reactions, let's provide some details about the Sinopharm BIBP COVID-19 vaccine, also known as BBIBP-CorV.[9] This vaccine, developed by Sinopharm Beijing Institute of Biological Products, is one of two whole inactivated virus COVID-19 vaccines produced by Sinopharm.[9] It is important to emphasize the features of the Sinovac vaccination as we move our attention to it and its negative effects after delivery[10]. Sinovac Biotech, a

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Chinese business, created CoronaVac, also known as the Sinovac COVID-19 vaccine, which is a full inactivated virus COVID-19 vaccine.[11] Sinovac is not required to be frozen, in contrast to many other vaccinations, and it can be stored at 2 to 8 degrees Celsius (35.6 to 46.4 degrees Fahrenheit).[12]

Some people have side effects from the vaccine, which are normal signs that their body is building protection. These side effects may affect their ability to do daily activities, but they go away in a few days. Some people have no side effects, and allergic reactions are rare.[7] Major complaints from COVID-19 Vaccine are a combination of pain, redness or swelling (where the shot was given) fever, fatigue, headache, muscle pain, chills, joint pain, nausea, vomiting, swollen lymph nodes, feeling unwell.[5] Most of the symptoms can likely be attributed simply to exuberant production of a cytokine that plays a vital role in potentiating early stages of the immune response, namely, type I interferon (IFN-I).[5]

The aim of this study was to find the association between covid-19 vaccine type and adverse effects following complete vaccination.

MATERIAL AND METHODS

A cross-sectional study was conducted in Sharif Medical and Dental College, Lahore over a period of one year from January 2022 to January 2023. The sample size was calculated to be 100, keeping a precision of 5%, confidence level 95% and prevalence of adverse effects after receiving COVID 19 vaccination to be 7%[13] using an online sample size calculator Scalex Sp 1.0.01.[14] Sampling technique used was convenient sampling. All participants irrespective of their age and gender were included in the study. Participants with any other systemic illness or those on medication for other illnesses were excluded from the study. Data was collected after obtaining ethical clearance from ethical committee of Sharif Medical Research Centre (No. SMDC/SMRC/270-22). Informed consent was taken from the participants before data collection. Data was collected using a pre-validated questionnaire with a Cronbach alpha value of 0.7.[15] It was divided into section 1 which included demographic characteristics (3-items) and section 2 COVID 19 vaccine side effects (30-items) with binary responses. Recorded data was coded and entered using SPSS statistical package version 23. p value ≤ 0.05 was taken as significant. Fisher exact test was used to find the association between development of infection post vaccine and the type of vaccine. Chi square test was used to find the statistical association of the type of vaccination used with side effects of vaccination i.e tiredness and fatigue, decreased sleep quality, fever, headache, haziness and lack of vision, pain at injection site, dizziness, sleepiness and dry throat. Fisher exact test was used to find the association between the type of vaccination and the post vaccine side effects i.e, joint pain, swollen ankles, muscle pain, nausea, abdominal pain, diarrhea, vomiting, bruises, bleeding gums, chills, irritation, body sweats, numbing and tingling sensation, clogged nose, runny nose, dyspnea, chest pain, irregular heartbeat, altered blood pressure and cough.

RESULTS

The study was conducted on 100 individuals with a mean age of 24.81±2.109 years with 25% males and 75% females. It was seen that 79% individuals were never infected with COVID before vaccination while 21% were infected. The types of vaccinations received have been shown in Table-I.

It was reported that majority of the individuals (92%) did not get infected with COVID after receiving the vaccination while only 8% were infected. Table-II shows that there was a non-significant association between type of COVID vaccination and frequency of infection after receiving these vaccines. It was seen that majority of individuals who developed COVID 19 infection were the ones receiving Sinovac.

Table-III shows that the association between type of vaccine and the side effects like fever, and cough were significantly associated with each other.

Table 1: Type of vaccination received by individuals

Type of vaccination	Frequency
PFIZER BioNTech	2
Sinopharm	47
Moderna	2
Sinovac	46
Cansino	3

Table-II: Association between type of COVID vaccines and probability of COVID 19 infection after receiving the vaccine (n=100).

Type covid vaccine received	COVID 19 Infection post vaccination			p value
	Yes n (%)	No n (%)	Total n (%)	
PFIZER BioNTech	0 (0%)	2 (100%)	2 (100%)	0.718
Sinopharm	3(6.4%)	44 (93.6%)	47(100%)	
Moderna	0 (0%)	2(100%)	2(100%)	
Sinovac	5 (10.9%)	41 (89.1%)	46(100%)	
Cansino	0(0%)	3(100%)	3(100%)	

Table-III: Shows that the association between type of vaccine and the side effects like fever, and cough were significantly associated with each other.

Potential side effects		Type of vaccination received			p value
		Sinopharm n(%)	Sinovac n(%)	Total	
Tiredness and fatigue	**Yes**	26 (55.3%)	31(67.4%)	57(61.3%)	0.232
	No	21(44.7%)	15(32.6%)	36(38.7%)	
Decreased sleep quality	**Yes**	8(17%)	10(21.7%)	18(19.4%)	0.565
	No	**39**(83%)	36(78.3%)	75(80.6%)	
Fever	**Yes**	5(10.6%)	14(30.4%)	19(20.4%)	0.018*
	No	42(89.4%)	32(69.6%)	74(79.6%)	
Headache	**Yes**	16(34%)	16(34.8%)	32(34.4%)	0.940
	No	31(66%)	30(65.2%)	61(65.6%)	
Haziness and lack of vision	**Yes**	7(14.9%)	5(10.9%)	12(12.9%)	0.563
	No	40(85.1%)	41(89.1%)	81(87.1%)	
Pain and swelling in injection site	**Yes**	28(59.6%)	22(47.8%)	50(53.8%)	0.256
	No	19(40.4%)	24(52.2%)	43(46.2%)	
Joint pain	**Yes**	1(2.1%)	6(13%)	7(7.5%)	0.059
	No	46(97.9%)	40(87%)	86(92.5%)	
Swollen ankles	**Yes**	1(2.1%)	1(2.2%)	2(2.2%)	1.000
	No	46(97.9%)	45(97.8%)	91(97.8%)	
Muscle pain	**Yes**	14(29.8%)	11(23.9%)	25(26.9%)	0.523
	No	33(70.2%)	35(76.1%)	68(73.1%)	
Nausea	**Yes**	3(6.4%)	4(8.7%)	7(7.5%)	0.714
	No	44(93.6%)	42(91.3%)	86(92.5%)	
Abdominal pain	**Yes**	1(2.1%)	3(6.5%)	4(4.3%)	0.361
	No	46(97.9%)	43(93.5%)	89(95.7%)	
Diarrhea	**Yes**	3 (6.4%)	2(4.3%)	5(5.4%)	1.000
	No	44(93.6%)	44(95.7%)	88(94.6%)	
Vomiting	**Yes**	1(2.1%)	0(0%)	1(1.1%)	1.000
	No	46(97.9%)	45(100%)	91(98.9%)	
Bruises	**Yes**	1(2.1%)	1(2.2%)	2(2.2%)	1.000
	No	46(97.9%)	45(97.8%)	91(97.8%)	
Bleeding gums	**Yes**	1(2.1%)	1(2.2%)	2(2.2%)	1.000
	No	46(97.9%)	45(97.8%)	91(97.8%)	
Chills	**Yes**	4(8.5%)	1(2.2%)	5(5.4%)	0.361
	No	43(91.5%)	45(97.8%)	88(94.6%)	
Irritation	**Yes**	3(6.4%)	1(2.2%)	4(4.3%)	0.617
	No	44(93.6%)	45(97.8%)	89(95.7%)	
Body sweats	**Yes**	2(4.3%)	0(0%)	2(2.2%)	0.495
	No	44(95.7%)	46(100%)	90(97.8%)	
Numbing and tingling sensation	**Yes**	1(2.1%)	3(6.5%)	4(4.3%)	0.361
	No	46(97.9%)	43(93.5%)	89(95.7%)	
Dizzy	**Yes**	8(17%)	7(15.2%)	15(16.1%)	0.813
	No	39(83%)	39(84.8%)	78(83.9%)	
Clogged nose	**Yes**	3(6.4%)	2(4.3%)	5(5.4%)	1.000
	No	44(93.6%)	44(95.7%)	88(94.6%)	
Runny nose	**Yes**	2(4.3%)	11(2.2%)	3(3.2%)	1.000
	No	45(95.7%)	45(97.8%)	90(96.8%)	
Dyspnea	**Yes**	0(0%)	(2.2%)	1(1.1%)	0.495
	No	47(100%)	45(97.8%)	92(98.9%)	

Chest pain	**Yes**	2(4.3%)	3(6.7%)	5(5.5%)	0.677
	No	44(95.7%)	42(93.3%)	86(94.5%)	
Sleepiness	**Yes**	12(25.5%)	19(41.3%)	31(33.3%)	0.107
	No	435(74.5%)	27(58.7%)	62(66.7%)	
Irregular heartbeat	**Yes**	(8.5%)	5(10.9%)	9(9.7%)	0.740
	No	43(91.5%)	41(89.1%)	84(90.3%)	
Altered blood pressure	**Yes**	5(10.6%)	2(4.3%)	7(7.5%)	0.435
	No	42(89.4%)	44(95.7%)	86(92.5%)	
Dry throat	**Yes**	5(10.6%)	7(15.2%)	12(12.9%)	0.510
	No	42(89.4%)	39(84.8%)	81(87.1%)	
Cough	**Yes**	1(2.1%)	8(17.4%)	9(9.7%)	0.015*
	No	46(97.9%)	38(82.6%)	84(90.3%)	

DISCUSSION

In the global fight against the COVID-19 pandemic, vaccination has emerged as a critical tool in controlling the spread of the virus and reducing the severity of illness.[16] Among the various vaccines available, those developed by Sinopharm and Sinovac have played significant roles, particularly in countries where they are widely administered.[17] However, like any medical intervention, these vaccines can induce a range of post-vaccination symptoms.[18] In this discussion, we delve into the common symptoms experienced by individuals post-Sinopharm and Sinovac vaccinations.[7]

According to our study 55.3% of individuals vaccinated with Sinopharm reported experiencing tiredness and fatigue, while 59.6% reported pain and swelling at the injection site. Other symptoms included muscle pain in 29.8% of participants, fever in 10.6%, and headaches in 34% of participants. The association between type of vaccine and post-vaccine symptom of fever was found to be significant in our study (p=0.018). A separate study focusing on Sinopharm recipients in Pakistan reported results comparable to our study where most people reported with pain at the injection site after first dose, noted by 61.3% of respondents.[19] This study reported a lower percentage of individuals who developed lethargy in (40.6%), myalgia or body pain in 23.9% and headaches in 21%[19] as compared to our study but a higher number of individuals with low-grade fever (22.4%)[19] as compared to our study. Al Kaabi et.al reported that a lower percentage Sinopharm recipients experienced post vaccination symptoms as compared to our study. It was reported that 42% of experienced pain at the vaccination site, 5.1% experienced tenderness, 9.6% reported headaches, and 12.2% experienced fatigue.[20] Additionally, 1.1% reported fever, cough, and allergies.[20] The association between type of vaccine and post-vaccine symptom of cough was found to be significant in our study (p=0.015). Our study reported cough to be a side effect in 2.1% Sinopharm recipients. Other symptoms included lethargy in 9.2% of participants, while 4.07% reported with back pain, abdominal pain, and diarrhea in 0.74% of individuals.[20] El Gendy et.al reported very conflicting results as compared to our study where all the post-vaccine symptoms were found to be less frequent.[21] Some participants reported pain, redness, or swelling at the injection site (12.5%), while 45% experienced fatigue and lethargy.[21] Headaches were reported by 10% of participants, with smaller proportions experiencing runny noses (7.5%), sore throats, allergies, and rashes (5% each).[21] Muscle pain was reported by 12.5% of participants, while dizziness and fever were noted in 2.5%.[21]

According to our study a large number of volunteers received the Sinovac vaccination; of them, 67.4% reported feeling exhausted and worn out, and 47.8% felt discomfort and swelling at the injection site. Fever and headache were reported as additional symptoms in 30.4% and 34.8% of the subjects, respectively. According to a study done in Indonesia, the most common side effects after receiving Sinovac vaccination was injection-related itchy pain, which affected up to 54.6% of participants[22] which is comparable but higher as compared to our study. It was also reported that a much lower percentage of individuals reported feeling fatigued and exhausted (46.9%)[22] as compared to our study. A comparable study conducted in Turkey found that 44.6% of subjects experienced injection site pain[23] after being vaccinated by Sinovac which is comparable to our study. A much lower percentage of individuals reported that they experienced fever (2.2%,) and headache (4.3%)[23] as compared to our study. On the other hand, 3.3% of participants reported experiencing nausea. Other associated symptoms people presented with were sleepiness, itching, excessive sweating and weakness.[23]

CONCLUSION

Among individuals who received Sinopharm vaccine pain at the injection site was the most prevalent side effect followed by tiredness and headache respectively. The individuals who received Sinovac reported tiredness and fatigue as the most prevalent post-vaccination followed by pain at injection site and then headache respectively. Fever and cough were the two post vaccination symptoms significant associations with vaccination type both of which were more prevalent in individuals who received Sinovac.

RECOMMENDATION

Vaccines can lower susceptibility in both diseased and uninfected people. This study, which focuses on the effectiveness of various vaccination types, will undoubtedly be useful to the medical community and the general public. People will be able to discover which vaccine is least likely to result in post-vaccination side effects. This study will aid in the choice of vaccines and the regulation of those with more severe adverse effects. As per our study due to the scarcity of individuals who received other vaccines, we had to limit our analysis to Sinopharm and Sinovac vaccines and it was found that most of the symptoms were more prevalent in Sinovac recipients as compared to Sinopharm. Post-vaccination COVID 19 infection was also more prevalent in those who received Sinovac.

LIMITATION

Due to scarcity of sample who received Pfizer, Moderna and Cansino, the analysis had to be limited to Sinopharm and Sinovac. A multicenter study with a larger sample size would have helped unravel more findings.

CONFLICT OF INTEREST

None

GRANT SUPPORT & FINANCIAL DISCLOSURE

Declared none

AUTHOR CONTRIBUTION

Sarah Mansoor: Conceptualization of study manuscript writing, data collection, data analysis, data interpretation, revision

Muhammad Hashim Nawaz: Manuscript drafting, data collection, data analysis

Hira Butt: Conceptualization of study manuscript writing, data collection, data analysis, data interpretation, revision

Ayesha Chheena: Concept and design, data interpretations, critical review

Amina Zahid, Maham Nasir: Manuscript drafting, concept and design, data collection,

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