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Side Effects of Sputnik V, Sinopharm, and AstraZeneca COVID-19 Vaccines among Healthcare Workers

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Abstract

Background: Vaccines during the pandemic COVID-19 were the best solution to overcome the pandemic. The aim of this study was to evaluate and compare Sputnik V, Sinopharm, and AstraZeneca vaccins' side effects.

Material and Methods: A cross-sectional study was designed among healthcare workers in a teaching hospital. The checklist was prepared for collecting data of demographic variables, respondents' medical history, and vaccines side effects.

Results: More than half of participants received Sinopharm, while the development of COVID-19 following AstraZeneca was significantly among smaller proportion of respondents than other vaccines (P< 0.0001). There was no significant difference between age group and general side effects. The prevalence of serious side effects was higher in healthcare workers younger than 40 years old (P< 0.0001). The emergence of oral side effects was higher in participants who received two doses of vaccines in comparison to individuals who received one dose (P< 0.0001).

Conclusion: The prevalence of serious side effects was higher in sputnik V in comparison to the other vaccines. The vaccines serious side effects were linked to the age of vaccinated people and immune system responses.

Keywords: Vaccination, COVID-19, Adverse Effects

Introduction

The outbreak of sever acute respiratory syndrome caused by a new member of the human coronaviruses family became a major public health challenge worldwide [1]. The rapid spread of this type of corona virus caused a global crisis and the available therapeutic drugs for this virus were not effective against pandemic COVID19 [2]. Receiving vaccines was the best way to increase population immunity, thus preventing from severe disease to overcome the pandemic COVID-19 [3,4]. Different types of vaccines are in clinical trial phase including DNA plasmid, inactivated virus vaccines such as the Covaxin and Sinopharm vaccines, adenovirus-vectored such as AstraZeneca and Sputnik V, mRNA-based vaccines such as the Pfizer-BioNTech and Moderna vaccines, protein subunit, and virus-like particle vaccines [2,5]. The Pfizer-BioNTech vaccine

showed efficacy more than 95% while two doses of Oxford-AstraZeneca showed 63% efficacy against symptomatic SARS-CoV-2 infection [6]. The public vaccination could reduce mortality of COVID-19 patients significantly, and it was almost the most effective strategy in COVID-19 pandemic. The general and minor side effects after vaccination were expected as the result of immunity response in the body [7]. According to the study by Riad et al, injection site pain, fatigue, headache, muscle pain, chills, and joint pain were the most common Pfizer–BioNTech and Sinopharm vaccine side effects [8]. These results were obtained by not only other studies but also in a study of the manufacturer. Headache and fever were the most AstraZeneca side effects according to the other studies [9]. Sputnik V, Sinopharm, and AstraZeneca were the major vaccines used in Iran during the pandemic COVID-19 [10]. Although using COVID-19 vaccines was safe and effective in most of the cases, serious side effects such as myocarditis were reported after receiving the mRNA coronavirus vaccines [11,12]. Thus, little is known about COVID-19 vaccines serious and skin related side effects which warrants further study in different groups of people. The aim of this study was to evaluate the different side effects such as general, oral, skin side effects of Sputnik V, Sinopharm, and AstraZeneca vaccines.

Materials and Methods

This cross-sectional study was carried out among healthcare workers in a teaching hospital (Pasteur hospital, Bam, Iran) from 27 January to 27 February 2021 who received at least one dose of Sputnik V, Sinopharm, AstraZeneca, or other vaccines. The checklist was prepared based on a review of articles to gather data about the demographic variables, medical history, and vaccines side effects [6,8]. Demographic variables including age, gender, and profession were captured. The using other drugs (antibiotics, NSAID, Antihistamines, and…) regularly was recorded in the checklist in participants. The volunteers were asked about COVID-19 vaccine adverse effects such as general signs and symptoms, oral side effects, and skin-related side effects. Skin-related side effects included ulcers, vesicles or cold sores, and white or red plaque. In addition, length of symptoms and the experiencing of serious side effects were evaluated. Serious side effects are defined as side effects requiring hospitalization, such as difficulty breathing, swelling of the face and neck, rapid heart rate, fever, or generalized rash (whole body).

The statistical tests were analyzed using SPSS version 23 (IBM, Armonk, NY, USA). The descriptive statistic for the qualitative variables was frequency and percentage. The chi-square (χ 2) and Fisher's exact tests were used to evaluate the association between the vaccine types received by individuals and the side effects. P values ≤ 0.05 were considered as statistically significant.

Results

In the present study, 300 healthcare workers were recruited. Almost 56% (n=170) of participants were female and the rest of them were male. The age of more than quarter of the participants was over 40 years old (Table 1). All the participants experienced at least one of the general side effects after vaccination.

Table 1. Demographic characteristics of the healthcare workers who received one of the Sputnik V, Sinopharm, or AstraZeneca COVID-19 vaccines, other vaccine, and no- vaccination, January–February 2021

Variable	Outcome	Frequency (%)
Gender	Female	170 (56%)
	Male	130 (43%)
Age	>40	100 (33%)
	<40	126 (42%)
	Not to say	74(24%)
Vaccines	Sputnik V	28 (9.3%)
	Sinopharm	191 (63.7%)
	AstraZeneca	61 (20.3%)
	Other vaccines or no-vaccination	20 (6.7%)

In this study, (n=68, 22%) of participants recorded at least one of the non-communicable diseases which was significantly (P< 0.001) higher in >40 year- old individuals in comparison to other ages (78% vs. 21%). The most common non-communicable disease reported by participants were chronic heart disease (n=25, 37%), high blood pressure (n=19, 28%), and diabetes (n= 18,25%), respectively. In total, 18% (n=54) of participants had been taking one of the antibiotics, anti-depression, anti-histamine, immunosuppressive, and nonsteroidal anti-inflammatory drugs (NSAID) regularly. The most common regularly taken drugs by the participants was NSAID (n=22, 6%). At the time of study, almost 13 out of 22 participants using NSAID had not contracted COVID-19 after vaccination.

More than half of participants received Sinopharm, while 20%, 9%, and 6% of them received AstraZeneca, Sputnik V and Barekat, respectively. Almost 81% of participants (n=243) received at least two doses from the same vaccine, while 17% of participants did not

receive 2-dose vaccines. In this study, 85% (n=256) of healthcare workers had contracted COVID-19 before vaccination while only 19% (n=59) of them had contracted COVID-19 after two-dose vaccination. The incidence of Covid-19 infected after vaccination was found as follows: in the sputnik V (n=8, 29%), Sinopharm (n=40, 21%), and AsteraZenka 14.7% (n=9, 15%), respectively. So, development of COVID-19 after AstraZeneca was significantly lower than other vaccines (P< 0.0001).

Table 2. The comparison of the type of vaccines and general side effects in the healthcare workers who received one of the Sputnik V, Sinopharm, and AstraZeneca COVID-19 vaccines, January–February 2021

General side effects	Sinopharm (n=191), Frequency (%)	AstraZeneca (n=61), Frequency (%)	Sputnik V (n=28), Frequency(%)
Local pain	22 (11%)	3 (4%)	-
Injection site redness	8 (4%)	4 (6%)	1 (4%)
Injection site swelling	6 (3%)	3 (4%)	1 (4%)
Fatigue	14 (7%)	3 (4%)	1 (4%)
Headache	23 (12%)	11 (18%)	1 (4%)
Fever	55 (28%)	11 (18%)	9 (36%)
Joint and muscle pain	2(1%)	4 (6%)	4 (16%)
Nausea	18 (9%)	5 (8%)	4 (16%)
Feeling unwell	14 (7%)	7 (11%)	4 (16%)
Chills	5 (2%)	3 (4%)	-
Without symptom	12 (6%)	-	-

All of the participants had received one, two or more doses from one of the Sputnik V, Sinopharm, AstraZeneca, or Barakat (Table 2). There was no significant difference between age group and general side effects (Table 3). There was no significant relationship between general side effects and number of vaccine doses (table 4).

Table 3. The comparison of age group and general side effects in the healthcare workers who received one of the Sputnik V, Sinopharm, or AstraZeneca COVID-19 vaccines, January–February 2021

General side effects	<40 years old	>40 years old
Local pain	14 (11%)	9 (9%)
Injection site redness	7 (5%)	5 (5%)
Injection site swelling	6 (4%)	3 (3%)
Fatigue	6 (4%)	5 (5%)
Headache	13 (10%)	12 (12%)
Fever	29 (28%)	28 (28%)
Joint and Muscle pain	16 (12%)	7 (7%)
Nausea	13 (10%)	6 (6%)
Feeling unwell	10 (7%)	12 (12%)
Chills	3 (2%)	3 (3%)
Without symptom	9 (7%)	10(10%)

Almost 13% of vaccinated healthcare workers reported serious side effects requiring hospitalization, such as difficulty breathing. Further, the most common vaccine serious side effects in vaccinated participants were observed in sputnik V (28%), AstraZeneca (16%), and Sinopharm (10%) vaccines (10%), respectively. The results revealed that prevalence of serious side effects was higher in sputnik V in comparison to other vaccines, and this relationship was significant (P< 0.01). The prevalence of serious side effects was higher in healthcare workers younger than 40 years old (P< 0.0001). The prevalence of serious side effects was higher among participants who received two doses than those who received one dose (P< 0.0001).

Oral and skin-related side effects: A total of 6% (n=18) of participants reported one of the oral side effects including angular cheilitis (4%) and white/red plaques (2%). There was no significant relationship between oral side effects and vaccine types. More than half of the vaccinated participants with oral symptoms recorded the emergence of these side effects about 1-3 days after vaccination. The emergence of oral side effects was higher in participants who received two doses of vaccines in comparison to individuals who received one dose (P< 0.0001) and associated with other general side effects e.g. fever and headache significantly (9/18).

Table 4. The comparison of number of vaccinated doses andgeneral side effects of the healthcare workers who received one of the Sputnik V, Sinopharm, or AstraZeneca COVID-19 vaccines, January–February 2021

General side effects	Two dose (n=223)	One-doses (n=48)
Local pain	19 (8.5%)	6 (12.5%)
Injection site redness	11 (4.9%)	5 (10.4%)
Injection site swelling	8 (3.6%)	2 (4.2%)
Fatigue	17 (7.6%)	3 (6.3%)
Headache	27(12.1%)	6 (12.5%)
Fever	60 (26.9%)	16 (33.3%)
Joint pain	22 (9.9%)	3(6.3%)
Nausea	26 (11.7%)	2 (4.2%)
Feeling unwell	23 (10.3%)	4(8.3%)
Chills	7 (3.1%)	0
Without symptom	1(0.4%)	1 (2.1%)

Discussion

In our study, most people, about 63%, had received the Sinopharm vaccine. The most general side effects in our study was fever (25%), headache (11%), muscle and joint pain (9%), nausea (9%), and feeling unwell (9%), respectively. Other studies and World Health Organization reported pain, redness, or swelling at the site of vaccine injection as COVID-19 vaccines general side effects [6,8,13]. In our study, the prevalence of general side effects such as fever, joint or muscle pain; nausea and feeling unwell were higher after receiving Sputnik V than other vaccines. According to our results, serious side effects requiring hospitalization were seen in the people who received Sputnik V higher than other vaccines, while in all three types of vaccines, the general side effects were reported. A study in Tehran by Babaee et al. demonstrated that the Sputnik V vaccine has the highest rate of adverse effects such as local reactions and systematic reactions, followed by the AstraZeneca and Sinopharm vaccines [10]. Although some serious side effects were reported after different types of COVID vaccines around the world [7], a study in Czech indicated the incidence of serious side effects requiring medical interventions after Pfizer was 1.3% [8]. Some cases of myocarditis were reported in adolescents following the first or second dose of Pfizer vaccine in Israel [12]. In this study, the serious side effects that require medical intervention was detected in 13% of participants, which was higher than other studies. Difficulty in breathing was reported after AstraZeneca vaccine more than other vaccines in a study by Attash et al. in Iraq [7]. Other rare side effects such as Bell's palsy and lymphadenopathy were identified among persons who received the Pfizer vaccine in a Saudi Arabian study [7,14–16].

The incidence of COVID-19 was reduced after receiving sputnik V, Sinopharm, and AsteraZenka in participants significantly, as also reported by other studies [4,17]. After receiving sputnik V and Sinopharm,2 8% and 20% of participants developed COVID-19 disease, while, among participants who received AstraZeneca, only 14% had been infected with COVID-19 after vaccination.

According to the results, more serious side effects were detected in younger participants and after the second dose of Sputnik V significantly. As reported before, the younger adults were more frequently affected by serious side effects after vaccination [8,18]; the vaccines serious side effects are attributed to the age of vaccinated people in this study where immune system responses play an important role in vaccines side effects [19]. In this study, oral side effects were associated with general side effects especially headache and fever significantly. These side effects occurred 1-3 days after two doses of vaccines. According to our results and the other studies, the frequency of oral side effects was higher after receiving two doses of vaccine in comparison to one dose vaccine [7,8].

The sample size was the main limitation of this study, so it is necessary to design a similar study on more people in different hospitals and in the community. This study was carried out on three vaccines; as such investigating the symptoms and all COVID-19 vaccines' side effects is necessary and it is required to carry out cohort studies to follow up the vaccinated people about the mid-term and long-term side effects of the vaccines.

Conclusion

Most participants preferred the Chinese vaccine, though AstraZeneca was more effective than sputnik V and Sinopharm. The most general side effects were detected in healthcare workers after sputnik V, AstraZeneca, and Sinopharm vaccines, respectively. The younger participants reported serious side effects more than the older participants. The most oral side effects were reported after two doses of vaccination in participants. According to this study, the vaccines serious side effects are attributed to the age of vaccinated people and immune system responses. It is suggested to investigate the COVID-19 vaccines side effects for years after vaccination.

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Conflict of interest

None declared.

Funding

None declared.

Ethical Considerations

Written informed consent had been obtained from each participant.

Code of Ethics

The study was reviewed and approved by the Ethics Committee of the Bam University of Medical Sciences (IR.MUBAM.REC.1400.049).

Authors' Contributions

Masoomeh Ghasemi: experiments, analysis, discussed the results and strategy, Supervised, directed and managed the study, Final approved of the version to be published. Sajad Khosravi: analysis, discussed the results and strategy, Final approved of the version to be published. Leila Malekyan: Supervised, directed and managed the study. Amin Faridi: experiments and collected data. Leili Abedi Gheshlaghi: analysis, discussed the results and strategy, Final approved of the version to be published. Mohammad Hossein Sobhanipoor: analysis, discussed the results and strategy, Final approved of the version to be published. Elham Isaei: analysis, discussed the results and strategy, Final approved of the version to be published.

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