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Reported Side Effects of COVID-19 Vaccination among Adults in Saudi Arabia: A Cross-Sectional Study

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Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic, caused by the severe acute respiratory syndrome coronavirus 2, is a major international crisis. Although vaccination is the only hope to end this pandemic, adverse effects attributable to vaccines are still being reported. Active surveillance is critical for generating near-real-time, high-quality evidence for potential safety hazards, allowing us to respond quickly to vaccination

Purpose: To investigate the prevalence of side effects following COVID-19 vaccination with Oxford–AstraZeneca among adults in northwestern Riyadh Province, Saudi Arabia.

Methods: This is a cross-sectional and community-based study performed among individuals who had received any type of COVID-19 vaccination. A convenience sampling method was used to collect data using an online survey.

Results: A total of 222 individuals responded to the survey, and the majority frequently reported both localized and systemic side effects after vaccination. The most reported side effects include pain at the site of injection, myalgia, headache, and fever. Some demographic factors were significantly associated with the reported post-vaccination side effects.

Conclusion: The most prevalent side effects experienced by individuals after receiving the COVID-19 vaccine were determined in this study. Prior to the administration of a vaccination, counseling programs should be established to help people understand and deal with the possible side effects, with a special focus on demographic differences.

Keywords
side effects, post COVID-19 vaccination, public health, Saudi Arabia

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Introduction

The COVID-19 pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a major international crisis (Azarpazhooh et al., 2020; Cai et al., 2021). In December 2019, the novel coronavirus disease 2019 (COVID-19) emerged in Wuhan, China (Fernandez et al., 2021; Li et al., 2020). Since its first report, COVID-19 has spread rapidly across 216 countries and territories (Alghamdi, 2021). At the end of January 2020, the World Health Organization (WHO) announced COVID-19 as a public health emergency of global concern, and on February 11, 2020, the WHO declared COVID-19 a pandemic after the virus had spread across 114 countries (Roy et al., 2020).

To date, the COVID-19 pandemic has critically impacted every aspect of the lives of individuals, resulting in mental health problems and negative alterations in healthy behaviors (Hernández et al., 2021). In general, vaccinations are known to prevent infections from spreading and decrease the incidence of various infectious diseases (Kwok et al., 2021). Therefore, it is the only hope to end the COVID-19 pandemic (Casas & Mena, 2021). The development of COVID-19

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vaccinations is an approach to reduce the spread of the COVID-19 pandemic (Kumari et al., 2021).

Currently, a significant number of people are being vaccinated to help attain herd immunity (Zhao et al., 2021). In December 2020, two mRNA vaccines were authorized by the Food and Drug Administration for use in the United States. These included the BNT162b2 mRNA COVID-19 vaccine developed by Pfizer-BioNTech and the mRNA-1273 COVID-19 vaccine produced by Moderna. The evidence suggests that the first dose of the BNT162b2 mRNA vaccine has a 91% (95% CI 85–94) effect on preventing hospitalization for COVID-19 infection 28–34 days after vaccination (Vasileiou et al., 2021). As all clinical trials of the three vaccines (Pfizer–BioNTech, Oxford–AstraZeneca, and Moderna) tested the reported high efficacy against the virus, they were approved for use in the United Kingdom (Vasileiou et al., 2021). Therefore, safe and effective vaccination remains the best intervention strategy to prevent the morbidity and mortality associated with the COVID-19 pandemic (Antonelli et al., 2021).

In December 2020, the Kingdom of Saudi Arabia first approved the use of the Pfizer-BioNTech vaccine; subsequently, the ChAdOx1-S vaccine was approved for use in February 2021 (Al-Mohaithef et al., 2021). Saudi Arabia was one of the first countries to approve the emergency use of the BNT162b2 vaccine. A month later, over a million people within the country had been administered the vaccine. By mid-April 2021, the Ministry of Health (MOH) had immunized over 3 million people for free. The beneficiaries included both Saudi and non-Saudi citizens without any health complications. Priority was given to people with chronic diseases, people over 65 years of age, and health care workers (Al-Mohaithef et al., 2021).

Although vaccination is a safe method to control the spread of the COVID-19 pandemic, some side effects have been reported. A study in the United States revealed some adverse effects among individuals who were administered the BNT162b2 mRNA COVID-19 vaccine. The unpleasant effects included general pain, fatigue, muscle pain, headache, chills, and fever. Other reported side effects were joint pain, nausea, muscle contractions, sweating, dizziness, flushing, loss of appetite, swelling at the injection site, insomnia, itching, tingling, diarrhea, nasal stuffiness, and sensation of heartbeats (Kadali et al., 2021a). Another study carried out in the United Kingdom reported that some adverse effects appeared among people vaccinated with Pfizer-BioNTech mRNA (BNT162b2) and Oxford–AstraZeneca (ChAdOx1 n-CoV-19). The adverse effects reported included mild headache and fatigue (Menni et al., 2021). These effects were more prevalent in women than in men and were more common in people aged 55 or below. Side effects emerged after the second vaccination, as reported in this study. In addition, individuals with a history of SARS-CoV-2 infection have reported more side effects (Menni et al., 2021).

As for Saudi Arabia, few studies have investigated the possible side effects of COVID-19 vaccination within its boundaries. Studies performed in Saudi Arabia have reported that side effects after receiving COVID-19 vaccines are relatively common (Alghamdi, 2021; Alhazmi et al., 2021). However, the studies did not encompass all possible side effects and did not categorize those side effects according to their type (e.g., localized and systemic). More up-to-date information on the COVID-19 vaccine is needed to improve future counseling services and lower the risk of probable side effects following vaccination. Thus, this study aimed to investigate the prevalence of side effects following COVID-19 vaccination (Oxford–AstraZeneca) and monitor other related factors in northwestern Riyadh Province, Saudi Arabia. Determining the frequency of adverse effects post-vaccination will provide a clear profile of side effects that will help develop proactive measures, such as the promotion of health education and counseling programs to overcome post-vaccination side effects. Furthermore, active surveillance is critical for generating near-real-time, high-quality evidence for potential safety hazards, allowing us to respond quickly to vaccination (Albogami et al., 2021).

Methods

Study Design, Setting, and Population

This study used a cross-sectional design to collect data from individuals who received COVID-19 vaccination (Oxford–AstraZeneca) in northwestern Riyadh Province of Saudi Arabia, which primarily includes suburban and rural areas.

Inclusion and Exclusion Criteria

The study included all individuals who received at least one dose of the Oxford–AstraZeneca vaccine, were aged 18 or above, and were able to read and respond to the questions. Participation in the study was voluntary and unvaccinated individuals were excluded.

Sample Size Determination and Procedure

The target sample size was calculated using a single population proportion formula (Pourhoseingholi et al., 2013):

$(n = [(Z/2)2P\ (1\text{-}P)]\ /d2)$ Where n = sample size, $(Z/2 = 1.96)$ at 95% level of confidence (CI), $p = .5$ (the anticipated proportion of reported side effects of COVID-19 vaccination among adults was assumed to be 50%) and d = 5% margin of error (0.05). According to this formula, the desired sample size was 385 participants.

A convenience sampling was used in this study. Where a Google form link and QR code were created to collect data from the participants using online methods. The researchers collected data from eligible participants at public locations such as shopping centers in the area. To avoid any direct contact during the COVID-19 pandemic, the participants

received a link from the researchers or the QR code to answer the survey. The participants provided consent to participate in the study before proceeding to the survey. Data were collected between March 14 and May 4, 2021. The total eligible respondents who completed the questionnaire in this study were 222. The reporting of this study follows the corresponding strengthening of the reporting of observational studies in epidemiology (STROBE) guideline (Field et al., 2014).

Measurement

Questionnaire development. The researchers developed a self-administered questionnaire to measure side effects and factors related to COVID-19 vaccination based on the literature and updated results from the Center for Disease Control and Prevention (CDC) (Storlie et al., 2021). First, the researchers developed the questionnaire in English, translated it into Arabic, and then back-translated it into English. Five experts in the field checked the validity of the contents. The questionnaire was released in both Arabic and English as all the area residents were targeted in the study. Furthermore, the researchers conducted a pilot test on 20 respondents to evaluate the reliability of the questionnaire. The results showed that the questionnaire (14 items) had acceptable internal consistency, with a Cronbach's alpha of 0.747. According to the findings of the pilot test, the researchers made corrections for feasibility, and 20 piloted respondents were excluded from the main study.

Table 1. Distribution of Demographic Characteristics of the Participants (N = 222).

Variables	Frequency (n = 222)	Percentage (%)
Age (years)		
18–29 years	66	29.8%
30–40 years	68	30.6%
41–51years	60	27.0%
More than 52 years old	28	12.6%
Gender		
Male	165	74.3%
Female	57	25.7%
Education level		
Non-educated	7	3.2%
Primary	5	2.3%
Secondary	21	9.5
Bachelor's degree	99	44.6%
Postgraduate	90	40.5%
Occupational status		
Government employee	118	53.2%
Private sector employee	40	18.0%
Retired	18	8.1%
Student	46	20.7%
Nationality		
Saudi	138	62.2%
Non-Saudi	84	37.8
Do you have a chronic disease		
No	179	80.6%
Yes	43	19.4%
Type of vaccination you've received		
Oxford–AstraZeneca	222	100.0%
Pfizer–BioNTech	0.0	0.0%

Questionnaire components. The questionnaire consisted of two parts. The first part included seven demographic variables: age, sex, education level, occupational status, nationality, chronic disease, and the type of received vaccination. The second part included questions about possible side effects related to COVID-19 vaccination. Fourteen items were arranged in a binary manner (yes or no). Possible side effects included pain at the site of injection, redness at the injection site, swelling at the injection site, headache, muscle pain, chills, fever, nausea, breathing difficulties, swelling of the face and throat, increased heart rate, rash all over the body, dizziness, and weakness. Side effects were sorted into three categories: (a) on the injection site, (b) all over the body, and (c) allergic reactions.

Data Analysis

The Statistical Package for Social Sciences (SPSS) version 25 was used for statistical analyses. First, descriptive statistics were calculated using frequencies and percentages. The researchers also performed inferential statistics using the chi-square test to examine the associations between categorical variables. Finally, the researchers fixed the significance level at $p < .05$.

Results

Distribution of Demographic Characteristics

In total, 222 individuals responded to the survey. Most of the respondents were aged between 30–40 years (30.6%), male (74.3%), bachelor's degree holders (44.6%), government employees (53.2%), Saudis (62.2%), and did not have any chronic diseases (80.6%). (See Table 1).

Prevalence of Post-COVID-19 Vaccination Side Effects

The results showed that the most common side effects after immunization with the Oxford–AstraZeneca COVID-19 vaccine was pain at the site of injection (78.4%), followed by muscle pain (57.2%), and headache (46.8%). In terms of allergic adverse effects, the most reported side effects were dizziness and weakness (3.2%) (see Table 2).

Association of Side Effects with Demographic Variables

The results revealed statistically significant relationships between some reported post-vaccination side effects and

Table 2. Prevalence of Side Effects Emerged Post- COVID-19 Vaccination (N = 222).

Items	Response	
	Yes N (%)	No N (%)
Select which of the following symptoms did you experience after receiving the vaccination?		
On the arm		
Pain in the arm site	174 (78.4%)	48 (21.6%)
Redness in the injection site	46 (20.7%)	176 (79.3%)
Swelling in the injection site	60 (27.0%)	162 (73.0%)
All over the body		
Tiredness	39 (17.6%)	183 (82.4%)
Headache	104 (46.8%)	118 (53.2%)
Muscle pain	127 (57.2%)	95 (42.8%)
Chills	69 (31.1%)	153 (68.9%)
Fever	101(45.5%)	121(54.5%)
Nausea	34 (15.3%)	188(84.7%)
Allergic reactions		
Breathing difficulties	1.0 (0.5%)	221(99.5%)
Swelling of the face and throat	3 (1.4%)	219(98.6%)
Increase heartbeat	1.0 (0.5%)	221(99.5%)
A rash all over the body	0 (0.0%)	222 (100%)
Dizziness and weakness	7(3.2%)	215(96.8%)

the demographic variables of the respondents. For example, there was evidence of statistically significant relationships between the age of vaccinated individuals and the reported post-vaccination side effects such as fatigue and headache. Respondents who belonged to the age group of 41–51 years reported more fatigue ($X^2 = 14.78$, $df = 4$, $p \leq .05$) and headaches ($X2 = 9.62$, $df = 4$, $p \leq .05$) than those who belonged to other age groups (Table 3).

In addition, there was a statistically significant relationship between the sex of the respondents who received the vaccination and some side effects. Side effects emerged significantly more frequently in male than in female respondents. The side effects reported included pain at the injection site ($X^2 = 3.95$, $df = 1$, $p \leq .05$), redness at the injection site ($X^2 = 9.64$, $df = 1$, $p \leq .05$), swelling at the injection site ($X^2 = 11.02$, $df = 1$, $p \leq .05$), muscle pain ($X^2 = 6.79$, $df = 1$, $p \leq .05$), and chills ($X^2 = 5.85$, $df = 1$, $p \leq .05$) (Table 3).

The results also showed a statistically significant relationship between the occupational status of the respondents and some side effects. Side effects significantly emerged more frequently in respondents who were government employees than in those who were not. Side effects reported included fatigue ($X^2 = 19.24$, $df = 3$, $p \leq .001$), headache ($X^2 = 22.94$, $df = 3$, $p \leq .001$), and chills ($X^2 = 10.66$, $df = 3$, $p \leq .05$).

Similarly, there were statistically significant relationships between the nationality of the individuals who received the vaccination and some side effects. For example, non-Saudi respondents reported more redness at the injection site than Saudi respondents ($X^2 = 5.07$, $df = 1$, $p \leq .05$), while Saudi respondents reported that they experienced more fatigue than non-Saudi respondents ($X^2 = 8.99$, $df = 1$, $p \leq .05$) (Table 3).

Finally, there was a statistically significant relationship between the level of education of the respondents and fatigue. Respondents with postgraduate education reported more fatigue than other individuals ($X^2 = 20.27$, $df = 4$, $p \leq .001$). However, the researchers did not observe a significant relationship between chronic diseases and the investigated side effects (Table 3).

Discussion

This study aimed to determine the prevalence of side effects of the COVID-19 vaccine, developed by Oxford–AstraZeneca, among individuals from northwestern Riyadh Province in Saudi Arabia. Most of the respondents were aged between 30–40 years, male, bachelor's degree holders, government employees, Saudi citizens, and had no chronic diseases.

The results of the study revealed that most respondents frequently reported localized side effects, where pain and swelling at the injection site were most commonly reported, followed by systemic adverse effects such as muscle pain and headache. The findings of this study are in line with those of previous studies that revealed that most individuals frequently reported localized and systemic side effects after receiving a COVID-19 vaccination, such as pain at the injection site, fatigue, headache, and muscle pain (Chapin-Bardales et al., 2021; Kadali et al., 2021b). The side effects associated with COVID-19 vaccination can be classified as either local or systemic, ranging from mild to moderate side effects (Riad et al., 2021a). Furthermore, the AstraZeneca COVID-19 vaccine can cause both localized and systemic side effects, according to studies done in Germany and the Czech Republic. The most common localized side effects were pain at the injection site (72.8%), while the most common systemic side effects were fatigue (73.9%), muscle pain (55.4%), shivering (48.4%), unwell feeling (46.7%), and nausea (45.7%) (Riad et al., 2021b). Similarly, other studies reported that the vast majority of the participants who received the mRNA-based vaccines mainly had a higher prevalence of localized and systemic side effects post-vaccination (Klugar et al., 2021). Nevertheless, the CDC listed the most common side effects associated with COVID-19 vaccinations and guidelines on how to diminish pain and discomfort after receiving a COVID-19 vaccination; this is by adopting certain practical measures, such as applying cool, clean, wet washcloths over the area of injection, and exercise or intentional movement of the affected arm. Similarly, the CDC recommends drinking plenty of fluids and dressing in light clothes to reduce the systemic discomfort caused by fever (CDC, 2021).

This study also showed statistically significant relationships between the age of respondents and the reported post-vaccination fatigue and headache. Individuals aged 41–51

Table 3. Association of Symptoms After Receiving COVID-19 Vaccination (Yes vs. No) with Demographic Variable (N = 222).

Symptoms		Age grouping (years)				X^2	df	sig	Gender		X^2	df	sig
		18–29	30–40	41–51	>52				Male	Female			
Pain in the arm site	No	13	15	12	8	1.28	4	.866	41	7	3.95	1	.047*
	yes	52	53	48	20				124	50			
Redness in the injection site	No	48	60	43	24	7.572	4	.109	139	37	9.636	1	.002*
	yes	17	8	17	4				26	20			
Swelling in injection site	No	49	53	37	22	5.75	4	.219	130	32	11.018	1	.001*
	yes	16	15	23	6				35	25			
Tiredness	No	62	54	42	24	14.78	4	.005*	136	47	.000	1	.996
	yes	3	14	18	4				29	10			
Headache	No	27	35	36	20	9.62	4	.047*	92	26	1.751	1	.186
	yes	38	33	24	8				73	31			
Muscle pain	No	30	26	29	10	2.950	4	.566	79	16	6.79	1	.009*
	yes	35	42	31	18				86	41			
Chills	No	37	50	44	22	9.02	4	.061	121	32	5.846	1	.016*
	yes	28	18	16	6				44	25			
Fever	No	26	41	37	16	8.59	4	.072	94	27	1.575	1	.209
	yes	39	27	23	12				71	30			
Nausea	No	51	55	56	25	6.79	4	.147	143	45	1.95	1	.163
	Yes	14	13	4	3				22	12			
Breathing difficulties	No	65	68	59	28	2.712	4	.607	164	57	.347	1	.556
	yes	0	0	1	0				1	0			
Swelling of the face and throat	No	63	68	59	28	2.825	4	.587	163	56	.093	1	.760
	yes	2	0	1	0				2	1			
Increase heartbeat	No	64	68	60	28	2.426	4	.658	165	56	2.908	1	.088
	yes	1	0	0	0				0	1			
Dizziness and weakness	No	62	68	57	27	3.40	4	.495	159	56	.491	1	.483
	yes	3	0	3	1				6	1			

Symptoms		Occupational status				X^2	df	sig	Nationality		X^2	df	sig
		Government	Private sector	Retired	Student				Saudi	Non-Saudi			
Pain in the arm site	No	29	8	3	8	1.416	3	.702	28	20	.382	1	.537
	yes	89	32	15	38				110	64			
Redness in the injection site	No	97	30	16	33	3.70	3	.300	116	60	5.07	1	.024*
	yes	21	10	2	13				22	24			
Swelling in injection site	No	81	33	14	34	3.193	3	.363	101	61	.009	1	.926
	yes	37	7	4	12				37	23			
Tiredness	No	85	38	16	44	19.24	3	.000*	122	61	8.99	1	.003*
	yes	33	2	2	2				16	23			
Headache	No	63	26	16	13	22.94	3	.000*	72	46	.140	1	.708
	yes	55	14	2	33				66	38			
Muscle pain	No	50	16	6	23	1.770	3	.622	60	35	.070	1	.791
	yes	68	24	12	23				78	49			
Chills	No	85	30	15	23	10.66	3	.014*	94	59	.110	1	.740

(continued)

Table 3. Continued.

Symptoms		Occupational status				X^2	df	sig	Nationality		X^2	df	sig
		Government	Private sector	Retired	Student				Saudi	Non-Saudi			
	yes	33	10	3	23				44	25			
Fever	No	67	23	13	18	7.054	3	.070	77	44	.246	1	.620
	yes	51	17	5	28				61	40			
Nausea	No	102	34	18	34	7.654	3	.054	114	74	1.21	1	.271
	yes	16	6	0	12				24	10			
Breathing difficulties	No	117	40	18	46	.885	3	.829	138	83	1.65	1	.199
	yes	1	0	0	0				0	1			
Swelling of the face and throat	No	117	39	18	45	1.10	3	.777	137	82	1.08	1	.300
	yes	1	1	0	1				1	2			
Increase heartbeat	No	118	39	18	46	4.571	3	.206	138	83	1.65	1	.199
	yes	0	1	0	0				0	1			
Dizziness and weakness	No	115	38	18	44	1.39	3	.707	136	79	3.47	1	.063
	yes	3	2	0	2				2	5			

Symptoms		Education level					X^2	df	sig	Chronic disease		X^2	df	sig
		Non-educated	Primary	Secondary	Bachelor's degree	Post-graduate				No	yes			
Pain in the arm site	No	1	1	2	21	23	2.88	4	.579	40	8	.286	1	.593
	yes	6	4	19	78	67				139	35			
Redness in the injection site	No	7	3	16	82	68	4.602	4	.331	148	28	6.512	1	.011*
	yes	0	2	5	17	22				31	15			
Swelling in injection site	No	7	3	17	71	64	3.935	4	.415	132	30	.278	1	.598
	yes	0	2	4	28	26				47	13			
Tiredness	No	7	5	18	91	62	20.27	4	.000*	147	36	.061	1	.805
	yes	0	0	3	8	28				32	7			
Headache	No	4	2	15	47	50	4.699	4	.320	93	25	.533	1	.466
	yes	3	3	6	52	40				86	18			
Muscle pain	No	3	2	6	48	36	3.348	4	.501	76	19	.042	1	.837
	yes	4	3	15	51	54				103	24			
Chills	No	5	4	13	66	65	1.482	4	.830	123	30	.018	1	.893
	yes	2	1	8	33	25				56	13			
Fever	No	3	1	12	53	52	3.269	4	.514	96	25	.284	1	.594
	yes	4	4	9	46	38				83	18			
Nausea	No	7	4	17	80	80	3.950	4	.413	152	36	.038	1	.845
	Yes	0	1	4	19	10				27	7			
Breathing difficulties	No	7	5	21	99	89	1.473	4	.831	178	43	.241	1	.623
	yes	0	0	0	0	1				1	0			
Swelling of the face and throat	No	7	5	21	97	89	.823	4	.935	176	43	.731	1	.393
	yes	0	0	0	2	1				3	0			
Increase heartbeat	No	7	5	21	98	90	1.248	4	.870	178	43	.241	1	.623
	yes	0	0	0	1	0				1	0			
Dizziness and weakness	No	7	5	21	96	86	1.571	4	.814	173	42	.120	1	.729
	yes	0	0	0	3	4				6	1			

X^2 = Pearson Chi-Square, df = degree-of-freedom sig = p-value <.05.

years reported higher fatigue after vaccination than other age groups. A possible explanation for this result is that their old age, at which individuals may be more restless compared with younger individuals, and their fear of receiving healthcare may have played a role. However, this result is inconsistent with the results of two studies conducted in Saudi Arabia. One of which reported no significant difference between individuals under or over 60 years of age and side effects following a COVID-19 vaccination (El-Shitany et al., 2021). Another study revealed that younger individuals had reported more side effects than older individuals (Albogami et al., 2021).

Furthermore, there was a statistically significant relationship between sex and side effects, where male respondents reported more side effects than females. This result is inconsistent with those of two other studies in Saudi Arabia, both of which revealed that female respondents reported more side effects after receiving a COVID-19 vaccination than male respondents (Alghamdi, 2021; Kadali et al., 2021b). Additionally, the study carried out by Alghamdi et al. examined side effects on three consecutive days and found that females reported significantly more side effects on all three days than males (Alghamdi, 2021). Moreover, the present study found that government employees reported some more side effects than respondents with other jobs after receiving COVID-19 vaccination. However, heavy labor and work stress during the pandemic may psychologically influence employees' reactions to vaccination.

Similarly, the Saudi and non-Saudi respondents reported different side effects. Saudi respondents reported more fatigue after receiving a COVID-19 vaccination, while non-Saudi respondents reported more redness at the injection site. In addition, there was evidence of a relationship noted between individuals with postgraduate education and fatigue; they reported more fatigue compared to respondents with other levels of education.

In the present study, allergic adverse effects were reported less frequently and were not significantly related to demographic variables. This finding is consistent with a previous study performed in Saudi Arabia that showed less significantly reported hypersensitivity adverse effects among individuals who received the first COVID-19 vaccine dose than among those who received the second dose (El-Shitany et al., 2021). However, in that study, allergic adverse effects were reported less frequently, and no significant relationships with demographic factors were found. These results could be related to the geographical boundary of this study, which only included respondents from a particular part of the Riyadh Province. Therefore, researchers suggest further investigations within a larger population in the future.

Strengths and Limitations

Although the strength of this study is highlighting the most frequent side effects of COVID-19 vaccination, it still had some limitations. First, the researchers conducted this study in a specific geographical area of the Riyadh Province. Second, the researchers used a convenience sampling method to collect data because of difficulties in reaching people during the pandemic. All the limitations mentioned above may influence the generalizability of the current study results to the entire population of Saudi Arabia.

Conclusions

This study determined that most respondents from Riyadh Province in Saudi Arabia frequently reported localized and systemic side effects after receiving COVID-19 vaccination. Furthermore, some of these side effects showed statistically significant relationships with demographic factors. According to the evidence of this study, policymakers need to implement educational and counseling programs for individuals before they receive a vaccination to help them understand and overcome potential post-vaccination side effects, paying more attention to demographic variations. Furthermore, health authorities should focus more on variations in individuals' ages, sexes, occupational status, and nationalities.

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Author Contributions

MA, FH have developed the conceptualization, methodology, and developed the participant surveys; acquisition, analysis, and interpretation of data. MM, and AM have contributed to the manuscript writing and have revised it critically for important intellectual content. AA has revised the paper with editing. All authors have reviewed and approved the final draft before submission.

Declaration of Conflicting Interests

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Ethical Consideration

The researchers obtained ethical approval to conduct this study from the Research Ethics Standing Committee at Shaqra University in the Kingdom of Saudi Arabia before data collection (ERC_SU_2021023). All respondents agreed to participate voluntarily before proceeding with the questionnaire. All responses were kept strictly confidential for research purposes only, and the results did not personally identify the respondents.

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