International Journal of Public Health Science (IJPHS)
Vol. 13, No. 3, September 2024, pp. 1079~1086
ISSN: 2252-8806, DOI: 10.11591/ijphs.v13i3.23988

Prevalence of COVID-19 vaccines side effects among health care workers in Kirkuk City, Iraq

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Article Info

Article history:

Received Sep 27, 2023
Revised Dec 23, 2023
Accepted Jan 30, 2024

Keywords:

COVID-19
Healthcare workers
Kirkuk City
Side effects
Vaccine

ABSTRACT

Frequent local and general side effects were revealed after vaccination with COVID-19 vaccine, which played a role in public confidence in and acceptance of the vaccine since the evidence source for the safety of the vaccines and their side effects were exclusively provided only from manufacturer-funded researches. This study aimed to assess the prevalence of COVID-19 vaccines side effects among health care workers in Kirkuk City, Iraq. This cross-sectional study was done in governmental hospitals in Kirkuk City/Iraq from May 7, 2022 to August 15, 2022 among 373 healthcare workers (only those who were vaccinated with the COVID-19 vaccine). The data were analyzed through the statistical package for social sciences (SPSS) program version 23.0. Total of 246 (66%) healthcare workers experienced at least one side effect following the COVID-19 vaccination. Reported side effects among females were higher (70.1%) than males (60.4%) and they were a little higher (67.2%) among participants with age ≤40 years. The most repeated side effects were general fatigue, injection site pain, and headache. In conclusion the majority of the reported side effects were mild to moderate in severity and not considered life-threatening. The rate of COVID-19 side effects was lower among the participants who received Sinopharm's COVID-19 vaccine in comparison to others vaccines.

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1. INTRODUCTION

The progressing coronavirus disease 2019 (COVID-19) pandemic has hit nearly all nations [1], [2]. The infectious disease COVID-19 poses a threat to the lives of millions of people around the world. In 2019, COVID-19 first appeared in China and spread quickly throughout the world [3]. The WHO estimates that COVID-19 has resulted in approximately 251 million confirmed positive cases and nearly five million fatalities. There have been 2 million confirmed positive cases and around 23 thousand fatalities in Iraq [4]. Which caused major alerts to the country's delicate health foundation in Iraq. And during this pandemic human worldwide are confronting serious healthcare challenges, lockdowns, uneasiness, and stress, as there's no particular therapy or immunization for this worldwide infectious disease [5]. Since non-pharmaceutical measures commonly embraced in numerous nations were incapable of controlling the widespread infection, COVID-19 immunization is one of the few hopes left, which may lead to herd immunity, which happens when a large segment of a population (the herd) develops immunity to the infectious disease, which inhibits the spread of the disease. As a result, the whole community becomes protected, not just those who are immune [6]. In the US, three COVID-19 vaccines are recognized or approved for use in adults [7]. The food

and drug administration (FDA) granted emergency use authorization (EUA) for two 2-dose mRNA vaccines, mRNA-1273 from Moderna and BNT162b2 from Pfizer-BioNTech, in December 2020 for individuals aged 18 years and 16 years, respectively. On August 23, 2021, the FDA granted the Pfizer-BioNTech vaccine approval for use in people older than 16 years [8]. The Iraqi ministry of health has officially granted the use of three vaccines: Oxford/AstraZeneca, Pfizer/BioNTech, and Sinopharm/Beijing [9].

February 15, 2022, which consider a low rate. Since vaccine hesitancy is negatively associated with willingness to accept COVID-19 vaccines [10]. Possible postvaccine adverse effects are supposed to be the main reason for vaccine hesitancy. So improving vaccine taking requires increasing community awareness of vaccine efficacy and being truthful about adverse effects [11], [12]. The Specialists on Immunization from the WHO's strategic advisory group (SAGE) recommend that doubt in safety information given by pharmaceutical establishments may play a significant role in minimizing the acceptability of vaccines [13], [14]. This problem reported also in many other countries, for example in a subsequent national study, fear of vaccines' potential side effects was the most common reason for immunization hesitation among general public groups in the United Kingdom [15].

To deal with this problem, the safety of vaccines after their use should be studied, and several tools can be used to study the safety of COVID-19 vaccines [16]. Because perceived vaccine safety helps increase vaccine acceptance, autonomous (non-sponsored) studies on vaccines' safety and side effects could be a pivotal resource to improve population trust in COVID-19 immunizations and their efficiency [17]. For example, the center for disease control and prevention (CDC) claimed that the COVID-19 vaccine's side effects include mainly typical side effects such as fatigue, chills, fever, myalgia, headache, and nausea, in addition to discomfort, edema, and redness at the injection site [18]. Accurate and continuous monitoring of the safety of COVID-19 vaccines is a crucial step. When the COVID-19 national vaccination programme was first being implemented in the US, the vaccine adverse event reporting system was put into place as an active surveillance system [19]. As well as in cooperation with the European Medicine Agency (EMA) and the European Centre for Disease Prevention and Control, several national agencies in Europe are implementing a similar system [20]. Therefore, to increase acceptance of the COVID-19 vaccine among the Iraqi population, this study was designed to provide independent evidence on the prevalence of self-reported COVID-19 vaccines side effects. The main objective of this study was to estimate the prevalence of COVID-19 vaccines side effects among health care workers in Kirkuk, Iraq.

2. METHOD

2.1. Design

We conducted a cross-sectional descriptive study. The study was conducted from May 7 to August 15, 2022. Our study aimed to measure the prevalence of COVID-19 vaccine side effects among randomly selected healthcare workers in governmental hospitals in Kirkuk, Iraq.

2.2. Instrument

The self-administered multiple-choice survey, which covered local, general and systemic side effects, was made available in both English and Arabic, and it was modified and adapted from previous studies on the side effects of various COVID-19 vaccines by the authors [21], [22]. The same online survey was created by using Google Forms for online data collection from healthcare workers. The instrument's content was revised by a panel of four experts. It consists of participants characteristics, medical disease anamnesis, and COVID-19 vaccine-related side effects. The reliability of the internal consistency of the instrument was assessed using Cronbach's alpha test. The total reliability was 0.82, demonstrating that the instrument was considered reliable with respectable internal consistency [23], [24].

2.3. Participants

The qualified participants in this study were hospital healthcare workers. We choose only those who were vaccinated with AstraZeneca-Oxford vaccine (ChAdOx1 COVID-19 vaccine), Pfizer-BioNTech vaccine (BTN162 vaccine), or Sinopharm vaccine (BBIBP-CorV). Irrespective of the number of doses they had received by the time of filling out the questionnaire.

2.4. Sample size and data collection

In Kirkuk City, there are an estimated 4145 healthcare professionals working in government hospitals. The sample size was determined using Epi Info TM version 7.2.5 (CDC, Atlanta, GA, 2021). To achieve a 5% error margin and a 95% confidence level, population survey study formulas were utilized [25]. As the prevalence of adverse effects following COVID-19 vaccinations ranged between 62% and 93% in prior studies, the expected frequency (outcome probability) is considered to be 60% [21], [26]. A non-

probability convenience sampling technique was used to recruit three hundred seventy-three (373) vaccinated health care workers. They include physicians, nurses, pharmacists, anesthesiologists, medical laboratory staff, and physiotherapists who work in three government hospitals in Kirkuk City, which consist of the Azadi Teaching Hospital, Kirkuk General Hospital and Pediatric Hospital.

2.5. Ethical considerations

Before conducting this study, written ethical permission was obtained from the committee of research ethics at the Kirkuk Health Directorate, Ministry of Health of Iraq, on October 14, 2021 (No. 443), and agreements from the administrations of selected government hospitals were obtained in writing. Participants gave their verbal consent and the elements of the tool were explained to the participants, including the study purpose, procedures, benefits, and the fact that their personal identifiers were not used to protect the respondents' confidentiality. In addition, all the participants were assured that their participation was voluntary.

2.6. Data analysis

The data were entered into Microsoft Excel 2019 for organization and then imported to the statistical package for social sciences (SPSS) program version 23.0 for statistical analysis. Descriptive statistics which include frequencies, percentages, and cross-tabulation were used to describe the study sample characteristics, COVID-19 anamneses and vaccines adverse effects. Inferential statistics like the Chi-squared test (x2), and Fisher tests were used with a confidence level of 95% and a significance level (p) of 0.05. As well as logistic regression was performed to calculate the odds ratio of COVID-19 side effects occurrence adjusted to some variables with a confidence level of 95%.

3. RESULTS AND DISCUSSION

3.1. Healthcare workers' characteristics

Overall, 373 vaccinated health care workers were involved in the final analyses; 214 (57.4%) were female and 159 (42.6%) were male. The average age of the participants was 30.8 years old, with 224 (60.1%) falling between the ages of 20 and 29. About 185 (49.5%) were married, 184 (49.3%) were nurses, 69 (18.5%) were physicians, and the rest were from different health occupations. Regarding the type of COVID-19 vaccine, most of the participants were vaccinated with Pfizer-BioNTech vaccine (74%), while 50 (13.4%) were vaccinated with AstraZeneca-Oxford vaccine, and only 47 (12.6%) were vaccinated with Sinopharm vaccine. Most of the participants had received two doses of the vaccine (82.3%), while 6.4% had received only one dose, and 17 (4.6%) of them had received three doses; 232 (62.2%) of them were infected with COVID-19 disease, the data shown in Table 1.

Table 1. Health care workers' characteristics (n=373 participants)

Characteristics	Category	Frequency (F)	Percentage (%)
Gender	Male	159	42.6
	Female	214	57.4
Age groups (years)	≤40 years	305	81.8
	>40 years	68	18.2
	Mean=30.8 years		
Marital status	Single	184	49.3
	Married	185	49.6
	Divorced	4	1.1
Occupation	Nurse	184	49.3
	Physician	69	18.5
	Medical laboratory staff	63	16.9
	Pharmacist	43	11.5
	Anesthesiologist	8	2.1
	Physiotherapist	6	1.6
Type of COVID-19 vaccine	Pfizer-BioNTech vaccine	276	74.0
	AstraZeneca Oxford vaccine	50	13.4
	Sinopharm vaccine	47	12.6
Number of COVID-19 doses	One dose	49	13.1
	Two doses	307	82.3
	Three doses	17	4.6
Previous infection with COVID-19	Yes	232	62.2
	No	141	37.8

3.2. Prevalence of COVID-19 side effects (in general) based on some variables

The results show that there was a significant increase (p=0.049) in the number of females who reported diverse side effects after vaccination (150, 70.1%) compared to males (96, 60.4%). Reported side effects were slightly higher (67.2%) among participants aged ≤40 years compared to those aged >40 years (60.3%), with no statistically significant difference. Fisher's test also revealed that the number of COVID-19 side effects was significantly lower in medical laboratory staff (30, 47.6%) than in other healthcare workers, with a significant p-value of 0.008. Moreover, the rate of COVID-19 side effects was found to be significantly lower among the participants who received Sinopharm's COVID-19 vaccine (22, 46.8%) in comparison to other participants who received Pfizer-BioNTech and AstraZeneca's Oxford COVID-19 vaccines, with a significant p value of 0.010. On the other hand, there was no significant difference between the reported side effects and the other variables, like age and marital status as presented in Table 2.

Table 2. Prevalence of COVID-19 side effects (in general) based on some variables

Variables	Outcome	Side effects		Sig.
		Yes	No	
Gender	Male	96 (60.4%)	63 (39.6%)	0.049*
	Female	150 (70.1%)	64 (29.9%)	
Age group	≤40 years	205 (67.2%)	100 (32.8%)	0.276
	>40 years	41 (60.3%)	27 (39.7%)	
Marital status	Single	118 (64.1%)	66 (35.9%)	0.808
	Married	125 (67.6%)	60 (32.4%)	
	Divorced	3 (75%)	1 (25%)	
Occupation	Anesthetist	7 (87.5%)	1 (12.5%)	0.008*
	Physician	52 (75.4%)	17 (24.6%)	
	Medical laboratory staff	30 (47.6%)	33 (52.4%)	
	Nurse	120 (65.2%)	64 (34.8%)	
	Pharmacist	32 (74.4%)	11 (25.6%)	
	Physiotherapist	5 (83.3%)	1 (16.7%)	
Type of vaccine	AstraZeneca Oxford	36 (72%)	14 (28%)	0.011*
	Pfizer-BioNTech	188 (68.1%)	88 (31.9%)	
	Sinopharm	22 (46.8%)	25 (53.2%)	

Chi-squared test and Fisher's exact test were used with a significance level (*) of <0.05

3.3. COVID-19 vaccine side-effects reported among healthcare workers by gender

A total of 246 (66%) healthcare workers experienced at least one side effect after vaccination with COVID-19 vaccines. The distribution of side effects was higher among females (70.1%) than males (60.4%). The most frequently reported side effects were general fatigue (39.7%), followed by injection site pain (39.1%), headache (37.5%), fever (36.7%), myalgia (28.2%), and sweating (18.2%). Besides, there was a significant difference between males and females (p-value 0.05) in the cases of general fatigue (35.8% vs. 64.2%), dizziness (31% vs. 69%), injection site pain (36.3% vs. 63.7%), injection site swelling (24.3% vs. 75.7%), muscle stiffness (20.6% vs. 79.4%), anorexia (20.6% vs. 79.4%), and runny nose (0% vs. 100%). On the other hand, there were no significant differences between males and females in relation to the other COVID-19 side effects as shown in Table 3 (see Appendix).

3.4. Predictors of COVID-19 vaccine side effects

Logistic regression was carried out to investigate the relationship between gender, age, experience, occupation, previous chronic disease, medical treatment, previous infection with COVID-19, and type of COVID-19 vaccine with the prevalence of COVID-19 side effects. Results showed that there was a significant effect of gender, previous infection with COVID-19, and type of COVID-19 vaccine variables on the prevalence and occurrence of post-COVID-19 vaccine side effects. Contrarily, there was no statistically significant relationship between the prevalence of COVID-19 vaccine side effects and age, occupation, experience, a previous chronic disease, or medical treatment as presented in Table 4 (see Appendix).

3.5. Discussion

The focus of this study was to investigate the adverse effects of COVID-19 vaccinations on healthcare workers' participants in an effort to achieve maximum data reliability and precision. In this survey, different health care providers were given the opportunity to participate because we believe that their professional experience is closely linked to the pandemic's important health issues.

Two third of the participants in this study experienced at least one side effect following the COVID-19 vaccines, distributed by AstraZeneca Oxford (72%), Pfizer-BioNTech (68.1%), and Sinopharm

(46.2%). Our study result is consistent with the results of a study conducted among German health care workers, where the frequency of reporting side effects following Pfizer-BioNTech and AstraZeneca COVID-19 vaccines was 88.1% [27]. For the Sinopharm vaccine, the result of this study shows that the frequency of side effects following the Sinopharm COVID-19 vaccine was less than the result of studies conducted in the United Arab Emirates and India, where the frequency of reporting side effects following the Sinopharm vaccine was 86% and 76%, respectively [28], [29].

The rate of COVID-19 sides effects among the participants who received Sinopharm's COVID-19 vaccine is significantly lower in comparison to other participants who received Pfizer-BioNTech or AstraZeneca's Oxford COVID-19 vaccines, with a significant p value of 0.010. This could be due to the vaccine's low immunogenicity. Although it is claimed that inactivated vaccines have an excellent safety profile, they require a booster dose to build immunological memory [30]. This finding is in line with the result of study conducted among Jordanian healthcare workers, in which most participants who received the Sinopharm vaccine did not report any side effects after either of the two doses [31].

Our findings also show that there was a significant difference between male and female health care workers in terms of COVID-19 vaccine side effects, with females reporting a slightly higher rate of diverse side effects after vaccination than males. This result is in line with the result of a study done in the United Arab Emirates involving 760 females and 320 males, where the prevalence of side effects of the Sinopharm COVID-19 vaccine among women is 83%, compared to 55% among men [29]. Other study conducted among the Saudi Arabian population who received the COVID-19 vaccine found the occurrence of post-vaccination side effects was significantly higher in females than males [32]. The number of COVID-19 side effects was significantly lower among medical laboratory staff in comparison to other healthcare workers from other professions. This could be because medical laboratory personnel have less contact with patients in comparison to other health care workers like physicians or nurses.

Most of the reported side effects were mild or moderate in severity and short in duration. The most common reported side effect was general fatigue (39.7%), followed by injection site pain (39.1%), headache (37.5%), fever (36.7%), myalgia (28.2%), and sweating (18.2%). This finding was in agreement with the findings of several previous studies in relation to the types and frequency of vaccine side effects. For example, a study conducted among various Slovak healthcare providers who took the mRNA-based COVID-19 vaccine revealed that the most repeated topical side effect was pain in the site of injection (85.2%), followed by swelling in the injection site 10.2%, and the most repeated general side effect was fatigue (54.2%), followed by headache (34.3%), myalgia (28.4%), and chilliness (26.4%) [21]. Another study conducted among health care workers in Saudi Arabia who received the Oxford/AstraZeneca COVID-19 vaccine showed that the most common side effects were injection site pain and redness, fever, fatigue, headaches, cough, sore throat, and dizziness [33]. In comparison to the manufacturer and other independent surveys, their findings show that pain at the injection site was the most commonly reported side effect, with fatigue and headaches coming in second and third [34], [35].

The odd ratio shows that there was a significant effect of gender 1.732 (CI 95%: 1.096–2.739), previous infection with COVID-19 0.610 (CI 95%: 0.393–0.946), and type of COVID-19 vaccine 2.875 (CI 95%: 1.192–6.192) variables on the prevalence and occurrence of post-vaccine side effects, our study has some limitations because of its cross-sectional, self-reported methodology and the potential for participant perceptions to have been impacted by psychological factors. An additional limitation of the research is its failure to examine the individuals' medical conditions and how those conditions might have impacted their reactions to the vaccinations.

At the other hand, the COVID-19 vaccinations fail to provide complete protection against infection, and the now accessible vaccines have reduced efficacy against some variants. Therefore, it is essential for both the general public and healthcare systems to prepare for the potential scenario where COVID-19 continues to exist and transforms into a recurring seasonal disease. Therefore To effectively combat the current SARS-CoV-2 variants and avoid the formation of future variants, it is crucial to implement coordinated surveillance of SARS-CoV-2, rapidly develop redesigned vaccines, and carry out extensive immunizations [36].

4. CONCLUSION

Approximately two-thirds of healthcare workers experienced at least one side effect after taking COVID-19 vaccines; the majority of the reported side effects were mild to moderate in severity and not considered life-threatening, like fatigue, injection site pain, headache, and fever. Reported vaccine side effects were higher among females compared to males, and they were also slightly higher among participants under the age of 40 compared to those over the age of 40. Moreover, the rate of COVID-19 side effects was lower among the participants who received Sinopharm's COVID-19 vaccine in comparison to other participants who received Pfizer-BioNTech and AstraZeneca's Oxford COVID-19 vaccines. The current study generally observes the COVID-19 vaccine's short-term side effects (immediately after vaccination). For this, we recommend future studies assess the medium- and long-term side effects of the COVID-19 vaccines.

APPENDIX

Table 3. Gender distribution of COVID-19 vaccine side effects reported by healthcare workers (n=373)

Vaccines Side effects	Male	Female	Total	Sig.
General fatigue	53 (35.8%)	95 (64.2%)	148 (39.7%)	0.031*
Headache	54 (38.6%)	86 (61.4%)	140 (37.5%)	0.22
Fever	57 (41.6%)	80 (58.4%)	137 (36.7%)	0.761
Sweating	27 (39.7%)	41 (60.3%)	68 (18.2%)	0.59
Dizziness	18 (31%)	40 (69%)	58 (15.5%)	0.049*
Injection site pain	53 (36.3%)	93 (63.7%)	146 (39.1%)	0.048*
Injection site swelling	9 (24.3%)	28 (75.7)	37 (9.9%)	0.018*
Injection site redness	7 (35%)	13 (65%)	20 (5.4%)	0.478
Chills	8 (40%)	12 (60%)	20 (5.4%)	0.807
Rash	1 (50%)	1 (50%)	2 (0.5%)	0.671
Itching	3 (33.3%)	6 (66.7%)	9 (2.4%)	0.568
Myalgia	39 (37.1%)	66 (62.9%)	105 (28.2%)	0.18
Muscle stiffness	7 (20.6%)	27 (79.4%)	34 (9.1%)	0.006*
Joint pain	12 (42.9%)	16 (57.1%)	28 (7.5%)	0.98
Anorexia	7 (20.6%)	27 (79.4%)	34 (7.5%)	0.006*
Diarrhea	6 (30%)	14 (70%)	20 (5.4%)	0.24
Abdominal pain	4 (23.5%)	13 (76.5%)	17 (4.6)	0.103
Nausea & Vomiting	2 (16.7%)	10 (83.3%)	12 (3.2%)	0.065
Heart burn	1 (16.7%)	5 (83.3%)	6 (1.6%)	0.246
Constipation	2 (66.7%)	1 (33.3%)	3 (0.8%)	0.578
Ear pain	3 (33.3%)	6 (66.7%)	9 (2.4%)	0.738
Eye pain	3 (33.3%)	6 (66.7%)	9 (2.4%)	0.738
Tinnitus	0 (0%)	4 (100%)	4 (1.1%)	0.139
Runny Nose	0 (0%)	8 (100%)	8 (2.1%)	0.023*
nasal Stiffness	5 (27.8%)	13 (72.2%)	18 (4.8%)	0.192
Sore throat	4 (23.5%)	13 (76.5%)	17(4.6%)	0.103
Blurred vision	0 (0%)	2 (100%)	2 (0.5%)	0.51
Hoarseness	2 (66.7%)	1 (33.3%)	3 (0.8%)	0.578
Palpitation	12 (48%)	13 (52%)	25 (6.7%)	0.574
Chest pain	7 (43.8%)	9 (56.3%)	16 (4.3%)	0.926
Change in blood pressure	3 (50%)	3 (50%)	6 (1.6%)	0.703
SOB	6 (37.5%)	10 (62.5%)	16 (4.3%)	0.672
Cough	4 (28.6%)	10 (71.4%)	14 (3.8%)	0.278
Cardiac arrythmia	3 (60%)	2 (40%)	5 (1.3%)	0.655
Difficulty in urination	2 (100%)	0 (0%)	2 (0.5%)	0.181
Pain or burning during urination	1 (50%)	1 (50%)	2 (0.5%)	1
Depression	8 (53.3%)	7 (46.7%)	15 (4%)	0.392
Anxiety	5 (41.1%)	7 (58.3%)	12 (3.2%)	0.945
Sleep disturbance	13 (34.2%)	25 (65.8%)	38 (10.2%)	0.268
Forgetting	5 (25%)	15 (75%)	20 (10.2%)	0.101
Total	96 (60.4%)	150 (70.1%)	246 (66%)	0.47

Chi-squared test and Fisher's exact test were used with a significance level (*) of <0.05

Table 4. Predictors of COVID-19 vaccine side effects

Predicator	Odd Ratio (CI 95%)	Sig.
Gender	1.732 (1.096-2.739)	0.019*
Age	0.917 (0.382-2.202)	0.847
Experience	0.936 (0.432-2.030)	0.868
Occupation		
Anesthetist	1.711 (0.83-35.460)	0.729
Physician	0.699 (0.74-6.606)	0.755
Medical laboratory staff	0.192 (0.21-1.780)	0.146
Nurse	0.400 (0.44-3.620)	0.415
Pharmacist	0.585(0.58-5.871)	0.648
Physiotherapist	N/A	N/A
Chronic Disease	0.745 (0.363-1.528)	0.422
Medical treatment	1.087 (0.584-2.023)	0.792
Previous infection with COVID-19	0.610 (0.393-0.946)	0.027*
Type of COVID_19 vaccine		
AstraZeneca- Oxford	2.875 (1.192-6.192)	0.019*
Pfizer-BioNTech	2.337 (1.205-4.530)	0.012*
Sinopharm	N/A	N/A

N/A, not account; OR, odd ratio; ∗, significant at p<0.05

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