Original Article

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Self-reported post-COVID-19 vaccine signs, symptoms among vaccinated medical staff: Types, severity, and associated factors

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ABSTRACT

Background: Vaccines against severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection vary in mechanisms, side effects, and effectiveness. Health care professionals have shown high vaccine coverage rates. **Aim**: This study aims to assess the prevalence of self-reported clinical signs and symptoms of COVID-19 infection among health care professionals in Iraq and determine the type and severity of COVID-19 vaccine-related symptoms. **Methods**: A cross-sectional survey was conducted from January 1st to July 1st, 2023, using an online questionnaire disseminated through social media platforms. **Results**: Among 770 participants, common symptoms included body aches (36.9%), malaise (34%), headache (22%), and fever (20%), with chest pain (4.2%) and vomiting (3.4%) being less common. Most symptoms lasted for a short duration, with 45.9% lasting one day, 36.3% lasting two days, and 17.7% lasting three days. Only 1.6% needed hospitalization, while 72.7% treated the symptoms at home and 25.7% did not require any treatment. Mixed vaccine recipients were more likely to experience multiple symptoms and deoxyribonucleic acid (DNA) vaccines were linked with fever and headache symptoms. Symptoms were more pronounced in individuals with a history of COVID-19 infection but not influenced by vaccine dosage. **Conclusion**: Symptoms such as body aches, headache, fever, vomiting, and malaise were significantly associated with prior COVID-19 infection and receiving DNA and messenger ribonucleic acid (mRNA) vaccines. Most vaccinated participants managed symptoms at home.

Keywords: self-reported, post-COVID 19, vaccine, signs, symptoms, medical staff

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INTRODUCTION

Belonging to the Coronaviridae family, coronaviruses are enclosed, positive-sense single-stranded ribonucleic acid (RNA) viruses.[1,2] A beta-coronavirus, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is closely linked to Middle East Respiratory Syndrome coronavirus (MERS-CoV) and SARS-CoV. The infectious disease termed COVID-19 was caused by SARS-CoV-2[1,2] and first identified in Wuhan, China, in December 2019. Due to its great infectivity, COVID-19 quickly spread worldwide, leading the World Health Organization (WHO) to declare it a pandemic[3] on March 11, 2020.

Iraq reported its first case of COVID-19 on February 24, 2020. As of August 9, 2023, Iraq has confirmed 2,465,545 cases and 25,375 fatalities, while globally, there have been 769,369,823 confirmed cases and 6954,336 fatalities.[4,5] Respiratory and multi-organ failure can occur as a result of a cytokine storm induced by SARS-CoV-2, which produces pro-inflammatory cytokines and chemokines including Interleukin-1 beta (IL-1β), Interleukin-6 (IL-6), Interleukin-18 (IL-18), tumor necrosis factor alpha (TNF-α), and macrophage inflammatory proteins.[6,7] Infected individuals can spread the virus through coughing, sneezing, speaking, singing, or breathing, as microscopic liquid particles are released from their mouth or nose. While some infected individuals require medical assistance, most suffer from mild to severe respiratory symptoms and recover without specialized care.[8] As Virchow notes, COVID-19 is also poses a risk factor for thrombosis due to endothelial dysfunction, platelet activation, and aberrant blood flow. Pregnant women with COVID-19 are particularly vulnerable to this danger.[9,10] The pandemic has had profound effects on global health and economics, resulting in millions of deaths and a diminished quality of life for many. Though vaccination reluctance remains a problem, the creation of efficient vaccines has been an important step. Numerous myths have been circulating about the acceptability, safety, and efficacy of vaccination, often tied to political or commercial goals. Some have asserted that vaccines are ineffective against new virus strains or that natural immunity is superior to immunization. Others have maintained that vaccines were developed in anticipation of outbreaks solely to maximize sales, while some have even claimed that pharmaceutical corporations conspired with the media and government to raise vaccination demand for profit.[11] A survey conducted in Saudi Arabia found that merely 64.9% of medical professionals were open to receiving a COVID-19 vaccination, with the primary concern being possible adverse consequences.[12] The aim of this study is to determine the frequency of self-reported clinical symptoms and indicators following vaccination, as well as to ascertain the kinds and degrees of symptoms and indications associated with vaccinations. Additionally, the study stives to explore the kind and intensity of the clinical symptoms and their correlation with a history of COVID-19 infection. Moreover, it attempted to investigate where post-vaccination signs and symptoms are linked to receiving a single vaccination or a combination of vaccinations.

MATERIALS AND METHODS

The study conducted was an analytic survey from January 1st to July 1st, 2023, spanning a period of six months. A total of 770 randomized health care professionals, including physicians, dentists, and pharmacists, working in Iraqi healthcare settings were eligible to participate. The sample was selected based on their responses to the recruitment process. Recruitment was carried out by distributing a Google form questionnaire through social media groups (Facebook, telegram, and WhatsApp) specifically for physicians, dentists, and pharmacists. Participants were contacted through their respective officials and were provided with detailed information about the study. The questionnaire consisted of two parts: the first part focused on demographics, while the second part aimed to explore previous COVID-19 infections and vaccine-related symptoms, including their severity, duration, and management needs. Prior to answering the questions, participants were informed that non-vaccinated individuals and those with chronic diseases were excluded from the study. Participants were asked to indicate the type of COVID-19 vaccine they received, which was categorized into five groups:

a. Deoxyribonucleic acid (DNA) vaccine (Astra Zeneca)
b. Messenger ribonucleic acid (mRNA) vaccine (Pfizer)
c. Killed virus vaccine (SINOPHARM)
d. DNA + mRNA vaccine
e. mRNA + killed virus vaccine

The questionnaire was prepared by the researcher and approved by the supervisor, drawing on insights from previous similar research.[2–4] To ensure its validity, three senior physicians, specializing in community medicine, family medicine, and internal medicine, validated the questionnaire's design and ability to measure the intended variables. The Cronbach's alpha value was calculated to be 84%.

Inclusion Criteria

All health care professionals (physicians, dentists, and pharmacists) currently practicing in Iraq and accessible through the designated website who had received vaccine doses (not more than 4 doses) were included in the study.

Exclusion Criteria

Health care workers with diabetes mellitus, hypertension, and ischemic vascular incidents were excluded from the study.

Ethical Considerations

The research proposal underwent a thorough review and approval process by the ethical and scientific committee of the Iraqi Board for Family Medicine (No. 125 on 1-4-2023). Participants were fully informed about the study's objectives, and their consent was obtained. The confidentiality of collected data was assured, with the information being used solely for this study.

Statistical Analysis

Data collected through the Google form questionnaire was compiled and purified using Microsoft Excel Sheet 2019. Subsequently, Statistical Package for the Social Sciences (SPSS) version 26 was utilized for the analysis. Descriptive Statistics: Descriptive statistics were presented using tables and graphs to provide a clear overview of the data. Inferential Statistics: The chi-square test was employed to determine the significance of associations between related categorical variables. A p-value less than 0.05 was considered statistically significant in this analysis.

RESULTS

The findings of this study indicated that a total of 770 participants were included, with 51.7% of them being male. Most participants, accounting for 92.7%, were aged below 45 years. Among the studied participants, 81% reported a history of prior COVID-19 infection. The duration since their last COVID-19 infection was reported as more than six months in 77.4% of cases, three to six months in 5.4% of cases, and less than three months in 16.6% of cases. Regarding the types of vaccines received, approximately 65% of participants received mRNA vaccines, while 13.8% received DNA vaccines, and 8.3% received killed virus vaccines. A smaller proportion, 6.5%, received a combination of mRNA and DNA vaccines, and 6% received a combination of mRNA and killed virus vaccines. When considering the number of vaccine doses received, 3.6% of participants received only the first dose, 68.6% received the second dose, 23.1% received the third dose, and 4.7% received the fourth dose. Notably, a significant majority of participants, accounting for 87.5%, received only a single type of vaccine throughout the study, as presented in Table 1.

Figure 1 illustrates the prevalence of different symptoms reported by participants who received the COVID-19 vaccine. Among the participants, 36.9% experienced body aches, 34% reported malaise, 22% suffered from headaches, and 20% had a fever. Additionally, a smaller percentage of participants, 4.2% and 3.4% respectively, experienced chest pain and vomiting.

Table 2 presents the duration and management of post-vaccination symptoms reported by the participants. Of those who experienced symptoms, 45.9% reported that the symptoms lasted for one day, 36.3% experienced symptoms for two days, and 17.7% had symptoms lasting for more than two days. In terms of management, 25.7% of participants reported that their post-vaccination symptoms required no treatment. The majority, comprising 72.75%, managed their symptoms at home. Only a small percentage, approximately 1.6%, required hospital admission for the management of their post-vaccination symptoms.

Table 3 presents the association between the number of symptoms experienced after vaccination, type of vaccine received, and number of vaccine doses. It highlights the prevalence of single symptoms and multiple symptoms among different vaccine groups, along with the corresponding p-values for statistical significance. The findings indicate that 25.2% of participants who received only one type of vaccine developed a single symptom, which was higher compared to the rate of single symptoms reported by those who received multiple types of vaccines. Conversely, the occurrence of multiple symptoms was more prevalent among recipients of multiple types of vaccines. This association was found to be statistically significant with a p-value of 0.007. Furthermore, among recipients of the killed vaccine, the rate of experiencing only one symptom was significantly higher compared to those who received other types of vaccines. Conversely, the rate of reporting three or more symptoms was found to be more prevalent among recipients of the killed vaccine compared to those who received other vaccine types. This association was statistically significant with a p-value of 0.001. However, no significant association was observed between the number of vaccine doses administered and the number of symptoms experienced after vaccination, with a p-value of 0.341.

Table 4 presents the analysis of associations between the duration of the last COVID-19 infection, the occurrence of symptoms, and the need for hospital admission among the participants. It also provides the corresponding p-values to assess statistical significance. The results indicate that there were no significant associations found between the duration of the last COVID-19 infection and

the occurrence of any symptoms post-vaccination. In all conditions, the p-values were greater than 0.05, suggesting no statistically significant relationship between the duration of the last infection and symptom occurrence. However, the rate of experiencing all symptoms was substantially higher among participants who had a longer duration since their last COVID-19 infection compared to those with no symptoms or those with symptoms of shorter duration. For all these conditions, the p-values were less than 0.05, indicating a statistically significant relationship between symptom occurrence and the duration of the last infection. Furthermore, the rate of experiencing all post-vaccination symptoms was significantly higher among participants who required hospital admission compared to those who did not require treatment or were managed at home. The p-values were less than 0.05 for all of these conditions.

Table 1: The distribution of included participants according to studied variables (No. = 770).

Characteristics	Variables	N	%
Sex	Male	398	51.7
	Female	372	48.3
Age group (years)	< 45 years	714	92.7
	≥ 45 years	56	7.3
Previously got infected by COVID-19	Yes	624	81.0
	No	146	19.0
Duration from Last infection (months)	< 3 months	104	16.6
	3–6 months	34	5.4
	> 6 months	486	77.4
Vaccine Type	mRNA	504	65.5
	DNA	106	13.8
	Killed Virus	64	8.3
	mRNA +DNA	50	6.5
	mRNA +Killed Virus	46	6.0
	DNA +Killed Virus	0	0.0
Vaccine Dose	First dose	28	3.6
	Second dose	528	68.6
	Third dose	178	23.1
	Fourth dose	36	4.7
Vaccination that you got	One type	674	87.5
	Mixed vaccines	96	12.5

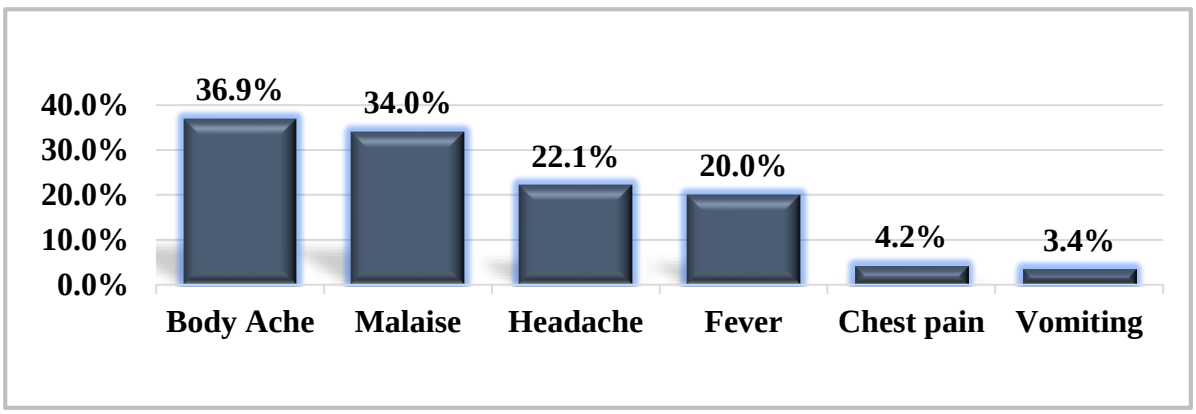

Figure 1: Frequency of signs and symptoms of COVID-19 vaccine in the study participants.

Table 2: The distribution of included participants according to studied symptoms variables (No. = 770).			
Characteristics	Variables	No.	%
Presence of symptoms	Yes	710	92.2
	No	60	7.8
Duration of symptoms (days)	1 day	326	45.9
	2 days	258	36.3
	> 2 days	126	17.7
Symptoms management	No	198	25.7
	At home	560	72.7
	Hospital admission	12	1.6

Table 3: The associations between number of vaccines, types of vaccine, number of doses and number of symptoms.									
Variables	1 symptom		2 symptoms		3 symptoms		>3 symptoms		P value
	No.	%	No.	%	No.	%	No.	%	
Vaccine that you got: One type	170	25.2	96	14.2	146	21.7	262	38.9	0.007
Mixed vaccines	12	12.5	18	18.8	32	33.3	34	35.4	
Vaccine type: mRNA	114	22.6	80	15.9	118	23.4	192	38.1	0.001
DNA	22	20.8	12	11.3	16	15.1	56	52.8	
Killed Virus	34	53.1	4	6.3	12	18.8	14	21.9	
mRNA +DNA	0	0.0	10	20.0	16	32.0	24	48.0	
mRNA +Killed Virus	12	26.1	8	17.4	16	34.8	10	21.7	
Number of doses: First dose	8	28.6	6	21.4	6	21.4	8	28.6	0.341
Second dose	128	24.2	78	14.8	108	20.5	214	40.5	
Third dose	38	21.3	24	13.5	54	30.3	62	34.8	
Fourth dose	8	22.2	6	16.7	10	27.8	12	33.3	

Table 4. Association of COVID-19 Symptoms with Duration of Previous Infection, Symptom Duration, and Management

Symptom	Duration of the previous infection			P-value
	< 3 months	3–6 months	> 6 months	
Body Ache (%)	42 (38.9%)	14 (41.2%)	188 (38.7%)	0.959
Malaise (%)	40 (37.0%)	12 (35.3%)	182 (37.4%)	0.968
Headache (%)	28 (25.9%)	10 (29.4%)	114 (23.5%)	0.662
Fever (%)	24 (22.2%)	8 (23.5%)	108 (22.2%)	0.984
Chest Pain (%)	6 (5.6%)	4 (11.8%)	20 (4.1%)	0.119
Vomiting (%)	6 (5.6%)	0 (0.0%)	20 (4.1%)	0.365
Symptom	Duration of symptoms			P-value
	1 day	2 days	> 2 days	
Body Ache (%)	76 (23.3%)	122 (47.3%)	86 (68.3%)	0.001
Malaise (%)	74 (22.7%)	120 (46.5%)	72 (57.1%)	0.001
Headache (%)	34 (10.4%)	68 (26.4%)	68 (54.0%)	0.001
Fever (%)	38 (11.7%)	62 (24.0%)	54 (42.9%)	0.001
Chest Pain (%)	0 (0.0%)	16 (6.2%)	16 (12.7%)	0.001
Vomiting (%)	4 (1.2%)	10 (3.9%)	12 (9.5%)	0.001
Symptoms management				
Symptom	No Treatment			
Body Ache (%)	28 (14.1%)			
Malaise (%)	20 (10.1%)			
Headache (%)	10 (5.1%)			
Fever (%)	6 (3.0%)			
Chest Pain (%)	0 (0.0%)			
Vomiting (%)	2 (1.0%)			

DISCUSSION

This cross-sectional study was conducted among 770 health care workers in Iraq, including doctors, pharmacists, and dentists. Over half of the participants were male, with the majority being younger than 45 years. These findings align with a study in Iraq among 2,202 health care workers, where 54.7% were males and 93.1% were younger than or equal to 49 years.[13] However, these results contrast with a German study where 72.3% of participants were females. This discrepancy may be due to the German study including a higher proportion of midwives and nurses. The majority of participants received a single type of vaccine, with mRNA (Pfizer) vaccines being the most common, administered to about two-thirds of the

sample. The remainder received DNA (AstraZeneca) or killed virus (Sinopharm) vaccines. These observations are consistent with studies in Iraq and Saudi Arabia, where the Pfizer vaccine was administered to 62.9%, 75%, 59.5%, 68.4%, and 70% of participants, respectively.[13–17] Despite the logistical challenges of transporting and storing the Pfizer-BioNTech vaccine, it has been in high demand due to its 95% effectiveness at preventing symptomatic COVID-19.[18] However, this is in direct contrast with studies in Jordan and Saudi Arabia, where 48.4% of participants were vaccinated with Pfizer-BioNTech, reflecting differences in vaccine availability. Over three-quarters of participants reported a history of prior COVID-19 infection, higher than studies in Pakistan and Turkey, which reported previous infection rates of 20.5% and 9.8%, respectively.[19,20] Additionally, more than two-thirds of health care workers in the current study received the second dose, higher than the 51.2% in the Turkish study.[20] These differences may be attributed to varying target populations, sample sizes, and study periods. The most commonly reported adverse effects in the study were body aches, malaise, headaches, and fever. A study conducted in India reported similar findings, with fatigue, fever, headache, and generalized muscular pain being the most common systematic adverse effects.[21] Hatmal et al. found malaise, headache, and fever to be the most frequent adverse effects among 10,064 individuals from 19 Arab countries.[22] Additionally, the National Health Service (NHS) reported that the most common side effects of COVID-19 vaccines were feelings of unwellness, fatigue, headache, aches and pains, or moderate flu-like symptoms.[23] The study found a significant association between the occurrence of multiple symptoms and receiving mixed vaccines. Participants who received Sinopharm vaccines experienced fewer side effects than those who received other vaccines, aligning with findings by Ganesan et al., who reported fewer side effects among Sinopharm recipients compared to Pfizer-BioNTech recipients ($p < 0.001$).[24] Abu-Hammad et al. also reported fewer systematic adverse effects with Sinopharm.[25] All symptoms (body ache, malaise, headache, fever, vomiting, and chest pain) were significantly associated with home management and a symptom duration of two days or more. These symptoms can generally be managed with over-the-counter medications, reducing the need for hospital visits. Health care workers' familiarity with dealing with adverse effects may also contribute to successful home management.

Finally, the study observed no significant association between the type of vaccine and duration of symptoms or hospitalization. Similar findings were reported in Iraq and the United Arab Emirates (UAE), where no significant relationship was found between vaccine type and the need for physician consultation or hospitalization.[15,24] **Limitations of the Study**

The design of the study and the fact that conditions like asthma and diabetes mellitus should have been taken into account are two things that could be seen as limitations, which could potentially impact the results. Additionally, the possibility of memory bias influencing the study could also be a limitation.

CONCLUSIONS

All clinical symptoms, except chest pain, have shown a significant association with prior COVID-19 infection and receipt of DNA and mRNA vaccines. The majority of vaccinated participants required treatment at home. It is important to note that not all vaccine recipients will experience side effects, and the presence or absence of these side effects does not necessarily indicate immunity or protection. It is crucial to understand that there is no direct correlation between vaccine side effects and efficacy. Furthermore, Food and Drug Administration (FDA) antibody tests are not recommended for evaluating individual immunity or the effectiveness of COVID-19 vaccines.

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