

Assessment of acceptance, concerns and side effects towards COVID-19 vaccination among the community: A cross-sectional study from Baghdad, Iraq

Zahraa Albasry^a, Anmar Al-Taie^{b,*}

^a Clinical Pharmacy Department, College of Pharmacy, Mustansiriyah University, Baghdad, Iraq

^b Clinical Pharmacy Department, Faculty of Pharmacy, Istinye University, Istanbul, Turkey

ARTICLE INFO

Keywords:

Acceptance
COVID-19
Iraq
Side effects
Vaccines

ABSTRACT

Introduction: The newly developed and marketed vaccines along with concerns about vaccine safety and long-term side effects has been raised an alarming in the general population. The aim of this study was to assess the rate of acceptance, perceptions and concerns towards receiving COVID-19 vaccines and to explore the incidence of vaccines' side effects among Iraqi population in Baghdad province, Iraq.

Method: This was a descriptive, cross-sectional study conducted via direct interviews among a convenient sample size of Iraqi population using a structured validated questionnaire consisting of using 24-item questionnaire to assess acceptance, concerns and the incidence of vaccines' side effects towards receiving COVID-19 vaccines.

Results: A total of 500 participants with an average age of 27.8 ± 3.7 years were included. Majority were females (70.6%). 43.4% had a history of COVID-19, and 46% received the Pfizer BioNTech vaccine. 73.4% ($P < 0.0001$) agreed about the importance of receiving the vaccination to protect the community against the COVID-19. 46.8% ($P < 0.0001$) were unsure about the adverse effects and long-term vaccine safety. 72.8% reported that transmission of COVID-19 infection to family members is the main concern for accepting vaccination. Fatigue (60%), injection site reactions (55.8%) were the most common vaccine's side effects. Young age ($P = 0.001$), females ($P < 0.0001$), and university educational ($P < 0.0001$) were the most significant deterrents for accepting vaccination.

Conclusion: This study highlights that the Iraqi population showed a considerable acceptance rate for the COVID-19 vaccines. However, vaccine safety is considered a high priority concern associated with the willingness of the population to vaccinate.

1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic caused by the highly contagious severe acute respiratory syndrome coronavirus 2 (SARSCoV-2) has spread viciously, posing major risks and crisis to human health with millions of infected people and deaths worldwide.¹ Since the declaration of the pandemic, several measures have been sequentially implemented to slow down the spread of the infection rate, such as lockdowns, social distancing, community use of face masks, travel restrictions, and self-isolation strategies.^{2,3} The SARSCoV-2 continued to spread despite these protective measures. Therefore, with many approved marketed vaccines available for use, a successful and effective vaccination program is considered the main strategy to provide

sufficient vaccination coverage in a population that can achieve herd immunity and, subsequently, prevention and spread control of the pandemic.^{4,5}

The World Health Organization (WHO) has recommended several vaccines for COVID-19.⁶ However, three vector vaccines have been approved in Iraq. These are the mRNA vaccine (Pfizer BioNTech); ChAdOx1 nCoV-19 (AstraZeneca/Oxford), and the inactivated SARSCoV-2 vaccine, BBIBP-CorV (Sinopharm). However, misconceptions and inaccurate information about certain aspects of the pandemic and the effectiveness of vaccination have been circulating alarmingly in the general population. Furthermore, the urgent use of newly developed and marketed vaccines along with concerns about vaccine safety regarding short-term testing and long-term side effects

* Corresponding author.

E-mail addresses: zahraaalbasry@yahoo.com (Z. Albasry), anmar.altaie@istinye.edu.tr (A. Al-Taie).

<https://doi.org/10.1016/j.cegh.2023.101217>

Received 17 July 2022; Accepted 10 January 2023

Available online 14 January 2023

2213-3984/© 2023 The Authors. Published by Elsevier B.V. on behalf of INDIACLEN. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

has been raised.⁷ This is considered one of the major obstacles that has been associated with variations and willingness to accept COVID-19 vaccines among the populations.⁸ There are many factors that could influence the population's acceptance of COVID-19 vaccination, including perceptions about the disease, vaccine safety and efficacy, doctor's recommendations, public vaccination attitudes, along with personal background, social and political projections.^{9–12}

During the pandemic era, this growing public health concern in Iraq has received scant attention in the research literature. The Iraqi Ministry of Health in Iraq has established an online portal website to explore the importance and facilitate registration for COVID-19 vaccination. Since the beginning of the COVID-19 pandemic, the country has passed through four prominent waves of SARS-CoV2 transmission. The Iraqi Ministry of Health reported a total of (2 364 453) confirmed cases and (25 247) deaths of SARS-CoV2 infection. Regarding the vaccine status, a total of 7 million people had received the vaccine, constituting nearly 25% of the total Iraqi population.¹³ Therefore, the primary aim of this study was to assess the rate of acceptance, perceptions and concerns towards receiving COVID-19 vaccines. The second aim was to explore the incidence of vaccines' side effects among Iraqi population in Baghdad province, Iraq.

2. Methods

2.1. Study design and sample setting

This was a descriptive, cross-sectional study that enrolled a random sample size of participants in Baghdad province, Iraq from December 2021 to April 2022. The study was approved by the ethical committee of the College of Pharmacy, University of Al-Mustansiriyah, Baghdad, Iraq (2611.06.09.2021). The enrolled participants was conducted by using Cochran's sample size formula. A sample size of a large population with an unknown degree of variability and assuming the maximum variability is 95% confidence level with $\pm 5\%$ precision. A total of 534 participants were approached during this study. However, 500 participants completed the entire questionnaire, giving a response rate of 93.6%.

Inclusion criteria included participants older than 18 years who received full doses of COVID-19 vaccines launched by the Iraqi Ministry of health (Pfizer, AstraZeneca, and Sinopharm COVID19 vaccines), and expressed willingness to take part in this study. The participants were invited randomly to participate from different regions of Baghdad province (Northern, Eastern, Central, and Southern). The participants who expressed readiness to take part in this study were provided with full verbal information regarding the objective of the study and with written informed consent. Furthermore, all participants were informed that participation was voluntary and they were assured of their anonymity and confidentiality of response. Those who dismissed participation, those not receiving vaccination, or those with incomplete response to the items of the questionnaire were excluded.

2.2. Questionnaire development

The information was collected using a structured self-administered questionnaire that was developed for the present study. The objectives of the study were described in an introductory letter included with the questionnaire, which was distributed and filled out by direct face-to-face interview with the participants and took nearly 10 min to complete. The questionnaire was developed after an extensive and comprehensive literature review and customized with rewording and reformatting to suit the objective of this study. The questionnaire items underwent translation from English into Arabic with forward and backward translation, and the content was validated by two academicians from pharmacy and medical backgrounds.

The final version of the questionnaire consisted of 24 questions divided into three sections. The first section (ten items) gathered data on

demographic characteristics of the participants, including age, gender, educational level, cigarette smoking, presence of chronic disease conditions, employment, health insurance, history of COVID-19 infection and type of the received vaccine. The second section consisted of six items which evaluated patients' perceptions towards accepting COVID-19 vaccines. The respondents were given options of 'agree', 'disagree', and 'not sure' to choose from the questions of this questionnaire part. The third section (eight items) gathered data to assess patients' concerns towards accepting COVID-19 vaccines.

2.3. Statistical analysis

Data were analysed using the Statistical Package for the Social Science (SPSS) version 23.0 and Microsoft Office Excel 2013. Descriptive analysis was used to describe the study population, and the results were expressed in numbers, percentages, means, and standard deviations. The Chi-square test was used to assess the differences in perceptions towards accepting COVID-19 vaccines and the incidence of vaccines' side effects among the study participants. The P-value was considered significant at < 0.05 and highly significant at < 0.01 .

3. Results

The mean age of the respondents was 27.8 ± 3.7 years, and most of the respondents (79%) were in the age range between 18 and 30 years. Nearly three-quarters of the study participants were females (70.6%). Most of the enrolled participants possessed a university level qualification (64.6%). The majority of the participants (90%) had no comorbid disease conditions, and were cigarette non-smokers (76%). 72% of the participants were employed, but without of health insurance (75%). Regarding COVID-19 status, 43.4% reported having a history of COVID-19 infection. Meanwhile, 46% of the respondents received the Pfizer

Table 1
Demographic characteristics of the study population (N = 500).

Variable	Number (n)	Percentage (%)
Age (median) years	27.8 \pm 6.5	
18–30	395	79
30–40	80	16
40–50	25	5
Gender		
Male	147	29.4
Female	353	70.6
Marital status		
Single	17.4	13
Married	82.6	87
Education level		
Primary	123	24.6
Secondary	54	10.8
University	323	64.6
Comorbid disease conditions		
Yes	50	10
No	450	90
Cigarette smoking		
Yes	120	24
No	380	76
Employment		
Yes	360	72
No	140	27
Health insurance coverage		
Yes	125	18
No	375	75
History of COVID-19 infection		
Yes	217	43.4
No	283	56.6
Vaccine type		
AstraZeneca	91	18.2
Pfizer BioNTech	230	46
Sinopharm	179	35.8

Data presented as number (n) and percentage (%).

BioNTech vaccine, followed by Sinopharm vaccine (35.8%), and AstraZeneca (18.2%), as shown in Table 1.

Table 2 presents the perceptions towards accepting different COVID-19 vaccines. 73.4% ($P < 0.0001$) of the enrolled participants agreed about the importance of receiving the vaccination to protect the community against the COVID-19 infection. Meanwhile, 64.2% ($P < 0.0001$) of the respondents agreed that the drug companies are capable of developing effective and safe vaccines against this pandemic. 46.8% ($P < 0.0001$) were unsure about the adverse effects and long-term safety of these newly launched vaccines, and nearly half of the respondents (52.2%; $P < 0.0001$) reported that most people will refuse to receive the COVID-19 vaccine once licensed in Iraq. However, 63.4% ($P < 0.0001$) of the study participants disagreed that the occurrence of side effects may prevent the community from receiving a vaccine for the prevention of COVID-19. Nearly three-quarters (76.6%; $P < 0.001$) agreed that the government through the Iraqi Ministry of Health will make the vaccine available for free administration.

Regarding the concerns towards accepting the different COVID-19 vaccines, 72.8% of the enrolled participants reported that transmission of COVID-19 to family members is the main concern for accepting vaccination, while 33.2% reported that the complications associated with the COVID-19 or the probability of death are the second concern for receiving the vaccine followed by concern about getting the COVID-19 infection in the future (28.2%). Other concerns are shown in Fig. 1. Stratifying the participants' level of vaccine acceptance in consideration of the demographic characteristics, there was a statistically significant difference regarding young age (18–30 years old; $P = 0.001$), females ($P < 0.0001$), university educational ($P < 0.0001$), participants without comorbidities ($P < 0.0001$) and no previous history of COVID-19 ($P = 0.04$), as shown in Table 3.

Regarding the incidence of side effects from different vaccines, as shown in Fig. 2. The most common side effect reported by the study participants was fatigue (60%), followed by reactions to the site of injection, including pain, redness, and swelling (55.8%), fever (53%), myalgia (48.6%), and an equal proportion of headache and chills (53%).

Table 2
Perceptions towards accepting COVID-19 vaccines (N = 500).

Perceptions	Agree/ Strongly agree n (%)	Not sure n (%)	Disagree/ Strongly disagree n (%)	P-value
It is essential to receive a vaccine to protect community against COVID-19	367 (73.4)	87 (17.4)	46 (9.2)	<0.0001
Drug manufactures are going to develop safe, effective and low cost COVID-19 vaccines	321 (64.2)	129 (25.8)	50 (10)	<0.0001
COVID-19 vaccines have no serious adverse effects and have long-term safety of these newly launched vaccines	191 (38.2)	234 (46.8)	75 (15)	<0.0001
In Iraq, most people will refuse to receive the COVID-19 vaccine	261 (52.2)	153 (30.6)	86 (17.2)	<0.0001
Side effects occurrence may prevent the community from receiving a vaccine for the prevention of COVID-19	86 (17.2)	97 (19.4)	317 (63.4)	<0.0001
The government through the Ministry of Health will make the vaccine available for free administration	383 (76.6)	80 (16)	37 (7.4)	<0.001

Data presented as number (n) and percentage (%).

Significant at $P \leq 0.01$.

Furthermore, the incidence of side effects reported by each single vaccine is shown in Fig. 3. The most common side effects reported by the study participants were reactions to the site of injection (82.2%) and chills (71.7%) caused by the Pfizer BioNTech vaccine, followed by fatigue (71.4%) and fever (65.9%) caused by the AstraZeneca vaccine, and myalgia (63%) caused by the Pfizer BioNTech vaccine. On the other hand, the Sinopharm vaccine was associated with the lowest frequency of side effects (Fig. 3). Stratifying the incidence of vaccines' side effects in consideration of the demographic characteristics, there was a statistically significant incidence of side effects among young age group (18–30 years old; $P = 0.02$), females ($P < 0.0001$), university educational ($P = 0.001$), participants without comorbidities ($P < 0.01$) and no previous history of COVID-19 ($P = 0.05$), as shown in Table 4.

4. Discussion

Since COVID-19 is a relatively new pandemic, and evidence with a high level of confidence has only recently been published, the risk of infection is directly related to the acceptance of vaccination, and worries about getting infected or transmitting the disease to others. Therefore, vaccination is considered the best health approach to prevent SARS-CoV2 virus spread.¹⁴ In the current study, there was a significant acceptance and willingness to receive the vaccine and most of the enrolled participants agreed on the importance of receiving the COVID-19 vaccination to protect the community against the pandemic. This is in line with a cross-sectional study conducted by El-Elimat et al.¹⁵ reporting that 66.5% of the participants stated that receiving the vaccine was important to protect against COVID-19. The significantly higher vaccination acceptance rate reported in this study might be related to the highly educated participants. These findings were in contrast with previous studies conducted earlier during the COVID-19 pandemic, reported by a low vaccination acceptance rate (26%).¹⁶ Previous studies assessing acceptance towards vaccines revealed huge regional variability. The findings of our study were higher than that reported in a cross-sectional study conducted in Lebanon by Hanna et al.,¹⁷ which found that 63.4% of the Lebanese population accepted to receive the COVID-19 vaccine. Our findings were also higher than earlier studies conducted in the UK (71.7%),¹⁸ the USA (69%),¹⁹ Japan (65.7%),²⁰ and Saudi Arabia (64.7%),²¹ but lower than the acceptance rate toward vaccination in China (88.6%).²² Meanwhile, 64.2% of the respondents agreed that drug companies are capable of developing effective and safe vaccines against this pandemic. The community's trust in the drug manufacturers that are capable of providing effective and safe products is another important determinant. In the present study, the majority of the respondents had received the Pfizer BioNTech vaccine, followed by the Sinopharm vaccine, and the AstraZeneca. This might be due to the competent mode of action and the high level of efficacy of the Pfizer BioNTech vaccine, reaching up to 95%.²³ The preference for the Pfizer BioNTech vaccine is in agreement with a cross-sectional study conducted in Indonesia by Harapan et al.,²⁴ which found that a higher acceptance rate towards vaccination was associated with the choice of vaccine effectiveness. Furthermore, the study conducted by El-Elimat et al.¹⁵ showed that 59% of the Jordanian people had confidence in pharmaceutical companies to develop safe and effective COVID-19 vaccines.

In the current study, the respondents were unsure about the presence of serious adverse effects and the long-term safety of the newly launched vaccines. Thus, the acceptance of vaccination among the Iraqi population is affected by the uncertainty of the vaccine's safety as well as the unknown or unwell-documented side effects of the vaccines. This could be related to the speed of vaccine development and registration, as no prior experience or successes, particularly with the novel technology approach, have been reported in the past. These findings were in line with an earlier study conducted in the USA,²⁵ which reported that nearly 63% of the population were worried about the side effects of the COVID-19 vaccine. Nevertheless, the majority of the respondents in the

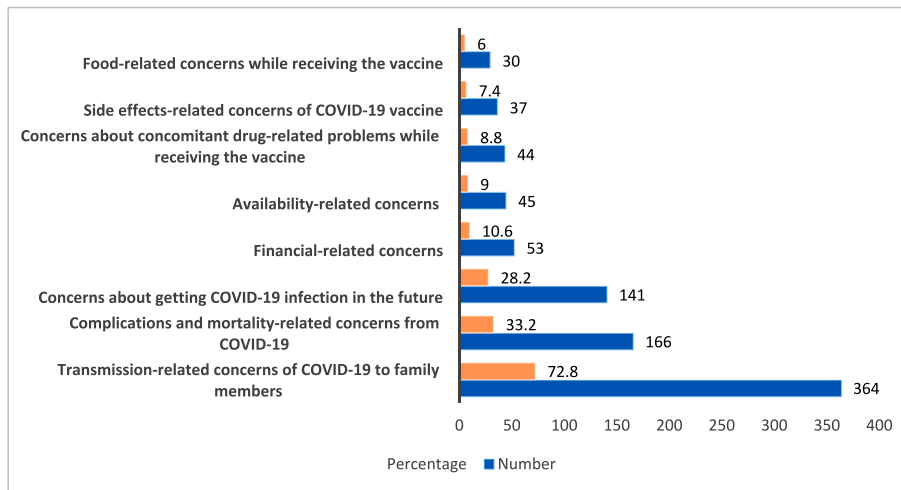


Fig. 1. Concerns towards accepting COVID-19 vaccines among the study participants.

Table 3
Correlation between level of accepting COVID-19 vaccines and the demographic characteristics.

Variable	Level of vaccine acceptance n (%)	P-value
Age (years)		0.001
18–30	201 (51)	
30–40	23 (29)	
40–50	5 (20)	
Gender		<0.0001
Male	44 (15.1)	
Female	247 (84.9)	
Education		<0.0001
Primary/Secondary	57 (20.7)	
University	218 (79.3)	
Comorbid disease conditions		<0.0001
Yes	8 (2.1)	
No	369 (97.9)	
History of COVID-19 infection		0.04
Yes	106 (42.4)	
No	144 (57.6)	

Data presented as number (n) and percentage (%).
Significant at $P \leq 0.05$.

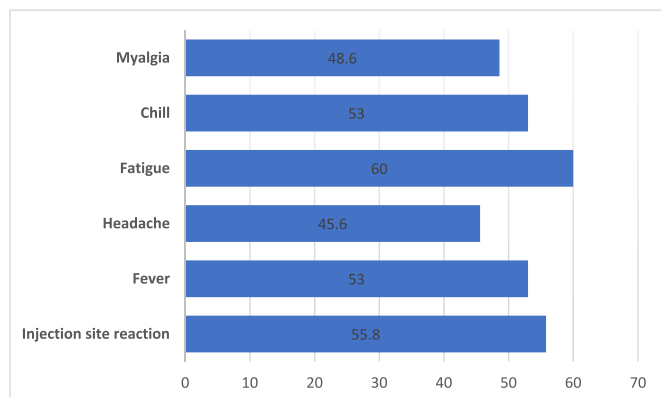


Fig. 2. Total incidence of side effects from different vaccines among the study participants.

present study (63.4%) disagreed that the occurrence of side effects may prevent the community from receiving a vaccine for the prevention of COVID-19. Therefore, it is crucial for healthcare providers to provide accurate information about vaccines' safety and efficacy to improve the population's confidence, especially the hesitant ones, and for the success

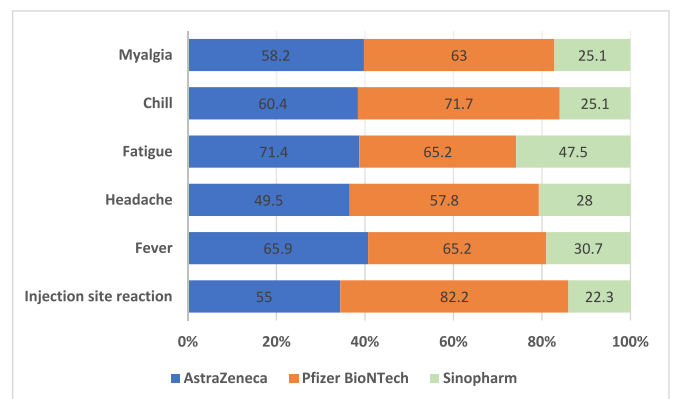


Fig. 3. Incidence of side effects from different vaccines among the study participants.

Table 4
Correlation between the incidence of vaccines' side effects and the demographic characteristics.

Variable	Incidence of vaccines' side effects (N = 300) n (%)	P-value
Age (years)		0.02
18–30	140 (46.7)	
30–40	109 (36.3)	
40–50	51 (17)	
Gender		<0.0001
Male	77 (25.7)	
Female	223 (74.3)	
Education		0.001
Primary/Secondary	89 (29.7)	
University	211 (60.3)	
Comorbid disease conditions		0.01
Yes	74 (24.6)	
No	226 (75.4)	
Cigarette smoking		0.08
Yes	118 (39.3)	
No	182 (60.7)	
History of COVID-19 infection		0.05
Yes	103 (34.3)	
No	197 (65.7)	

Data presented as number (n) and percentage (%).
Significant at $P \leq 0.05$.

of vaccination campaigns.²⁶

An important consideration towards a high acceptance rate is the vaccine's convenience, availability, and affordability and that the willingness to pay for the vaccine could be considered a predictor of vaccination acceptance or refusal.²⁶ Thus, in order to encourage the Iraqi people towards accepting vaccination, the Iraqi Ministry of Health made the three different COVID-19 vaccines available for free administration. This is in contrast to an earlier study which reported that only 36.2% believed that the government would be able to provide the vaccine for free.¹⁵

During the time of data collection for this study, the number of daily new cases in Iraq continued to rise. Therefore, 72.8% of the enrolled participants reported that transmission of COVID-19 infection to family members is the main concern for accepting vaccination. These findings highlight that realizing the SARS-CoV-2 virus as a threat might be more inclined to protect from the pandemic and that the higher the COVID-19 worries, the higher the participant's acceptance of the vaccines.^{21,27–29} Our findings were in line with the findings of Mertens et al.,³⁰ which found that perceived risks for family members' especially older ones who are identified as vulnerable to COVID-19, were the most important concerns and worries regarding vaccination acceptance. Similarly, the second reported concern during this study was related to the COVID-19 complications, or the probability of death. Our findings were also in accordance with an earlier study which found that the fear of death is the second important concern.¹⁵

Social characteristics play a key role in the acceptance of vaccinations among the community. In the present study, young age, females, high education level, and no comorbidities were significant factors affecting the vaccination acceptance. This can be explained as our enrolled population included more females, younger, and highly educated respondents, and given Iraq's status as a country with mostly a young population. Furthermore, the young and highly educated respondents are more in contact with the recent technology and consequently have better access to information about the vaccination programs, compared to other participant groups which can figure out community acceptance or refusal of COVID-19 vaccines.³¹ These findings were in alignment with earlier studies which found that young age, female gender, and high education level reported higher vaccination acceptance.^{15,17,21,22,27} However, this is contrary to other studies reporting higher vaccination acceptance among males and older people with chronic disease conditions, such as hypertension.^{14,17,21,32–34}

It is well-known that any medication, including vaccines are without adverse effects. The most common side effect reported by the study participants was fatigue, followed by reactions to the site of injection, fever, myalgia, and an equal proportion for headache and chills. Our findings were consistent with a study by Riad et al.³⁵ and Zhu et al.³⁶ reporting that fatigue, headache, muscle pain, and chills the most common side effects. Moreover, our study revealed that the Pfizer BioNTech vaccine recipients were more prone to side effects in comparison to the other two vaccines. The same prevalence rate of these side effects pointed out by earlier studies.^{36–38} Similarly, there was a statistically significant incidence of these side effects among young age group, females, university educational level, participants without comorbidities and no previous history of COVID-19 infection. These findings were in accordance with a study conducted by Riad et al.³⁵ and Menni et al.³⁹ reporting that young adults, females and history of SARS CoV-2 infection have a significant risk factor for vaccines' adverse effects. Moreover, these groups of population tend to develop more frequent and intense side effects linked with stronger immune responses, increased immunogenicity and reactogenicity than elders and males, respectively.^{39,40}

To the best of our knowledge, this is the first study conducted to assess the rate of acceptance, perceptions, and concerns towards receiving COVID-19 vaccines and to explore the incidence of vaccines' side effects among the Iraqi population in Baghdad province, Iraq. Therefore, the findings of this study can give an in-depth overview of the

development, implications, and awareness of the COVID-19 vaccination program in the Iraqi community, particularly aiming to raise the awareness of those populations that have a lower acceptance rate toward the COVID-19 vaccine. Nevertheless, the present study has some limitations. First, the study enrolled participants living in Baghdad province and is not representative of the whole Iraqi population, which could be linked to a different acceptance rate of the COVID-19 vaccines. Second, the survey was self-reported, and this may have contributed to the inconsistent understanding of questions between participants and a recall bias. Given these limitations into account, further prospective cohort studies with a larger sample size have to be conducted to further give further insights on acceptance, perceptions and concerns toward COVID-19 vaccines.

5. Conclusion

The findings of this study revealed that the Iraqi population showed a considerable acceptance rate for the COVID-19 vaccines as they are considered the most promising and affordable intervention to control the spread of the pandemic. However, vaccine safety is a global challenge and is considered a high priority concern associated with the willingness of the population to vaccinate. There is a notable need and a remarkable responsibility of healthcare providers to design educational campaigns to raise awareness and increase acceptance of COVID-19 vaccines along with providing updated and evidence-based information regarding the importance of these vaccines to achieve herd immunity among the Iraqi community.

Ethics approval

The study was approved by the Research Ethics Committee of College of Pharmacy, University of Al-Mustansiriyah, Baghdad, Iraq (2611.06.09.2021).

Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Informed consent

Written informed consent was obtained from all subjects before the study.

Data availability

All data analysed during the current study are publicly available as noted in the manuscript text.

Declaration of competing interest

There are no conflicts of interest.

Acknowledgment

Not applicable.

References

- Al-Taie A, Denkdemir FR, Sharief Z, Buyuk AS, Şardaş S. The long view on COVID-19 therapeutics and oral antivirals: living with endemic disease and lessons from molnupiravir. *OMICS*. 2022;26(6):324–328.
- Koh D. COVID-19 lockdowns throughout the world. *Occup Med*. 2020;70:322.
- Dey SK, Rahman MM, Siddiqi UR, Howlader A. Analyzing the epidemiological outbreak of COVID-19: a visual exploratory data analysis approach. *J Med Virol*. 2020;92:632–638.
- Rawat K, Kumari P, Saha L. COVID-19 vaccine: a recent update in pipeline vaccines, their design and development strategies. *Eur J Pharmacol*. 2021;892, 173751.

- 5 Norhayati MN, Che Yusof R, Azman YM. Systematic review and meta-analysis of COVID-19 vaccination acceptance. *Front Med.* 2022;8, 783982.
- 6 COVID-19 Advice for the Public: *Getting Vaccinated*; 2022. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines/advice>. Accessed August 7, 2022.
- 7 Wu Harrison EAJW. Vaccine confidence in the time of COVID-19. *Eur J Epidemiol.* 2020;35(4):325e30.
- 8 Feleszko W, Lewulis P, Czarnecki A, Waszkiewicz P. Flattening the curve of COVID-19 vaccine rejection-an international overview. *Vaccines.* 2021;9(1):44.
- 9 Al-Qerem WA, Jarab AS. COVID-19 vaccination acceptance and its associated factors among a middle eastern population. *Front. Publ Health.* 2021;9, 632914.
- 10 Daley MF, Narwaney KJ, Shoup JA, Wagner NM, Glanz JM. Addressing parents' vaccine concerns: a randomized trial of a social media intervention. *Am J Prev Med.* 2018;55:44–54.
- 11 Arede M, Bravo-Araya M, É Bouchard, et al. Combating vaccine hesitancy: teaching the next generation to navigate through the post truth era. *Front Public Health.* 2018; 6:381.
- 12 Syed Alwi SAR, Rafidah E, Zurraini A, Juslina O, Brohi IB, Lukas S. A survey on COVID-19 vaccine acceptance and concern among Malaysians. *BMC Publ Health.* 2021;21:1129.
- 13 Public Health Directorate. Available from: http://www.phd.iq/English/PDFModule_Details.php?ID=13. Accessed January 7, 2022.
- 14 Jones S, Mason N, Palser T, Swift S, Petrilli CM, Horwitz LI. Trends in risk-adjusted 28-day mortality rates for patients hospitalized with COVID-19 in England. *J Hosp Med.* 2021;16(5):290–293.
- 15 El-Elimat T, AbuAlSamen MM, Almomani BA, Al-Sawalha NA, Alali FQ. Acceptance and attitudes toward COVID-19 vaccines: a cross-sectional study from Jordan. *PLoS One.* 2021;16(4), e0250555.
- 16 Paul E, Steptoe A, Fancourt D. Attitudes towards vaccines and intention to vaccinate against COVID-19: implications for public health communications. *Lancet Reg Health Eur.* 2021;1, 100012.
- 17 Hanna P, Issa A, Noujeim Z, Hleyhel M, Saleh N. Assessment of COVID-19 vaccines acceptance in the Lebanese population: a national cross-sectional study. *J Pharm Policy Pract.* 2022;15(1):5.
- 18 Sherman SM, Smith LE, Sim J, et al. COVID-19 vaccination intention in the UK: results from the COVID-19 vaccination acceptability study (CoVAccS), a nationally representative cross-sectional survey. *Hum Vaccines Immunother.* 2021;17(6): 1612–1621.
- 19 Reiter PL, Pennell ML, Katz ML. Acceptability of a COVID-19 vaccine among adults in the United States: how many people would get vaccinated? *Vaccine.* 2020;38(42): 6500–6507.
- 20 Yoda T, Katsuyama H. Willingness to receive COVID-19 vaccination in Japan. *Vaccines.* 2021;9(1):48.
- 21 Al-Mohaithef M, Padhi BK. Determinants of COVID-19 vaccine acceptance in Saudi Arabia: a web-based national survey. *J Multidiscip Healthc.* 2020;13:1657–1663.
- 22 Lazarus JV, Ratzan SC, Palayew A, et al. A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med.* 2020:1–4.
- 23 Jones S, Mason N, Palser T, Swift S, Petrilli CM. Trends in risk-adjusted 28-day mortality rates for patients hospitalized with COVID-19 in England. *J Hosp Med.* 2021;16(5):290–293.
- 24 Harapan H, Wagner AL, Yufika A, Winardi W, Anwar S, et al. Acceptance of a COVID-19 vaccine in Southeast Asia: a cross-sectional study in Indonesia. *Front Public Health.* 2020;8:381.
- 25 Pogue K, Jensen JL, Stancil CK, et al. Influences on attitudes regarding potential COVID-19 vaccination in the United States. *Vaccines.* 2020;8(4).
- 26 MacDonald NE. Vaccine hesitancy: definition, scope and determinants. *Vaccine.* 2015;33(34):4161–4164.
- 27 Alqudeimat Y, Alenezi D, AlHajri B, et al. Acceptance of a COVID-19 vaccine and its related determinants among the general adult population in Kuwait. *Med Princ Pract.* 2021;30(3):262–271.
- 28 Reiter PL, Pennell ML, Katz ML. Acceptability of a COVID-19 vaccine among adults in the United States: how many people would get vaccinated? *Vaccine.* 2020;38(42): 6500–6507.
- 29 Karlsson LC, Soveri A, Lewandowsky S, et al. Fearing the disease or the vaccine: the case of COVID-19. *Pers Individ Differ.* 2021;172, 110590.
- 30 Mertens G, Gerritsen L, Duijndam S, Salemkink E, Engelhard IM. Fear of the coronavirus (COVID-19): predictors in an online study conducted in March 2020. *J Anxiety Disord.* 2020;74, 102258.
- 31 Freed GL, Clark SJ, Butchart AT, Singer DC, Davis MM. Sources and perceived credibility of vaccine-safety information for parents. *Pediatrics.* 2011;127 (Supplement 1):S107.
- 32 Malik AA, McFadden SM, Elharake J, Omer SB. Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine.* 2020;26, 100495.
- 33 Lazarus JV, Ratzan SC, Palayew A, et al. A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med.* 2020:1–4.
- 34 Di Gennaro F, Murri R, Segala FV, et al. Attitudes towards anti-SARSCoV2 vaccination among healthcare workers: results from a national survey in Italy. *Viruses.* 2021;13(3).
- 35 Riad A, Pokorný A, Attia S, Klugarov A, Klugar MKo_s_cikM. Prevalence of COVID-19 vaccine side effects among healthcare workers in the Czech Republic. *J Clin Med.* 2021;10(7):1428.
- 36 Zhu F-C, Li Y-H, Guan X-H, et al. Safety, tolerability, and immunogenicity of a recombinant adenovirus type-5 vectored COVID-19 vaccine: a dose-escalation, open-label, non-randomised, first-in-human trial, 1845e54 *Lancet.* 2020;395, 10240.
- 37 Mathioudakis AG, Ghrew M, Ustianowski A, et al. Self-reported real-world safety and reactivity of COVID-19 vaccines: a vaccine recipient survey. *Life.* 2021;11(3):249.
- 38 Xia S, Duan K, Zhang Y, et al. Effect of an inactivated vaccine against SARS-CoV-2 on safety and immunogenicity outcomes: interim analysis of 2 randomized clinical trials. *JAMA.* 2020;324(10), 951e60.
- 39 Menni C, Klaser K, May A, et al. Vaccine side effects and SARS-CoV-2 infection after vaccination in users of the COVID Symptom Study app in the UK: a prospective observational study. *Lancet Infect Dis.* 2021, 939e49.
- 40 Voysey M, Clemens SAC, Madhi SA, et al. Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK, 99e111 *Lancet.* 2021;397, 10269.