

Acceptance and attitudes towards COVID-19 vaccine among the general public in Iraq

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ABSTRACT

INTRODUCTION: The COVID-19 pandemic has posed major human health risks and jeopardised the world. Universal vaccination is crucial to stop the escalation of the pandemic and to achieve herd immunity. The willingness of the public to be vaccinated is recognised as a key issue in achieving the vaccination coverage required for herd immunity.

OBJECTIVE: This study aimed to explore the acceptability and attitudes towards COVID-19 vaccines among the Iraqi population and to identify the predictors of acceptance or rejection.

METHODS: A web-based, cross-sectional study was conducted by enrolling Iraqi citizens living in Iraq and aged 18 years and above. The questionnaire used in this study included participants' sociodemographic information and questions related to knowledge, attitudes, and perception regarding COVID-19 disease and vaccines.

RESULTS: A total of 1743 responses were received. Nearly two-thirds of the respondents (64.3%) had positive attitudes towards accepting the COVID-19 vaccine. The results showed that gender, age, marital status, educational level, and being infected with COVID-19 are significant factors in accepting the vaccine. About half of the participants (49.4%) reported receiving a COVID-19 vaccine. When they were asked about their reasons for taking the vaccine, 55.3% of them reported that they feared transmitting the virus to their families if they got the disease. The most common reason for refusal and hesitancy to accept COVID-19 vaccination was "fear of the unexpected future effects of the vaccine" (52.1%).

CONCLUSION: Our survey highlighted several factors influencing the participants' level of acceptance. Knowing these factors can direct intervention measures and policy-making efforts to formulate more efficient mass educational campaigns to improve public awareness about the importance of vaccination and hence promote herd immunity and COVID-19 related health outcomes.

Key words: COVID-19, Vaccine, Acceptance, Attitude, Iraq.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a novel coronavirus that was discovered in Wuhan, China, in late 2019.¹ COVID-19 has posed major risks to human health and jeopardised the world as it was declared a global pandemic by the World Health Organization (WHO) on 11 March 2020.²

The pandemic has resulted in a disastrous impact worldwide, having so many consequences on the healthcare system and economy and instilling fear in communities.³ Glob-

ally, as of 14 October 2022, there have been 620,878,405 confirmed cases of COVID-19, including 6,543,138 deaths, reported to WHO.⁴ This prompted the urgent need to initiate preventive measures to contain the pandemic, including partial or complete lockdowns, travel restrictions, contact tracing, use of protective equipment like face masks, and social distancing.³ However, the transmission of the virus is more likely to rebound when these strategies are lifted.⁵

As early as January 2020, the Iraqi health authorities, in coordination with the WHO, have taken a series of preventive measures to deal with the pandemic. In addition to implement-

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ing lockdown procedures and preventing mass gatherings, rapid response teams have been launched nationwide to carry out COVID-19 active surveillance testing, awareness-raising campaigns and the dissemination of COVID-19 infection prevention and control messages and guidelines. However, these measures did not prevent the emergence of the disease in the country. Health officials reported the first confirmed case of COVID-19 on 24 February 2020 in Najaf Governorate.⁶ As of 14 October 2022, there were 2,460,844 confirmed cases in Iraq, with 25,356 related deaths.⁴

The most hopeful strategy to lessen the pandemic burden on population health, concerning both death rates and exhausting healthcare systems, remains within the capacity of medical technology. Such medical technology involves developing effective and safe antiviral agents and vaccines. Given that effective antiviral therapy remains limited, the world pins its hopes on vaccination as the only reliable strategy for preventing COVID-19 and its devastating consequences.⁷

Since the beginning of the pandemic, many research centres and pharmaceutical companies embarked on a race to produce safe and effective vaccines to fight against this global health threat. As a result of these tremendous efforts, more than one hundred fifty vaccines are under development,⁸ with many have been successfully developed and approved for emergency use, such as Oxford-AstraZeneca, Pfizer-BioNTech, and Moderna COVID-19 vaccines.^{9,10}

Nevertheless, the pandemic does not end by just approving vaccines unless there is general acceptance by the public to receive the vaccine.¹¹ Emerging evidence states that vaccines reduce the spread of SARS-CoV-2 and achieve herd immunity.¹² But to achieve herd immunity, we must vaccinate at least 60-80 % of the population.^{7,13} Iraq launched its coronavirus vaccination campaign on 2 March 2021 after receiving the first shipment of the Sino-

pharm vaccines donated by China.¹⁴ The Ministry of Health (MoH) has set a simple mechanism to receive the vaccination by registering through an online application. Additionally, Iraqi citizens and foreigners in Iraq can obtain the vaccine by visiting primary healthcare centres directly. Iraqi health authority approved three COVID-19 vaccines for use in Iraq: Oxford-AstraZeneca, Pfizer-BioNTech, and Sinopharm. As of 22 September 2022, 19,264,920 total vaccine doses were administered in Iraq, with 7,852,141 persons fully vaccinated, representing about 19.5% of the Iraqi population,⁴ a percentage that is still insufficient to contain the pandemic.

The public's willingness to be vaccinated against COVID-19 is recognised as a key issue in determining the success of a vaccination procedure.¹⁵ However, vaccine hesitancy remains a significant challenge in achieving the vaccination coverage required for herd immunity. Vaccine hesitancy refers to a delay in acceptance or refusal of vaccination despite the availability of vaccination services. Understanding vaccine hesitancy and identifying its determinants could assist decision-makers in setting policies to enhance the impact of vaccination strategies.¹⁶ Hence, the present study aimed to measure the attitude of a sample of Iraqi people towards the importance of the vaccine in preventing COVID-19 and its association with some sociodemographic features and attitude and practice about COVID-19. Also, the study identified the participants' source of information about the COVID-19 vaccine and the reasons behind their decision to accept or refuse and hesitate to take the vaccine.

METHODS

Setting and study design: A cross-sectional, web-based survey was conducted from September through October 2021.

Ethical consideration: Respondents were informed that the questionnaire is anonymous,

voluntary, and takes only a few minutes.

Definition of the participants: Iraqi citizens currently living in Iraq and aged 18 years and above were included in the study.

Sampling: We used convenient sampling with the “snowball” technique to quickly recruit a large sample size. The questionnaire was designed using Google Forms. The link to the questionnaire was disseminated through the most popular social media platforms, such as Facebook, Messenger, and WhatsApp, targeting the various provinces of Iraq. In addition, the respondents were requested to share the link as widely as possible with their contacts.

The questionnaire: The authors developed the questionnaire based on recent literature reviews. It included many sections, the first included questions related to the sociodemographic features of the participants. The second was allocated to measure the participants' attitudes about the importance of the COVID-19 vaccine in prevention of COVID-19. The third included questions about attitude, practice and experience with COVID-19. While the fourth included the reasons behind accepting the vaccine for those who received it, and reasons for rejecting or hesitating in getting the vaccine for those who did not receive it. The questionnaire was developed in English and then translated by many experts into Arabic to accommodate the local language. Before the start, a pilot test was performed among a sample of 25 participants from different Iraqi provinces to assess the understandability and appropriateness of the questions. Analysing responses to the pilot test helped in refining the final questionnaire and confirming its validity and reliability. The data obtained from the pilot sample was not used in any further analysis.

Outcomes and procedure: We measured the participants' attitude about the importance of vaccination in preventing COVID-19 using a Likert scale of five: strongly agree, agree, neutral, disagree, or strongly disagree. Then, the participants' attitude were studied to find any

association with:

Sociodemographic factors like age, gender, marital status, educational level, employment status, monthly income, and presence of chronic medical conditions.

Attitude about COVID-19, like rating participants' information on COVID-19, considering COVID-19 pandemic as a major risk for the society in Iraq, and being a major threat to participants' life; experience like caught COVID-19 by the participants themselves, their family members and friends; and practice in followed the precautionary guidelines for COVID-19.

Out of the following, the participants were asked to choose the main source of their information about COVID vaccine: mass media, internet and social media, published scientific articles, health care workers, family members and colleagues, or other specified. He was given the right to choose more than one option. Finally, the participant was asked to report reasons for taking or refusing (hesitating) the COVID -19 vaccine.

Statistical analysis: Data analysis was performed using SPSS software (version 25.0). The chi-square test was used to determine the significance of the association when comparing categorical data. We considered P-value <0.05 to be statistically significant.

RESULTS

A total of 1743 responses were received. The mean age of the study participants was 38.7 ± 8.6 years, ranging from 18 to 83 years. Around a quarter of all participants (24%) were 41-50 years old. Most participants were male, 1011 (58.1%). Almost half of the participants, 834 (47.8%), had under-graduation certificates. For other demo-social features see [Table 1](#).

Among study participants, 636 (36.5%) had been infected with COVID-19 confirmed by polymerase chain reaction (PCR) test. In addition, 936 (53.7%) reported having a family member or friends infected with COVID-19

Table 1 | Sociodemographic characteristics of study participants.
Total number of the participants = 1743

Variable		N (%)
Gender	Male	1011 (58.1)
	Female	732 (41.9)
Age in years	18–30	343 (19.7)
	31–40	388 (22.3)
	41–50	418 (24.0)
	51–60	366 (20.9)
	>60	228 (13.1)
Marital status	Married	1408 (80.8)
	Unmarried	335 (19.2)
Educational level	Primary	107 (6.1)
	Secondary	304 (17.5)
	Undergraduate	834 (47.8)
	Postgraduate	498 (28.6)
Employment	Employed	1556 (89.3)
	Unemployed	187 (10.7)
Monthly income Iraqi dinars	<500.000	173 (9.9)
	500.000-999.000	578 (33.2)
	1000.000-1999.000	673 (38.7)
	≥2000.000	318 (18.2)
Chronic medical condition	Yes	481 (27.6)
	No	1262 (72.4)

confirmed by PCR test. Among them, 89 (5.1%) had lost a family member or friend due to COVID-19.

The majority of the sample (1530, 87.8%) thought that the COVID-19 pandemic holds a major risk to the society in Iraq, and 1398 (80.2%) thought that the disease threatens their lives. More than half (54.6%) reported high adherence to the COVID-19 precautionary guidelines like keeping physical distancing, wearing face masks, frequent hand washing, and using sanitisers. In response to the question 'Do you trust the local governmental policies to control COVID-19 disease', only 307 (17.6%) participants chose "No, I don't trust at all" while (293, 16.8%), (578, 33.2%), and (565, 32.4%) reported "Yes, I trust a lot", "Yes, I trust somewhat", and "Yes, I trust a little", respectively. When the study participants were asked to rate their knowledge of COVID-19 disease and vaccines, 667 (38.3%) respondents report-

Table 2 | Association between sociodemographic characteristics of study participants and their opinion on the importance of vaccination in controlling COVID-19.

Variable	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total	P-value
Gender							
Male	412 (40.7%)	276 (27.3%)	113 (11.2%)	121 (12.0%)	89 (8.8%)	1011 (58.1%)	< .001
Female	276 (37.7%)	156 (21.3%)	169 (23.1%)	49 (6.7%)	82 (11.2%)	732 (41.9%)	
Age (years)							
18–30	119 (34.7%)	71 (20.7%)	51 (14.8%)	59 (17.3%)	43 (12.5%)	343 (19.7%)	< .001
31–40	187 (48.2%)	133 (34.3%)	48 (12.4%)	11 (2.8%)	9 (2.3%)	388 (22.3%)	
41–50	201 (48.1%)	135 (32.3%)	57 (13.6%)	14 (3.4%)	11 (2.6%)	418 (24.0%)	
51–60	117 (32.0%)	73 (19.9%)	67 (18.3%)	50 (13.8%)	59 (16.1%)	366 (20.9%)	
>60	64 (28.1%)	20 (8.8%)	59 (25.9%)	36 (15.7%)	49 (21.5%)	228 (13.1%)	
Marital status							
Married	629 (44.7%)	417 (29.6%)	189 (13.4%)	88 (6.2%)	85 (6.1%)	1408 (80.8%)	< .001
Unmarried	59 (17.6%)	15 (4.5%)	93 (27.8%)	82 (24.4%)	86 (25.7%)	335 (19.2%)	
Educational level							
Primary	16 (15.0%)	5 (4.7%)	23 (21.5%)	28 (26.1%)	35 (32.7%)	107 (6.1%)	< .001
Secondary	49 (16.1%)	21 (6.9%)	58 (19.1%)	82 (27.0%)	94 (30.9%)	304 (17.5%)	
Undergraduate	393 (47.1%)	246 (29.5%)	130 (15.6%)	36 (4.3%)	29 (3.5%)	834 (47.8%)	
Postgraduate	230 (46.2%)	160 (32.1%)	71 (14.3%)	24 (4.8%)	13 (2.6%)	498 (28.6%)	
Employment							
Employed	677 (43.5%)	423 (27.2%)	272 (17.5%)	99 (6.3%)	85 (5.5%)	1556 (89.3%)	< .001
Unemployed	11 (5.9%)	9 (4.8%)	10 (5.3%)	71 (38.0%)	86 (46.0%)	187 (10.7%)	
Monthly income (ID)							
<500.000	63 (36.4%)	45 (26.0%)	24 (13.9%)	15 (8.7%)	26 (15.0%)	173 (9.9%)	0.279
500.000-999.000	231 (40.0%)	135 (23.4%)	95 (16.4%)	52 (9.0%)	65 (11.2%)	578 (33.2%)	
1000.000-1999.000	277 (41.2%)	163 (24.2%)	111 (16.5%)	68 (10.1%)	54 (8.0%)	673 (38.6%)	
≥2000.000	117 (36.6%)	89 (27.9%)	52 (16.3%)	35 (11.0%)	26 (8.2%)	319 (18.3%)	
Chronic medical condition							
Yes	201 (41.8%)	120 (24.9%)	77 (16.0%)	44 (9.2%)	39 (8.1%)	481 (27.6%)	0.536
No	487 (38.6%)	312 (24.7%)	205 (16.2%)	126 (10.0%)	132 (10.5%)	1262 (72.4%)	
Total	688 (39.5%)	432 (24.8%)	282 (16.2%)	170 (9.7%)	171 (9.8%)	1743 (100%)	

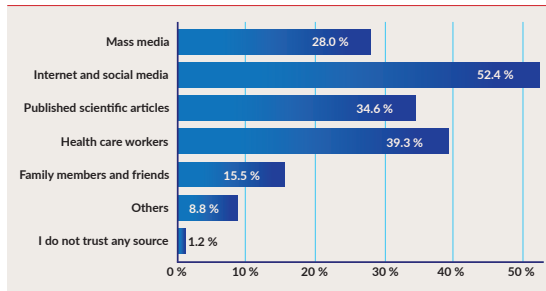


Figure 1 | The sources of information about the COVID-19 vaccination.

ed having very good information; 969 (55.6%) reported having enough information, and 107 (6.1%) reported having little or poor information.

More than half of the participants (52.4%) trusted the internet and social media as sources of information about COVID-19 vaccines. For other sources see **Figure 1**.

The master question to assess the participant's attitude towards vaccine acceptance was: 'Do you agree that COVID-19 vaccines are important to control the pandemic?' Inter-

estingly, nearly two-thirds of the participants (64.3%) agreed or strongly agreed, while about one-fifth of participants (19.5%) disagreed or strongly disagreed with this view, and the remaining 16.2% of participants were neutral (hesitant).

Results from a univariate chi-square test found that gender, age, marital status, educational level, and employment are significant factors for accepting the view that vaccination is important in controlling the COVID-19 pandemic. Additionally, being infected with Covid-19, having a family member or friend who was infected with COVID-19, following the COVID-19 precautionary guidelines, and perception of the seriousness and consequences of the COVID-19 on society or one's life were significant factors for accepting this view (**Table 2 and 3**).

About half of the participants (861, 49.4%) reported having received a COVID-19 vaccine. Among them, more than half (54.6%) get the

Table 3 | Factors associated with the accepting the view that vaccination is important in controlling COVID-19.

Variable	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total	P-value
• Have you caught the Covid-19?							
Never infected	393 (35.5%)	241 (21.8%)	209 (18.8%)	128 (11.6%)	136 (12.3%)	1107 (63.5%)	< .001
Yes, without symptoms	36 (40.0%)	22 (24.4%)	16 (17.8%)	9 (10.0%)	7 (7.8%)	90 (5.2%)	
Yes, mild symptoms	161 (44.6%)	101 (28.0%)	46 (12.7%)	28 (7.8%)	25 (6.9%)	361 (20.7%)	
Yes, moderate/severe symptoms	90 (52.3%)	63 (36.6%)	11 (6.5%)	5 (2.9%)	3 (1.7%)	172 (9.9%)	
Yes, critical symptoms	8 (61.5%)	5 (38.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	13 (0.7%)	
• Did one of your family members or friends get COVID-19?							
Never infected	286 (35.4%)	173 (21.4%)	154 (19.2%)	93 (11.5%)	101 (12.5%)	807 (46.3%)	< .001
Yes, mild-severe symptoms	285 (40.1%)	188 (26.4%)	107 (15.0%)	68 (9.6%)	63 (8.9%)	711 (40.8%)	
Yes, critical symptoms	67 (49.3%)	43 (31.6%)	15 (11.0%)	6 (4.4%)	5 (3.7%)	136 (7.8%)	
Yes, died due to COVID-19	50 (56.2%)	28 (31.5%)	6 (6.7%)	3 (3.4%)	2 (2.2%)	89 (5.1%)	
• How would you rate your information of COVID-19?							
Very good information	263 (39.4%)	162 (24.3%)	109 (16.4%)	62 (9.3%)	71 (10.6%)	667 (38.3%)	0.807
Enough information	388 (40.0%)	236 (24.4%)	157 (16.2%)	99 (10.2%)	89 (9.2%)	969 (55.6%)	
Little or poor information	37 (34.6%)	34 (31.8%)	16 (15.0%)	9 (8.3%)	11 (10.3%)	107 (6.1%)	
• Have you followed the precautionary guidelines for COVID-19?							
Very much following	391 (41.1%)	251 (26.4%)	144 (15.2%)	86 (9.0%)	79 (8.3%)	951 (54.6%)	< .001
Following less	283 (39.0%)	177 (24.4%)	134 (18.5%)	65 (9.0%)	66 (9.1%)	725 (41.6%)	
No	14 (20.9%)	4 (6.0%)	4 (5.9%)	19 (28.4%)	26 (38.8%)	67 (3.8%)	
• Do you think COVID-19 pandemic holds a major risk toward the society in Iraq?							
Yes	631 (41.2%)	390 (25.5%)	266 (17.4%)	127 (8.3%)	116 (7.6%)	1530 (87.8%)	< .001
No	37 (41.6%)	26 (29.2%)	13 (14.6%)	8 (9.0%)	5 (5.6%)	89 (5.1%)	
Unsure	20 (16.1%)	16 (12.9%)	3 (2.5%)	35 (28.2%)	50 (40.3%)	124 (7.1%)	
• Do you think COVID-19 is a threat to your life?							
Yes	572 (40.9%)	370 (26.5%)	229 (16.4%)	118 (8.4%)	109 (7.8%)	1398 (80.2%)	< .001
No	31 (29.2%)	17 (16.1%)	19 (17.9%)	21 (19.8%)	18 (17.0%)	106 (6.1%)	
Unsure	85 (35.6%)	45 (18.8%)	34 (14.2%)	31 (13.0%)	44 (18.4%)	239 (13.7%)	
Total	688 (39.5%)	432 (24.8%)	282 (16.2%)	170 (9.7%)	171 (9.8%)	1743 (100%)	

Table 4 | Distribution of vaccinated participants according to type of vaccine and vaccine doses.

Variable	One dose	Two doses	Total
Pfizer	124 (60.2%)	346 (52.8%)	470 (54.6%)
Sinopharm	53 (25.7%)	208 (31.8%)	261 (30.3%)
AstraZeneca	29 (14.1%)	101 (15.4%)	130 (15.1%)
Total	206 (23.9%)	655 (76.1%)	861 (100%)

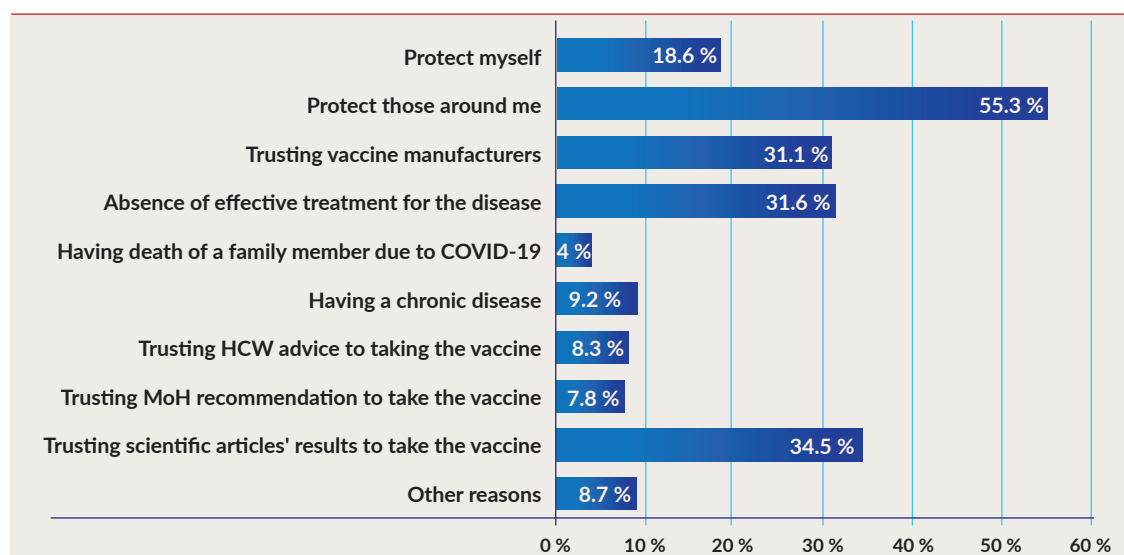
American vaccine from Pfizer-BioNTech, and the remaining 30.3% and 15.1% get the Chinese vaccine from Sinopharm and the European vaccine from Oxford-AstraZeneca, respectively see **Table 4**. The vaccinated participants' main reasons for taking the vaccine was "fear of transmitting the virus to their families if they got the disease" (52.1%). The other reasons for taking the COVID-19 vaccine are shown in **Figure 2**. Most vaccinated participants (93%) were willing to encourage others to receive the vaccine, whereas only 1.4% were not willing, and the remaining 5.2% were unsure of their response.

About two-thirds (63.1%) of the 882 participants who were not vaccinated expressed their willingness to get the vaccine, 13.2% refused, and 23.7% were unsure or hesitant. The most common reason for refusal and hesitancy to accept COVID-19 vaccination was "fear of the unexpected future effects of the vaccine" (52.1%). The other barriers to COVID-19 vaccination are shown in **Figure 3**.

DISCUSSION

When COVID-19 spread around the world, it became evident to researchers and health professionals that the only tool to combat this disease is by building herd immunity. As it is a highly infectious disease, a large percentage of people will need to be immune to COVID-19 to establish herd immunity.^{7,13} There has been a global effort to produce an effective vaccine for combatting COVID-19.⁸ Vaccination could be an effective strategy for slowing the spread of the current pandemic. We need to vaccinate a large part of the population to reach herd immunity; otherwise, the fight for control of the disease and its devastating consequences may not be successful.¹²

This study was conducted during the third wave of the COVID-19 pandemic in Iraq and after the vaccine was made available there. To the best of our knowledge, it is the first kind of study done in Iraq to assess the attitude of the public toward the novel COVID-19 vaccine after the introduction of the vaccine. The study findings would provide useful insight for policy-makers in designing vaccination programs against COVID-19 and develop effective strategies to increase public awareness about the importance of vaccination.


Figure 2 | Reasons for taking COVID-19 vaccine.

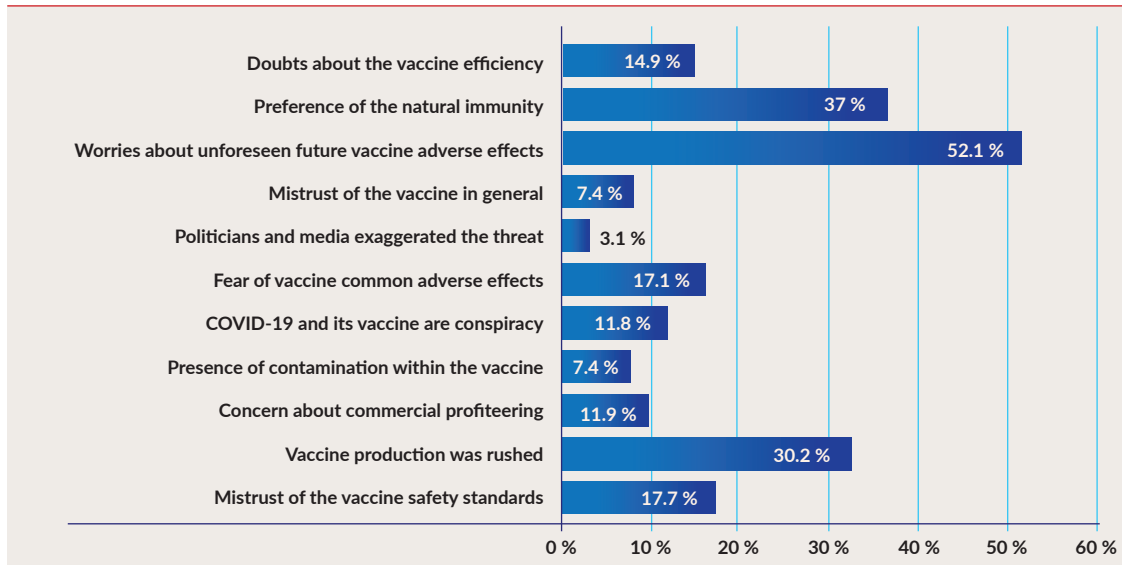


Figure 3 | Reasons for COVID-19 vaccine refusal and hesitation.

This study explored the attitudes, acceptance, and hesitancy associated with a COVID-19 vaccine among the Iraqi population. Generally, studies on COVID-19 vaccine attitude have reported various rates of acceptance to take the vaccine across different countries and at different time points. Data from a single country could report variable results depending on the time when the study was conducted. These factors should be taken into account when translating these research data into specific policy-making interventions.¹⁷

In the current study, most participants had a positive attitude towards the vaccines. Almost two-thirds (64.3%) of the respondents believed that vaccination effectively controls the pandemic. The level of acceptance of a COVID-19 vaccine among our study participants was lower than that reported from the United States (71%), Canada (79%), Australia (73%), Germany (68%), Italy (80%), Spain (80%), China (85%), South Korea (78%), Brazil (88%), and Mexico (85%).^{18,19} However, the acceptance level estimated in this survey was consistent with that reported in France (62%)¹¹ and higher than what is reported in Russia (42%).²⁰ At the regional level, the acceptance level reported in our study was higher than that reported among a sample of Kuwaiti subjects (53.1%)²¹

and too close to that reported from Saudi Arabia (64.7%).²²

The acceptability level of our study (64.3%) is considerably low, given the magnitude of the COVID-19 pandemic. Recent estimates suggested a threshold for COVID-19 herd immunity to be more than 85% as the highly infectious Delta variant has now become almost the dominant COVID-19 strain worldwide.²³ In line with our findings, a recent systematic review showed that the Middle East has the lowest COVID-19 vaccine acceptance rates. The review related the negative attitudes towards vaccination to the widespread embrace of conspiratorial beliefs by the region's people [24].

Previously conducted surveys have proven good knowledge to be a significant predictor of correct practices in infection prevention and control.^{25,26} In our study, nearly a third of the participants (38.3%) reported having very good information about COVID-19, and more than half (55.6%) reported having enough information. However, our data could not reveal a significant role of knowledge in influencing respondents' attitudes toward vaccination. This might be explained as the respondents may have overestimated their information about the disease and vaccine.

Our data showed that 52.4% of the respondents considered social media networks as a reliable source of information for COVID-19. Healthcare workers appeared to be a trusted source of information to 39.3% of them. Several studies examined the role of the social network in shaping public attitudes toward COVID-19 vaccines.²⁷⁻³⁰ Myths and conspiracy theories about vaccines can be propagated across social media. Hence, health authorities, healthcare professionals, and media platforms can collaborate to improve public knowledge and trust in the effectiveness and safety of vaccines.

Our study highlighted several sociodemographic factors significantly associated with respondents' attitude level toward COVID-19 vaccine acceptance. Such factors included gender, age, marital status, educational level, and employment. The study showed that males were significantly more likely than females to accept COVID-19 vaccination, consistent with prior studies.^{31,32} This finding might indicate that the male population may be less affected by conspiracy theories than females.

Regarding the age factor, acceptance of the COVID-19 vaccine was highest among individuals aged 31-50 years (about 80%) and lowest among those above 60 years (36.9%). These observations are consistent with a study conducted in the United States.³³ However, other studies have shown that acceptability increases with age.^{32,34} These conflicting observations might be related to regional differences in public perceptions and beliefs about COVID-19 vaccination, which differ across age groups. Hence, local public health strategies should aim to enhance attitudes towards the COVID-19 vaccine among older people, who are at a higher risk of severe COVID-19 consequences.³⁵

Our study found that positive attitudes toward the vaccine are more prevalent among individuals with a higher education degree. The possible explanation for this might be as those people are more exposed to educational

campaigns and scientific discussions related to vaccine safety and effectiveness due to their higher literacy skills. Our data also highlight higher acceptance rates among married individuals (74.3%) compared to the unmarried group (22.1%). Fear of contracting the infection and its consequences and leaving family members behind may explain this positive attitude towards the vaccines among married respondents.

The current study found no significant association between comorbidity and COVID-19 vaccine acceptance. However, people with chronic diseases are more vulnerable to severe COVID-19-related consequences.³⁵ These data suggest that awareness campaigns need to be targeted towards them to change their mindsets about the impact of COVID-19 infection and vaccination on their health status.

As shown in our analysis, themes contributing to positive attitudes toward the COVID-19 vaccine included being infected with Covid-19, having a family member or friend who was infected with COVID-19, following the COVID-19 precautionary guidelines, and having a perception of the seriousness and consequences of the COVID-19 on one's life or society as a whole. Therefore, to increase the uptake of the vaccine, all these concerns, in addition to reasons for taking the vaccine mentioned in **Figure 2**, should be addressed by public health strategies. In addition, this study revealed that 17.6% of respondents do not trust the government's response to the pandemic, compared to 82.4% who trust the government's efforts to vary degrees. This is a crucial factor since several studies report that populations with higher trust in the national healthcare systems are more likely to accept health services, including vaccinations.^{36,37}

The COVID-19 pandemic entails three important challenges that may impede people's confidence in the vaccine. First, the vaccine is new and produced quickly; thus, the level of hesitancy will be high. Second, the people's

trust in the vaccine will take time, and finally, the challenge against the misinformation by anti-vaccinationists.³⁸ The negative sentiments toward the COVID-19 vaccine started surfacing in social media and then in the news media platforms from the initial days of the vaccine development. These sentiments misled people with conspiracy beliefs and misinformation.

The current study demonstrated that the main barriers that contributed to refusal and hesitancy toward the COVID-19 vaccine were concerns about unforeseen future effects of the vaccine (52.1%), preference for natural immunity (37%), the fast pace of vaccine development (30.2%), the fear of the safety and side effects of the vaccine (about 17%). Meanwhile, our survey observed that only 15.1% of vaccinated respondents chose the Oxford-AstraZeneca vaccine, which had the lowest vaccination rate compared to Pfizer-BioNTech (54.6%) and Sinopharm (30.3%). This could be due to the intensive media coverage of the rare thromboembolic adverse events associated with this vaccine candidate in the first quarter of this year, which may exacerbate concerns about the vaccine's safety and affect hesitancy levels.³⁹

Limitation: A key limitation of the current study is an online survey. People with limited access to social media networks, such as the elderly, illiterate, and people from lower socioeconomic classes, may not have been able to participate in this survey. This could lead to an underrepresentation of these groups, which might hamper the generalizability of our results despite the large sample size. Thus, future studies using better approaches to accommodate these categories may be required.

CONCLUSION

The current study demonstrated that about two-thirds of participants had a positive attitude towards COVID-19 vaccination acceptance. Such a percentage needs to be increased to

contain the ongoing pandemic. Additionally, our survey indicated several factors influencing the participants' level of acceptance, like gender, age, level of education, and marital status. In addition, the experience of having COVID-19, the participant or a member of his family or friend influenced the participant's level of acceptance.

Our results are crucial to gain insight into the common factors that influence an individual's vaccination decisions to help policy-makers to develop effective strategies to assure the public, improve trust in health authorities, curb the spread of misinformation about the vaccine, and clarify the role of vaccination in acquiring herd immunity and preventing disease transmission.

REFERENCES

1. Zhu H, Wei L, Niu P. The novel coronavirus outbreak in Wuhan, China. *Glob. Health Res. Policy* 2020;5:1-3.
2. Yang J, Chen X, Deng X, Chen Z, Gong H, Yan H, et al. Disease burden and clinical severity of the first pandemic wave of COVID-19 in Wuhan, China. *Nat Commun*. 2020; 11(1): 5411.
3. Nicola M, Alsaifi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, et al. The socioeconomic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*. 2020;78:185-193.
4. WHO coronavirus (COVID-19) dashboard. 2021. <https://covid19.who.int/>. Accessed: 14 October, 2022.
5. Ferguson NM, Laydon D, Nedjati-Gilani G, Imai N, Ainslie K, Baguelin M, Ghani AC. Impact of Non-Pharmaceutical Interventions (Npis) to Reduced Covid-19 Mortality and Healthcare Demand; Imperial College London: London, UK, 2020.
6. Early COVID-19 preparation saved lives in Iraq. WHO EMRO. 2021. Available from <http://www.emro.who.int/iraq/news/early-covid-19-preparation-saved-lives-in-iraq.html>. Accessed 13 October, 2021.
7. Frederiksen LSF, Zhang Y, Foged C. Frederiksen LS, Zhang Y, Foged C, Thakur A. The long road toward COVID-19 herd immunity: vaccine platform technologies and mass immunization strategies. *Frontiers in immunology*. 2020 Jul 21;11:1817.
8. Kaur SP, Gupta V. COVID-19 vaccine: A comprehensive status report. *Virus Res* 2020; 288: 198114.
9. U.S. Food and Drug Administration. COVID-19 Vaccines. 2021. Available from: <https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/covid-19-vaccines>. Accessed February 14, 2021.
10. AstraZeneca. AstraZeneca's COVID-19 vaccine authorised for emergency supply in the UK. 2021. Available from: <https://www.astrazeneca.com/media-centre/press-releases/2020/astrazeneca-covid-19-vaccine-authorised-in-uk.html>. Accessed 14 February, 2021.
11. Neumann-Bohme S, Varghese NE, Sabat I, Barros PP, Brouwer W, van Exel J, et al. Once we have it, will we use it? A Euro-

- pean survey on willingness to be vaccinated against covid-19. *Eur J Health Econ*. 2020 Sep; 21(7): 977-982.
12. Dagan N, Barda N, Kepten E, Miron O, Perchik S, Katz MA, et al. BNT162b2 mRNA Covid-19 Vaccine in a Nationwide Mass Vaccination Setting. *N Engl J Med*. 2021 Apr 15;384(15):1412-1423. doi: 10.1056/NEJMoa2101765.
 13. Kim JH, Marks F, and Clemens JD. Looking beyond COVID-19 vaccine phase 3 trials. *Nat. Med*. 2021;27:205-211.
 14. Iraq receives first Covid vaccines, gift from China. FRANCE 24. 2021. Available from: <https://www.france24.com/en/live-news/20210302-iraq-receives-first-covid-vaccines-gift-from-china>. Accessed 13 October, 2021.
 15. Lin Y, Hu Z, Zhao Q, Alias H, Danaee M. Understanding COVID-19 vaccine demand and hesitancy: A nationwide online survey in China. *PLoS Negl Trop Dis*. 2020; 14: e0008961.
 16. Eskola J, Duclos P, Schuster M, MacDonald NE. How to deal with vaccine hesitancy? *Vaccine* 2015;33:4215-4217.
 17. Cascini F, Pantovic A, Al-Ajlouni Y, Failla G, & Ricciardi W. Attitudes, acceptance and hesitancy among the general population worldwide to receive the COVID-19 vaccines and their contributing factors: A systematic review. *E Clinical Medicine*, 2021;40:101113.
 18. Adebisi YA, Alaran AJ, Bolarinwa OA, Akande-Sholabi W, Lucero-Priso DE. When it is available, will we take it? Social media users' perception of hypothetical COVID-19 vaccine in Nigeria. *Pan Afr Med J*. 2021 Mar 2;38:230.
 19. Lin C, Tu P, Beitsch LM. Confidence and receptivity for COVID-19 vaccines: a rapid systematic review. *Vaccines* (Basel) 2021;9:16.
 20. Global Attitudes: COVID-19 Vaccines. Ipsos MORI. 2021. <https://www.ipsos.com/ipsos-mori/en-uk/globalattitudes-to-covid-19-vaccines-wef>. Accessed 10 February, 2021. *unapproachable?*
 21. Alqudeimat Y, Alenezi D, AlHajri B, Alfouzan H, Almkhazzeem Z, Altamimi S, Almansouri W, Alzalalah S, Ziyab AH. 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.
 22. Al-Mohaithef M, Padhi BK. Determinants of COVID-19 Vaccine Acceptance in Saudi Arabia: A Web-Based National Survey. *J Multidiscip Healthc*. 2020 Nov 20;13:1657-1663.
 23. del Rio C, Malani PN, Omer SB. Confronting the Delta Variant of SARS-CoV-2, Summer 2021. *JAMA*. 2021; 326(11):1001-1002.
 24. Sallam, M. COVID-19 Vaccine Hesitancy Worldwide: A Concise Systematic Review of Vaccine Acceptance Rates. *Vaccines* 2021;9:160.
 25. Chen S, Qiu Z, Xu L, Chen J, Lin Y, Yang Y, et al. People groups' responses to SARS in the community. *Chin Rural Health Serv Adm*. 2003;23:15-8.
 26. Pawlowski B, Atwal R, Dunbar RI. Sex differences in everyday risk-taking behavior in humans. *Evol Psychol*. 2008;6(1): 147470490800600104.
 27. Chen M, Li Y, Chen J, Wen Z, Feng F, Zou H, Fu C, Chen L, Shu Y, Sun C. An online survey of the attitude and willingness of Chinese adults to receive COVID-19 vaccination. *Hum Vaccines Immunother*. 2021;17(7):2279-2288.
 28. Lazarus, J.V.; Ratzan, S.C.; Palayew, A.; Gostin, L.O.; Larson, H.J.; Rabin, K.; Kimball, S.; El-Mohandes, A. A global survey of potential acceptance of a COVID-19 vaccine. *Nat. Med*. 2021;27:225-228.
 29. Seale H, Heywood AE, Leask J, Sheel M, Durrheim DN, Bolsewicz K, Kaur R. Examining Australian public perceptions and behaviors towards a future COVID-19 vaccine. *BMC Infect Dis*. 2021;21:1-9.
 30. Popa GL, Muntean A-A, Muntean M-M, Popa MI. Knowledge and Attitudes on Vaccination in Southern Romanians: A Cross-Sectional Questionnaire. *Vaccines* 2020;8:774.
 31. Wong LP, Alias H, Wong PF, Lee HY, AbuBakar S. The use of the health belief model to assess predictors of intent to receive the covid-19 vaccine and willingness to pay. *Hum Vaccin Immunother*. 2020 30 July; 16(9):2204-2214.
 32. Malik AA, McFadden SM, Elharake J, Omer SB. Determinants of covid-19 vaccine acceptance in the US. *EClinicalMedicine*. 2020 12 August;26:100495.
 33. 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.
 34. Fisher KA, Bloomstone SJ, Walder J, Crawford S, Fouayzi H, Mazor KM. Attitudes toward a potential sars-cov-2 vaccine: a survey of U.S. adults. *Ann Intern Med*. 2020 15 December; 173(12): 964-973.
 35. Bonanad C, García-Blas S, Tarazona-Santabalbina F, Sanchis J, Bertomeu-González V, Fácila L, et al. The effect of age on mortality in patients with covid-19: a meta-analysis with 611,583 subjects. *J Am Med Dir Assoc*. 2020;21(7):915-918.
 36. Quinn SC, Jamison AM, An J, Hancock GR, Freimuth VS: Measuring vaccine hesitancy, confidence, trust and flu vaccine uptake: results of a national survey of White and African American adults. *Vaccine*. 2019;37: 1168-1173.
 37. Musa D, Schulz R, Harris R, Silverman M, Thomas SB: Trust in the health care system and the use of preventive health services by older black and white adults. *Am J Public Health*. 2009;99:1293-1299.
 38. Alduwayghiri EM, Khan N. Acceptance and Attitude toward COVID-19 Vaccination among the Public in Saudi Arabia: A Cross-sectional Study. *J Contemp Dent Pract*. 2021;22(7):730-734.
 39. Sønderkov KM, Dinesen PT, Østergaard SD. Sustained COVID-19 vaccine willingness after safety concerns over the Oxford-AstraZeneca vaccine. *Dan Med J* 2021;68(5): A03210292 PMID: 33870886.

Abbreviations list: Coronavirus disease 2019 (COVID-19), Iraqi Dinar (ID), Ministry of Health (MoH), polymerase chain reaction (PCR), Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), Statistical Packages for Social Sciences-version 25 (SPSS-25), World Health Organization (WHO).

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