

RESEARCH ARTICLE

Prevalence and correlates of COVID-19 vaccine hesitancy in the general public in Iraqi Kurdistan: A cross-sectional study

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Abstract

Low vaccine acceptance is a major barrier to vaccination coverage in every health system. This study aimed to explore the prevalence and associated factors of the COVID-19 vaccine hesitancy in a sample of the general population in Iraqi Kurdistan. The general population with both genders with different educational levels and sociodemographic characteristics from the Duhok governorate was eligible to participate in this cross-sectional study in 2021. Therefore, an online Google form was sent to main pages and social groups through two main social media platforms. To obtain a representative sample of individuals with different educational levels, the author visited the main shopping center in Duhok city to collect the information from illiterate and low-level education individuals. The study found that 83.5% ($n = 773$) of the participants have not received and 51.4% ($n = 476$) did not intend to receive the COVID-19 vaccine. A small percentage has not decided to receive a COVID-19 vaccine yet ($n = 17$, 1.8%). The intention to receive a COVID-19 vaccine was increased with increasing level of education; 25.9%, 26.7%, 39.8%, and 53.6% in illiterate, under high school, high school, and college and higher, respectively ($p < 0.0001$). Healthcare workers were more likely to intend to receive a COVID-19, 57.5% vs 40.1%, $p < 0.0001$. Individuals who had concerns about the side effects of a COVID-19 vaccine were more likely to not receive and not intend to receive the COVID-19 vaccine. Prevalence of COVID-19 vaccine hesitancy was high in this region and was correlated with lower education and concerns about side effects.

KEYWORDS

acceptance rate, COVID-19, vaccine hesitancy

1 | INTRODUCTION

The world is undertaking the COVID-19 vaccination drive to overcome the current crisis that occurred due to the COVID-19 pandemic.¹ By June 23, 2021, it has been estimated that 22.0% of the world population would have received at least one dose of a COVID-19 vaccine. It is projected that 2.7 billion doses have been administered and each day 40.0 million doses have been administered worldwide. In terms of the COVID-19 vaccine coverage in low-income countries, only 0.9% of the general population have received at least one dose.²

Vaccination is considered to be a highly effective strategy in reducing severe illness and mortality from COVID-19 disease. The COVID-19 vaccines are also considered to be safe and have low risks of severe adverse events.³⁻⁵ Low uptake of vaccines is determined to be a major threat to the impact of vaccination in the prevention of disease and mortality from the COVID-19. It seems that populations across the world have concerns about the safety of the COVID-19 vaccines and the potential side effects.⁶⁻⁸

The number of patients with COVID-19 is increasing in Iraqi Kurdistan. According to a recent report, between November 2020

and February 2021 a total of 7669 persons were infected by the COVID-19 and 510 of them died (1.09%) in the Duhok governorate.⁹ By 25 July 2021, 1,552,648 and 123, 332 had confirmed and active COVID-19 disease across Iraq.¹⁰ The current condition in Iraqi Kurdistan calls for the urgency in vaccinating and examining the contributing factors to vaccine hesitancy.

In 2012, the Strategic Advisory Group of Experts (SAGE) of the World Health Organization created the definition of vaccine hesitancy as delay in acceptance or refusal of vaccination despite the availability of vaccination services. Vaccine hesitancy is considered to be a complex and context-specific issue and it differs based on the time, place, and types of vaccines. Certain factors affect the rate of vaccine acceptance such as convenience, complacency, and confidence".¹¹

Immunization is considered to be one of the most important actions that protect children from serious illnesses. The vaccine saves the lives of millions every year worldwide. The low acceptance of specific vaccines or vaccination programs in the general public has become a major issue to the vaccination coverage in high-income,^{12,13} and low and middle-income countries.¹⁴ Several factors are associated with low vaccine acceptance, such as cultural and environmental factors. The definite reasons for low vaccine acceptance are often not completely known to health policymakers. Vaccine hesitancy is a complex issue and is different according to time, location, and types of vaccines. In addition, it is affected by issues like complacency, convenience, confidence, and sociodemographic contexts.¹⁵

The vaccination for COVID-19 in Iraq started on May 10, 2021. By July 5, 2021, 0.97% and 1.74% of Iraqi populations have received all doses and the first dose of the vaccination against the COVID-19, respectively. We need to find out the complex factors that influence vaccination decisions in general populations. In addition, the determinants of vaccine hesitancy must be examined in a specific population to improve vaccine coverage. There is no official study on the prevalence of COVID-19 vaccine hesitancy in Iraqi Kurdistan. In this regard, the author aimed to explore the prevalence and its associated factors of the COVID-19 vaccine hesitancy in a sample of the Kurdish population in the Duhok governorate in Iraqi Kurdistan.

2 | MATERIALS AND METHODS

2.1 | Design and population

Individuals from various geographical areas of the Duhok governorate were invited both through an online technique and personally to participate in this cross-sectional study. In this regard, the general population of different genders, educational levels, and other sociodemographic characteristics from the Duhok governorate in Iraqi Kurdistan were invited between April 14 and

May 21, 2021. To reach the target population, the individuals were invited from different areas and settings by sending an online Google form to two main social media networks in this region, including Viber and Facebook.

To obtain the representative sample of the target population, an online form was sent to the main pages and social groups. The social media groups consisted of employees, nurses, policymakers, and entertainment, news, media groups, job opportunity, university, industry, and music professionals. Most of the individuals who use social media are those with some degree of literacy. The individuals with low levels of education and illiterate individuals were sought in a face-to-face technique. In this regard, the author visited the main shopping areas of Duhok city for four days to include the illiterate and low education level individual. Therefore, the main shopping areas were divided into four parts. The individuals who visited the shopping centers and the vendors were invited personally to answer the questions. In a face-to-face technique, the author used the researcher-administered technique to collect information.

2.2 | Data collection setting

The officially recognized governorates inside Iraqi Kurdistan are Erbil, Sulaymaniyah, Halabja, and Duhok¹⁶ (see Figure 1). The target populations of this study live in the Duhok governorate. It has the following seven districts: Zakho, Semel, Amedi, Shekhan, Duhok, Akre, and Bardarash. The members of the above-mentioned groups were from different districts of the Duhok governorate.

2.3 | Settings of COVID-19 vaccinations

The KRG has provided the following vaccination settings for the COVID-19 vaccine in different districts of the Duhok governorate. The settings have been distributed sufficiently between rural and urban areas. The vaccination settings in the Duhok district are Azadi Teaching Hospital, Khabat Primary Health Center (PHC), Bahdinan PHC, Mohammed Salih Buti PHC, Nizarke PHC, Qazi Mohammed PHC, Shahidan center for family medicine, Zawita PHC, Bagera PHC, and Duhok PHC. The vaccination settings in Zakho district are Khabur PHC, Saeed Piran PHC, and Bedar PHC. The settings in Akre district are Gulan Public Hospital, Azadi PHC, Dinarte PHC, Bjel PHC, Girdesin PHC, and Akre Directorate of Health. The settings in Amedi district are Butan PHC, Deralok PHC, Sheladize PHC, and Gara PHC. The settings in Semel district are Sharya PHC, Ashty PHC, Tanahi PHC, Khanke PHC, Gulan PHC, and Domiz PHC in Domiz IDP camp. The vaccination settings in Shekhan district are Atrosh PHC, Qasrok PHC, Chre PHC, Aras PHC, and Baadre PHC. The COVID-19 vaccination settings in Bardarash district are Bardarash PHC, Khazir PHC, Kalak PHC, and Rovia PHC.

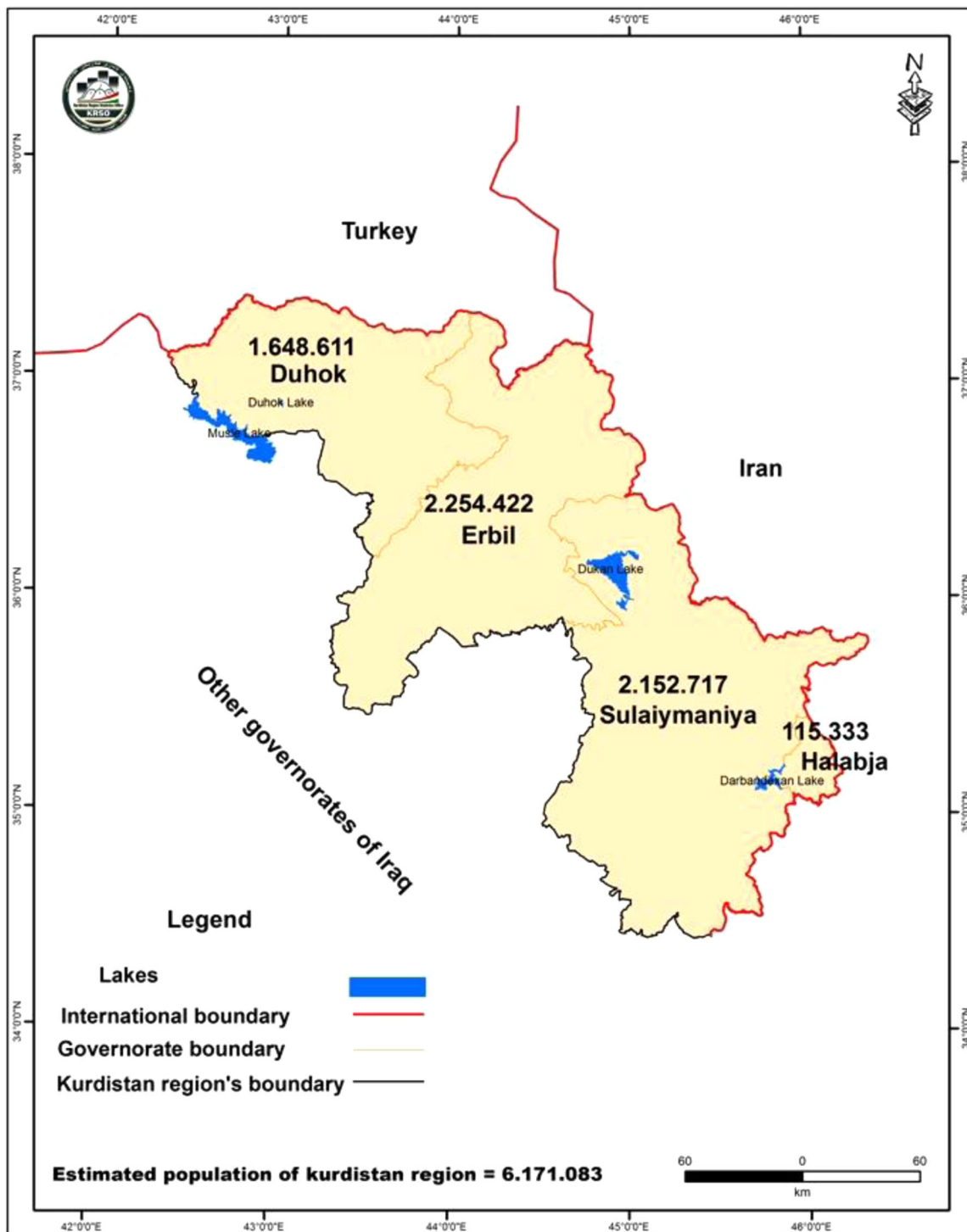


FIGURE 1 Map of the estimated population of Kurdistan region at governorate level 2020

2.4 | Sample size and sampling

The sample size required for this study was calculated using Cochran's sample size formula. The Cochran formula calculates the ideal sample size based on the desired precision level and confidence interval and the estimated proportion of the attribute present in the

population. Cochran's formula is used for the determination of the sample size in large populations.

The Cochran formula is:

$$n_0 = \frac{Z^2 pq}{e^2},$$

where, e is the desired level of precision (i.e., the margin of error), p is the (estimated) proportion of the population that has the attribute in question, and q is $1 - p$.

Based on the estimated population of the Duhok governorate in Iraqi Kurdistan in 2020, the population of the Duhok governorate was 1,648,611 persons.¹⁶ The estimated sample size for this study was 385 persons based on the Cochran formula. But the authors increased the sample size to get a more representative sample of the target population and compensate for the possible missing information.

To obtain a representative sample of the target population, the author tried to obtain responses of both genders and from different age classes and educational levels. In this regard, through the online technique, the invitation was sent to both male and female persons with different educational levels in different social media groups. But, it is hard to create complete homogeneity for the age, gender, and education through the online route. To compensate for the numbers of illiterate and lower educated individuals, the author visited the main shopping center in Duhok city.

2.5 | Eligibility criteria

Individuals who were aged 16 years and older of both genders and irrespective of sociodemographical aspects were eligible to participate in this study. Consent was taken from all persons before inclusion into the study. The individuals who were not interested were not included in the study. Persons whether have received or not received the vaccine were eligible to take part in this study. Of the total 330 individuals who were invited personally to shopping centers, only six persons did not accept to participate in the study. Finally, 602 and 324 were included in the study through an online technique and personally, respectively.

2.6 | Measurement of vaccine hesitancy

The SAGE Working Group on Vaccine Hesitancy Survey Tool was used for data collection in this study. The Vaccine Hesitancy Scale has 10 question items.¹⁷ A slight modification was made on the questions to adjust for the reality of the COVID-19 vaccine. The questions were responded as yes or no for more facilitation and to reduce the possible bias. The author asked the individuals whether the COVID-19 vaccine is important for their health, COVID-19 vaccines are effective, whether having any person vaccinated is important for the health of others in your community. Do you believe that the COVID-19 vaccines offered by the Iraqi government are beneficial? In addition, the author asked them to report whether new vaccines carry more risks than older vaccines and the information they receive about the COVID-19 vaccine from the vaccine program is reliable and trustworthy. Whether getting the COVID-19 vaccine is a good way to protect them from COVID-19 disease? Generally, do you follow what your doctor or health care provider recommends about the

COVID-19 vaccine for your health? Also, were they concerned about the serious adverse effects of the COVID-19 vaccine and whether they do not need the COVID-19 vaccine because the disease is not common anymore?

The education of the participants was categorized as illiterate, under high school, high school, and college and higher. The persons who complete two years at university receive the institute degree and those who complete four years or more at a university receive the college degree in this region. The author categorized both institutes and colleges in one category of education because the author did not expect a significant difference in the awareness of these persons toward the COVID-19 vaccination.

2.7 | Statistical analyses

The general information of the individuals was presented in numbers (%) or means (SD). The prevalence of infection by COVID-19 and intention to receive the first and second doses of COVID-19 vaccine was determined by dividing the number of individuals who reported a positive response by the total number of the sample multiplied by 100. The prevalence of vaccine hesitancy toward the COVID-19 in general populations was determined in number and percentage. The uncertainty of the outcomes was determined by a 95% confidence interval. The normality of the continuous variables was confirmed by a histogram. Association of the intention to receive the COVID-19 vaccine with sociodemographic and vaccine hesitancy items was examined by Pearson's χ^2 test. The comparison of age among individuals with different intentions to receive the COVID-19 was examined by one-way analysis of variance. The significant difference level was determined in a $p < 0.05$. JMP Pro 14.3 was used to perform statistical calculations.

2.8 | Ethical views

The permission to conduct this study was obtained from the College of Nursing, University of Duhok. Verbal consent was acquired from all individuals before participation in this study either through an online technique or personal invitation. The study did no harm to the individuals because no intervention was applied to the subjects. The individuals were free to reject participation.

3 | RESULTS

3.1 | Study groups

The mean age of the participants was 33.1 (SD: 11.4 years) between 16 and 81 years. The participants consisted of males (617, 66.6%) and females (309, 33.4%). The participants had different education levels; including illiterate (54, 5.8%), under high-school (135, 14.6%), high-school (103, 11.1%), and college and higher (634, 68.5%). They

TABLE 1 General characteristics and intention of subjects to receive COVID-19 vaccine

Characteristics (n = 926)	Frequency distribution		95% Confidence interval	
Age (range: 16–81 years) mean (SD)	33.1	11.4	32.4	33.9
16–19	34	3.7	2.6	5.1
20–29	340	36.7	33.7	39.9
30–39	319	34.5	31.5	37.6
40–49	152	16.4	14.2	18.9
50–59	54	5.8	4.5	7.5
60–69	20	2.2	1.4	3.3
70–79	7	0.8	0.4	1.6
Gender no (%)				
Male	617	66.6	63.5	69.6
Female	309	33.4	30.4	36.5
Education no (%)				
Illiterate	54	5.8	4.5	7.5
Under high school	135	14.6	12.5	17.0
High school	103	11.1	9.3	13.3
College and higher	634	68.5	65.4	71.4
Occupation setting no (%)				
Healthcare worker	357	38.6	35.5	41.7
Non-healthcare worker	569	61.5	58.3	64.5
Have you been infected by the COVID-19? no (%)				
No	570	61.6	58.4	64.6
Yes	356	38.5	35.4	41.6
Did you receive the COVID-19 vaccine? no (%)				
No	773	83.5	81.0	85.7
Yes	153	16.5	14.3	19.1
Do you intend to receive the COVID-19 vaccine? no (%)				
No	476	51.4	48.2	54.6
Not decided	17	1.8	1.2	2.9
Yes	433	46.8	43.6	50.0
Do you intend to receive the second dose of the COVID-19?				
No	9	5.9	3.1	10.8
Yes	144	94.1	89.2	96.9

were working in the healthcare sector (357, 38.6%) and the non-healthcare sector (569, 61.5%). The study found that 38.5% ($n = 356$) of the participants have been infected by COVID-19. Most of the participants reported that they have not received the COVID-19 vaccine (83.5%, 773). Only a small percent of the participants have received the COVID-19 (16.5%, 153). More than half of the

participants (51.4%, 476) reported that they do not intend to receive the COVID-19 vaccine and 1.8% ($n = 17$) have not decided yet to receive the vaccine or not. Only 46.8% ($n = 433$) intended to receive the COVID-19 vaccine. Of 153 (16.5%) who received the first dose of the COVID-19 vaccine, 94.1% ($n = 144$) of them reported that they intended to receive the second dose as well (Table 1).

3.2 | COVID-19 vaccine hesitancy in Iraqi Kurdistan

Most of the participants reported that receiving the COVID-19 vaccine has importance for health (62.6%) and is effective (69.2%), and having any person vaccinated is important for the health of other members of their community (73.7%). More than half of the participants believed that all COVID-19 vaccines are not beneficial (52.8%) and believed new vaccines carry more risks than older vaccines (52.7%). The participants reported that the information they receive about the COVID-19 vaccine is reliable and trustworthy (60.0%). In addition, they believed that getting the COVID-19 vaccine is considered a good way to protect them from COVID-19 disease (71.0%). They reported that they follow the advice of their doctors and healthcare providers to receive the COVID-19 vaccine (60.3%). However, they were concerned about the serious adverse effects of the COVID-19 vaccine (56.4%) and did not believe that they did not need the COVID-19 vaccine because the disease is not common anymore (78.5%), see Table 2.

3.3 | Contributing factors to the COVID-19 vaccine hesitancy in Iraqi Kurdistan

The study reported that the intention of the participants to receive the COVID-19 vaccine was increased with increasing the level of education. The intention of the participants to receive the COVID-19 vaccine was 25.9%, 26.7%, 39.8%, and 53.6% in illiterate, under high school, high school, and college, and higher, respectively ($p < 0.0001$). The participants with lower levels of education were more likely to be hesitant to receive the COVID-19 vaccine. The percentage of hesitancy was decreased with increasing level of education. In addition, the persons who work in a healthcare setting were more likely to intend to receive the COVID-19 compared to those persons who work in a non-health setting or unemployed, 57.4% versus 40.1%, $p < 0.0001$. A similar pattern was found for the individuals who received the COVID-19 vaccine. The individuals who had concerns about the side effects of the COVID-19 vaccines were more likely to not receive and not intend to receive a COVID-19 vaccine (Table 3). The individuals who intended or did not intend to receive the COVID-19 vaccine had a similar mean age (Figure 2).

The study showed that the individuals who reported that the COVID-19 is not important for their health, COVID-19 vaccines were not effective, having any person vaccinated is not important for the health of others in their community, and those who believed that the COVID-19 vaccines offered by the government program in their community are not beneficial were not likely to receive the COVID-

TABLE 2 Prevalence of vaccine hesitancy toward COVID-19 vaccine in general populations

Vaccine hesitancy items (n = 926)	Frequency distribution no (%)	
	Yes	No
Importance of COVID-19 vaccine health	582 (62.9)	344 (37.2)
Effectiveness of COVID-19 vaccines	641 (69.2)	285 (30.8)
Importance of any vaccinated person for the health of others	682 (73.7)	244 (26.4)
Beneficial of all COVID-19 vaccines	437 (47.2)	489 (52.8)
More risks of new vaccines versus older vaccines	488 (52.7)	438 (47.3)
Reliability and trustworthiness of received information from the vaccine program	556 (60.0)	370 (40.0)
Receiving a COVID-19 vaccine as a good way of protection against the disease	657 (71.0)	269 (29.1)
Following the instructions of the doctor or health care provider	558 (60.3)	368 (39.7)
Concerns about the serious adverse effects of the COVID-19 vaccine	522 (56.4)	404 (43.6)
Not required to get a COVID-19 vaccine due to begin common the disease	199 (21.5)	727 (78.5)

TABLE 3 Association of the intention of the population to receive the COVID-19 with sociodemographic characteristics

Characteristics (n = 926)	Intention to receive the COVID-19 vaccine no (%)			p value	Received the COVID-19 vaccine		p value
	No	Not decided	Yes		No	Yes	
Gender				0.7622			0.3428
Male	316 (51.2)	10 (1.6)	291 (47.2)		510 (82.7)	107 (17.3)	
Female	160 (51.8)	7 (2.3)	142 (46.0)		263 (85.1)	46 (14.9)	
Education				<0.0001			<0.0001
Illiterate	40 (74.1)	0 (0.0)	14 (25.9)		48 (88.9)	6 (11.1)	
Under high-school	96 (71.1)	3 (2.2)	36 (26.7)		128 (94.8)	7 (5.2)	
High-school	56 (54.4)	6 (5.8)	41 (39.8)		90 (87.4)	13 (12.6)	
College and higher	284 (44.8)	8 (1.3)	342 (53.9)		507 (80.0)	127 (20.0)	
Occupation setting				<0.0001			<0.0001
Healthcare sector	148 (41.5)	4 (1.1)	205 (57.4)		275 (77.0)	82 (23.0)	
Non-healthcare sector	328 (57.6)	13 (2.3)	228 (40.1)		498 (87.5)	71 (12.5)	
Concerns of adverse side-effects				0.0482			0.0289
Yes	283 (54.2)	6 (1.2)	233 (44.6)		448 (85.8)	74 (14.2)	
No	193 (47.8)	11 (2.7)	200 (49.5)		325 (80.5)	79 (19.6)	

Note: The Pearson's χ^2 test was performed for statistical analyses. The red bold numbers show the significant differences.

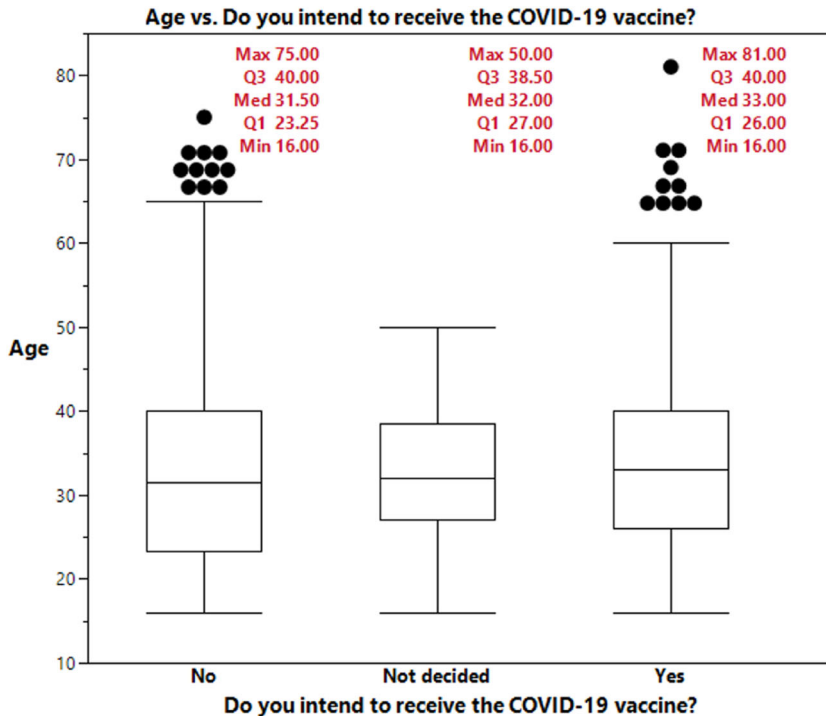


FIGURE 2 Median age of individuals versus the intentions to receive the COVID-19 vaccine

19 vaccine. In addition, the participants who believed that the new vaccines carry more risks than older vaccines, the individuals who did not trust the information received by the vaccine programmers, or believed that getting the COVID-19 vaccine is not a good way to protect them from COVID-19 disease were not likely to receive the COVID-19 vaccine. Interestingly, the individuals who were not advised by doctors or healthcare providers to receive the COVID-19 vaccines, or were concerned about serious adverse effects of the COVID-19 vaccine were not likely to not receive the COVID-19 vaccine. The individuals who believed that the COVID-19 disease is not common were more likely to be hesitant to receive the COVID-19 vaccine (Table 4).

The study showed that the individuals who were infected by the COVID-19 were more likely to receive the COVID-19 vaccine compared to those who were not infected by the COVID-19, 20.8% versus 13.9%; $p = 0.0063$. In addition, the infected individuals by the COVID-19 were more likely to intend to receive the COVID-19 vaccine, 54.5% versus 41.9%, $p = 0.0002$ (Table 5).

4 | DISCUSSION

This study found that only 16.5% of the participants have received the COVID-19 vaccine and 46.8% of them intended to receive the COVID-19 vaccine. Most of the first dose vaccine receivers were ready to receive the second dose of the COVID-19 vaccine as well. Individuals who were infected by the COVID-19 were more likely to receive and intend to receive the COVID-19 vaccine. Persons with lower levels of educations were less likely to intend to receive the COVID-19 and those who work in the nonhealth sector.

Vaccine hesitancy is considered to be a global issue. It has been reported that 50%–60% of the respondents worldwide will receive a COVID-19 vaccine based on different countries.¹⁸ For example, the surveys conducted in the UK have found different levels of willingness among ethnic groups. A UK survey reported that 18% of the respondents are hesitant to receive a COVID-19 vaccine in contrast with 72% hesitancy in Black ethnicity, 42% among South Asians of Pakistani and Bangladeshi, 32% in mixed ethnicities.¹⁹ The highest COVID-19 vaccine acceptance rates were reported in Ecuador (97.0%), Malaysia (94.3%), Indonesia (93.3%), and China (91.3%), and the lowest rates were reported in Kuwait (23.6%), Jordan (28.4%), Italy (53.7), Russia (54.9%), Poland (56.3%), United States (56.9%), and France (58.9%).²⁰ Iraqi Kurdistan with a 46.8% acceptance rate is considered to be among the countries with the lowest rates.

The study did not find a statistically significant difference in the prevalence of vaccine hesitancy between male and female individuals, but the vaccine hesitancy was high in both genders, 51.2% and 51.8%, respectively. In addition, the participants who were hesitant or were willing to receive a COVID-19 had similar ages. Robertson et al.¹⁹ reported that 21% of females and 14.7% of males are hesitant to receive a COVID-19 vaccine in the UK. In similarity with this study, the younger age group and those with lower levels of education have higher prevalence rates of hesitancy to receive a COVID-19 vaccine; 28.3% in 25–34 years and 14.3% in 55–64 years; 24.6% in secondary school graduates and 13.2% among college graduates.

This study found that 77.0% of the healthcare workers (HCWs) have not received a COVID-19 vaccine and 41.5% were hesitant to receive a COVID-19 vaccine. The high prevalence of vaccine hesitancy in HCWs is a matter of concern for a health system. The HCWs have trusted sources of health information for non-HCWs.

TABLE 4 Association of vaccine hesitancy items to receive the COVID-19 vaccine

Vaccine hesitancy items (n = 926)	Intention to receive the COVID-19 vaccine no (%)		
	Yes	No	Not decided
Importance of COVID-19 vaccine health			
Yes	412 (70.8)	163 (28.0)	7 (1.2)
No	21 (6.1)	313 (91.0)	10 (2.9)
Effectiveness of COVID-19 vaccines			
Yes	369 (57.6)	264 (41.2)	8 (1.2)
No	64 (22.5)	212 (74.4)	9 (3.2)
Importance of any vaccinated person for the health of others			
Yes	402 (58.9)	267 (39.1)	13 (1.9)
No	31 (12.7)	209 (85.7)	4 (1.6)
Beneficial of all COVID-19 vaccines			
Yes	297 (68.0)	128 (29.3)	12 (2.7)
No	136 (27.8)	348 (71.2)	5 (1.0)
More risks of new vaccines versus older vaccines			
Yes	152 (31.1)	323 (66.2)	13 (2.7)
No	281 (64.2)	153 (34.9)	4 (0.9)
Reliability and trustworthiness of received information from the vaccine program			
Yes	342 (61.5)	204 (36.7)	10 (1.8)
No	91 (24.6)	272 (73.5)	7 (1.9)
Receiving a COVID-19 vaccine as a good way of protection against the disease			
Yes	406 (61.8)	237 (36.1)	14 (2.1)
No	27 (10.0)	239 (88.8)	3 (1.1)
Following the instructions of the doctor or health care provider			
Yes	387 (69.4)	160 (28.7)	11 (2.0)
No	46 (12.5)	316 (85.9)	6 (1.6)
Concerns about the serious adverse effects of the COVID-19 vaccine			
Yes	233 (44.6)	283 (54.2)	6 (1.1)
No	200 (49.5)	193 (47.8)	11 (2.7)
Not required to get a COVID-19 vaccine due to begin common the disease			
Yes	25 (12.6)	174 (87.4)	0 (0.0)
No	408 (56.1)	302 (41.5)	17 (2.3)

Note: p value is <0.0001 for all except 0.0481 for item number 9. The Pearson's χ^2 test was performed for statistical analyses.

In this regard, the non-HCWs would be more hesitant to receive a COVID-19 vaccine. The HCWs are at greater risk of exposure to infections in healthcare settings, therefore, it is expected that they are more willing to receive a COVID-19 vaccine.³

Several factors could be associated with vaccine hesitancy; such as misinformation and conspiracy theories.^{21,22} Also, health

TABLE 5 Association of intention to receive the COVID-19 vaccine with infection by the COVID-19

Recovering the COVID-19 vaccine (n = 926)	Infection by the COVID-19 disease		p value
	Yes	No	
Received the COVID-19 vaccine			
Yes	74 (20.8)	79 (13.9)	0.0063
No	282 (79.2)	491 (86.1)	
Intention to receiving the COVID-19 vaccine			
Yes	194 (54.5)	239 (41.9)	0.0002
No	153 (43.0)	323 (56.7)	
Not decided	9 (2.5)	8 (1.4)	

Note: Pearson's χ^2 test was performed for statistical analyses. The red bold numbers show the significant differences.

inequalities, socioeconomic disadvantages, racism, and obstacles to access are considered to be the drivers of low confidence and poor uptake.^{5,23} Paul et al.²⁴ reported that 16% of respondents had high levels of mistrust toward the COVID-19 vaccines in the UK. Ethnic minorities and those with lower levels of education, lower annual income, poor knowledge of COVID-19, and individuals with poor compliance with government COVID-19 guidelines have higher distrust attitudes. They reported that 14% and 23% of the respondents were unwell and unsure to receive a COVID-19 vaccine. This rate was high in our community, 51.4% and 1.8%, respectively. Paul et al.²⁴ reported that the main predictors of COVID-19 vaccine uncertainty and refusal were low-income groups, poor adherence to COVID-19 government guidelines. In addition, other main factors were being female, not having received a flu vaccine last year, and living with children. The vaccine attitudes have different levels of mistrust toward vaccine benefits and concerns about future unforeseen side-effects as the main determinants of both uncertainty and unwillingness to vaccinate against COVID-19.²⁴ This study showed that the persons who had the concerns of side-effects of a COVID-19 vaccine were more likely to be hesitant to receive a COVID-19 vaccine, that is, 54.2%. In addition, they had a significantly higher prevalence rate of not receiving a COVID-19 vaccine, 85.8% versus 80.5%, respectively. Previous studies have reported that the rejection rate is higher for the vaccines with unknown side effects compared to the less effective vaccine with lesser side effects.²⁵ A global survey conducted in 19 countries²⁶ reported that 71.5% of the respondents would take a COVID-19 vaccine if it is proven to be safe and effective. In addition, 48.1% reported that they would get vaccinated if their employer recommends it. It is interesting to mention that the willingness to receive the vaccine may not be a good predictor of acceptance because vaccine decisions are considered to be complicated and multifactorial and change over time.

The possible factor associated with COVID-19 vaccine hesitancy is misinformation about health-related issues. The misinformation can pose

a crucial threat to the trust of the public to receive a covid-19 vaccine. Fake news about the COVID-19 vaccine is circulating among the populations since the advent of the vaccine.²⁷ Montagni et al.²⁸ reported that fake news detection and health literacy scores in France are related to getting vaccinated against the COVID-19 disease. The individuals who have access to fake news have higher rates of antivaccination or hesitancy. A similar pattern was reported for individuals with low literacy scores.²⁸ In similarity with the findings reported in this study, Meier et al.²⁹ reported that the individuals who feel greater vulnerability to COVID-19 were more likely to intend to receive a COVID-19 vaccine in the United States.

The trust of the public toward the COVID-19 vaccine could be different based on the vaccine types. For example, a study reported the highest level of trust in the mRNA platform. A higher level of acceptance was observed in both BNT162b and mRNA-1273 compared to AZD1222.³⁰ In addition, the findings of the recent reports on hemorrhage, blood clots, and thrombocytopenia after administration of the COVID-19 vaccines in people with pre-existing coagulation disorders or the patients on certain medications have raised the public's concern in social media. This has resulted in a temporary suspension of the Oxford/AZ CoViD vaccine in some European countries.³¹ Some officials were reluctant to receive the OxfordAstraZeneca (ChAdOx1 nCov-19) in Duhok at early May 2021. These officials waited for and received the mRNA-based Pfizer-BioNtech. Possibly, this unresponsive behavior resulted in to some extent mistrust to receive the COVID-19 vaccine among people in the Duhok governorate.

Religious beliefs may have a role in the rejection and acceptance of the COVID-19 vaccine. Religious beliefs affect antivaccine decisions.³² Some religious leaders attempt to convince their congregation to not receive the vaccine. These leaders mention that the COVID-19 vaccine "can cause homosexual tendencies" and it "controls the mind."³³

Wong et al.³⁴ reported a very low rate of vaccine acceptance. The overall acceptance rate of the COVID-19 vaccine was 37.2% in Hong Kong. The acceptance rate of the COVID-19 vaccine was increased with age. The perceived severity and benefits of the vaccine, cues to action, and trust in the healthcare system or vaccine manufacture were determined to be the positive correlates of the COVID-19 vaccine and the perceived access barriers and harm were negative correlations of the vaccine acceptance.³⁴ The people in this region are very concerned about the side effects of the COVID-19 vaccines. More than half of the individuals who participated in this study reported that the new vaccines carry more risks than older vaccines (52.7%). It seems that the older vaccinations such as BCG, DTP, and so forth, have been implanted safely in people's minds. The positive point of this region is that the people trust the information provided by doctors and healthcare providers, but the high hesitancy in healthcare providers poses a major threat to vaccination coverage in the region.

The mistrust toward the COVID-19 vaccines is considered to be the main challenge in achieving the required vaccination coverage for population immunity. Vaccine acceptance in the general public and HCWs is considered to have a decisive role to control the COVID-19 pandemic successfully. The COVID-19 vaccine acceptance rates among HCWs

were reported as 27.7% in the Democratic Republic of the Congo³⁵ to 78.1% in Israel.³⁶

In this study, 1.84% of the population have not decided to receive a COVID-19 vaccine yet. Different rates of undecided vaccine receivers have been reported across the world. For example, Cerda et al.²⁵ reported that 28% of the Chilean individuals have not decided to receive the COVID-19 vaccine. In any case, the undecided individuals are more flexible to change their minds to receive the vaccine by appropriate awareness campaigns.²⁶

Appropriate strategies are required to change the public's mind to receive a COVID-19 vaccine because the low acceptance rate of the vaccine could pose a serious risk to the COVID-19 pandemic control. These strategies must directly focus on community-specific concerns or misconceptions and address historic issues breeding distrust. In addition, these strategies should be sensitive to religious or philosophical beliefs.³⁷ These strategies need for a deliberate collaboration among different stakeholders such as the government, religious leaders, and civil society.³⁸

Receiving vaccines in Iraq in general and in Iraqi Kurdistan, in particular, is not mandatory yet. But, the Kurdistan Region Government has a plan to obligate the employees to receive a COVID-19 vaccine in the next weeks. Despite feeling vaccination emergency as a mandatory commitment to decrease the infectious contacts and COVID-19 hospitalizations and return to normal life customs, mandatory vaccination for mRNA vaccines is a controversial issue.³⁹

5 | LIMITATIONS

The main limitation of this study is that a percentage of the responses were collected through an online technique. The online technique may not make for complete homogeneity of the responses in terms of education, age, gender, and other sociodemographic aspects. In addition, the online technique did not allow the author to include more required contributing factors in the study.

6 | CONCLUSIONS

This study showed that Iraqi Kurdistan has a high rate of COVID-19 vaccine hesitancy and this is correlated with lower levels of education and concerns about side effects.

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ETHICS STATEMENT

The written consent form was taken from participants before filling the questionnaire. In addition, verbal consent was taken from the individuals with whom I did the interview.

DATA AVAILABILITY STATEMENT

The raw data of this study is available through the following link.
<https://drive.google.com/file/d/10pCKCx0EBK7Krw33hXx1QfB3B4tu-Jl2f/view?usp=sharing>

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