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Knowledge, Attitudes, and Practices Regarding COVID-19 Vaccination Among Internally Displaced People in the Kurdistan Region of Iraq (KRG)

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ABSTRACT

Background: Iraq has yet to establish and initiate any vaccination initiatives to address the ongoing COVID-19 outbreak and mitigate its spread and mortality. **Objective:** This study aimed to evaluate the existing knowledge, attitudes, and behaviors surrounding COVID-19 vaccination amid the third wave of the outbreak. **Methods:** This cross-sectional study utilized an anonymous online questionnaire, modeled after a study conducted in Bosnia and Herzegovina, to investigate COVID-19 vaccination attitudes and practices during the third wave of the outbreak in the country. **Results:** In total, 2744 subjects from 27 camp for Internally Displaced People (IDP camps) in the Kurdistan region of Iraq, mostly male 1642 (61.4%), either with no previous education 701 (26.2%) or with a primary school degree 973 (36.4%), married 1610 (60.2%) and since 2014 1540 (57.6%) stationaed in the IDP Camps were included in the study. Mean age of our sample was 35.2±12.9 ranging 18- 94 years. The mean knowledge test score for our sample was 6.9±3.7 with correct answer rates ranging 27.7-78.2%. Only 31 (1.2%) of subjects scored maximum points on the knowledge test score. In total 1170 (42.7%) subjects agreed that COVID-19 vaccination programs will prevail in a battle versus COVID-19, while 1592 (58.0%) agreed that everyone should be vaccinated against COVID-19. Regarding the vaccination rates, only 421 (15.3%) have already been vaccinated against COVID-19, while 1658 (62.7%) expressed interest to get vaccinated in the future. **Conclusion:** Our study sheds light on vaccination attitudes among IDP camps in the Kurdistan region of Iraq. Despite lower knowledge scores, willingness to vaccinate against COVID-19 is relatively high, likely due to limited access to vaccines, perceived risk of the disease, and trust in healthcare providers.
Keywords: COVID-19, pandemic, Iraq, vaccination, healthcare.

1. BACKGROUND

COVID-19, caused by the novel β-coronavirus known as SARS-CoV-2 (1), is a highly contagious illness primarily transmitted through respiratory droplets when an infected person, whether symptomatic or asymptomatic, sneezes or coughs (2, 3). Following a median incubation period of approximately 5.1 days, typical symptoms of COVID-19 include loss of smell and taste, fever, sore throat, cough, difficulty breathing, headache, abdominal pain, and diarrhea (4-6). Severe cases of COVID-19 may progress to acute respiratory distress syndrome (ARDS), septic shock, metabolic acidosis, coagulation abnormalities, multiple organ failure, or fatality (7, 8).

The first case of COVID-19 in Iraq was identified on February 24th 2020 in Najaf by a person who had recently arrived from Iran (9). The initial surge reached its highest point in September 2020. There was a two-peaked pattern, with the lowest points happening in January 2021 and January 2022, followed by peaks in February 2021 and a smaller one in February 2022 (10).

The Iraqi healthcare system was ill-

equipped to handle the pandemic, largely due to sanctions, prolonged periods of both external and internal conflict, and rampant corruption, all of which severely weakened healthcare services. Since the beginning of the pandemic, strict epidemiological measures have been enforced, including masking, isolation of cases, limiting public exposure, and hospitalization of seriously affected persons in special hospital wards (11). However, the success in controlling COVID-19 hinges on adherence to preventive measures like vaccination, mask-wearing, hand hygiene, avoiding gatherings, and rapid vaccination, which are influenced by public knowledge, attitudes, and practices. Studies on these aspects are crucial for correcting misconceptions, promoting vaccine acceptance, and guiding vaccination strategies to contain the disease (12).

2. OBJECTIVE

The objective of this paper is to examine the knowledge, attitudes, and practices (KAP) related to COVID-19 vaccination among refugees during the third wave of the outbreak in Iraq, a period marked by uncontrolled spread akin to the scenario observed in Italy during the early stages of the pandemic. By swiftly addressing existing knowledge gaps, attitudes, and behaviors, there is potential to regain control over the situation. The insights derived from this study are anticipated to be valuable for policymakers facing these difficult circumstances, offering pertinent information to inform decision-making.

3. MATERIAL AND METHODS

Subjects

This observational cross-sectional study was conducted from April 20th to 28th, 2021, amid the third wave of the COVID-19 outbreak in Iraq, focusing on the refugee population. Participants were asked to complete an anonymous online questionnaire, adapted from a study in Romania (12), Bosnia and Herzegovina (13) and information from the Center for Disease Control and Prevention (CDC) regarding vaccination (14). The questionnaire was translated into the native language and disseminated through face to face interview among refugee camps (IDP Camps) in the Kurdistan Region of Iraq. Prior to commencement, the questionnaire and the study itself were reviewed and approved by the Bioethical Committee of the Barzani Charity Foundation. Participants were briefed on the study's objectives, their voluntary participation, the online informed consent process, and instructions for completing the questionnaire. Exclusion criteria encompassed individuals under 18 years of age and those not holding Iraqi citizenship.

Study instruments

The survey questionnaire, which typically required 3-5 minutes to complete, was structured into two main sections: (i) a demographic profile of the participants and (ii) questions assessing knowledge, attitudes, and practices (KAP) related to COVID-19 vaccination. The demographic profile section covered aspects such as gender, age, marital status, education level, occupation, place of residence, and COVID-19 history including testing, symptoms, and infection status.

The second section of the questionnaire comprised 15 knowledge-based questions, 2 questions pertaining to attitudes, and 3 statements reflecting current behaviors related to COVID-19 vaccination, as outlined in Table 1. The knowledge test scored between 0 to 15, with a higher score indicating a better understanding of COVID-19 vaccination. Questions in the knowledge test assessed various aspects including COVID-19 clinical presentation, transmission routes, therapeutic options, reasons for vaccine avoidance, safety concerns, side effects, and misconceptions about COVID-19 vaccines. Respondents could answer true/false answers, with an additional "I don't know" option. The internal consistency of the knowledge test, measured by Cronbach's alpha coefficient, was found to be 0.766,, indicating a good level of reliability.

Attitude questions (A1-A2) focused on agreement with universal vaccination and confidence in overcoming the COVID-19 crisis. The behavior statements (P1-P3) addressed activities such as visiting crowded places, wearing face masks, and receiving the COVID-19 vaccine.

Statistical analysis

The collected data underwent analysis using the Statistical Package for Social Sciences (SPSS) IBM Statistics version 26.0. The results were presented as simple frequencies and cross-tabulations, highlighting correct answers in knowledge tests and exploring different attitudes and behaviors towards COVID-19 vaccination. Overall knowledge test scores, attitudes, and practices among the sample were compared across demographic variables using the independent sample t-test and one-way analysis of variance (ANOVA) where applicable. Multiple linear regression analysis was employed to identify factors linked with knowledge test scores, while binary logistic regression was used to examine independent predictors associated with various attitudes and practices concerning COVID-19 vaccination. Unstandardized coefficients (β), odds ratios (ORs), and 95% confidence intervals were utilized to quantify the associations between knowledge, attitudes, and practices and different variables. The significance level was set at $p < 0.05$, two-sided.

4. RESULTS

In total, 2744 subjects from 27 IDP-Camps in the Kurdistan region of Iraq have filled the survey questionnaire and after excluding 70 subjects due to exclusion criteria the final sample consisted of 2674 subjects. Our study sample was mostly male 1642 (61.4%), either with no previous education 701 (26.2%) or with a primary school degree 973 (36.4%), married 1610 (60.2%) and since 2014 1540 (57.6%) stationaed in the IDP-Camps. Mean age of our sample was 35.2±12.9 and it ranged 18 to 94 years. COVID-19 symptoms such as fever, shortness of breath, muscle pain, dry cough, vomiting, diarrhea and loss of smell and taste has been

	N	Questions	Answers	Correct answer rate
Knowledge test	1.	The main COVID-19 symptoms are fever, fatigue, dry cough, muscle pain, loss of smell and taste, abdominal pain and diarrhea.	True, False, I don't know	78.2%
	2.	COVID-19 is spread airborne via respiratory droplets from the infected individual.	True, False, I don't know	74.0%
	3.	Currently, there is no effective cure for COVID-19, but early symptomatic and supportive treatment can help most of the infected to recover.	True, False, I don't know	57.5%
	4.	Vaccination against COVID-19 is the only effective way to prevent of getting infected.	True, False, I don't know	53.2%
	5.	Patients who currently have antibodies due to previous COVID-19 infection, don't need to be vaccinated.	True, False, I don't know	32.3%
	6.	Patients who had COVID-19 infection, don't need to be vaccinated.	True, False, I don't know	42.9%
	7.	My blood type is less susceptible to COVID-19, so I don't need to be vaccinated.	True, False, I don't know	36.5%
	8.	Patients who are not at risk for severe and critical forms of COVID-19 don't need to be vaccinated.	True, False, I don't know	42.3%
	9.	COVID-19 vaccine is not safe due to the fact that its development was so fast.	True, False, I don't know	36.3%
	10.	Getting the vaccine against COVID-19, makes people more prone for other infections and diseases	True, False, I don't know	42.1%
	11.	COVID-19 vaccines cause infertility.	True, False, I don't know	42.9%
	12.	COVID-19 vaccines have a lot of side effects and can cause death.	True, False, I don't know	52.4%
	13.	You can get COVID-19 from the vaccine against COVID-19.	True, False, I don't know	44.7%
	14.	COVID-19 vaccines have tracking chips.	True, False, I don't know	27.7%
	15.	COVID-19 vaccines alter DNA.	True, False, I don't know	30.2%
Attitudes	1.	Do you agree that vaccination programs will win the fight vs COVID-19?	Agree, Disagree, I don't know	43.1%,, 28.5%,, 28.4%
	2.	Do you agree that everyone should be vaccinated against COVID-19?	Agree, Disagree, I don't know	57.9%,, 23.8%, 18.3%
Practices	1.	In recent days, have you visited crowded places or were in contact with a lot of people?	Yes, No	52.3%, 47.7%
	2.	In recent days, have you worn a mask while leaving your home?	Yes, No	80.4%, 19.6%
	3.	Have you already been vaccinated against COVID-19?	Yes. No	15.6%, 84.4%
	4.	Are you going to get the vaccine if not vaccinated?	Yes, No	60.6%,39.4%

Table 1. Knowledge, attitudes and practices towards COVID-19 vaccination questionnaire structure

reported among 1002 (37.5%) subjects in the last year, from which 782 (29.2%) were COVID-19 positive. From subjects who were COVID-19 positive, only 227 (8.5%) did reinfect again. COVID-19 related death among family members, friends and relatives was reported among 795 (29.7) subjects. All other demographic characteristics compared between different camps are displayed in Table 2.

COVID-19 vaccination knowledge test scores

The internal consistency, Cronbach's alpha coefficient of the knowledge test was 0.766, indicating good level of reliability. The mean knowledge test score for our sample was 6.9±3.7 with correct answer rates on questions ranging from 27.7% to 78.2%. Only 31 (1.2%) of subjects scored maximum points on the knowledge test score. Knowledge test scores differed across sex, age, marital status education levels, COVID-19 symptoms, COVID-19 positive and COVID-19 reinfected cases (p<0.05) which are presented in Table 2. In the realm of multivariate analysis, the impact of personal experiences and beliefs on COVID-19 emerges with statistical significance. For instance, the unfortunate loss of a relative or friend to COVID-19 is linked to an increased likelihood of having had COVID-19 symptoms (OR=1.5, [1.19 ; 1.91], p= 0.0007). Conversely, a perception that individuals not at risk for severe forms of the virus do not require vaccination is associated with a higher chance of reporting no COVID-19 symptoms (OR=1.52, [1.06 ; 2.18], p= 0.0218). Furthermore, those who have received the COVID-19 vaccine are more likely to report symptoms compared to those who have not (OR=1.53, [1.09 ; 2.15], p= 0.0133). Interestingly, skepticism about the safety of the vaccine, expressed through the belief that its rapid development poses risks, correlates with an increased likelihood of experiencing COVID-19 symptoms (OR=1.56, [1.14 ; 2.13], p= 0.005). Similarly, the misconception that COVID-19 spreads exclusively through airborne respiratory droplets is associated with a higher likelihood of reporting symptoms (OR=1.72, [1.07 ; 2.76], p= 0.0255). Engaging in activities involving crowded places or extensive social contact in recent days is linked to a substantial increase in the probability of reporting symptoms (OR=2.15, [1.71 ; 2.71], p <0.0001). Additionally, the belief that

COVID-19 vaccines alter DNA corresponds to a higher likelihood of experiencing symptoms (OR=2.18, [1.3 ; 3.65], p= 0.003). Moreover, individuals who have previously had a COVID-19 infection and those who believe in the possibility of reinfection are significantly more likely to report symptoms (OR=2.98, [1.89 ; 4.7], p <0.0001). Notably, a positive COVID-19 test result is strongly associated with a heightened rate of experiencing symptoms (OR=8.34, [6.44 ; 10.8], p <0.0001).

COVID-19 vaccination attitudes

In total 1170 (42.7%) subjects agreed that COVID-19 vaccination programs will prevail in a battle versus COVID-19, while 1592 (58.0%) agreed that everyone should be vaccinated against COVID-19. Contrary to common misconceptions, the assertion that the primary symptoms of COVID-19, including fever, fatigue, dry cough, muscle pain, loss of smell and taste, abdominal pain, and diarrhea, are absent, yields a significantly lower likelihood of reporting symptoms (OR=0.26, [0.15 ; 0.45], p <0.0001). Similarly, expressing uncertainty about these symptoms being indicative of COVID-19 is associated with a reduced probability of experiencing them (OR=0.34, [0.23 ; 0.51], p <0.0001). Dispelling another myth, the belief that COVID-19 vaccines lead to infertility is debunked as false, with individuals holding this misconception showing a decreased likelihood of reporting symptoms (OR=0.64, [0.48 ; 0.86], p= 0.0027). Expressing uncertainty about the necessity of universal COVID-19 vaccination is linked to a lower likelihood of experiencing symptoms (OR=0.66, [0.46 ; 0.94], p= 0.0208). Furthermore, harboring uncertainty about the vaccine making individuals more susceptible to other infections and diseases is associated with a diminished likelihood of COVID-19 symptom manifestation (OR=0.7, [0.52 ; 0.94], p= 0.0192).

COVID-19 vaccination practices

A significant proportion of the subjects 1387 (52.4%) visited places of mass social gatherings and wore 2194 (83.0%) face masks while leaving their home. Regarding the vaccination rates, only 421 (15.3%) have already been vaccinated against COVID-19, while 1658 (62.7%) expressed interest to get vaccinated in the future. Navigating through a spectrum of beliefs and attitudes regarding COVID-19 and vaccination, various perceptions emerge with distinct associations to the reported rates of COVID-19 symptoms over the past year.

Contrary to the notion that COVID-19 vaccines induce infertility, this belief is not statistically linked to an increased likelihood of experiencing symptoms (OR=0.68, [0.45 ; 1.05], p= 0.079). On a similar note, the misconception that one's blood type confers immunity and negates the need for vaccination shows no significant correlation with symptom prevalence (OR=0.77, [0.58 ; 1.02], p= 0.064), while the converse belief is also not associated with symptom manifestation (OR=0.77, [0.53 ; 1.12], p= 0.1699). Furthermore, uncertainties surrounding the necessity of vaccination for individuals who previously had a COVID-19 infection or the potential of contracting the virus from the vaccine

Characteristics		Number of participants N (%)	Knowledge score
Gender	Male	1642 (61.4%)	7.1±3.8
	Female	1032 (38.6%)	6.6±3.6
Age	18–29	1087 (40.6%)	7.3±3.7
	30–49	1199 (44.8%)	6.8±3.7
	>50	388 (14.6%)	6.1±3.7
Marital status	Single	648 (24.2%)	7.2±3.6
	Married	1610 (60.2%)	6.8±3.6
	Engaged	216 (8.1%)	8.3±4.0
	Divorced	48 (1.8%)	5.7±3.6
Education	None	701 (26.2%)	6.6±3.6
	Primary school	973 (36.4%)	6.7±3.6
	High school	638 (23.9%)	7.3±3.7
	Bachelors' degree	360 (13.4%)	7.7±3.8
	Master's Degree	2 (0.1%)	6.0±5.6
COVID-19 symptoms	Yes	1002 (37.5%)	7.4±3.4
	No	1672 (62.5%)	6.6±3.8
COVID-19 positive	Yes	782 (29.2%)	7.5±3.5
	No	1892 (70.8%)	6.7±3.7
COVID-19 reinfection	Yes	227 (8.5%)	6.6±3.4
	No	2447 (91.5%)	6.9±3.7
COVID-19 related death	Yes	795 (29.7%)	7.2±3.6
	No	1879 (70.3%)	6.8±3.7

Table 2. Demographic characteristics of the sample in comparison with knowledge scoresvaccination questionnaire structure

are not linked to variations in symptom rates (OR=0.9, [0.65 ; 1.26], p= 0.5501; OR=0.9, [0.67 ; 1.21], p= 0.4905, respectively). Similarly, the belief that vaccination is the sole effective preventive measure against COVID-19 or that it increases susceptibility to other infections is not significantly associated with symptom prevalence (OR=0.94, [0.67 ; 1.3], p= 0.6902; OR=0.94, [0.65 ; 1.36], p= 0.753). Various other beliefs, such as concerns about vaccine side effects, the absence of a cure for COVID-19, and the efficacy of mask-wearing or vaccination programs, are similarly not linked to variations in symptom reporting.

5. DISCUSSION

To the best of the readers' knowledge, this is the first study concerning vaccination KAP among IDP-Camps in the Kurdistan region of Iraq . The study involved a sample predominantly composed of male participants, many of whom had limited education and were married. A notable portion reported experiencing COVID-19 symptoms, with a significant percentage testing positive for the virus. COVID-19-related deaths among family, friends, and relatives were also reported. Regarding COVID-19 vaccination knowledge, the mean score was moderate, with only a small percentage scoring maximum points. Multivariate analysis highlighted the influence of personal expe-

riences and beliefs on COVID-19 symptoms. In terms of vaccination attitudes, a considerable proportion believed in the effectiveness of vaccination programs, and a majority agreed on the importance of universal vaccination. However, vaccination rates remained relatively low, with a significant percentage expressing interest in future vaccination. Various beliefs and attitudes surrounding COVID-19 and vaccination were explored, with certain perceptions showing no significant correlation with reported symptom rates over the past year. These findings underscore the complex interplay between individual beliefs, vaccination attitudes, and reported COVID-19 symptoms within the studied population.

When our study results were compared to the inital study (13), our study showed a larger number of already vaccinated individuals and a more positive response rate regarding the willingness to vaccinate against COVID-19. The observed difference could be attributed to severeal health-related and socio-related aspects. Firstly, vaccination will prevent further spread of the disease, when infected present with less severe clinical form and protect those around the infected which are usually close family members (12, 13, 15). Secondly, the vaccination grants individuals also social aspect of life, with being able to enter places of mass gathers, travel abroad and be in a more social interaction with others (15). Even though a Russian study (16) pointed that the knowledge regarding vaccination as a preventive measure highly influences COVID-19 acceptance rate, our study shows that even though our population knowledge test scores were lower than those observed in Bosnia and Herzegovina (13) and Romania (12), the willingness to vaccinate was higher which could be attributed to limited access to vaccines in camps, perceived risk of COVID-19 because of the death of the close ones, more trust in healthcare providers and desire for normalcy and mobility. Furthermore, this study was conducted in a different setting than the inital study, refugee camps vs general population, which adds to the observed differences. The population of refugee camps seeks medical help and their trust is thus higher from their medical providers (17). However, refugees in the Kurdistan region of Iraq, even though their vaccination acceptance rate is higher than in the European studies (12, 13), still need education programs to make the current rate of vaccination higher. Higher knowledge regarding COVID-19 vaccines was determined as a predictor for vaccination against the disease and this was showe din multiple studies (12, 13, 18).

Despite varying correct response rates ranging from 27.7.% to 78.2%. in our study, they are below those reported in the initial study. Higher knowledge not only enhances the likelihood of harboring positive attitudes towards immunization against the disease but also fosters favorable practices and a willingness to vaccinate against COVID-19. Achieving herd immunity necessitates approximately 50% of the populace to receive vaccination, a threshold currently attainable with only 15.6% of the population. Consequently, vaccine hesitancy emerges as a burgeoning concern, inexorably linked to inadequate understanding of the novel coronavirus and the vaccine itself.

This study has multiple limitations. Firstly, its cross-sectional design poses challenges in establishing causality as it lacks prospective follow-up of the sample and the ability to observe changes in specific behavioral patterns related to COVID-19 over time. Secondly, the study lacks the abillity to capture longitudinal effects of the vaccination programs.

6. CONCLUSION

Our study sheds light on vaccination attitudes among refugees in the Kurdistan region of Iraq. Despite lower knowledge scores, willingness to vaccinate against COVID-19 is relatively high, likely due to limited access to vaccines, perceived risk of the disease, and trust in healthcare providers. However, challenges remain, including the need for education programs to boost vaccination rates. The findings of this study suggest that comprehensive education efforts are necessary to achieve favorable outcomes and safeguard populations from the transmission of COVID-19 in various nations.

key sectors, including health, food, non-food items, water and sanitation (WASH), education, shelter, and camp management (CCCM), the foundation exemplifies its commitment to aiding vulnerable populations. Its quality management system was further recognized in 2023 when it achieved ISO 9001:2015 certification.

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This research was conducted with complete impartiality to ensure the absence of any conflict of interest. The collaboration with the Barzani Charity Foundation was based solely on the relevance of its contributions to the research objectives. The independence of the research process and its outcomes has been strictly maintained to uphold transparency and credibility.

For further details about the Barzani Charity Foundation and its work, please visit https://bcf.krd/. The foundation's achievements underscore its unwavering commitment to serving humanity, particularly during challenging times such as the global COVID-19 pandemic, providing hope and tangible support to those in need.

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