



## Original article

## Willingness of Middle Eastern public to receive COVID-19 vaccines

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## ABSTRACT

**Background:** COVID-19 is a pacing pandemic that affected health systems, economy, and social life in the whole world. Currently, there is no treatment for it, but the world is in a race that yielded, in a relatively short time than usual, several approved, promising vaccines in the middle of a storm of debates because of the speed of their production and approval.

**Objective:** This study assessed the willingness of Middle Eastern Arab publics to receive COVID-19 vaccines and investigated the factors behind any reluctance to receive them.

**Methods:** A self-administered questionnaire was distributed through social media applications in four Arab countries (Jordan, Saudi Arabia, Lebanon, and Iraq). Participants' demographics, medical history, their experience with COVID-19, and their willingness to receive the available vaccines were obtained and analyzed.

**Results:** A total of 2,925 completed forms were included. Only 25% of the participants were willing to receive a vaccine while 33% were hesitant. Iraqis were the most willing to receive it while Jordanians were the least (35% and 17% of each country, respectively). Interestingly, 60% of the acceptors were ready to pay for the vaccine if not covered by governments. It was also found that American vaccines were preferred by 50% of the acceptors. However, 30% of acceptors were unsure of which vaccine is the best and 11% stated that any vaccine is good. Social media were the major source of information about COVID-19 and its vaccines. Finally, predictors of acceptance of the vaccines included living in Saudi Arabia and Iraq, being unmarried, having monthly income > \$1,000, holding a medical degree, having high fear from COVID-19, feeling of being at risk of getting infected with COVID-19, and previous reception of influenza vaccine, whereas predictors of refusal included female sex and previous infection with COVID-19.

**Conclusion:** Middle Eastern Arabs are less likely to accept receiving the COVID-19 vaccines compared with non-Arabs. Health authorities in these countries are advised to intensify their awareness-raising activities about the vaccines while ensuring fair distribution of them.

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## 1. Introduction

As of December 2020, and after one year of the initial outbreak of the severe acute respiratory syndrome coronavirus 2

(SARS-CoV-2), this viral outbreak was associated with more than 80 million Coronavirus disease 19 (COVID-19) victims and more than 1.8 million deaths worldwide (World Health Organization, 2020a). The accelerated worldwide spread of SARS-CoV-2 has stressed the urgent needs for the initiation of preventive measures in an attempt to suppress its terrifying spread, which included among others a complete lockdown of several countries for several weeks (Cauchemez et al., 2020; Mitjà et al., 2020), the execution of quarantine and isolation (Nussbaumer-Streit et al., 2020), the use of protective equipment like face masks (Lyu and Wehby, 2020), as well as the execution of social distancing (Qian and Jiang, 2020).

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The application of such strict measures has caused an unprecedented disruption of the global societal and economic activities (Asante and Mills, 2020), and affected the mental health of the general population (Ozamiz-Etxebarria et al., 2020; Rossi et al., 2020). Therefore, this necessitates the search for a more effective measure to control or possibly end COVID-19 pandemic. Since there is no officially effective antiviral treatment for COVID-19 so far, the world pins its hopes on vaccines to counter COVID-19. The World Health Organization (WHO) has emphasized that the development of COVID-19 vaccine is considered the “vital tool” needed to end the current health crisis, and to reinforce the society’s socioeconomic status (World Health Organization, 2020b).

Since early 2020, several global pharmaceutical companies have invested huge efforts trying to develop vaccines against COVID-19 (World Health Organization, 2020c). As a result of these tremendous efforts, a number of vaccines have been successfully developed in several countries such as the Russian vaccine Sputnik V (Burki, 2020), and the American Pfizer/BioNTech and Moderna vaccines (Food and Drug Administration, 2020). These vaccines have been authorized for general use after being rigorously evaluated by the regulatory authorities for their quality, safety and effectiveness (Burki, 2020; Food and Drug Administration, 2020).

Nevertheless, COVID-19 health crisis does not end by just approving vaccines. In order to reach “herd immunity”, studies recommend that at least 70% of the population must be vaccinated (Bartsch et al., 2020). The success of this procedure is largely dependent on the willingness of public to be vaccinated, especially that vaccines were developed under exceptional circumstances (World Health Organization, 2020d). Such accelerated speed in vaccine development may lead to increased individuals’ hesitancy to receive it (Dror et al., 2020). Thus, it is essential for health officials worldwide to estimate the public willingness to take the available COVID-19 vaccines and define the predictors of acceptance or rejection. Recognizing such predictors could assist decision makers in setting policies dealing with any worrisome regarding these vaccines.

Thus, the main aim of the current study was to evaluate public perception and willingness to receive any of the newly approved COVID-19 vaccines in four middle eastern Arab countries (Jordan, Saudi Arabia, Lebanon, and Iraq) and to investigate the factors affecting any hesitancy in receiving these vaccines.

## 2. Methods

### 2.1. Study design, subjects, and data collection

This is a cross-sectional survey-based study that was conducted in December 2020 using a self-administered, pre-validated online questionnaire. The link to the questionnaire was posted on randomly selected public groups in the selected countries by the researchers from each country. In addition, we requested the members of these public groups to spread it among other public groups in their countries. Therefore, we used several social media platforms (Facebook, WhatsApp, Instagram, and Twitter) in an attempt to maximize the spread rate of the questionnaire in the studied countries. Only adults  $\geq 18$  years old were included in the analysis of the results.

### 2.2. Study questionnaire development

The questionnaire was a revised version of a previous one used to evaluate Jordanian public hesitancy towards COVID-19 vaccination (Abu Farha et al., 2021). The final draft was then tested for face and content validity by several academic experts. They assessed the questionnaire items’ relevance, specificity, and comprehensive-

ness. Afterward, the questionnaire was translated to Arabic, and two experts cross compared the translated version with the original one for validation. A pilot test was performed among a sample of 30 participants from the four countries. The participants were requested to evaluate its structure, clarity, length, and give their overall impression. Then, some questions were remodeled based on their feedback. The data obtained from the pilot test was not included in the final data analysis.

The questionnaire included 23 questions divided into four domains: part 1 included participant’s demographic and medical data (11 questions), part 2 assessed participant’s previous experience with COVID-19 (5 questions), while part 3 evaluated participant’s willingness to receive any of the approved COVID-19 vaccines (4 questions), and finally, part 4 was concerned with sources of information about COVID-19 vaccines adopted by the participant (3 questions). Regarding the second part, participant’s fear from COVID-19 was assessed using a scale from 1 to 5, where a score of 5 indicated the highest fear level, while a score of 1 indicated the lowest fear level.

### 2.3. Ethical considerations

This study followed The World Medical Association Declaration of Helsinki guidance (World Medical Association, 2013), and the study protocol was approved by the Institutional Review Board of the Applied Science Private University, Jordan (Approval number: 2020-PHA-33). Participants were requested to approve an electronic informed consent, which contained a statement about anonymity of the survey and voluntary participation.

### 2.4. Statistical analysis

The Statistical Package for the Social Science (SPSS®) version 22 (IBM Corp., Armonk, NY, USA) was used for data analysis. The mean  $\pm$  standard deviation (SD) and percentages were used for continuous and categorical variables, respectively. Normality was checked using the Shapiro-Wilk test. Chi-square test was used to assess the difference between respondents’ willingness to receive/recommend/purchase COVID-19 vaccines. In addition, multinomial logistic regression was performed to model the relationship between a set of predictors and the subjects’ willingness to receive COVID-19 vaccines divided into three groups (acceptors, hesitant, and rejecters). The Likelihood ratio chi-square test was used to assess the goodness-of-fit of the model. Statistical significance was considered at  $P \leq 0.05$ .

## 3. Results

### 3.1. Demographic characteristics of the study participants

A total of 2,925 participants from the four Arab countries were included in the present study. Of them 868 (38.0%) were from Jordan, 833 (28.5%) from Iraq, 632 (21.6%) Lebanon, and 592 (20.2%) from Saudi Arabia. The median age of participants was 27 years (with interquartile range [IQR] of 16) and around two-third of them ( $n = 1,826$ ; 62.4%) were females. Most of the respondents had a Bachelor or graduate degree ( $n = 2,368$ ; 80.9%) and less than half of them were married ( $n = 1,322$ ; 45.2%). Besides, half of the participants reported a monthly income  $< \$500$  ( $n = 1,453$ ; 49.7%) and 45.8% of them had a biomedical degree ( $n = 1,341$ ). For more details about participants’ demographics refer to Table 1.

**Table 1**  
Demographic characteristics of participants.

Variable (n, %)	Total (N = 2,925)	Jordan (n = 868)	Lebanon (n = 632)	KSA (n = 592)	Iraq (n = 833)
<b>Age</b> (median ± IQR, years)	27.0 ± 16.0	32.0 ± 17.0	24.0 ± 14.0	36.0 ± 25.0	24.0 ± 7.0
<b>Sex</b>	1,099 (37.6)	230 (26.5)	192 (30.4)	330 (57.1)	339 (40.7)
Male	1,826 (62.4)	738 (73.5)	440 (69.6)	254 (42.9)	494 (59.3)
Female					
<b>Educational level</b>	212 (7.2)	43 (5.0)	76 (12.0)	66 (11.1)	27 (3.2)
School level or below	347 (11.9)	131 (15.1)	87 (13.8)	47 (7.9)	82 (9.8)
Diploma	1,764 (60.3)	476 (54.8)	388 (61.4)	348 (58.8)	552 (66.3)
Bachelor	602 (20.6)	218 (25.1)	81 (12.8)	131 (22.1)	172 (20.6)
Masters/PhD					
<b>Holding a medical related degree</b>	1,584 (54.2)	497 (57.3)	461 (72.9)	363 (61.3)	263 (31.6)
No	1,341 (45.8)	371 (42.7)	171 (27.1)	229 (38.7)	570 (68.4)
Yes					
<b>Monthly income</b>	1,453 (49.7)	389 (44.8)	453 (68.6)	162 (27.4)	467 (56.1)
≤ \$500	717 (26.4)	279 (32.1)	126 (19.9)	95 (16.0)	271 (32.5)
\$501 - \$1,000	295 (10.1)	109 (12.6)	41 (6.5)	69 (11.7)	76 (9.1)
\$1,001 - \$2,000	406 (13.9)	91 (10.5)	30 (4.7)	266 (44.9)	19 (2.3)
> \$2,000					
<b>Marital status</b>	1,322 (45.2)	475 (54.7)	255 (35.6)	406 (68.6)	216 (25.9)
Married	1,603 (54.8)	339 (45.3)	407 (64.4)	186 (31.4)	617 (74.1)
Unmarried <sup>1</sup>					

IQR, interquartile range; KSA, Kingdom of Saudi Arabia.

<sup>1</sup> Includes single, divorced, and widowed.**Table 2**  
Medical information of the participants.

Variable (n, %)	Total (N = 2,925)	Jordan (n = 868)	Lebanon (n = 632)	KSA (n = 592)	Iraq (n = 833)
<b>Having a chronic disease</b>	2,530 (86.5)	741 (85.4)	562 (88.9)	470 (79.4)	757 (90.9)
No	395 (13.5)	127 (14.6)	70 (11.1)	122 (20.6)	76 (9.1)
Yes					
<b>Having received influenza vaccine</b>	1,794 (61.3)	608 (70.0)	331 (52.4)	328 (55.4)	527 (63.3)
No	1,131 (38.7)	260 (30.0)	301 (47.6)	264 (44.6)	306 (36.7)
Yes					
<b>Having infected with COVID-19</b>	2,336 (79.9)	738 (85.0)	533 (84.3)	500 (84.5)	595 (67.8)
No	589 (20.1)	130 (15.0)	99 (15.7)	92 (15.5)	268 (32.2)
Yes					
<b>Fear score from COVID-19 (out of 5, median ± IQR)</b>	3.0 ± 1.0	3.0 ± 1.0	3.0 ± 2.0	3.0 ± 2.0	3.0 ± 2.0
<b>Knowing someone infected with COVID-19</b>	212 (7.2)	82 (9.4)	40 (6.3)	52 (8.8)	38 (4.6)
No	2,713 (92.8)	786 (90.6)	592 (93.7)	540 (91.2)	795 (95.4)
Yes					
<b>Knowing someone died of COVID-19</b>	1,262 (43.1)	411 (47.4)	367 (58.1)	254 (42.9)	230 (27.6)
No	1,663 (56.9)	457 (52.6)	265 (41.9)	338 (57.1)	603 (72.4)
Yes					
<b>Feeling at risk of getting infected with COVID-19</b>	1,231 (42.1)	323 (37.2)	255 (40.4)	322 (54.4)	331 (39.7)
No/unsure	1,694 (57.9)	545 (62.8)	377 (59.7)	270 (45.6)	502 (60.3)
Yes					

IQR, interquartile range; KSA, Kingdom of Saudi Arabia.

### 3.2. Medical information of the study participants

As depicted in Table 2, only 13.2% of participants (n = 395) reported having chronic diseases, with hypertension and diabetes being the most prevalent ones (38.5% and 30.0%, respectively). More than one-third the participants (n = 1,131; 38.7%) had received the influenza vaccine previously. In addition, about 20% of the participants (n = 589) revealed that they had been infected with COVID-19, while most of them (n = 2,713; 92.8%) reported knowing someone infected with COVID-19, and more than half of them (n = 1,663; 56.9%) knew someone who died of COVID-19. The median score of fear of infection with COVID-19 was 3 out of 5 (IQR = 1) with 57.9% of participants (n = 1,694) feeling that they are at risk of getting infected with the virus.

### 3.3. Willingness to receive COVID-19 vaccines

Only 24.9% of the participants (n = 728) showed acceptance of receiving an available COVID-19 vaccine, while 32.6% (n = 955) were hesitant, and the rest of them denied the willingness to take it (Table 3). Public from the different countries have shown significant differences in their acceptance to receive the vaccine, with Iraqi participants showing the highest acceptance rate of 34.7% while Jordanians had shown the lowest rate (17.1%). Among those who accepted to take the vaccine, 60.2% (n = 438) were ready to pay for it if the cost is not covered by their governments. On the other hand, 32.2% of participants (n = 943) were willing to advise their relatives and friends, who are at risk of infection, to get vaccinated.

**Table 3**  
Participant willingness to receive, purchase, or recommend COVID-19 vaccine.

Variable (n, %)	Total (N = 2,925)	Jordan (n = 868)	Lebanon (n = 632)	KSA (n = 592)	Iraq (n = 833)	P-value <sup>1</sup>
<b>Willingness to receive a COVID-19 vaccine</b>						
Acceptors	728 (24.9)	148 (17.1)	117 (18.5)	174 (29.4)	289 (34.7)	< 0.001
Hesitant	955 (32.6)	247 (28.5)	220 (34.8)	199 (33.6)	289 (34.7)	
Rejecters	1,242 (42.5)	473 (54.5)	295 (46.7)	219 (37.0)	255 (30.6)	
<b>Willingness to purchase the vaccine if the cost is not covered by the government<sup>2</sup></b>						
Acceptors	438 (60.2)	100 (76.6)	69 (59.0)	103 (59.2)	166 (57.4)	0.035
Hesitant	125 (25.0)	30 (20.3)	39 (33.3)	40 (23.0)	73 (25.3)	
Rejecters	108 (14.8)	18 (12.2)	9 (7.7)	31 (17.8)	50 (17.3)	
<b>Willingness to advise relatives and friends at risk of infection to get vaccinated</b>						
Acceptors	943 (32.2)	209 (24.1)	162 (25.6)	220 (37.2)	352 (42.3)	< 0.001
Hesitant	985 (33.7)	261 (30.1)	228 (36.1)	205 (34.6)	291 (34.9)	
Rejecters	997 (34.1)	398 (45.9)	242 (38.3)	167 (28.2)	190 (22.8)	

KSA, Kingdom of Saudi Arabia.

<sup>1</sup> Calculated using Pearson Chi square test.

<sup>2</sup> Percentage calculated for subjects who were willing to take the vaccines (n = 728).

Participants who were willing to receive the vaccine were asked about the one they prefer to receive. The American vaccine (Pfizer-BioNTech) was preferred by 45.2% of them (n = 329) followed by Moderna vaccine (the other American vaccine, n = 43, 5.9%). It was also found that around 30% of the participants (n = 215) reported that they were unfamiliar with the current vaccines so, they did not know which one to select.

#### 3.4. Participant source of information about COVID-19 vaccines

More than half of the participants (n = 1,553; 53.1%) stated that medical websites were the most used sources of information about the vaccines, followed by social media (n = 956, 32.7%), television (n = 936, 32%), and healthcare providers (n = 867, 29.7%). However, 12.5% of participants (n = 366) reported that they were not interested in knowing about COVID-19 vaccines.

#### 3.5. Predictors of public willingness to receive COVID-19 vaccines

Multinomial logistic regression analysis (Table 4) has identified eight factors that were found to be protective against COVID-19 refusing the vaccine (i.e., participants were less likely to refuse the vaccine,  $P \leq 0.05$  with odds ratio (OR) < 1). These included holding a medical related degree (OR = 0.768), monthly income > \$1,000 (OR = 0.719), being unmarried (OR = 0.686), living in Saudi Arabia (OR = 0.454) or Iraq (OR = 0.328), having received influenza vaccine previously (OR = 0.449), having high fear score from COVID-19 (OR = 0.745), and feeling of being at risk of getting infected with COVID-19 (OR = 0.656). On the other hand, factors that were significantly associated with higher refusal to COVID-19 vaccines ( $P \leq 0.05$  with OR greater than 1) included female sex (OR = 1.843) and having infected with COVID-19 (OR = 1.322).

Regarding predictors of participants' hesitancy to receiving COVID-19 vaccines, five factors were found to be protective against the hesitancy to receive the vaccine (i.e., participants were less hesitant to receive the vaccine,  $P \leq 0.05$  with OR < 1). These were monthly income > \$1,000 (OR = 0.736), being unmarried (OR = 0.705), living in Iraq (OR = 0.682), having received previous influenza vaccine (OR = 0.578), and feeling at risk of getting infected with COVID-19 (OR = 0.770). On the other hand, female sex was found to be significantly associated with higher hesitancy degree (OR = 1.322).

The model fit was found significant with  $\chi^2$  (df = 32) = 419.826 at  $P \leq 0.001$ , which indicated that our full model predicts significantly better or more accurately than the null model.

## 4. Discussion

This study is the first to measure the extent to which Middle Eastern Arab societies accept COVID-19 vaccines and to identify significant predictors of rejection by them. Studies from other parts of the world have revealed different rates of acceptance of COVID-19 vaccines. For example, the acceptance rate was 90% in China (Lazarus et al., 2021), 76.5% in Canada (Frank and Arim, 2020), 58% to 69% in the United States of America (Fisher et al., 2020; Malik et al., 2020; Reiter et al., 2020), and 55% in Russia (Lazarus et al., 2021). Interestingly the current study has shown that Arab countries were the least in acceptance rates compared with those reports. Overall, only 24.9% of our participants were willing to receive a vaccine when available while 32.6% were hesitant and 42.5% were against it. This variation among countries could be due to different factors such as the local COVID-19 prevalence and mortality rates, the countries' economic, social and political statuses, education and national awareness, and most importantly the public trust in their government and the national health agencies (Frank and Arim, 2020; Guidry et al., 2021).

Approximately 65% of our participants reported that their primary sources of information about COVID-19 and its vaccines were the social networking platforms and television. Since this finding goes in line with the results of other studies in other countries (Ali et al., 2020; Mohamad et al., 2020; Basheti et al., 2021), it may be justified by the fact that the internet and traditional media are the most popular and accessible sources of information, especially during the quarantine and the lockdown times. However, sources that are not related to official health authorities may spread exaggerated, flawed, and misleading information that can negatively affect mental health of the public causing fear, anxiety, and depression (Garfin et al., 2020). This fear may, in turn, negatively influence the willingness to receive a potentially effective and safe COVID-19 vaccine that may bring the pandemic to an end. Therefore, people must be advised to follow and connect with local health authorities for the most geographically-relevant information. On the other hand, and especially in times of crises, local authorities must set official channels within the available media to communicate with the public and deliver reliable information.

In this study, several predictors were identified to be significantly influencing the public willingness to receive the COVID-19 vaccines. Females were significantly more likely to refuse to take the vaccine than males (OR = 1.84,  $P \leq 0.001$ ). This finding is consistent with two recent cross-sectional studies conducted in the USA, China and Jordan (Kreps et al., 2020; Qunaibi et al., 2021; Wang et al., 2020). The reason for women being more skeptical

**Table 4**  
Multinomial logistic regression for factors affecting either participants' rejection or hesitancy to receiving COVID-19 vaccines.

Variable	Willingness to receive the vaccine [Reference group is the one willing to receive the vaccine]			
	Rejection		Hesitancy	
	OR	P-value	OR	P-value
<b>Age (years)</b>	1.004	0.573	1.001	0.866
<b>Sex</b>	Reference	< 0.001*	Reference	0.010*
Male	1.843		1.322	
Female				
<b>Educational level</b>	Reference	0.089	Reference	0.274
Low (diploma or lower)	0.790		0.856	
High (university or higher)				
<b>Holding a medical-related degree</b>	Reference	0.018*	Reference	0.178
No	0.768		0.860	
Yes				
<b>Monthly income</b>	Reference	0.019*	Reference	0.031*
≤ \$1,000	0.719		0.736	
> \$1,000				
<b>Marital status</b>	Reference	0.006*	Reference	0.013*
Married	0.686		0.705	
Unmarried (single, divorced, widowed)				
<b>Country of current residence</b>	Reference		Reference	0.171
Jordan	0.934	0.662	1.251	0.166
Lebanon	0.454	< 0.001*	0.801	0.009*
Saudi Arabia	0.328	< 0.001*	0.682	
Iraq				
<b>Having a chronic disease</b>	Reference	0.301	Reference	0.985
No	0.849		0.997	
Yes				
<b>Having received influenza vaccine</b>	Reference	< 0.001*	Reference	< 0.001*
No	0.449		0.578	
Yes				
<b>Having infected with COVID-19</b>	Reference	0.029*	Reference	0.286
No	1.322		1.148	
Yes				
<b>Fear score from COVID-19</b>	0.745	< 0.001*	1.004	0.930
<b>Knowing someone infected with COVID-19</b>	Reference	0.080	Reference	0.305
No	0.680		0.792	
Yes				
<b>Know someone died of COVID-19</b>	Reference	0.712	Reference	0.718
No	0.961		0.962	
Yes				
<b>Feeling at risk of getting infected with COVID-19</b>	Reference	< 0.001*	Reference	0.015*
No/unsure	0.656		0.770	
Yes				

OR, odds ratio.

\* P ≤ 0.05 is considered significant.

might be that they are more influenced by the online-based conspiracy theories, especially after the anti-vaccination sentiment on social media that is led mainly by females.

The public of Iraq and Saudi Arabia were significantly more likely to accept taking the vaccine compared with the other countries in this study. The higher acceptance rate in Iraq could be justified by the high COVID-19 prevalence (599,965) and mortality rate (12,865) (World Health Organization, 2020a), while in Saudi Arabia the political and economic stability and trust of the public in the government may have increased the acceptance rate especially that the government efforts, services and guidelines during the outbreak have led to minimizing the number of daily cases and deaths of the disease (World Health Organization, 2020a; World Health Organization, 2020e). On the other hand, almost half of the Jordanians and Lebanese citizens were against receiving the vaccine. The economic, social, and political instability in Lebanon may have loosened the trust of the public in their government regarding the fair provision of safe and effective vaccines that are held and stored under optimal conditions (Le Borgne and Jacobs 2016; Malaeb, 2018). The low acceptance rate to take the vaccine by the Jordanians may be justified by the public frustration from many decisions taken by their authorities to deal with the COVID-19 pandemic. A recent

study found that around 58% of Jordanians did not trust the Ministry of Health's approach to manage COVID-19, and 66% of them did not trust the information about the number of COVID-19 cases published by Government (Elayeh et al., 2020).

Other predictors that were found to significantly and positively influence the willingness to receive the vaccines included holding a medical-related degree, history of receiving influenza vaccine, having a higher score of fear of getting infected by COVID-19, and the perception of being at a high risk of infection. In contrast, being previously infected with COVID-19 was found to increase the level of refusal to receive the vaccines. This finding might be explained by the common misconception that previously COVID-19 infected people have lifelong immunity and do not need to get vaccinated.

Finally, although this study was proactive in revealing the feelings of the Arab publics towards the COVID-19 vaccines and that it contributed to defining some predictors of acceptance or rejection of the vaccines, there were some limitations that must be pointed out. We have included only four Arab countries because a number of researchers in other countries were unable to participate in distributing the questionnaire. We believe that our four countries are representative of the Arab world because they include countries with diverse economic and political conditions, but at the same

time they share the prevailing culture in the Arab world. Also, some Arab governments have announced during the study period that they would soon provide the vaccines to their people. This prompted us to shorten the time for collecting responses to the questionnaire in order to complete the survey before the vaccines become available, which led to a smaller number of participants than planned. In addition, in this study we have recruited a convenience sample of participants via social media which introduced selection bias; as most of the respondents were young, and around 46% of them reported holding a biomedical degree. This may limit the generalizability of results to the general population. Therefore, we strongly recommend further studies that would shed more light on the perception of Middle Eastern communities about COVID-19 and its related developments, emphasizing the role of governments in spreading adequate awareness and providing vaccines to people in a safe and fare way.

## 5. Conclusions

This study has generally reflected a low level of willingness to receive the COVID-19 vaccine by Middle Eastern people during the pandemic. Several predictors were found to hinder their acceptance of the vaccines, which may endanger achieving the “herd immunity” to successfully combat this pandemic. The study findings may assist the authorities in Arab countries in setting effective strategies for the immunization programs by correcting the public misconceptions, re-establishing their trust, and facilitating their willingness to receive the vaccines.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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