

JORDANIANS' ACCEPTANCE OF THE COVID-19 VACCINE AND THE REASONS FOR THEIR VACCINE HESITANCY

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ABSTRACT

The objective of this study was to determine Jordanians' acceptance of coronavirus disease 2019 (COVID-19) vaccines, assess its determinants, and identify reasons for hesitancy.

An online-based, cross-sectional, anonymous study was conducted on Jordanian adults (n = 2,261; aged ≥20 years) in April 2021. Logistic regression analysis was used to identify the determinants of COVID-19 vaccine acceptance. Reasons for hesitancy were also examined.

This study identified an acceptance of 58.2% among participants. It identified predictors and established a profile of the most hesitant toward COVID-19 vaccines: female, young, lower educational level, poor compliance with recommended vaccinations in the past, no history of chronic conditions, economically not affected by the pandemic, and other characteristics described in more detail in this article. Vaccine hesitancy was also associated with distrust in the safety of the vaccines and a lower perceived severity of COVID-19.

This low acceptance rate is alarming. Authorities' strategies should be more specific, targeting these identified characteristics that are most hesitant towards the vaccine and adopting structured awareness campaigns that offer transparent information about the safety of the vaccines, the technology used in their production, and the seriousness of the disease.

Keywords: COVID-19 vaccines, acceptance, Jordan

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) that is caused by coronavirus 2 (SARS-CoV-2) was classified by the World Health Organisation (WHO) as a pandemic on 11 March 2020.^{1,2} COVID-19 has been related to a broad range of symptoms, from asymptomatic to fatal.³ It caused a global crisis that necessitated diminution strategies to restrain the pandemic.⁴ These strategies

that were adopted worldwide included obligatory masking policies, hand sterilisation, social distancing, travel restrictions, and partial or complete lockdowns.⁵

Although such protocols have an essential effect on flattening the epidemic curve, it is temporary, as the re-emergence of COVID-19 has been reported as societies and economies reopened.^{6,7} Knowing vaccines' long history of controlling and preventing infectious diseases, such as plague, smallpox, and polio,⁸ the announcement of COVID-19 vaccines gave the world hope. However, there are challenges, such as availability and global distribution,⁹ long-term protection, and virus evolution leading to new genetic variants.^{10,11} Yet one of the serious concerns and a major obstacle in the efforts to control the pandemic is vaccine hesitancy. Vaccine hesitancy is described as a 'delay in acceptance or refusal of vaccination despite the availability of vaccination services'.¹²

Jordan has one of the highest per capita rates of COVID-19 infection in the world.^{1,13} As of May 2021, Jordan reported more than 722,700 confirmed COVID-19 cases and over 9,200 deaths.^{1,13} It also has one of the

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lowest reported COVID-19 vaccine acceptance rates worldwide, ranging from 28.4 to 37.4%.¹⁴⁻¹⁶ But it is worth mentioning that these studies were conducted at a time when vaccines were not yet available in Jordan. This study was conducted on the acceptance of COVID-19 vaccines among Jordanians at the time of availability of the vaccines, as the first doses of Pfizer-BioNTech's vaccine were available in Jordan at the end of January 2021.¹⁷ In this study, we aim to assess Jordanians' acceptance of COVID-19 vaccines, determine its predictors, and identify the main reason for hesitancy at the time of the availability of COVID-19 vaccines in Jordan, thus identifying a more realistic than predicted finding. This is important because these results might guide policymakers to plan, improve, and conduct effective strategies to confine the spread of the infection and stop further deaths.

MATERIALS AND METHODS

2.1 Study design

This is an online, cross-sectional, survey-based study targeting Jordanian adults that was conducted in April 2021 to assess their acceptance of COVID-19 vaccination. The questionnaires were anonymous to ensure privacy and confidentiality. Participation was voluntary. Respondents were informed about the purpose of the study, and they were asked if they were willing to participate. Anyone who gave consent was enrolled in this study. Ethical approval of the study was obtained from the technical training directorate at the Royal Medical Services (RMS). The inclusion criteria were Jordanians who are living in Jordan and are 20 years old or above. Non-Jordanians, those younger than 20 years old, those not living in Jordan, and those who did not give their consent were excluded from this study.

The online survey was conducted using the Google Forms platform, distributed via a link through social media such as Facebook and WhatsApp. All respondents were requested to share the link with their contacts, employing a simplified snowball sampling technique to increase participation levels. This method of distribution was chosen because of the nature of the pandemic, as it offers social distancing and limits contact.

2.2 Sample size

The sample size was calculated using an online Raosoft sample size calculator designed for population surveys. Based on the Jordan estimated population of 10 million,¹⁸ the minimal calculated sample size required to achieve a 3% margin of error and a confidence level of 99% is 1,843.

2.3 Study instruments

This self-administrated questionnaire was designed based on a literature review and discussion within the research team, and it was validated by a team of experts. The questionnaire was originally developed in the English language and then translated into Arabic. Afterward, it was translated back to English by different translators and, finally, compared by a third translator to ensure that the translation did not change the meaning of the original English version. The Arabic version was used in this survey because Arabic is the official language in Jordan.¹⁸ A pilot sample (n=30) was used to check the clarity of expression and improve the wording of the survey items. It showed significant modifications were not required. Data from the pilot sample were excluded from any further analysis. The final version of the questionnaire needed about 5–10 minutes to complete. To ensure that participants met the inclusion criteria, questions about nationality, age, and region of residence were included in the questionnaire.

The questionnaire consisted of five sections: (I) socio-demographic characteristics, (II) medical history, (III) effect of COVID-19 infection, (IV) acceptance of COVID-19 vaccines and reasons for hesitancy, and (V) confidence in COVID-19 vaccines.

2.3.1 Socio-demographic characteristics

The survey collected information regarding nationality, gender, age, region of residency, and educational level.

2.3.2 Medical history

The medical history section consisted of two yes-or-no questions: (1) 'Do you have any chronic disease?' and (2) 'Did you take the seasonal influenza vaccine this year?'

2.3.3 Effect of COVID-19 infection

In this section, participants were asked if they or any of their family members were infected with COVID-19 and if they were economically affected by the pandemic. Answers were yes, no, or don't know and yes, no, or slightly, respectively.

2.3.4 Acceptance of COVID-19 vaccines and reason for hesitancy

This was the survey's primary outcome. Here participants were asked if they received COVID-19 vaccination (yes, no). Participants who were against vaccination were further asked to state their reason.

2.3.5 Confidence in COVID-19 vaccines

Participants were asked three (yes, no, or don't know) questions: 'Do you think these vaccines are safe?'; 'Do you think these vaccines are efficient?'; 'Were there

enough clinical trials carried out on them?"

2.4 Statistical analysis

Descriptive analysis was performed, presenting variables in numbers and percentages. A logistic regression model was fitted to identify factors that contributed to COVID-19 vaccine acceptance among participants. A chi-square test was used to evaluate the association between different variables and COVID-19 vaccine acceptance, with a significance level of $P < 0.05$. The logistic regression was performed twice. In the first time, the relation between ungrouped variables and acceptance responses was analysed. In the second time, for further, easier, and straightforward analysis, all variables were included in an adjusted analysis; negative responses of 'no' and 'don't know/not sure' of any given variable were combined in a category, and a positive response of 'yes' was categorised in another category. Regarding answers to whether participants were economically affected by the pandemic, 'yes' and 'slightly' were fitted into one category, and 'no' was considered as another category. Binomial regression analysis was then fitted on the adjusted data to establish validity. The odds ratio with 95% confidence intervals (CIs) was then investigated, and the significance of the odds ratio (OR) from univariate analysis and the adjusted OR (aOR) in multivariate analyses was evaluated at $P < 0.05$. All analyses were performed using SPSS software version 26 (SPSS Inc., Chicago, IL, USA).

RESULTS

3.1 Sample characteristics

Sample characteristics that represent the socio-demographic, medical history, and the effect of COVID-19 sections are presented in Table 1. A total of 2,261 participants enrolled in this study gave their consent, completed the survey, and fulfilled the inclusion criteria. More than half of the sample were females (1,415, 62.6%), and almost half of the participants belonged to the youngest age category of this survey (20–39, 50.5%). Moreover, 67.8% of the participants had finished college or university compared with only 239 participants (10.6%) who only finished high school. Only 445 (19.1%) had chronic diseases. Sixty-one percent of the sample was economically affected or slightly affected by the pandemic. Additional details of the sample characteristics are presented in Table 1.

3.2 Acceptance of COVID-19 vaccines

In this study, 58.2% of the participants stated their acceptance of the vaccine. Table 2 shows the determinants of COVID-19 vaccine acceptance resulting from logistic regression analysis on the unchanged and grouped data. All variables in both logistic regression analyses

TABLE 1: SAMPLE CHARACTERISTICS OF THE PARTICIPANTS, PRESENTED IN NUMBER AND PERCENTAGE. N: NUMBER; %: PERCENTAGE.

Sample characteristics	n	%
Gender		
Female	1,415	62.6%
Male	846	37.4%
Age		
20–39	1,138	50.3%
40–59	939	41.5%
60 and above	184	8.1%
Place of residence		
Capital	1,284	57%
Central	428	19%
Northern	391	17%
Southern	158	7%
Educational level		
High school or below	239	10.6%
Diploma and bachelor's degrees	1,533	67.8%
Postgraduate level	489	21.6%
Do you have any chronic diseases?		
Yes	432	19.1%
No	1,829	80.9%
Did you take the influenza vaccine?		
Yes	394	17.4%
No	1,867	82.6%
Infected by COVID-19 in self/family		
Yes	1,304	57.7%
No	940	41.2%
I do not know.	17	1.1%
Were you economically affected by COVID-19?		
Yes	884	39%
No	869	38.4%
Slightly	508	22.6%

had a significant relation with the acceptance of the COVID-19 vaccine except for one variable — infected by COVID-19 in self or family — which was insignificant. The similarities in both outcomes prove the validity of the adjusted logistic analysis. Table 3 represents the participants' acceptance of COVID-19 vaccines with respect to categories of different variables. Sixty-five percent of male participants accepted vaccination, and they were 1.6 times more likely to accept the vaccine than females (OR=1.6, 95CI%=1.3–1.9, $p < .001$).

TABLE 2: PREDICTORS OF COVID-19 ACCEPTANCE RUNNING MULTIPLE LOGISTIC REGRESSION ANALYSES ON BOTH THE UNCHANGED DATA AND THE ADJUSTED GROUPED DATA. ALL VARIABLES WERE STATICALLY SIGNIFICANT WITH P VALUE<0.05, EXCEPT FOR INFECTED BY COVID-19 IN SELF/FAMILY, WHICH WAS OF P VALUE GREATER THAN 0.5 IN BOTH SETS OF ANALYSES. X2: CHI-SQUARE VALUE; DF: DEGREE OF FREEDOM; P: P VALUE.

Predictors	1st analysis			2nd adjusted analysis		
	X2	df	P	X2	df	P
Gender	24.865	1	< 0.001	24.865	1	<0.001
Age	23.350	2	< 0.001	23.350	2	<0.001
Region	153.537	3	< 0.001	153.537	3	<0.001
Level of education	41.146	2	< 0.001	41.146	2	<0.001
History of chronic disease	10.277	1	0.001	10.277	1	<0.001
Took the flu vaccine	48.061	1	< 0.001	48.061	1	<0.001
Infected by COVID-19 in self/family	0.348	2	0.84	0.118	1	0.73
Economically affected by the pandemic	534.676	2	< 0.001	535	1	<0.001
Safety of COVID-19 vaccine	671.207	2	< 0.001	555	1	<0.001
Efficacy of COVID-19 vaccine	767.102	2	< 0.001	751	1	<0.001
Enough clinical research	264.922	2	< 0.001	263	1	<0.001
Overall statistics	2539.491	20	< 0.001	2405.354	15	<0.001

TABLE 3: JORDANIANS' ACCEPTANCE OF THE COVID-19 VACCINE WITH RESPECT TO CATEGORIES OF DIFFERENT VARIABLES AND THEIR ODDS RATIO (OR) EVALUATED AT P <0.05. N: NUMBER; %: PERCENTAGE; CI: CONFIDENCE INTERVAL; OR: ODDS RATIO; SIG.: SIGNIFICANT SET AT P<0.05; REF.: REFERENCE.

Variables	Acceptance of COVID -19 vaccines				OR (95% CI)	Sig.
	Yes		No			
	N	(%)	N	(%)		
Overall	1,316	58.2%	945	41.8%		
Gender						
Female	767	54.2%	648	45.8%	Ref.	
Male	549	65%	297	35%	1.6(1.3–1.9)	< 0.001
Age						
20–39	614	54%	524	46%	Ref.	
40–59	571	60.8%	368	39.2%	1.2(1–1.4)	0.04
60 and above	131	71.2%	53	28.8%	2.1(1.5–3.96)	< 0.001
Residency						
North gover-nate	138	35.3%	253	64.7%	Ref.	
Central gover-nate	249	58.2%	179	41.8%	2.6(1.9–3.4)	< 0.001
South gover-nate	62	39.2%	96	60.8%	1.2(0.81–1.7)	0.4
Capital	867	67.5%	417	32.5%	3.8(3–4.8)	< 0.001
Education						
High school/ less	94	39.3%	145	60.7%	Ref.	

College	913	59.6%	620	40.4%	2.27(1.7–3)	< 0.001
Postgraduate	309	63.2%	180	36.8%	2.6(1.9–3.6)	< 0.001
Chronic disease						
Yes	281	65%	151	35%	1.4 (1.14–1.8)	0.0014
No	1,035	56.6%	794	43.4%	Ref.	
Taken flu vaccination						
Yes	291	73.9%	103	26.1%	2.3(1.82–2.96)	< 0.001
No	1,025	55%	842	45%	Ref.	
Infected by COVID-19 in self/family						
Yes	755	57.9%	549	42.1%	0.97(0.81–1)	0.73
No/don't know	561	58.6%	396	41.4%	Ref.	
Economically affected by the pandemic						
Yes/slightly	1,074	77%	318	23%	8.7(7.2–10.4)	<0.001
No	242	28%	627	72%	Ref.	
It is safe						
Yes	885	84.5%	162	15.5%	9.92 (8.09–12.2)	< 0.001
No/don't know	431	35.5%	783	64.5%	Ref.	
It is effective						
Yes	1,254	75.1%	415	24.9%	25.8 (19.4–34.4)	< 0.001
No/don't know	62	10.5%	530	89.5%	Ref.	
Enough research was done						
Yes	650	80.8%	154	19.2%	5.01 (4.09–6.15)	< 0.001
No/don't know	666	45.7%	791	54.3%	Ref.	

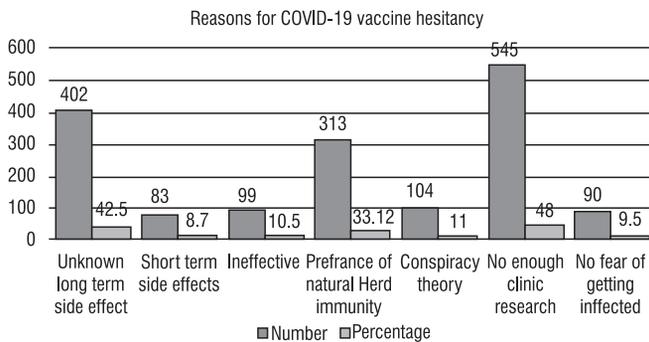


Fig 1: Reasons for vaccine hesitancy of 945 participants (anti-COVID-19 vaccination group), presented in number and percentage

People of the age group of 60 and above (OR=2.1, 95CI%= 1.5–3.96, P <0.001) were two times as likely to respond positively towards vaccination compared to people of a younger age group (20–39), and 72.1% of elderly participants stated their acceptance of the vaccines. Likewise, participants with postgraduate degrees (OR=2.6, 95CI%=1.9–3.6, P<.001) had the highest accep-

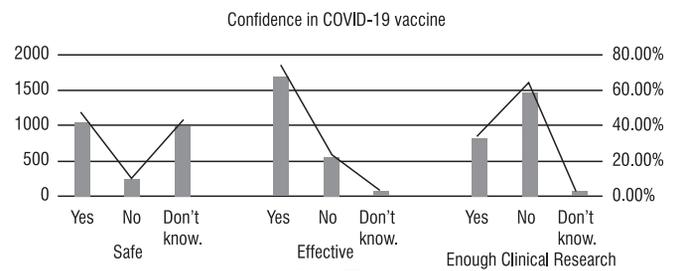


Fig 2: Confidence of the participants in COVID-19 vaccines in terms of safety, effectiveness, and clinical research. Presented as number and percentage: 1,047 (46.3%) think they are safe, 246 (10.9%) think they are not safe, and 968 (42.8%) did not know whether they were safe; 1,669 (73.8%) think they are effective, 553 (24.5%) think they are not effective, and 39 (1.7%) did not know; 804 (35.6%) believe that there was not enough clinical research or trials on the vaccine, 1,443 (63.8%) think enough clinical research or trials were performed on the vaccine, and only 14 (0.6%) did not know. (n): number; %: percentage.

tance rate in this survey and were 2.6 times more likely to accept vaccination than those who only finished high school. In addition, 63.2% of those with post-graduate degrees accepted the vaccine compared to only 39.3% of those who only finished high school. Besides, people living in the capital (OR=3.8, 95CI%=3–4.8, P<.001) were 3.8 times more likely to accept the vaccine than people living in the north governate. Furthermore, participants who took the seasonal flu vaccine (OR=2.3, 95CI%=1.82–2.96, p<.001) were 2.3 times more likely to accept the vaccine than those who did not take the flu shot. People who were economically affected by the pandemic (OR=8.7, 95CI%=7.2–10.4, p<.001) were 8.7 times more likely to accept the vaccine than those who were not affected economically, with an acceptance rate of 77% and 28% in the respective groups. Further details are provided in Table 3.

3.3 Reasons for hesitancy

Several reasons for vaccine hesitancy were stated by the 945 participants who were against the vaccine (anti-COVID-19 vaccination group). Not having enough clinical research on the vaccines was the most common reason for hesitancy (48%), followed by the unknown long-term side effects (42.5%). Moreover, 313 respondents (33.12%) reported their preference of natural herd immunity. Only 11% of the anti-COVID-19 vaccination group believed that COVID-19 is a conspiracy, and the least common reason for hesitancy was the fear of short-term side effects, as reported by 83 out of 945 participants (8.7%). More details about the reasons for hesitancy are presented in Figure 1.

3.4 Confidence in COVID-19 vaccines

In this study, 1,047 respondents (46.3%) believed that the vaccines are safe, and 1,669 participants (73.8%) think they are effective. More than half of the respondents (1,443, 63.8%) believed that there is not enough clinical research on the vaccines. Further details concerning the confidence in COVID-19 vaccines among Jordanians are shown in Figure 2.

DISCUSSION

The COVID-19 vaccine acceptance reported in this study (58.2%) was higher than previous local findings.¹⁴⁻¹⁶ However, it was lower than other regional and international findings. A 64.7% acceptance rate was reported in Saudi Arabia,¹⁹ 97.0% in Ecuador, and 91.3% in China.²⁰ Moreover, most Western countries report relatively higher public acceptance (59–75%).²⁰ Though there is improvement in vaccine acceptance, it is still below the suggested average threshold of acceptance (67%)²¹ that is needed to stop the spread of the disease.

In this study, we identified several COVID-19

vaccine acceptance determinants. Consequently, a profile of individuals who are most hesitant toward vaccination was established: female, young, no history of chronic disease, low educational level, and not affected economically by the pandemic. Other determinants highlight the underlying vaccine hesitancy apparatus in anti-COVID-19 vaccine conduct, specifically vaccine confidence and compliance.¹² As stated earlier, males were more likely to accept COVID-19 vaccines than females; this agrees with prior findings^{14,16,22-27} and is in contrast with another regional study.¹⁹ This could be explained by the fact that males have a lower belief in conspiracy theories regarding COVID-19 and a higher belief that the disease is dangerous.^{28,29} Concerning age, we found that as age increases, the vaccine acceptance also increases. This may be because younger people are more exposed to social media, which circulates much misinformation regarding COVID-19 and vaccines. In addition, older people are at higher risk of severe COVID-19 disease. This finding was coincident with other findings,^{14, 19, 23,25,26} and inconsistent with other studies.^{16,27} Likewise, we found that as educational level increases, the acceptance of COVID-19 vaccines also increases, which agreed with previous studies.^{14,22-24,26} The rest of our results confirmed other studies' findings concerning COVID-19 vaccine acceptance: living in Amman or the central governate,¹⁵ a history of chronic disease,^{14, 24,26} and good compliance with vaccines in the past such as flu shots.^{24,26}

To our knowledge, the relation between the economic impact of COVID-19 disease on individuals and their vaccine acceptance was not addressed in the literature. This study demonstrated that being affected economically by the pandemic significantly increases COVID-19 vaccine acceptance. We assumed that the devastating economic consequences of COVID-19-related restrictions would lead to an increase in population acceptance levels, as a way of trying to reopen economies. Economic and job insecurities due to the pandemic are indeed predictors for acceptance of COVID-19 vaccines. This could be another helpful tool to identify professions and communities that are at risk of vaccine hesitancy.

Concerning the reasons for COVID-19 vaccine hesitancy, the main reasons stated by participants who were against vaccination were that not enough clinical research has been done on the vaccines and the unknown long-term side effects. These reasons reveal uncertainty about the COVID-19 vaccines, which could be because the technology being used in manufacturing certain types of COVID-19 vaccines is new with no evidence of success or experience using such techniques, not to forget the short time taken to develop them. This uncertainty reveals distrust in the safety but not in the efficacy of the vaccines, as most of the participants in this survey believe that the vaccines

are effective, whereas more than half of them reported uncertainty about the safety of these vaccines. Most in the anti-COVID-19 vaccination group frankly stated that the reason behind their refusal is the unknown long-term side effects associated with COVI-19 vaccines, and only a few participants believed that the vaccines were ineffective. Other studies also confirmed that doubts concerning vaccine safety were the prime reason for COVID-19 vaccine refusals in Jordan.^{15, 16}

Many participants in the anti-COVID-19 vaccination group also stated that they preferred natural herd immunity and being immunised naturally. Some stated they had no fear of getting infected, and others stated that COVID-19 is a conspiracy. From this, we concluded that vaccine compliance might fuel anti-COVID-19 vaccination attitudes, as vaccine refusal was strongly related to lower recognition of COVID-19's severity. Given vaccine safety concerns in this group, this will not favour the individual benefit–risk assessment of COVID-19 vaccination and will thus decrease acceptance levels. This was in line with other studies on COVID-19 vaccination acceptance.³⁰⁻³²

Strengths and limitations

Though the sample size was large decreasing the effect of existing bias. The survey was web-based thus, reaching otherwise unreachable participants, with a more private environment for them to answer the questions honestly than a face-to-face interview. There are some limitations worth mentioning. Firstly, this study used an online questionnaire, so it does not include individuals without Internet access, which might have introduced a selection bias. Secondly, the questionnaire was self-reporting, so a difference between the actual and reported responses could exist, resulting in social desirability bias.

CONCLUSION

Our results suggest that authorities should focus on people of specific socio-economic backgrounds who are more hesitant towards vaccination and not take a non-specific approach to promote the vaccination programme. We also recommend that the awareness campaigns give insight into the new technology that was used in manufacturing some of the vaccines and focus on certain issues behind vaccine hesitancy, such as vaccine safety and compliance.

REFERENCES

- 1 World Health Organization. WHO Coronavirus Disease (COVID-19) Dashboard: World Health Organization. 2021 [cited 2021 May 15]. Available from: <https://covid19.who.int>
- 2 World Health Organization. Coronavirus disease 2019 (COVID-19): situation report, 51. Geneva: World Health Organization. 2020. Available from: <https://apps.who.int/iris/handle/10665/331475>.

- 3 Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, et al. Presenting characteristics, comorbidities, and outcomes among 5,700 patients hospitalized with covid-19 in the New York city area. *JAMA* 2020 May 26; 323(20): 2052–9.
- 4 Phua J, Weng L, Ling L, Egi M, Lim CM, Divatia JV, Shrestha BR, Arabi YM, Ng J, Gomersall CD, Nishimura M, Koh Y, Du B; Asian Critical Care Clinical Trials Group. Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations. *Lancet Respir Med* 2020 May; 8(5):506-517.
- 5 Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, Agha M, Agha R. The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *Int J Surg* 2020 Jun; 78:185-93.
- 6 Devi S. COVID-19 resurgence in Iran. *Lancet* 2020 Jun 20; 395(10241):1896. doi: 10.1016/S0140-6736(20)31407-0.
- 7 Shimizu K, Wharton G, Sakamoto H, Mossialos E. Resurgence of covid-19 in Japan. *BMJ* 2020 Aug 18; 370:m3221.
- 8 Harrison EA, Wu JW. Vaccine confidence in the time of covid-19. *Eur J Epidemiol* 2020 Apr; 35(4):325–30.
- 9 The Lancet Microbe. COVID-19 vaccines: the pandemic will not end overnight. *Lancet Microbe*. 2021 Jan; 2(1):el.
- 10 Tang X, Wu C, Li X, Song Y, Yao X, Wu X, Duan Y, Zhang H, Wang Y, Qian Z. On the origin and continuing evolution of SARS-CoV-2. *Natl Sci Rev* 2020; 7(6):1012–23. <https://doi.org/10.1093/nsr/nwaa036>
- 11 Sallam M, Ababneh NA, Dababseh D, Bakri FG, Mahafzah A. Temporal increase in D614G mutation of SARS-CoV-2 in the Middle East and North Africa. *Heliyon* 2021 Jan; 7(1):e06035.
- 12 MacDonald NE. Vaccine hesitancy: Definition, scope and determinants. *Vaccine* 2015; 33(34):4161-4.
- 13 Ministry of Health. COVID-19 updates in Jordan: Ministry of Health. 2020 [cited 2021 May 5]. Available from: <https://corona.moh.gov.jo/en/MediaCenter/1491>.
- 14 Sallam M, Dababseh D, Eid H, Al-Mahzoum K, Al-Haidar A, Taim D, Yaseen A, Ababneh NA, Bakri FG, Mahafzah A. High Rates of COVID-19 Vaccine hesitancy and its association with conspiracy beliefs: a study in Jordan and Kuwait among other Arab countries. *Vaccines* 2021; 9(1):42.
- 15 Al-Qerem WA, Jarab AS. COVID-19 Vaccination acceptance and its associated factors among a Middle Eastern population. *Front Public Health* 2021 Feb 10; 9:632914.
- 16 El-Elimat T, AbuAlSamen MM, Almomani BA, Al-Sawalha NA, Alali FQ. Acceptance and attitudes toward COVID-19 vaccines: A cross-sectional study from Jordan. *PLoS One* 2021 Apr 23; 16(4):e0250555.
- 17 Roya News English. Pfizer's COVID-19 vaccine to be delivered to Jordan at end of January: Obeidat Amman: Roya News. 2020 [cited 2021 May 5]. Available from: <https://en.royanews.tv/news/23890/2020-12-03>.
- 18 Wikipedia contributors. "Jordan." Wikipedia, The Free Encyclopedia. [cited 2021 May 20]. Available from: <https://en.wikipedia.org/w/index.php?title=Jordan&oldid=1024890714>.
- 19 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; 13:1657-63.
- 20 Sallam M. COVID-19 vaccine hesitancy worldwide: a concise systematic review of vaccine acceptance rates. *Vaccines (Basel)* 2021 Feb 16; 9(2):160.
- 21 Randolph HE, Barreiro LB. Herd immunity: understanding COVID-19. *Immunity* 2020 May 19; 52(5):737–41.
- 22 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 Jul 30; 16(9):2204–14.
- 23 Malik AA, McFadden SM, Elharake J, Omer SB. Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine* 2020 Aug 12; 26:100495.
- 24 Schwarzinger M, Watson V, Arwidson P, Alla F, Luchini S. COVID-19 vaccine hesitancy in a representative working-age population in France: a survey experiment based on vaccine characteristics. *Lancet Public Health* 2021 Apr; 6(4):e210-21.
- 25 Lazarus JV, Ratzan SC, Palayew A, Gostin LO, Larson HJ, Rabin K, et al. A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med*. 2021 Feb;27(2):225-228. Epub 2020/10/22. doi: 10.1038/s41591-020-1124-9.
- 26 Ruiz JB, Bell RA. Predictors of intention to vaccinate against COVID-19: Results of a nationwide survey. *Vaccine* 2021 Feb 12; 39(7):1080-6.
- 27 Alqudeimat Y, Alenezi D, AlHajri B, Alfouzan H, Almokhaizeem Z, Altamimi S, Almansouri W, Alzalalah S, Ziyab A. Acceptance of a COVID-19 vaccine and its related determinants among the general adult population in Kuwait. *Med Princ Pract* 2021 Jan 22; 10:2052–61. doi: 10.1159/000514636.
- 28 Sallam M, Dababseh D, Yaseen A, Al-Haidar A, Ababneh NA, Bakri FG, Mahafzah A. Conspiracy beliefs are associated with lower knowledge and higher anxiety levels regarding COVID-19 among students at the University of Jordan. *Int J Environ Res Public Health* 2020; 17:4915.
- 29 Sallam M, Dababseh D, Yaseen A, Al-Haidar A, Taim D, Eid H, Ababneh NA, Bakri FG, Mahafzah A. COVID-19 misinformation: Mere harmless delusions or much more? A knowledge and attitude cross-sectional study among the general public residing in Jordan. *PLoS ONE* 2020; 15:e0243264
- 30 Lin C, Tu P, Beitsch LM. Confidence and receptivity for COVID-19 vaccines: a rapid systematic review. *Vaccines (Basel)* 2020; 9:e16.
- 31 Ward JK, Alleaume C, Peretti-Watel P. The French public's attitudes to a future COVID-19 vaccine: the politicization of a public health issue. *Soc Sci Med* 2020; 265:113414.
- 32 Hacquin A-S, Altay S, de Araujo E, Chevallier C, Mercier H. Sharp rise in vaccine hesitancy in a large and representative sample of the French population: reasons for vaccine hesitancy. *PsyArXiv* 2020 Nov 17. <https://doi.org/10.31234/osf.io/r8h6z> (preprint, version 2).

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