

Factors Influencing COVID-19 Vaccine Acceptance among Healthcare Professionals in Jordan: A Web-Based National Survey

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Abstract

Objective: Health workers play an important part as role models, advocates for vaccination, vaccinators and educators in a community. Furthermore, they are at high risk of infected with COVID-19 as they are in the frontlines. Thus, this study purposed to determine the factors influencing the acceptance of COVID-19 vaccine among the healthcare professionals in Jordan.

Methods: A cross-sectional design and a convenience sampling method were used to recruit the study population from different healthcare sectors. A web-based survey was used to collect data.

Results: A total of 1594 healthcare professionals responded and 74% of them ages less than 45 years. Almost 65% of the respondents were registered nurses and 68.4% of them are married. A total of 94.9% of the participants heard about COVID-19 vaccine, but only 56.5% of them had got the opportunity to attend lectures/discussions about COVID-19 vaccine. Official government websites were the primary source of obtaining information about COVID-19 (36.3%). The acceptance rate of COVID-19 vaccine acceptance was 63%. There were positive correlations between vaccine acceptance and compliance toward COVID-19 ICPs ($r = 0.119, p < 0.01$), knowledge about COVID-19 ($r = 0.256, p < 0.01$), age ($r = 0.170, p < 0.01$), and years of experience ($r = 0.105, p < 0.01$). Further, age, knowledge, and compliance were for significant predictors of the acceptance of COVID-19 vaccine.

Conclusions: It is necessary to develop specific interventions to healthcare professionals with low acceptance rates and take into considerations the predictors of COVID-19 vaccine acceptance. Further research is needed to explore the factors influencing the refusal of the COVID-19 vaccine by healthcare professionals.

Keywords: Acceptance, COVID-19; healthcare professionals, COVID-19 vaccine.

Introduction

The COVID-19 pandemic was first identified in December 2019 in Wuhan, China. Since then, COVID-19 has resulted in global social and economic disruption such as postponement or cancellation of events, agricultural disruption and food shortages, and decreased emissions of pollutants and greenhouse gases [1].

Since the appearance of COVID-19 in December 2019, scientists began to develop vaccines to end this pandemic. Vaccines considered as one of the most effective public

health measures which save millions of lives yearly [2,3]. As of February 2021, over 50 vaccine candidates are in clinical research. In the last phase of clinical trials, several COVID-19 vaccines demonstrated efficacy as high as 95% in preventing symptomatic COVID-19 infections. Currently, ten vaccines are authorized by at least one national regulatory authority for public use [4]. According to the Centers for Disease Control and Prevention (CDC) (2021a) [5], only Pfizer-BioNTech (BNT162b2) and Moderna (mRNA-1273) vaccines are authorized and recommended to prevent COVID-19 in U.S.

Global authorities including the World Health Organization (WHO) and CDC have recommended giving COVID-19 vaccines to healthcare personnel and long-term care facility residents; frontline essential workers and people age 75 years and older; and people aged 65 through 74 years and people aged 16 through 64 years with underlying medical conditions and other essential workers [6].

Healthcare professionals play an important part as role models, advocates for vaccination, vaccinators, and educators in a community. Furthermore, they are at high risk to be infected with COVID-19 as they are in the frontlines. It has been confirmed in behavioral insights surveys, for instance, the family doctor is the most trusted source of information related to COVID-19 (WHO, 2021) [7]. As family doctors are vaccinators themselves, they would play an important role as advisors of vaccination for all other groups (WHO 2021) [7]. Unfortunately, there is a lack of studies about the acceptance of healthcare professionals of COVID-19 vaccines in Jordan, however, there are few studies conducting about vaccinations acceptance among Jordanian population prior administering vaccine [8,9]. Thus, this study purposed to determine the factors influencing the acceptance of COVID-19 vaccine among the healthcare professionals in Jordan. Also, the study has the following research questions:

- 1) What is the acceptance level of COVID-19 vaccine among the healthcare professionals in Jordan?
- 2) What are the relationships between acceptance of COVID-19 vaccine; knowledge of COVID-19; compliance of infection control precautions (ICPs); and socio-demographic factors among the healthcare professionals in Jordan?
- 3) What are the significant factors influencing acceptance of COVID-19 vaccine among the healthcare professionals in Jordan?

Methods

Design

This study used a cross-sectional design to administer a self-reported online questionnaire. Data were collected over four weeks from January 3 to February 15, 2021.

Study Settings

Jordan is one of the 23 Arab countries in the Middle East bordered by Saudi Arabia to the south and the east, Iraq to the north east, Syria to the north and Israel and Palestine to the west. The first level subdivision in Jordan is the governorate [10]. The governorates are divided into districts, which are often further subdivided into sub-districts. In addition, Jordan is divided into 12 governorates; Amman Governorate has the largest population among them as well as the country's economic, political and cultural centres [10]. The health services in Jordan comprise multiple providers, namely: public sector; private sector; and Royal Medical Services (RMS). The study was conducted

in Jordan. The study settings were acute care (i.e. medical and surgical wards) and out-patient departments of general hospitals (i.e. public sector, private sector and RMS), primary healthcare centres within the public sector and (i.e. medical and surgical wards) the RMS.

Sampling

The reference population were all healthcare professionals and able to use smart phones or computers. However, the accessible population for this study were all healthcare professionals who had an access to internet and were willing to complete the survey questionnaire online. A convenience sampling method was used to recruit the study population from different healthcare sectors. The inclusion criteria were: healthcare professionals, working in a healthcare facility (i.e. public, private or RMS). The estimated sample size was calculated using the software computer program G*power [12]. Using F tests - ANOVA: One-Way ANOVA, between groups with an effect size $f = 0.15$, α significance error of 0.05, level of power 95%, and number of groups= 5, a minimum of 1594 participants were required for the current study.

Ethical Considerations

Ethical approval was obtained from the Scientific Research Committee at Al- Zaytoonah University of Jordan. Consent was assumed if the participant read the information sheet and cover letter. The cover letter included the purpose of the study, the time required to fill out the questionnaire, its benefits, risks, and the contact information of the principal researcher. Participation in the study was voluntary. No names or personal identification information were included in the data collection. The researchers further ensured the confidentiality and anonymity of the collected data through designing the electronic survey where no identifying information on the subjects was included in the survey or identified by the e-survey software once completed.

Data Collection Procedure

This study used an electronic survey, or more specifically a web-based survey. It is a survey instrument that physically resides on a network server and that can be accessed only through a web browser. We used Qualtrics, which is an online survey software program to create the survey questions. The direct link that is generated for completing the survey was distributed online through WhatsApp, Facebook, messenger, and other types of social media. The researchers also contacted the hospital directors, so they can distribute the direct link of the questionnaire to their employees. Completing the study survey was considered a tacit consent.

Measurements

A 23-item survey instrument was adapted by the authors using WHO course materials (WHO, 2020) [12] on Emerging respiratory viruses, including COVID-19, and covered the domains of healthcare professionals' characteristics,

knowledge, compliance related to COVID-19, and acceptance of COVID-19 vaccine. The participants were asked to complete demographic details and work characteristics information (8 items), knowledge of COVID-19 vaccine (five yes, no, and do not know items), compliance toward COVID-19 infection control (nine statements/4-point Likert scale), and intention to receive a COVID-19 vaccine (one-item on a four-point scale ('definitely not' to 'definitely yes')). The overall content validity of this instrument is 88.6%, which considered acceptable, and the reliability coefficient for instrument using Cronbach's alpha internal consistency coefficient was 0.72.

Data Analysis

The data were entered, cleaned, screened for missing items and analyzed using Statistical Package for the Social

Sciences (SPSS, version 24). Descriptive statistics (frequency, percentages, means, and standard deviations) were used to describe the basic features of the data in a study by providing simple summaries about the sample and the measures. In addition, inferential statistics were used (correlation coefficient and multiple regression) to examine the relationship between study variables and the factors influencing the acceptance of COVID-19 vaccine. The significant of the results was set at $p \leq 0.05$.

Results

A total of 2147 invitees, 1594 healthcare professionals provided the informed consent and completed the study questionnaire with a response rate of 74.3%. Table 1 displays the descriptive statistics of the demographic variables of the study participants. Of the 1594 participants, 1036 (65%) females and 559 (35%) males.

Table 1. Socio-demographic characteristics of healthcare workers (N=1594)

Characteristics	n (%)
Gender	
Male	559 (35)
Female	1036 (65)
Age	
< 25 years	80 (5.0)
25-34 years	720 (45.2)
35-44 years	380 (23.8)
45-54 years	289 (18.2)
≥ 55 years	125 (7.8)
Marital Status	
Single	365 (22.9)
Married	1090(68.4)
Divorced	104 (6.6)
Widow	35 (2.1)
Occupation	
Registered nurse	991 (65.2)
Physician	380 (21.6)
Pharmacist	118 (6.9)
Lab technician	55 (2.9)
Dentist	61 (3.3)
Experience	
≤ 4 years	292 (18.3)
5-9 years	400 (25.1)
10-14 years	313 (19.6)
15-19 years	305 (19.2)
20-24 years	187 (11.7)
≥ 25 years	97 (6.1)
Source of Knowledge	
Family and friends	60 (3.8)
News media	533 (33.4)
Official government websites	579 (36.3)
Social media	422 (26.5)
Heard About COVID-19	
Yes	1513 (94.9)
No	81 (5.1)
Attended Lectures/Discussion about COVID-19	
Yes	901 (56.5)
No	693 (43.5)
n: number; %: percentage	

Most of the respondents (74%) were below 45 years of age. Majority of respondents were registered nurses (n=991, 65.2%), and 68.4% (n=1090) of them were married. The majority (94.9%) of the participants reported that they heard about COVID-19 vaccine, but only 56.5% of them had got the opportunity to attend lectures/discussions about COVID-19 vaccine. Moreover, the primary source of information that they obtained about COVID-19 was through official Government Websites (36.3%).

Bivariate associations were performed between knowledge mean score, compliance mean score, age of respondents, years of experience and intent to accept COVID-19 vaccine among healthcare professionals in Jordan. When respondents were asked, will you agree to vaccinate against COVID-19? Of the 1594 respondents, 327 (20.5%) were strongly agree to accept taking the hypothetical vaccine, 677 (42.5%) were agree to accept taking the hypothetical vaccine, 366 (23%) were disagree, and 157 (9.8%) were strongly disagree to accept taking the vaccine, while 67 (4.2%) respondents did not record their answer. Hence, the acceptance rate of COVID-19 vaccine was 63% (n=1,004) and 32.8% (n=523) reported no acceptance of the vaccine.

Pearson's correlation was calculated to find any significant relationship with *p* values less than 0.05. The results revealed that there were positive correlations between vaccine acceptance and compliance mean score toward COVID-19 ICPs ($r = 0.119, p < 0.01$) and between vaccine acceptance and knowledge mean score regarding COVID-19 ($r = 0.256, p < 0.01$). In addition, the result showed positive relationship between age and years of experience with vaccine acceptance ($r = 0.170, p < 0.01$; $r = 0.105, p < 0.01$, respectively). Furthermore, the relationship between the compliance, age and years of experience was found statistically significant ($r = 0.280, p < 0.01$; $r = 0.129, p < 0.01$, respectively). Finally, the results revealed that statistically significant relationship between healthcare professionals' (HCPs) knowledge towards COVID-19, age, and years of experience ($r = 0.115, p < 0.01$; $r = 0.129, p < 0.01$, respectively). However, the result revealed a strong positive correlation between years of experience and age of healthcare professionals ($r = 0.87, p < 0.01$) as shown in Table 2.

Table 2. Pearson correlation between knowledge of COVID-19, compliance of infection control precautions, age, years of experience, and acceptance of COVID-19 vaccine.

Variable	Vaccine Acceptance	Compliance	Knowledge	Age	Experience
Vaccine Acceptance	1				
Compliance	0.119**	1			
Knowledge	0.256**	0.241**	1		
Age	0.170**	0.280**	0.115**	1	
Experience	0.105**	0.320**	0.129**	0.87**	1

Note. N=1594** Correlation is significant at the 0.01 level (2-tailed).

Hierarchical multiple regression analysis was used to find the factors that are significantly affecting vaccine acceptance of COVID-19. The results showed that model one that contained age explained 7.4% ($R^2 = 0.074$) of the variance in accepted COVID-19 vaccine (Table 3) and the model was significant ($p \leq 0.05$). After entry of years of experience in the second model, the total variance explained by the model was 7% ($R^2 = 0.079$) and was not significant ($p = 0.21$). The third model by adding (knowledge towards COVID-19) accounted for additional 24% of the variance in compliance, ($R^2 = 0.246$) which was statistically significant ($p \leq 0.001$). The fourth

model (compliance towards COVID-19 safety measures) was entered on the last step, and it accounted for additional 8% of the variance in compliance ($R^2 = 0.08$) which was statistically significant ($p \leq 0.001$). The variables in the first model, third model and the fourth model accounted for 40% of the variance in overall acceptance of COVID-19 vaccine. The result revealed that age, knowledge and compliance accounted for significant predictors of the acceptance of COVID-19 vaccine. It is noted also that participants' years of experience was appeared to be non-significant factor in model two.

Table 3. Four Steps Multiple Hierarchical Regression Analysis Model regarding acceptance COVID-19 vaccine

Variable	Model 1		Model 2		Model 3		Model 4	
	β	p-value	β	p-value	β	p-value	β	p-value
Age	0.08	≤ 0.05	0.05	0.43	0.05	0.37	0.05	0.36
Experience			0.04	0.51	0.06	0.24	0.06	0.22
Knowledge					0.254	≤ 0.001	0.21	≤ 0.001
Compliance							0.13	≤ 0.001
R²	0.074	≤ 0.05	0.079	0.21	0.246	≤ 0.001	0.086	≤ 0.001
Adjusted R²	0.004	≤ 0.05	0.003	0.13	0.065	≤ 0.001	0.080	≤ 0.001
R² change	0.006	≤ 0.05	0.011	0.14	0.079	≤ 0.001	0.097	≤ 0.001

*significant at $\alpha = 0.05$ one tailed test
 **significant at $\alpha = 0.001$ one tailed test

Discussion

COVID-19 is considered a major global public health crisis that resulted in 152 888 infections and 1413 deaths in healthcare professionals. Compared to other world regions such as Africa and Europe, the Eastern Mediterranean region had the highest number of reported deaths per 100 infections [13]. Healthcare professionals are more likely to have access to the vaccine at an early stage and play a significant role in providing information about the vaccine for the general population. It is crucial to vaccinate the maximum number of healthcare professionals to prevent the infection and the loss of our frontline workforce that already suffers from a serious shortage. Thus, it is important to assess predictors of vaccine acceptance among healthcare professionals to help healthcare institutions and policymakers to increase the uptake of the vaccine. This study investigated the acceptance rate of the COVID-19 vaccine and factors that affected the acceptance of the COVID-19 vaccine among healthcare professionals in Jordan.

The acceptance rate of the COVID-19 vaccine in the current study was 63%. In comparing with a U.S. study, 36% of the healthcare professionals were willing to take the COVID-19 vaccine while 56% were not sure or would wait to review more data. Another study in the Democratic Republic of the Congo found that 27.7% of healthcare professionals were willing to receive a COVID-19 vaccine [14]. On the contrary, the reported vaccine acceptance rate among healthcare professionals in France and China was 76.9% and 76.4% respectively [15,16]. The vaccine acceptance rate in this study was higher than in the U.S and Congo but lower than in France and China. Also, the vaccine acceptance rate in this study was higher than the COVID-19 vaccine acceptance among the general public in Jordan, which was 28.4% [17]. The high percentage of respondents in our study accepting to take the vaccine may highlight the importance of knowledge about the COVID-19 vaccine as most of the respondents in our study reported that they heard about the COVID-19 vaccine, more than half of them attended lectures or discussions about COVID-19 vaccine, and one-third obtained information about COVID-19 through official Government Websites. The high acceptance of the COVID-19 vaccine among HCWs in Jordan may have consequences on the Jordanian community since various studies had shown that vaccinated healthcare professionals were more likely to recommend vaccines to their families and patients [18,19].

COVID-19 vaccine acceptance increased with increasing age and knowledge towards COVID-19. Studies that included both the general population and healthcare professional's samples indicated that acceptance of a COVID-19 vaccine was higher among older adults compared to younger adults [19-22]. Age is considered a strong risk factor for the severity of COVID-19 disease, ICU admission rate, and death [23]. Thus, older adults need to be vaccinated as soon as possible and this could explain the increase in the acceptance of the COVID-19 vaccine among older healthcare

professionals. In this study, it is noted that respondents relied on official government websites, news media, and social media, respectively, to obtain information about COVID-19. A different pattern was observed in another study among healthcare professionals in Congo in which respondents relied on social media, family, and friends for information on COVID-19 [14]. Similar findings were reported in a global cross-sectional study in which respondents relied on information from official and government websites, news media, and social media to obtain information about COVID-19 [24]. The same study also linked the knowledge about COVID-19 from trustful resources such as government sources with higher vaccine acceptability. These results stress the role of media coverage using different channels to provide healthcare professionals with updated information about issues related to COVID-19. Additionally, this study found that COVID-19 vaccine acceptance increased with increasing compliance toward COVID-19 ICPs among healthcare professionals. This finding implied that healthcare professionals in Jordan did not consider their adherence to ICPs as a substitute for the COVID-19 vaccine. Similarly, in UK study among adults revealed that one of the predictors of COVID-19 vaccine refusal was poor adherence to COVID-19 government guidelines [25]. Inconsistent results were reported by a study conducted in China, which found that increase in personal protection behaviors decrease vaccine acceptance [26]. A national studies found that the main factors for refusal were concerns about the use of these vaccines and loss of trust in them [8,9].

A major strength of our study is the first study examined the acceptance of COVID-19 among healthcare professionals. Also, a large sample of healthcare professionals surveyed. However, the study had some limitations that should be acknowledged. Firstly, it is a cross-sectional study that do not assess the cause and effect relationship. Secondly, a web-based self-administered survey that based on participants' opinions was used, which may affect the responses. Thirdly, the study sample was convenience and may not be representative of all Jordanian healthcare professionals which may lead to overrepresentation or underrepresentation. Finally, when the study was performed, still the vaccine was not accessible, thus the participants' intentions could be changed.

Conclusion and Implications

Acceptance of the COVID-19 vaccine among healthcare professionals in Jordan was high, with a large percentage of healthcare professionals accepted to take the vaccine. Determinants of vaccine acceptance were older age, knowledge towards COVID-19, and compliance towards COVID-19 ICPs. Healthcare professionals with low acceptance rates should be targeted and taking into considerations the predictors of COVID-19 vaccine acceptance. Also, specific interventions should be developed to enhance acceptance among this specific cohort. Further research is needed to understand the factors influencing the

refusal of the COVID-19 vaccine by healthcare professionals to improve the acceptance rate.

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Declarations

Funding

This study has not been funded.

Conflict of Interest

There is no conflict of interest related to this research.

Ethical Approvals

Ethical approval was obtained from the Scientific Research Committee at the Al-Zaytoonah University of Jordan.

Consent to Participate

Consent was assumed if the participant read the information sheet and cover letter.

Consent for publication

All authors agreed to publish the current study at the Journal of Public Health.

Availability of data and materials

Not applicable

Code availability

Not Applicable

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