

# COVID-19 Vaccine Acceptance and Its Risk Factors in Iranian Health Workers 2021

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## What's Known

- A growing number of people around the world are hesitant to get vaccinated against COVID-19.
- Previous research found that the acceptance rate ranged between 30-90%.

## What's New

- We found that 29.6% of the participants felt unprepared for vaccination, and female healthcare providers were more hesitant to receive the vaccine.
- The source of information, past medical history, infection exposure, and collective trust in the vaccine all influence vaccine acceptance rate.

## Abstract

**Background:** Ensuring vaccine acceptance in societies is a growing challenge for healthcare systems worldwide. This study aimed to identify factors associated with vaccine acceptance rates.

**Methods:** This cross-sectional study was conducted as a national web-based survey from February 9<sup>th</sup>-13<sup>th</sup>, 2021, just before the release of the COVID-19 vaccine in Shiraz, Iran. Independent variables included age, gender, occupation, history of COVID-19 infection, underlying diseases, and source of information. The willingness to be vaccinated was the dependent variable. A logistic regression analysis was performed to determine the relationship between different variables and the willingness to receive the COVID-19 vaccine. The significance level was set at less than 0.05. The data were analyzed using SPSS software version 21.

**Results:** Of 2,699 healthcare respondents, 70.3% indicated a willingness to receive the COVID-19 vaccine, of whom 49.2% preferred to receive a foreign vaccine and 24.68% desired to receive an Iranian vaccine. The women were more willing to receive the vaccine (67.6%) than the men (78.2%). Based on the results of logistic regression, gender ( $P<0.001$ ) and job ( $P=0.005$ ) were the most important associating factors to the willingness to receive the COVID-19 vaccine.

**Conclusion:** Although the majority of participants were willing to receive the COVID-19 vaccine, 29.6% were not yet ready. Women's healthcare providers were more hesitant to recommend the vaccine. As a result, the findings of this study can help policymakers and decision-makers in the field of health, treatment, and prevention of COVID-19 in raising the level of vaccination awareness among healthcare workers.

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## Introduction

In December 2019, an outbreak of an unknown disease was reported in Wuhan, China, and the World Health Organization (WHO) named it Coronavirus Disease 2019 (COVID-19).<sup>1</sup> Pandemics, if not controlled and managed properly, can have a social and economic impact on societies.<sup>2</sup> During pandemics, preventive behaviors such as mask-wearing and regular hand washing are critical in further spreading of the virus.

To fully control the spread of the virus and manage the pandemic, scientists in most countries are working to develop a safe and effective vaccine to inoculate eligible people, which in the case of COVID-19 would be a large number of people. So far, a number of COVID-19 vaccines have been approved by WHO, despite the fact that the evidence is still evolving. The acceptance rate of the vaccines is one of the most significant challenges that communities face, when it comes to immunization.<sup>1</sup> Therefore, health policymakers must thoroughly assess the factors and barriers affecting vaccines acceptance in communities, as well as finding out strategies to encourage and inform people to get vaccinated.<sup>3,4</sup>

Despite evidence has shown that vaccination plays a critical role in saving lives, a growing number of people around the world are still skeptical of COVID-19 vaccines.<sup>5</sup> During the COVID-19 pandemic, one of the main factors preventing people from getting vaccinated was the rampant misinformation circulated among people. People are inevitably exposed to misinformation, rumors and false theories about vaccination that can easily distort their insights.<sup>6,7</sup> To combat misinformation, it is critical to build up trust in communities about vaccines and their benefits, which can be accomplished with the help of health experts and scientists. Previous studies found that the acceptance rate for COVID-19 vaccines ranged between 30-90%.<sup>8,9</sup>

When the vaccine was developed for previous pandemics, such as influenza A (H1N1), the vaccine uptake ranged from 8% to 68%.<sup>10</sup> Another study conducted in the United States found that vaccine acceptance rates were 64%,<sup>11</sup> while in a study in the UK, the rate of influenza vaccine acceptance was 56.1%.<sup>12</sup> To improve vaccine acceptance rates, health experts need to not only provide ample information about vaccination, but also facts to counter misinformation and build trust in communities.<sup>13</sup> COVID-19 vaccines have been started to be distributed on a small scale in developed countries. As a result, physicians and public health professionals have to be prepared to deal with challenges affecting vaccination rates, such as the expected spread of misinformation about vaccination via the social media.<sup>14</sup>

This study aimed to assess the COVID-19 vaccine acceptance and its associating factors among Iranian health workers. The findings of this study add context to the factors that can have a negative impact on the vaccination rates in societies. It also helps policymakers, especially in developed countries, to come up with comprehensive plans and strategies to

improve global vaccination acceptance.

## Subjects and Methods

This cross-sectional study was conducted as a national web-based survey from February 9<sup>th</sup> to 13<sup>th</sup>, 2021, just before the mass rollout of COVID-19 vaccines in Shiraz, Iran, which began with 2,699 healthcare providers. On the same day that the first COVID-19 vaccine was administered in Iran, the study questionnaire was distributed among eligible people. The inclusion criteria were being health workers, aged between 20-59, resident and employed in Shiraz, and incomplete questionnaires were considered as exclusion criteria. Since all healthcare providers were the first to receive the vaccine in Iran, they were all eligible. Thus, the study included everyone who got vaccinated and consented to fill out the questionnaire. Participants in the study received no incentive for their participation. The study was approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.REC.1399.1203). The participants were informed about the research methodology, and voluntary participation was emphasized. Written informed consent was obtained from all the participants.

The cluster sampling method was applied in this research study. At first, by using the statistics of the Deputy Minister of Development and the proportionate share, eight hospitals and 10 health centers (as clusters) were chosen by a simple random sampling method. The questionnaire was then sent to health workers via email, WhatsApp, Telegram, and Instagram, based on a randomly generated list of their names.

The questionnaire consisted of 11 questions, each with sub-questions, including the sociodemographic characteristics of the participants, job category, history of chronic diseases such as diabetes mellitus and cardiac disorders, and history of the previous infection with COVID-19 and/or hospitalization as a result of it. There were also questions about the participants' willingness to receive the vaccine, their preferred brand of vaccine, and, if applicable, reasons for their unwillingness to receive the vaccine. Additionally, the participants were asked about the source they received information about the COVID-19 vaccines. Independent variables included age, gender, job, history of COVID-19 infection, underlying diseases, and source of information. The only dependent variable was willingness to be vaccinated. The internal consistency of the questionnaire was obtained via the Cronbach's alpha. The Cronbach's alpha reliability coefficient of the questionnaire

in the present study was found to be 0.94, which means that the questionnaire has acceptable reliability. In addition, the concurrent validity of the questionnaire was measured by sending the questionnaire to 40 experienced professors to evaluate its validity. Based on the results of the content validity analysis, CVR for all the questions were greater than 0.29. The CVI of the questionnaire was 0.94, which was deemed to be at an appropriate level. The sample size was estimated to be 1150 by calculating  $\alpha=0.05$  and  $Z\alpha=1.96$ , the 95% confidence level, and the least percentage of vaccine acceptance rate (25%) provided in the literature, as well as considering the marginal error of 0.025.<sup>15</sup>

Since this was a national web-based survey, a design effect of 1.8 was taken into account, and a threshold of 2,100 participants was calculated to make this study clinically significant. However, 2,699 people completed our questionnaire and enrolled in our study.

### Statistical Analysis

Data were analyzed using SPSS software for Windows, version 21.0 (IBM Corp., Chicago, IL., USA). Descriptive statistics were determined for all the variables such as frequency, percentage, and mean $\pm$ SD were used for qualitative and quantitative data, accordingly. The association between different variables and the willingness to receive the COVID-19 vaccine was investigated using logistic regression analysis. The test was run separately for each variable, and then an adjusted analysis was run on all of the variables with  $P<0.2$  in the first step. In both steps, the significance level of 0.05 was used. The Hosmer-Lemeshow test was used to determine the model's Goodness of Fit.

## Results

The data from 2699 healthcare providers who completed the questionnaire and entered the study revealed that the mean age of participants was 35.71 $\pm$ 8.90 years and 73.5% of them were

women. The detailed findings of this study are summarized in table 1.

As table 2 shows, 380 (14.7%) of all participants had at least one chronic disorder, of whom 278 (73.2%) were willing to receive the COVID-19 vaccine. About 67.6% of the women showed willingness to receive the vaccine, while this number was 78.2% in men ( $P<0.001$ ). Among job categories, staff who were directly involved in the management of COVID-19 showed the highest level of willingness (72.4%), while the administrative employees showed the lowest level of willingness (62.4%) to receive the vaccine. Table 2 summarized the detailed findings of the study.

The adjusted analysis on variables with a  $P<0.2$  indicated that the odds ratio between being a woman and willingness to receive the COVID-19 vaccine was 0.54 (95% CI of 0.44-0.67). In addition, the odds ratio between administrative employees and willingness to receive the vaccine was found to be 0.62 (95% CI of 0.44-0.86). More details of the adjusted results are presented in table 3.

## Discussion

The findings of the current study indicated that 70.4% of all participants were willing to receive the COVID-19 vaccine. In line with the literature, The results of the current study indicated that women were less inclined to receive vaccines than the men. Furthermore, educational level and married status had no significant effect on willingness to receive the vaccine, in contrast to a previous study that found marital status was significantly associated with vaccine acceptance.<sup>9</sup> According to a study conducted by Honarvar and colleagues on the acceptance and non-acceptance of influenza vaccine in pregnant women in South of Iran, only 25 (6%) of 397 women had a history of vaccination. Besides, 383 pregnant women (92.06%) did not receive the vaccine. 116 people (30.28%) stated that they did not have enough information about the flu vaccine.

**Table 1:** Frequency of the participant's willingness to receive the COVID-19 vaccine

Variable	Condition	N (%)
Willingness to be vaccinated	Yes	1899 (70.36)
	No	800 (29.64)
If yes, what kind of vaccine do you prefer?	Iranian	469 (24.68)
	Foreign	935 (49.22)
	No difference	495 (26.10)
If no, reasons for unwillingness	It is too soon to make a decision	400 (50.01)
	I am suspicious of the present vaccines	160 (20.01)
	I am concerned about the adverse effects	191 (23.92)
	I think present vaccines are ineffective	11 (1.40)
	Other reasons	38 (4.66)

**Table 2:** Frequency of Demographic and non-demographic characteristics of study participants

Variable		N (%) N=2,699	Willingness to receive COVID-19 vaccine N (%)
Age (year)	20-29	818 (30.30)	576 (70.41)
	30-39	1003 (37.20)	700 (69.79)
	40-49	648 (24.00)	460 (70.98)
	≥50	230 (8.50)	163 (70.86)
Sex	Men	714 (26.50)	558 (78.15)
	Women	1985 (73.50)	1341 (67.55)
Job category	Non-related COVID-19 hospital staff	483 (17.90)	338 (69.97)
	Administrative employees	245 (9.10)	153 (62.44)
	Employees in the environmental health and prevention departments directly involved with COVID-19 patients	377 (14.00)	260 (68.96)
	Other categories	1278 (47.40)	925 (72.37)
	Employees in the logistic and financial departments	260 (9.60)	180 (69.23)
	Retired	35 (1.30)	25 (71.42)
History of COVID-19 infection	Yes	21 (0.80)	18 (85.71)
	No	887 (32.90)	628 (70.80)
Underlying diseases	Yes	1812 (67.10)	1271 (70.14)
	No	380 (14.10)	278 (73.15)
Source of information	Radio and TV programs	2319 (85.90)	1621 (69.90)
	Health workers	586 (21.70)	413 (70.47)
	Reputable news agency	631 (23.40)	455 (71.10)
	Social media	383 (14.20)	287 (74.93)
	Articles	524 (19.40)	358 (68.32)
	Others	557 (20.60)	377 (67.68)
	Others	18 (0.70)	9 (50.00)

**Table 3:** Simple and multiple Logistic Regression analysis on the association between willingness to receive the vaccine and demographic variables

Variable		Crude		Adjusted	
		OR (95% CI)	P value	OR (95% CI)	P value
Age category (year)	20-29	Reference	-	NA <sup>‡</sup>	NA
	30-39	0.97 (0.79, 1.19)	0.797	NA	NA
	40-49	1.03 (0.82, 1.29)	0.818	NA	NA
	≥50	1.02 (0.74, 1.40)	0.935	NA	NA
Sex	Men	Reference	-	Reference	-
	Women	0.58 (0.48, 0.71)	<0.001	0.55 (0.44, 0.67)	<0.001
Job category	Non-related Covid-19 hospital staff	Reference	-	Reference	-
	Administrative employees	0.71 (0.52, 0.99)	0.045	0.62 (0.45, 0.87)	0.005
	Employees in health and prevention	0.95 (0.71, 1.28)	0.766	0.91 (0.67, 1.22)	0.514
	Staff who directly involved in patients with COVID-19	1.12 (0.89, 1.41)	0.343	1.10 (0.87, 1.38)	0.440
	Other categories	0.97 (0.69, 1.34)	0.867	0.81 (0.37, 1.75)	0.589
	Employees in logistic and financial department	1.07 (0.51, 2.29)	0.999	0.92 (0.55, 1.28)	0.626
	Retired	2.58 (0.75, 8.88)	0.146	1.93 (0.57, 6.79)	0.306
History of COVID-19 infection	No	Reference	-	NA	NA
	Yes	0.97 (0.81, 1.16)	0.754	NA	NA
Underlying diseases	No	Reference	-	NA	NA
	Yes	0.852 (0.67, 1.09)	0.204	NA	NA
Source of information	Radio and TV programs	Reference	-	Reference	-
	Health workers	1.08 (0.85, 1.39)	0.568	1.11 (0.90, 1.43)	0.404
	Reputable news agency	1.25 (0.94, 1.68)	0.142	1.21 (0.89, 1.63)	0.201
	Social media	0.91 (0.71, 1.17)	0.473	0.89 (0.68, 1.15)	0.354
	Articles	0.88 (0.68, 1.13)	0.337	0.83 (0.64, 1.08)	0.160
	Others	0.42 (0.16, 1.07)	0.071	0.39 (0.15, 1.02)	0.055

<sup>‡</sup> not applicable to include in the logistic regression model. Hosmer-Lemeshow test for goodness of fit of the model (P=0.499)

44 women (11.48%) believed that they did not need the vaccine. Moreover, five of them (20%) believed that they did not need a vaccine, which was consistent with the findings of the present study.<sup>16</sup>

Although the majority of the participants were willing to receive the COVID-19 vaccine, 29.6 percent were not prepared to receive it. This finding was consistent with a national web-based survey conducted in Saudi Arabia, which found that approximately 35% of people were unwilling to receive the COVID-19 vaccine.<sup>9</sup> Recent studies in the United Kingdom revealed that vaccine hesitancy and resistance were 35% and 31%, respectively.<sup>17</sup> Furthermore, 93.3% of the Indonesians were willing to be vaccinated if the government offered it free of charge. These studies along with the findings of the present study, highlighted the importance of combating vaccine hesitancy and resistance in societies.<sup>3, 4, 18</sup>

According to our findings, 49.2% of the participants preferred to receive an imported vaccine, while only 24.7% preferred an Iranian vaccine. Because of a variety of cultural and economic factors, it appears that people in the developing countries prefer foreign-made vaccines over domestic ones.<sup>19</sup> This could help conspiracy theorists to propagate misinformation about vaccines, which could lead to public distrust of vaccination.<sup>5, 20</sup> A study by Wilson and others highlighted that there was a positive correlation between false social media narratives and public concerns about the safety of vaccines.<sup>21</sup> Moreover, our findings indicated that the participants of the present study believed that the most trustworthy source of vaccine information was healthcare providers in collaboration with reputable news agencies. This is consistent with the existing evidence suggesting that spreading valid and reliable information by health experts can significantly reduce the misinformation and improve the vaccines acceptance rates.<sup>8, 18</sup>

In this study, as in previous studies, we observed that there were several reasons for people's unwillingness to receive vaccines, such as needing more time to make decisions, being skeptical of current vaccine development, and having concern about the adverse effects of newly developed vaccines.<sup>19, 22</sup> People rigorously monitored the efficacy and adverse side effects of vaccines using data from pre-clinical and clinical trials. Therefore, it is crucial that we provide concrete evidence with clear explanations that can be understood by people of educational levels to not only counter misinformation, but also to increase people's trust in vaccines and their beneficial effects.<sup>18, 19</sup>

Our findings also revealed that retired staff and those directly involved in the treatment of COVID-19 patients were more likely to receive the vaccine, whereas administrative employees were 38% less likely than non-related COVID-19 hospital staff to receive the vaccine. Although a previous study in Indonesia concluded that there was no significant difference between greater vaccine acceptance and underlying diseases, the findings of our study suggested that individuals directly involved in the treatment of COVID-19 patients, as well as those with underlying diseases, felt more compelled to become vaccinated. This finding was also supported by Moghadami and others.<sup>23</sup> One of the limitations of the study was that it was conducted at a time when vaccination in Iran was not fully formed, and it was done only in a limited way on the medical staff due to limited information about the vaccine. Vaccine acceptance was also influenced by a number of behavioral, cultural, comorbidities such as obesity, use of alternative medicine, and organizational factors that were not considered.<sup>24</sup> Nonetheless, the literature in this area is inconclusive; and further research is recommended.

## Conclusion

Despite the fact that the majority of the participants were willing to receive the COVID-19 vaccine, 29.6% still believed they were not prepared for vaccination. Women healthcare providers were less likely to get the vaccine. The vaccine acceptance rate was influenced by the source of information, past medical history, infection exposure, and collective trust in the vaccine. Recognizing these factors and barriers to vaccine acceptance in the community can therefore help health policymakers in developing strategies to encourage and inform people about vaccination.

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## Authors' Contribution

M.H: Is the lead author and contributed to interpreting the data and revising the manuscript; A.M, Z.M.N, A.M, Z.M, and L.H: Planned the study, contributed to interpreting the data and drafting and revising of the manuscript. All authors have read and approved the final

manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**Conflict of Interest:** None declared.

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