



## Determinants of COVID-19 Vaccine Acceptance in Ardabil: a Web-Based Survey

### ARTICLE INFO

#### Article Type

Original Research

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#### How to cite this article

Jafarzadeh M, Ziapour A, Rezaei F. Determinants of COVID-19 Vaccine Acceptance in Ardabil: a Web-Based Survey. Health Education and Health Promotion. 2022;10(2):221-225.

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#### Article History

Received: October 13, 2022  
Accepted: January 10, 2022  
ePublished: March 11, 2022

### ABSTRACT

**Aims** COVID-19 has harmed people's lives and efforts are being made to speed up vaccinations. The growing problem of vaccine uncertainty may affect the uptake of the COVID-19 vaccine. The objectives of this study were to examine the determinants of COVID-19 vaccine acceptance.

**Materials & Methods** From July 3 to September 25, 2021, we conducted a web-based, cross-sectional study among the citizens of Ardabil with a snowball sampling strategy under a highly restricted environment. A questionnaire was designed and filled out by 768 participants through social media and email. Associations between COVID-19 vaccine acceptance and determinants were explored using the chi-squared test. Key determinants that predict vaccine acceptance among respondents were modeled through logistic regression analysis.

**Findings** Of the 932 survey invitees, 768 responded to the questionnaire (response rate, 82.4%). The majority (55.2%) of the study participants were female. Of the 768 respondents, 486 (63.2%) showed interest to accept the COVID-19 vaccine. Willingness to get the vaccine is relatively high among older age groups (59.4% among 40+ year old), being married (56.9%), and city dwellers participants (83.09%). In multivariate model, respondents who were above 40 years (OR: 0.7; 95% CI:0.5-0.94), and married (OR: 1.43; 95% CI: 0.97-2.09) were significantly associated with vaccine acceptance ( $p < 0.05$ ). Besides, people having trust in the health system and vaccine were most likely to accept the vaccine (OR: 1.26; 95% CI: 1.01-1.56), and those having a higher perceived risk of acquiring infection were 4.83 times (OR: 4.83; 95% CI: 3.78-6.17) higher odds of accepting the vaccine.

**Conclusion** Our study identified religious/personal beliefs and risk perceptions as the most important predictors that would be affecting COVID-19 vaccine uptake.

**Keywords** COVID-19; Vaccine; Cross-Sectional; Web-based

### CITATION LINKS

[1] Coronavirus disease 2019 ... [2] Effectiveness of telephone-based ... [3] If the world fails to protect ... [4] How will country-based mitigation measures ... [5] Coronavirus disease-2019 pandemic ... [6] Vaccine hesitancy: causes, consequences ... [7] Economic consequences of COVID-19 disease ... [8] Determinants of COVID-19 vaccine ... [9] The COVID-19 vaccine development ... [10] Exploring the barriers in maintaining ... [11] The state of vaccine confidence 2016: global insights through ... [12] How close are countries of the WHO European Region to achieving the goal of vaccinating 75% of key ... [13] COVID-19 vaccine hesitancy worldwide ... [14] Student nurses' intention to get the influenza ... [15] Korean college students' attitudes and health behaviour ... [16] Risk perceptions: assessment ... [17] Self-determination, smoking, diet ... [18] COVID-19 vaccine hesitancy in Canada ... [19] Attitudes toward a potential SARS-CoV-2 vaccine ... [20] Determinants of Covid-19 vaccine acceptance ... [21] Influences on attitudes regarding ... [22] The UPTAKE study: a cross-sectional ... [23] Framework for equitable allocation of COVID-19 ... [24] Yoga in the schools: a systematic ... [25] Willingness to vaccinate against Covid-19 in ... [26] Acceptance of a COVID-19 Vaccine in Japan ... [27] COVID-19 in the Shadows of MERS-CoV in the ... [28] A simulation model for forecasting covid-19 pandemic ... [29] The race for coronavirus vaccines ... [30] Developing Covid-19 vaccines at ... [31] Predicting vaccination using numerical ... [32] Ensuring global access to COVID-19 ... [33] Acceptance of a pandemic influenza ...

## Introduction

COVID-19 disease is a new species of the coronavirus family that was first identified in Wuhan city, Hubei province, China, and from there it spread to other countries [1, 2]. The new coronavirus pandemic in 2020 posed a global health concern [3]. On January 30, 2020, the Director-General of the World Health Organization (WHO) declared the outbreak of coronavirus as a public health emergency and international concern [4]. The virus spreads through small droplets from coughing, sneezing, and talking [5]. Adults may also become infected by touching a contaminated surface and then touching their face (eye, nose, and mouth). The transmission also occurs through aerosols that can stay suspended in the air for longer periods [6]. Coronavirus has infected close to 132 million people with more than 2.8 million deaths as of April 7, 2021 [7]. In the United States alone, the number of COVID-19 cases surpassed 30.5 million with more than 552,000 deaths [8]. Equitable access to safe and effective vaccines and observance of health protocols is critical to ending the COVID-19 pandemic [9]. WHO recommends that initial vaccination should prioritize groups at the highest risk of exposure to infection in each country, including health workers, older persons, and those with other health issues. Once COVID-19 vaccines become more available, countries can expand to vaccinate other priority groups and the general population [10, 11]. In the Islamic Republic of Iran from 3 January 2020 to 12 October 2021, there have been 5,716,394 confirmed cases of COVID-19 with 122,868 deaths, reported to WHO, and of 2 October 2021, a total of 57,676,540 vaccine doses have been administered [12].

Yet there is a small group of people who have refused to get COVID-19 vaccines [4]. The anti-vaccine sentiment gets more attention than the actual number of vaccine refusers and appears to have a disproportionate impact on public discourse. In turn, this persistent questioning of vaccine safety despite overwhelming scientific evidence has increased vaccine hesitancy, questions about the safety and efficacy of vaccines among some parents even if they comply with the vaccination recommendations [5]. Because vaccine hesitancy in the United States, the proportion of adults who get flu vaccines remains low [6]. On the other hand, to control the epidemic herd immunity is needed. Herd immunity occurs when a large portion of a community becomes immune to a disease, making the spread of disease from person to person unlikely. As a result, the whole community becomes protected [7].

This study aimed to examine the determinants of COVID-19 vaccine acceptance.

## Materials and Methods

This cross-sectional survey was designed using the Survey Monkey platform and was performed in 2021 on the people of Ardabil province, Iran. Using the snowball sampling strategy, the study investigators shared the survey link on social media (WhatsApp, Telegram channel, and email) for those aged 20 and above (because, at the time of the study, this age group was eligible to receive the vaccine). Data were gathered from 768 adults.

A researcher-made questionnaire with 24 questions was used. This questionnaire consisted of two parts. The first part consisted of 7 questions on sex, age, education, ensuring the health system and vaccine, marital status, and being urban or rural, and the second part consisted of 10 questions in 5 domains, (Perceptions of risk, vaccine safety, vaccine side-effect, chronic disease, religious/personal beliefs). Perceptions of risk had two dimensions: perception of susceptibility and perception of severity, and each one was measured using three questions on a four-point scale. Maximum score was set at 24 and the minimum score was four. For assessment, participants' knowledge about COVID-19 and vaccination was assessed using 6 questions, which were adapted from previous research with "true," "false" or "not sure". Each correct response to a knowledge item has been assigned 1 point, and 0 points have been assigned to each incorrect/not sure response. For knowledge items, the total score ranged from 0 to 6. Ensure the health system and vaccine were measured by 2 questions asking respondents to indicate whether they have "a great deal of ensuring", "only some ensure" or "hardly any ensure at all" in the health system. For analysis, we dichotomized the responses into "a great deal of ensuring" and "hardly any ensure" the total score ranged from 0 to 2. Religious/personal beliefs were measured using three questions on a four-point scale. Maximum score was set at 12 and the minimum score was four. Vaccine safety by 2 questions in this part each correct response to a vaccine safety item has been assigned 1 point, and 0 points have been assigned to each incorrect/not sure response the total score ranged from 0 to 2, and vaccine side-effect by 3 questions, in this part each correct response to a vaccine safety item has been assigned 1 point, and 0 points have been assigned to each incorrect/not sure response the total score ranged from 0 to 3. Chronic disease with a question total score ranged from 0 to 1. The validity of the questionnaire was determined by two methods of face validity and content validity, which were confirmed by experts in health education and infectious disease specialist. The total content validity index (CVI) in the "relevancy", "simplicity", and "clarity" were 83.6, 92.9, and 91.7. The

reliability of the questionnaire was further evaluated through internal consistency ( $\alpha=0.83$ ) and test-retest ( $r=0.82$ ).

The study was approved ethically by the Ardabil University of Medical Science. The primary participants were requested to roll out the survey further. On receiving and clicking the link, participants got auto-directed to the informed consent page. After they were allowed to take the survey. Participants were aware of the purpose of the study and provided informed consent before accessing the questionnaire and participated voluntarily. No compensation was provided, and all collected data was stored securely.

The data were analyzed by SPSS software version 23 using descriptive statistical methods chi-square and regression tests.

## Findings

In our sample, about 68.2% said that they were ready to get the vaccine.

Mean age of study participants was  $42.47 \pm 12.07$  years. The majority of the participants were female, married, and had a college degree. Among the respondents, 18.09% were Unemployed/retired (Table 1).

**Table 1)** Demographic characteristics of participants

Variables	Total sample % (n/N)	Acceptance of a COVID-19 vaccine % (n/N)	p- value
<b>Sex</b>	44.8 (344/768)	33.13 (114/344)	0.0001
Male			
Female	55.2 (424/768)	50.47 (214/424)	
<b>Place of residence</b>			0.0001
Urban	60.2 (462/768)	76.6 (354/462)	
Rural			
<b>Educational attainment</b>			0.005
Diploma and lower	41.92 (322/768)	61.8 (199/322)	
College degree			
<b>Marital status</b>			0.04
Married	83.2 (639/768)	56.9 (364/639)	
Single	16.7 (129/768)	48 (62/129)	
<b>Employment status</b>			0.005
Unemployed/retired	18.09 (139/768)	15.1 (21/139)	
Government worker	56.77 (436/768)	93.8 (409/436)	
Non-government worker	25.13 (193/768)	61.6 (119/193)	

The result showed Women were more likely than men to get the vaccine against COVID ( $p<0.001$ ), and government worker were the most willing group to receive vaccination against COVID-19 ( $p<0.002$ ). The mean COVID-19 knowledge score for participants about COVID-19 and vaccination was  $4.37 \pm 1.41$  (range: 0–6) and Participant's knowledge significantly differed across genders, occupations, and residence places ( $p<0.05$ ). Willingness to get the vaccine is relatively high among older age groups (59.4% among 40+ year old), being married (56.9%), and city dwellers participants (83.09%).

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In multivariate model, respondents who were above 40 years (OR: 0.7; 95% CI:0.5-0.94), and married (OR: 1.43; 95% CI: 0.97-2.09) most wanted to get vaccine. Besides, people having trust in the health system were most likely to accept the vaccine (OR: 1.26; 95% CI: 1.01-1.56), and those having a higher perceived risk of acquiring infection were 4.83 times (95% CI: 3.78-6.17) were more likely to receive the vaccine.

According to the findings, the most important factor was the perceived risk of acquiring infection ( $\beta=0.68$ ,  $p=0.001$ ) and the second factor was, religious/personal beliefs Which were impressed on receiving the vaccine ( $\beta=0.28$ ,  $p=0.001$ ).

The necessary information about factors adjusted associations related to acceptance COVID-19 vaccine was given in Table 2.

**Table 2)** Factors adjusted associations related to acceptance COVID-19 vaccine

Variables	Total sample % (n/N)	Acceptance of a COVID-19 vaccine % (n/N)	p- value
<b>Vaccine safety</b>			0.005
Yes	63.4 (487/768)	74.1 (361/487)	
No	38.6 (297/768)	31.9 (95/297)	
<b>Chronic disease</b>			0.002
Yes	22.4 (172/768)	45.6 (80/172)	
No	77.6 (596/768)	47.1 (281/596)	
<b>Vaccine side- effect</b>			0.001
Yes	41.7 (321/768)	62.2 (219/321)	
No	60.2 (466/768)	76.6 (354/462)	
<b>Religious/personal beliefs</b>	60.6 (466/768)	69.52 (324/466)	0.0001

## Discussion

Vaccination is considered one of the most outstanding public health inventions in the 21 st century [13]. In this study, results show that 68.2% of participants were shown willingness to receive vaccination against COVID-19. level of acceptability is considerably low given the magnitude of the COVID-19 pandemic [14-16]. Researchers suggest that herd immunity occurs when a large portion of a community becomes immune to a disease, making the spread of disease from person to person unlikely [17-19]. Herd immunity also can be reached when enough people have been vaccinated against the disease [20]. But reaching herd immunity through vaccination against COVID-19 might be difficult for many reasons [20, 21]. If the proportion of vaccinated people in a community is below the herd immunity threshold, contagious diseases could continue to spread [18, 19]. The level of acceptance of a COVID-19 vaccine in our study was lower than that among Malaysian residents (94.3%) [16], adults in the United States (70%) [17], and residents of 7 European countries [22]. Moreover, a study conducted in Saudi conducted in 2020 showed an acceptability level of 64.7% [21], which is close to our estimate. We identified several factors associated with acceptance of a COVID-19 vaccine; Females were more likely than males to accept vaccination against COVID-19

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**Determinants of COVID-19 Vaccine Acceptance in Ardabil ...** and people over 40 years (59.4%). Moreover, acceptability in these groups was similar to the findings of a study conducted among adults in Saudi [19]. Nevertheless, local public health strategies should aim to improve acceptance of a potential COVID-19 vaccine among younger adults [20-23].

Moreover, the acceptability of COVID-19 vaccination differed according to marital and employment status, results show government staff, people living in the city, and married people were more willing than those in other [24]. Also, results showed, that acceptance of a COVID-19 vaccine was related to self-perceived chances of contracting the infection and its severity [25-27]. Also, the majority of study participants were concerned about side effects and the safety of the vaccine. Such factors have been reported in prior studies [28, 29]. Studies have shown that a higher trust in the health system is associated with the utilization of preventive health services such as vaccination [30-33]. Although our study sample was large, the generalizability of our results is hampered by the doubtful representativeness of our study sample due to the nonrandom sampling technique used. Another limitation of our study is that participants needed access to a smartphone, tablet, or computer to be able to participate, which might have introduced a possible selection bias. Nevertheless, our study assessed a wide range of factors about the acceptability of COVID-19 vaccination, which may help in guiding future public health efforts that aim to increase the uptake of COVID-19 vaccines.

## Conclusion

This study reflected a high level of acceptance of COVID-19 vaccination among the adult population in Ardabil city during the pandemic period. To expand vaccine uptake in response to the COVID-19 pandemic, immunization programs should be designed to remove barriers in vaccine price and vaccination convenience. In addition, health education and communication from authoritative sources will be important to alleviate public concerns about vaccine safety.

**Acknowledgments:** Our grateful thanks go to all participants in the present study.

**Ethical Permissions:** This study was drawn from a research project (No. IRAUMS.REC. 1399.089).

**Conflicts of Interests:** Nothing to declare

**Authors' Contributions:** Nejaddadgar N (First Author), Introduction Writer/Methodologist/Main Researcher/Statistical Analyst/Discussion Writer (50%); Jafarzadeh M (Second Author), Assistant Researcher (20%); Ziapour A (Third Author), Methodologist (15%); Rezaei F (Third Author), Assistant Researcher (15%)

**Funding/Sources:** This study was sponsored by the Deputy of Research and Technology at AUMS.

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