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Predictors of the intention to receive the COVID 19 vaccine by Iranians 18–70 year old: Application of health belief model

Roya Jahanshahi-Amjazi, Mohsen Rezaeian¹, Mehdi Abdolkarimi², Mostafa Nasirzadeh³

Department of Health Education and Health Promotion, School of Health, Student Research Committee, Rafsanjan University of Medical Sciences, Rafsanjan, Iran, ¹Department of Epidemiology and Biostatistics, School of Medicine, Occupational Environment Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran, ²Department of Health Education and Health Promotion, School of Health, Rafsanjan University of Medical Sciences, Rafsanjan, Iran, ³Department of Health Education and Health Promotion, School of Health, Occupational Environment Research Centre, Rafsanjan University of Medical Sciences, Rafsanjan, Iran

Address for correspondence:

Dr. Mostafa Nasirzadeh, Department of Health Education and Health Promotion, School of Health, Occupational Environment Research Centre, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. E-mail: mnasirzadeh13@rums.ac.ir

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Abstract:

BACKGROUND: In terms of public health, vaccination is considered as the most effective approach against the infectious diseases. Accepting and receiving the first vaccine produced as an innovation may not be easy. Therefore, the present study was conducted to investigate the predictors of intention to receive COVID-19 vaccine by Iranians aged 18–70 years based on the health belief model in 2021.

MATERIALS AND METHODS: This descriptive study was performed on 2365 people aged 18–70-year old in Iran by random cluster sampling. Receipt of data was done electronically questionnaire through the Porcelain system. Data were analyzed using SPSS software version 20 using Chi-square, one-way analysis of variance, independent *t*-test, and multiple regression analysis at a significance level of 0.05.

RESULTS: The mean score of receiving the Iranian corona vaccine was 3.06 ± 1.30 out of 5 points. About 16.7% reported that they will definitely choose the Iranian vaccine. The highest correlation was between the intention to receive the vaccine with self-efficacy ($r = 0.239, P < 0.001$) and barriers to receiving the vaccine ($r = -0.237, P < 0.001$). Self-efficacy ($\beta = 0.114, P < 0.001$), perceived barriers ($\beta = -0.126, P < 0.001$), and benefits of vaccine ($\beta = 0.061, P = 0.022$) were most important predictors the intention to receive the vaccine.

CONCLUSION: Approximately 38% reported that they would definitely and probably not choose the Iranian corona vaccine. Therefore, it is suggested that more information should be provided about the features and benefits of domestically produced vaccines compared to foreign products.

Keywords:

COVID-19 vaccines, health belief model, intention, Iran

Background

In December 2019, a type of coronavirus called COVID-19 was reported from Wuhan, China. The virus is capable of aerosol transmission and is transmitted through respiratory droplets as well as mucous membranes.^[1]

The virus has now turned into a pandemic and has spread all over the world;^[2] it is likely to threaten global health and weaken

the international economy. COVID-19 has also led to the hospitalization of a large number of people at the intensive care units of hospitals.^[3,4] The virus infects people of all ages, the evidence indicates that the elderly (people over 60) and people with special conditions and certain diseases such as cardiovascular disease, diabetes, chronic lung diseases, and cancer are more likely to suffer from the severe COVID-19.^[5]

Although strategies such as preserving personal hygiene, frequent hand washing,

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surface disinfection, and keeping physical distance are important ways of preventing the disease,^[2] the catastrophic consequences of COVID-19 have strengthened the urgent need for an effective vaccine to control the spread of the disease. In terms of public health, vaccination is regarded the most effective strategy against the spread of various infectious diseases.^[6] Thus, the development of a vaccine against COVID-19 infection is a top priority on the agenda. Accepting and receiving the first vaccine, as an innovation, might not be easy. Studies have indicated that some characteristics of the vaccine, including effectiveness, duration of safety, side effects, and approvals from trusted organizations are likely to affect the public acceptance of a given vaccine.^[7] Moreover, being a member of the medical staff, higher income, and higher perceived risk have also been among the main factors that have increased individuals' desire to be vaccinated.^[8]

One of the most practical models of health education in prevention is the health belief model, which is especially useful for designing programs for disease prevention.^[9] This model is based on people's motivation for action. This model highlights that the way a person's perception creates motivation and action, and it can also cause preventive behavior and the acceptance of that behavior in him. In general, speaking, this model focuses on changes in one's beliefs, and changes in beliefs will result in changes in behavior. Health belief model constructs include perceived susceptibility, perceived severity, perceived barriers, perceived benefits, perceived self-efficacy, and cues to action.^[10,11] Perceived susceptibility refers to a person's mental belief about the susceptibility for suffering from a disease or readiness of a disease. Perceived severity refers to one's belief in the negative consequences of suffering from a disease or a damaging situation. Perceived benefits refer to one's belief in the positive consequences of the recommended behavior, such as early diagnosis and receiving appropriate treatment. Perceived barriers include believing in the existence of problems. Self-efficacy is personal judgment about one's ability to conduct the desired behavior. Finally, cues to action are the strategies adopted to prepare for taking an action.^[11,12] Studies have shown that changing people's attitudes play a key role in adopting behavior and controlling COVID-19.^[13] Mirzaei *et al.* reported that the constructs of the health belief model predict 29.3% of preventive behaviors from COVID-19.^[14]

Health belief model constructs are known to be important predictors for influenza vaccine. Thus, investigating the significant constructs of the health belief model affecting COVID-19 vaccination may be important for conducting the required interventions to increase the

popular acceptance of the vaccine.^[15] In their study, Wong *et al.* reported that the most important predictors of COVID-19 vaccine were high perceived benefits, fewer barriers for receiving the vaccine, and higher perceived susceptibility to infection.^[15] Thus, the present study aimed at determining the predictors of intention to receive COVID-19 vaccine by Iranians aged 18–70 years, based on the health belief model. The results of this study are expected to be effective in promoting public acceptance of vaccination and controlling COVID-19 pandemic.

Materials and Methods

Study design and setting

The statistical population of descriptive cross-sectional study included 18–70 years Iranians.

Study participants and sampling

The samples have been selected by using a random cluster sampling method. Thus, at first, the Iranian cities were divided into 5 categories (north, south, east, west, and center) on the map. Then two provinces were randomly selected from each category, and four cities or counties were randomly selected from each province on the map [Figure 1].

At first, the population of cities was searched by using Google search engine, and according to the sample size of the study, the estimated sample size of each city was determined. Then, through the website of the Iran Post (the posting company of the Islamic Republic of Iran), at least 5 area codes of the postal codes of the selected cities were identified. Then, by using the telecommunication system and postal codes, as many as four times of the selected samples of each city, invitation messages were sent to (Mobile Telecommunication Company [MCI] of Iran) and MTN Iran cell numbers. The message contained an electronic link for the



Figure 1: Classification of the country for the purpose of cluster sampling

questionnaire, and the recipients were asked to complete the questionnaire.

If the participation rate of the population was low for a period of 2 weeks, SMS was resent to other MCI of Iran numbers in those areas. Data collection was done from February 16, 2021 to April 17, 2021.

$$n = \frac{Z_{1-\frac{\alpha}{2}} P(t-P)}{d^2}$$

Based on the formula and the study conducted by Wong *et al.*,^[15] the sample size was estimated to be 9585 individuals (the intention for receiving the vaccine in the aforementioned similar study is 0.48, with confidence interval of 95%, and an error value of 0.01). Inclusion criteria were willingness to participate in the study, being Iranian, and being 18–70 years. Moreover, exclusion criteria were the incomplete completion of the questionnaire.

Data collection tool and technique

The data collection tool was a questionnaire extracted from the study conducted by Wong *et al.*^[15] The first part includes demographic information (age groups, gender, educational level, occupation, marital status, income, presence of chronic diseases, place of residence, the individual or his/her family’s history of suffering from COVID-19). The second part includes the questions related to the constructs of the health belief model that was completed online. Thus, perceived susceptibility and perceived severity include 3 questions each with a score range of 3–15 about the COVID-19. Perceived benefits include two questions with a range of 2–10 points, perceived barriers include 5 questions and a score range of 5–25. Cues to action include 3 questions with a score range of 3–15. Finally, self-efficacy includes 3 questions with a score range of 3–15. The 5-point (1–5) Likert response scale (definitely disagree, disagree, no opinion, agree, and definitely agree) was applied about the Iranian COVID-19 vaccine. The perceived barrier questions were scored in reverse. The intention to receive the vaccine was evaluated with a 5-point Likert scale, and it included yes definitely (score 5), probability yes (score 4), maybe because I have doubts (score 3), probably NO (score 2), and definitely NO (score 1). The scores ranged from 1 to 5. The response method was self-reported, and the results of the scores were also reported in percentage.

The data were analyzed using (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp) as well as Chi-squared test, one-way analysis of variance, independent *t*-test, and multiple regression analysis at a significance level of 0.05. The results were provided in form of tables, chart, and textual descriptions as mean, standard deviation, and frequency percentage.

Ethical consideration

To observe the required ethical principles, individuals were reassured at the beginning of the experiment and before observing the question page that all their information would be kept confidential and anonymous. The ethics code IR.RUMS.REC.1399.256 from the National Ethics Committee in Biomedical Research was received.

Results

As many as 2365 of 18-to-70-year-old Iranians participated in this study, the response rate based on the estimated sample size was reported to be 24.67%. According to the five-category classification [Figure 1], the percentage of participants was 7.62% for the first category of the map, 6.42% for the second category, 9.62% for the third category, 51.02% for the fourth category, and finally, 25.32% for the fifth category. Most of the participants were in the age range of 18–28 years, and 62.3% of the respondents were females. As many as 73.2% of the participants had academic education, and 33.3% of the participants were employee, in the present study, as many as 63.2% of the participants were married. Moreover, as many as 36.4% of them had a monthly salary of 2–5 million Toman, 18.9% of them had a history of suffering from an underlying and chronic disease. Finally, 27.4% of them had a history of suffering from COVID-19, and 52.9% of them have reported that a family member had already suffered from COVID-19 [Table 1].

The mean scores of perceived susceptibility and severity for COVID-19 were, respectively, 11.27 ± 2.71 and 9.98 ± 2.88 out of 15 points. Moreover, the mean score was 7.89 ± 1.90 out of 10 points for perceived benefits, 14.52 ± 4.47 out of 25 for perceived barriers, 9.83 ± 2.50 for cues to action, and 10.15 ± 3.02 out of 15 for self-efficacy to receive the vaccine, and finally, 3.06 ± 1.30 out of 5 points for the intention to receive Iranian vaccine. The behavioral priorities of the people for the intention to receive Iranian vaccines are listed in Figure 2 based on the selected provinces and the national average; thus, as

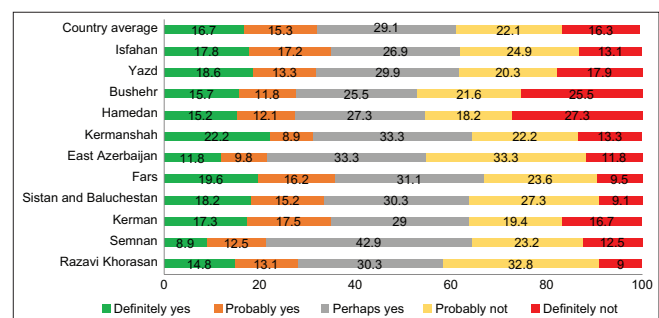


Figure 2: Behavioral preferences Intention to receive the Iranian COVID-19 vaccine by selected cities and national average

Table 1: Status of demographic characteristics of participants and its relationship with the intention to receive the Iranian corona vaccine

Variable	n (%), Mean±SD of intention to receive Iranian corona vaccine	P
Age (years)		
18-28	809 (34.2), 55 (2.3)	0.227
29-39	788 (33.3), 3.0±1.3	F=1.41
40-50	524 (22.2), 3.0±1.3	
40-50	189 (8.0), 3.2±1.3	
62-70	55 (2.3), 3.0±1.2	
Gender		
Female	1473 (62.3), 3.0±1.2	0.503
Male	892 (37.7), 3.0±1.3	T=0.671
Education		
Academic	1731 (73.2), 3.0±1.3	0.011
Diploma	502 (21.1), 3.1±1.3	F=3.72
Guidance	93 (3.9), 3.2±1.2	
Primary	39 (1.6), 3.0±1.2	
Job		
Student	599 (25.3), 2.9±1.2	0.001
Housewife	401 (17), 3.3±1.2	F=5.24
Farmer	18 (0.8), 3.3±1.5	
Self-employed	300 (12.7), 2.9±1.3	
Unemployed	103 (4.4), 2.7±1.4	
Retired	106 (4.5), 3.3±1.4	
Worker	50 (2.1), 3.3±1.1	
Employee	788 (33.3), 3.0±1.3	
Marital status		
Widow	19 (11.11), 3.6±1.3	0.001
Divorced	75 (11.11), 3.0±1.3	F=6.61
Single	766 (11.11), 2.9±1.2	
Married	1495 (63.2), 3.1±1.3	
Income		
>8 million	203 (10.4), 2.6±1.3	0.001
5-8 million	403 (20.4), 3.0±1.3	F=8.93
2-5 million	709 (36.4), 3.1±1.2	
<2 million	631 (32.4), 3.0±1.2	
Underlying disease		
No	1918 (81.1), 3.0±1.3	0.123
Yes	447 (18.9), 3.1±1.3	F=-1.54
Infection with COVID-19		
I don't know	402 (17.0), 3.1±1.2	0.379
No	1315 (55.6), 3.0±1.3	F=0.971
Yes	648 (27.4), 3.0±1.2	
Family history of COVID-19		
No	1112 (47.1), 3.0±1.3	0.238
Yes	1247 (52.9), 3.0±1.2	T=1.180

Tests used: Independent t-test and one-way ANOVA. SD=Standard deviation

many as 16.7% of Iranians have reported that they would definitely choose the Iranian vaccine.

Table 2 shows correlation between the mean scores of the health belief model structures and the intention to receive the Iranian vaccine. The highest correlation was between the intention to receive the vaccine with

self-efficacy ($r = 0.239, P < 0.001$) and removing barriers to receiving the vaccine ($r = 0.237, P < 0.001$). Based on multiple regression analysis, self-efficacy ($B = 0.049, P < 0.001$), perceived barriers ($B = -0.037, P < 0.001$), and benefits of vaccine ($B = 0.042, P = 0.022$), respectively, were the most important predictors of vaccine intention [Table 3].

In this study, there was a significant relationship between educational level, occupation, marital status, and income with the intention to receive the Iranian corona vaccine ($P < 0.05$) [Table 1]. Lysergic acid diethylamide (LSD) *post hoc* test indicated a significant difference between the mean score of intention to receive vaccine among academic education people with guidance school education ($P = 0.046$) and high school education (Diploma) ($P = 0.004$). Moreover, in terms of the mean score of intention to receive the Iranian COVID-19 vaccine, there was a significant difference between employee and retirees ($P = 0.038$), employee and unemployed individuals ($P = 0.017$), employee and housewives ($P < 0.001$), and between workers and self-employed individuals ($P = 0.042$), between workers and the unemployed individuals ($P = 0.008$), between retirees with self-employed individuals ($P = 0.005$), between retirees and college students ($P = 0.015$), and between retirees and unemployed individuals ($P = 0.001$), and finally, between housewives with college students, self-employed, and unemployed individuals ($P < 0.001$).

The LSD *post hoc* test has also indicated that in terms of the mean score of intention to receive the Iranian COVID-19 vaccine, there was a significant difference between single individuals and married people ($P < 0.001$) and between single individuals and widows/widowers ($P = 0.015$). Moreover, in terms of the mean score of intention to receive the Iranian COVID-19 vaccine, there was a significant difference between individuals with an income of higher than 8 million Toman per month and other groups with different income levels ($P < 0.001$); in other words, the intention to receive the Iranian COVID-19 vaccine was lower for individuals having an income of higher than 8 million Toman per month in comparison to other groups.

As for intention to receive foreign vaccines, the highest intention was for receiving vaccines produced in the United States (38.6%) and the lowest rate of willingness was reported for vaccines made in China (10.8%). Moreover, the people's priorities for receiving the vaccines produced in Russia, Britain, Sweden, and Cuba were 29.7%, 27.7%, 15.1%, and 12.1%, respectively.

Discussion

The present study aimed at determining the acceptance

Table 2: Correlation between health belief model and intention to receive Iranian COVID-19 vaccine

Variable	Susceptibility	Severity	Benefits	Barriers	Cues to action	Self-efficacy	Intention to receive vaccine
Susceptibility	1						
Severity	0.62**	1					
Benefits	0.38**	0.31**	1				
Barriers	-0.15**	-0.01**	-0.51**	1			
Cues to action	0.28**	0.17**	0.51**	-0.51**	1		
Self-efficacy	0.30**	0.26**	0.51**	-0.51**	0.52**	1	
Intention to receive vaccine	0.09**	0.08**	0.21**	-0.231**	0.20**	0.23**	1

**Correlation at significant level<0.001

Table 3: Multiple regression analysis between health belief model constructs and the score of intention to receive Iranian COVID-19 vaccine

Model	Not standardized coefficients		Beta standardized coefficients	t	P
	B	SE			
Constant	2.47	0.241	-	10.25	<0.001
Susceptibility	-0.013	0.013	-0.027	-1.02	0.304
Severity	0.019	0.012	0.042	1.60	0.109
Benefits	0.042	0.018	0.061	2.30	0.022
Barriers	0.037	0.008	-0.126	-4.83	<0.001
Cues to action	0.025	0.013	0.048	1.89	0.059
Self-efficacy	0.049	0.011	0.114	4.39	<0.001

Dependent variable: Intention to receive Iranian COVID-19 vaccine. R=0.258, R²=0.081. SE=Standard error

and reception rate of Iranian-produced COVID-19 vaccine and the factors influencing them based on the health belief model for the prevention of COVID-19 disease in Iran. Using individual psychology factors in predicting vaccination behavior through using behavioral change theories have been indicated in various studies, and applying the health belief model has been confirmed in this regard.^[16] The study conducted by Shmueli has indicated that the health belief model predicts 78% of the variance of vaccination behavior.^[17]

In the present study, only 16.7% of the participants reported that they were definitely willing to receive the Iranian COVID-19 vaccine; this is not in an acceptable, though. However, as many as 15.3% of the participants were likely to apply for the vaccine, and more than half of participants have reported that they were either skeptical or unwilling to receive the vaccine. Different studies have reported different results in terms of individuals' willingness to receive new vaccines. The study conducted by Guidry *et al.*^[18] has indicated that 60% of the participants had definitely or possibly expressed their willingness to receive the new vaccine of COVID-19. Only 25% of the participants were definitely or highly unwilling to receive the vaccine; this is not in line with the finding of our study. Moreover, the study conducted by Reiter *et al.* has indicated that the majority of participants stated that they would definitely like to receive COVID-19 vaccine; this is

not in line with the results of the present study.^[19] In explaining this contradiction, one can refer to issues as the type of vaccine investigated, different brands, the newly emerged nature of the disease, lack of proper information on Iranian-produced vaccines, and different sensitivities of people based on the cultural characteristics in different societies. Moreover, it is also possible to highlight the existence of scientific contradictions on the effects and necessity of vaccination and its consequences among the experts of a given society. Different studies have indicated that in such conditions, the majority of people are more likely to take the opinions of specialists and physicians into account in comparison to the opinions provided by policymakers.^[20] In addition, there seems to be growing concerns on the rapid production of vaccines and their effectiveness; these factors will, thus, result in people's decreased willingness to be vaccinated.^[21]

In the present study, there was no relationship between the willingness to receive the Iranian COVID-19 vaccine and age. However, there was a significant relationship between educational level and income with one's willingness to receive the vaccine. People with higher income and educational levels showed less willingness to receive Iranian vaccines. In some studies, age has been introduced as an influential factor; as younger individuals are less concerned, they showed less willingness to be vaccinated.^[20] It seems that in the present population, sensitization did not differ significantly in different age groups. Moreover, it can be stated that high-income individuals are more likely to be able to buy their favorite vaccine from the free market.

In this study, there was a significant correlation between the intention for receiving vaccine and health belief mode constructs; this is in line with some studies conducted in this field.^[15,22] However, this correlation was poor for perceived susceptibility and severity, and a higher correlation was observed for perceived barriers and self-efficacy. The results of the study conducted by Wong indicated that perceived benefits and barriers for receiving the vaccine are the most important factors determining an individual's willingness to receive the COVID-19 vaccine.^[15] In the present study, two factors

of barriers and benefits in the regression model were able to predict the intention. The study conducted by Dror indicated that accepting to be vaccinated depends on individuals' personal attitude toward the benefits of vaccination.^[23] Thus, it seems necessary to justify and explain the benefits of vaccination in a population that is being investigated.

In the present study, the perceived severity and susceptibility scores for the possible consequences and complications of COVID-19 were not favorable. Since the health promotion studies indicate that designing threatening messages about the severity of the disease is effective in vaccination,^[24] it is recommended to conduct the required interventions and campaigns with the aim of sensitizing and highlighting the severity of complications arising from the lack of vaccination; this has been also approved by Aligol *et al.*^[25]

The results of the multiple regression showed that self-efficacy is the most important predictor of one's willingness to be vaccinated; this is in line with the results of the study conducted by Shmueli.^[17] Moreover, different studies have indicated that self-efficacy is one of the most important factors determining the implementation of COVID-19 prevention behaviors.^[26] Self-efficacy refers to the feeling of having control over a new situation and challenge. Thus, in situations such as vaccination for the newly emerged diseases, where one's feeling of control over the new situation is not quite desirable, improving self-efficacy can be regarded as one of the factors that determine one's willingness to be vaccinated.^[27] Therefore, the health system's policy makers are required to create a feeling in individuals that they can use the Iranian vaccine (that has been approved by regulatory and standard organizations) without any problem or complication.

Limitation and recommendation

Given the electronic methods for data collection, only individuals having access to smartphones and internet can normally participate in the study, which is one of the limitations of research. Another limitation of the study was the poor response of the people in some areas, especially in northern Iran, the research results are less generalizable to these areas.

Respondents were mainly academically educated and resident in the city, therefore, it is suggested that a study should be designed and conducted on groups with lower levels of education and rural areas in person. Investigating the determinants of vaccination intention in Iran based on the pattern of health belief and conducting large-scale research is one of the strengths and innovations of the research.

Conclusion

At the time of data collection (1 month before the onset of the fourth peak of the disease), as many as 66% of participants were sensitive to COVID-19, around 58% felt barriers to receive the vaccine, and as many as 65% of them reported that they were less encouraged by others to receive the vaccine. As many as 16.7% of the participants reported that they would definitely choose the Iranian vaccine, the highest correlation was observed between the intention to receive the vaccine and self-efficacy ($r = 0.239$, $P < 0.001$) and removing the barriers of receiving the vaccine ($r = 0.237$, $P < 0.001$). Moreover, self-efficacy ($B = 0.049$, $P < 0.001$), perceived barriers ($B = -0.037$, $P < 0.001$), and benefits of vaccine ($B = 0.042$, $P = 0.022$) were, respectively, reported to be the most important predictors of intention to receive the vaccine. Therefore, it is recommended to provide transparent information about the Iranian vaccines and compare them with similar foreign products through public media and channels to encourage people to accept the vaccine.

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Conflicts of interest

There are no conflicts of interest.

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