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# Reasons for not getting COVID-19 vaccine in Ardabil, a Northwestern province in Iran: Based on an ecological approach

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**Abstract:**

**BACKGROUND:** Understanding the reasons for not getting the COVID-19 vaccine can help to increase acceptability and tackle vaccine hesitancy and consequently reach high coverage for this new vaccine. Using an ecological approach, the reasons for not getting the vaccine in the Iranian population was investigated.

**METHODS AND MATERIAL:** This study was conducted from October to December 2021 on 426 participants who had not received the COVID-19 vaccine. The following subsets of questions were included in the questionnaire: intrapersonal level factors, interpersonal level factors, group and organization, and society and policy-making. Multivariable logistic regression was used, and the odds ratio (OR) and 95% confidence intervals (CIs) were estimated for vaccine hesitancy (dependent variable) according to the reasons for not getting COVID vaccine scores (independent variable) using multivariable logistic regression in 3 different models, including Model 0: unadjusted, Model 1: adjusted for age, gender, and underlying disease, and Model 2: adjustment for age, gender, underlying disease, education, place of living, income, marital status, and employment.

**RESULTS:** A significant difference was found regarding gender between likely and not likely groups ($P$ = 0.016). A significant association was observed between the vaccine hesitancy and interpersonal (unadjusted model: OR = 0.833 (CI: 0.738–0.942), $P$ for trend = 0.003; model 1: OR = 0.820 (CI: 0.724–0.930), $P$ for trend = 0.002; model 2: OR = 0.799 (CI: 0.703–0.909), $P$ for trend = 0.001) and group and organization (unadjusted model: OR = 0.861 (CI: 0.783–0.948), $P$ for trend = 0.002; model 1: OR = 0.864 (CI: 0.784–0.952, $P$ for trend = 0.003; model 2:OR = 0.862 (CI: 0.781–0.951, $P$ for trend = 0.003). There was no significant association between vaccine hesitancy and intrapersonal and society and policy-making ($P$ > 0.05).

**CONCLUSIONS:** We found that a high score of "interpersonal" and "group and organization" factors were associated with lower intention to COVID vaccine. Moreover, women had higher vaccination intentions than men.

**Keywords:**

Behavior, COVID-19, vaccination hesitancy

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## Introduction

Immunization is now the only option for a return to normal life and illness prevention with the long-term goal of eradicating the disease and the short-term goal of controlling the disease in individuals and communities.[1,2] Vaccination has been proven to be a very successful and cost-effective control of infectious disease outbreaks. The vaccination program of the World Health Organization (WHO) has greatly reduced



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the prevalence of numerous diseases.[3-5] Vaccines, along with antibiotics and water purification systems, have increased life expectancy in developing countries by eradicating several diseases that have killed millions throughout the history.[6] Even though the vaccines are very effective and have few side effects, no vaccine is completely free of negative effects.[7-9] Unfortunately, since the COVID-19 vaccine has been discovered, an increasing number of people have refused to be vaccinated. Fear of vaccines has been expressed in the anti-vaccination movement as a result of a lack of trust in government and institutions, national and global health, and misinformation about the safety of vaccines.[10,11] All of these factors contribute to a steady decline in vaccination coverage, ultimately leading to an increase in morbidity and mortality.[12,13] According to the WHO, anti-vaccine activities are as hazardous as the viruses on the list because they halt progress in the fight against vaccine-preventable diseases.[14,15] Vaccine avoiders, some of whom are also "vaccine-free," believe that immunization is useless, ineffectual, and primarily benefits vaccine makers.[16] Health policies and actions by government and non-government officials as well as international health bodies such as the WHO are frequently challenged by rumors.[17] Vaccination information is widely disseminated via social media and the internet. Social media platforms have evolved into a common source of health data. People may utilize social media to improve their knowledge of the disease, transmission, and preventative measures during an epidemic. Online health information is sometimes accompanied by rumors and conspiracy theories that are not always based on scientific facts, exposing users to potentially harmful misinformation.[18-20] Health researchers must be aware of the elements that influence behavior in order to succeed in modifying or establishing healthy behavior and theories play a role in this process.[21]

For decades, the ecological approach has been at the heart of health promotion. The ecological approach is concerned with the nature of people's interactions with their physical and sociocultural settings. The ecological approach's main strength is its integrated multi-level focus. Intrapersonal, interpersonal, group and organization, and society and policy-making are the four central elements of the ecological approach to performing actions. Each of these levels has an impact on behavior.[22,23] Since the ecological approach is a comprehensive approach that plays a critical role in planning and identifying the causes of behaviors, we, for first time, sought to investigate the reasons for not getting the COVID-19 vaccine in the Iranian population using an ecological approach.

## Materials and Methods

### Study design and setting

The current cross-sectional study was conducted in Ardabil Province, a mountainous province in northwestern Iran, from October to December 2021. Ardabil is located in northwestern Iran and consists of 12 cities.

### Study participants and sampling

The following inclusion criteria were applied: age greater than 18 years old and not getting the COVID-19 vaccine. Exclusion criteria included incomplete questionnaire completion, an unwillingness to participate in the study, pregnancy, and the presence of psycho-behavioral problems such as autism, attention deficit-hyperactivity disorder, bipolar disorder, major depressive disorder, and schizophrenia. Originally, each of the city's health centers was considered a cluster. We referred to the health centers after obtaining a permit and a letter of introduction from the Ethics Committee of Khalkhal University of Medical Sciences. According to the census office, people over the age of 18 who had not received the COVID-19 vaccine were identified in each of the centers using the Sib system (https://sib.arums.ac.ir). We applied a random sampling method. Based on the sample size, the identified individuals were contacted, then participants were asked to complete the questionnaire in a consultation room after being informed about the study's objectives.

In the Ardabil province, 250,000 people who are eligible to be vaccinated have refused to do so. The following formula was used to calculate the sample size:

$$n = \frac{Nz^2pq}{Nd^2 + z^2pq} = 384$$

N = 250000

d = 0.05

P = q = 0.5

Z = 1.96

Finally, considering the sample loss, 426 subjects were recruited for this study.

### Data collection tool and technique

To collect data, the respondents were given a two-section questionnaire to fill out. The sections were as follows: sociodemographic characteristics of participants including gender, age, marital status, level of education, employment status, place of living (urban or rural), income, having an underlying disease, and the likelihood

of getting the COVID-19 vaccine in the future. A 23-item vaccine hesitancy scale was developed by the researchers in the present study [Supplementary Table]. Then, a panel of experts certified the validity of the scale, after making some revisions in the item's wording and phrasing, as well as the response format. For the scale, the content validity ratio and content validity index were estimated at 0.81 and 0.86, respectively. The questionnaire was piloted on 22 participants who were not considered in the final analysis; its internal consistency was assessed by calculating Cronbach's alpha as 0.81. The following subsets of questions based on the ecological approach were included in this questionnaire: intrapersonal level factors, interpersonal level factors, group and organization, and society and policy-making (5-point Likert Scale: 0 = strongly disagree, 1 = disagree, 2 = neutral, 3 = agree, 4 = strongly agree) [Supplementary Table].

### Ethical consideration

Informed written consent was obtained from each participant. This research was approved by the Medical Ethics Committee of Khalkhal University of Medical Sciences (approval number: IR.KHALUMS.REC.1400.012).

### Statistical analysis

All statistical analyses were conducted using IBM SPSS Statistics software (Version 24) (IBM SPSS Statistics, Armonk, USA). A *P* value of less than 0.05 was considered to be statistically significant. The normality of variables was confirmed using the Kolmogorov- Smirnov test. The differences in variables across the "likelihood of getting the COVID-19 vaccine" in the future were detected using a Chi-square test and independent *t*-test. Moreover, the odds ratio (OR) and 95% confidence intervals (CIs) were estimated using multivariable logistic regression in 3 different models, including Model 0: unadjusted, Model 1: adjusted for age, gender, and underlying disease, and Model 2: adjustment for age, gender, underlying disease, education, place of living, income, marital status, and employment.

## Results

The participants' characteristics across the "Likelihood of getting the COVID vaccine have been presented in Table 1. The responses to the question on the "likelihood of getting a COVID-19 vaccine" in the future were: likely (47.9%) and not likely (51.6%). A significant difference was found regarding gender between likely and not likely groups ($P = 0.016$), but there was no significant difference regarding other demographic variables ($P > 0.05$). Regarding reasons for not getting the COVID-19 vaccine, no significant differences were observed in the intrapersonal factors and society and policy-making factors between the not likely and likely groups ($P = 0.337$ and $P = 0.847$, respectively). However, the mean score of interpersonal factors and group and organization factors was significantly higher in the not likely group compared to the likely group ($P < 0.05$). ORs and 95% CI for vaccine hesitancy (dependent variable) according to the reasons for not getting COVID-19 vaccine scores (independent variable) are shown in Table 2. A significant association was observed between vaccine hesitancy and Interpersonal in all 3 models (Model 0: unadjusted. b. Model 1: adjusted for age, gender, and underlying disease. c. Model 2: adjustment for age, gender, underlying disease, marital status, place of living, employment status, and education) (OR = 0.833 (CI: 0.738–0.942), *P* for trend = 0.003; OR = 0.820 (CI: 0.724–0.930), *P* for trend = 0.002; OR = 0.799 (CI: 0.703–0.909), *P* for trend = 0.001). Also, A significant association was found between vaccine hesitancy and Group and organization in all 3 models (Model 0: unadjusted. b. Model 1: adjusted for age, gender, and underlying disease. c. Model 2: adjustment for age, gender, underlying disease, marital status, place of living, employment status, and education) (OR = 0.861 (CI: 0.783–0.948), *P* for trend = 0.002; OR = 0.864 (CI: 0.784–0.952), *P* for trend = 0.003; OR = 0.862 (CI: 0.781–0.951), *P* for trend = 0.003).

There was no significant association between vaccine hesitancy and intrapersonal and society and policy-making ($P > 0.05$).

## Discussion

Iran was among the primary nations where COVID-19 has spread in early 2020. So, the government has intended to end this outbreak by vaccination. Several vaccines including homegrown such as COVIran Barekat and importing vaccines such as Sinopharm, AstraZeneca/Oxford, Sputnik V, etc. are currently used in Iran.[24]

Since COVID-19 vaccines are still under development, there is a lack of information regarding the safety of the vaccines.[25] However, according to research when there is limited experience and information regarding the safety of a new vaccine, people tend to make their beliefs based on attitudes to available vaccines such as the Pandemrix vaccine (an influenza vaccine) and the MMR vaccine (a vaccine against measles, mumps, and rubella).[26,27] The Pandemrix vaccine led to critical conflict because of its relation to an increased risk of narcolepsy.[28] Also, an association between the MMR vaccine and autism has been reported. However, 12 years after publishing a landmark study that turned tens of thousands of parents around the world against the MMR vaccine because of an implied link between vaccinations and autism, the Lancet has retracted

**Table 1: The characteristics of the subjects in the Not likely and Likely groups**

| Variables | Likelihood of getting COVID vaccine | | *P* |
|---|---|---|---|
| | Not likely (*n*=221) | Likely (*n*=205) | |
| Intrapersonal factors | 41.02±6.32 | 40.39±7.07 | 0.337* |
| Interpersonal factors | 7.18±1.64 | 6.70±1.58 | 0.003* |
| Group and organization factors | 8.60±1.96 | 7.99±2.12 | 0.002* |
| Society and policy-making factors | 7.43±1.72 | 7.46±1.86 | 0.847** |
| Age (years) | 30.01±7.5 | 29.86±7.44 | 0.836* |
| Place of living (*n*) (%) | | | |
| Urban | 220 (52.3%) | 201 (47.7%) | 0.163** |
| Rural | 1 (20%) | 4 (80%) | |
| Marital status (*n*) (%) | | | |
| Married | 117 (49.2) | 121 (50.8) | 0.122** |
| No married | 104 (55.3) | 84 (44.7) | |
| Level of education (*n*) (%) | | | |
| High school | 51 (48.1) | 55 (51.9) | 0.658** |
| Diploma | 87 (52.4) | 79 (47.6) | |
| Associate Degree | 19 (45.2) | 23 (54.8) | |
| Bachelor | 58 (56.9) | 44 (43.1) | |
| Master | 5 (55.6) | 4 (44.4) | |
| Employment status (*n*) (%) | | | |
| Governmental | 9 (45) | 11 (55) | 0.98** |
| Private | 23 (52.3) | 21 (47.7) | |
| Housewife | 103 (52.6) | 93 (47.4) | |
| Unemployed (earned) | 1 (25) | 3 (75) | |
| Unemployed (no income) | 15 (57.7) | 11 (42.3) | |
| Pupil | 15 (50) | 15 (50) | |
| Soldier | 1 (50) | 1 (50) | |
| Student | 21 (51.2) | | |
| Other | 33 (53.2) | | |
| Income (*n*) (%) | | | |
| ≤1 Million Tomans | 13 (59.1) | 9 (40.9) | 0.66** |
| 2 Million Tomans | 70 (47) | 79 (53) | |
| 3 Million Tomans | 67 (54.5) | 56 (45.5) | |
| 4 Million Tomans | 36 (53.7) | 31 (46.3) | |
| ≥5 Million Tomans | 35 (53.8) | 30 (46.2) | |
| Having an underlying disease (*n*) (%) | | | |
| Yes | 33 (60) | 22 (40) | 0.125** |
| No | 188 (50.7) | 183 (49.3) | |
| Gender (*n*) (%) | | | |
| Female | 113 (47.1) | 108 (58.1) | 0.016** |
| Male | 127 (52.9) | 78 (41.9) | |

Values are expressed as means±SD. **P*<0.05 was considered as significant using an Independent *t*-test for comparison between the two groups. ***P*<0.05 was considered as significant using the Chi-square test

the paper.[29] Although many studies have proven these claims to be incorrect, people still have insubstantial fears about the vaccine.[30,31] Based on available research people who perceive the vaccines as safe have more intention to take the vaccine.[32,33] Misinformation about the vaccines and lack of advanced vaccination knowledge can cause anxiety and overestimating possible adverse effects.[34] In the study by Bokaee Nezhad *et al*.[35] a slight reduction in the twitter users' desire to get vaccination when reports on side effects of vaccines increased.

Vaccine hesitancy is one of the challenges in the fight against COVID-19.[36] The concept of "vaccine hesitancy" means to delay accepting or refusing vaccination despite the availability of vaccination services.[33] WHO regarded vaccine hesitancy as an important threat to global health in 2019.[37] A global report on COVID-19 vaccine acceptance presented that nearly 30% of the studied participants would hesitate or refuse to accept the COVID-19 vaccination when it is available.[38] Fears and concerns about the safety of a vaccine could lead to vaccine hesitancy.[39] Vaccine hesitancy could be a serious barrier to reach coverage for population immunity.[40] It is affected by factors such as low perception of disease risk, availability of vaccines, and trust in the safety and effectiveness of vaccines as well as contextual, individual,

**Table 2: ORs and 95% CI for vaccine hesitancy (dependent variable) according to the reasons for not getting COVID vaccine scores (independent variable)**

| Variables | OR (CI) | *B* | *P** |
|---|---|---|---|
| Intrapersonal | | | |
| Model 1 | 0.984 (0.956-1.013) | 0.016 | 0.278 |
| Model 2 | 0.641 (0.956-1.014) | 0.015 | 0.315 |
| Model 3 | 0.985 (0.957-1.015) | 0.015 | 0.333 |
| Interpersonal | | | |
| Model 1 | 0.833 (0.738-0.942) | 0.182 | 0.003 |
| Model 2 | 0.820 (0.724-0.930) | 0.198 | 0.002 |
| Model 3 | 0.799 (0.703-0.909) | 0.224 | 0.001 |
| Group and organization | | | |
| Model 1 | 0.861 (0.783-0.948) | 0.149 | 0.002 |
| Model 2 | 0.864 (0.784-0.952) | 0.146 | 0.003 |
| Model 3 | 0.862 (0.781-0.951) | 0.149 | 0.003 |
| Society and policy-making | | | |
| Model 1 | 1.006 (0.904-1.119) | 0.006 | 0.911 |
| Model 2 | 1.012 (0.909-1.128) | 0.012 | 0.825 |
| Model 3 | 1.012 (0.908-1.128) | 0.012 | 0.830 |

*$P<0.05$ statistically significant by Multivariable logistic regression. Model 0: unadjusted, Model 1: adjusted for age, gender, and underlying disease, and Model 2: adjustment for age, gender, underlying disease, education, place of living, income, marital status, and employment

and group factors.[33] Various research showed that higher income, older age, higher education, and higher trust in government can increase the intention of individuals to accept a vaccine.[41-43] Accordingly, Tam *et al*.[39] suggested that issues including safety issues, long-term side effects, and mistrust of vaccines contribute to vaccine hesitancy. Soares *et al*.[41] concluded that considerable vaccine hesitancy persists, even with the widespread availability and highly effective and safe immunization strategies at least in the developed world. In the study by Saied *et al*.,[40] the key vaccination barriers were the lack of information about the vaccine and its possible side effects, the faster rate of vaccine development, and concern regarding high financial costs. Kumar *et al*.[44] evaluated vaccine acceptability and the reason for hesitancy among the Indian population. Approximately, every four in eight people were not sure to take the vaccine, and one in five people refused to be vaccinated. The authors suggested health education to understand and address vaccine-specific concerns to improve vaccine coverage, and enhance confidence among the population. To enhance the acceptance of COVID-19 vaccines, extensive and targeted health promotion campaigns are required to allay specific concerns raised by the public.[45]

It was predicted that many hesitant people may have an intention to vaccinate if supplied with truthful knowledge that the vaccine is effective and safe.[46] Then, policymakers and public health officials require to make strategic vaccine-acceptance approaches to effectively manage the pandemic and decrease future infections and deaths from COVID-19.[47] Moreover, fake news and misleading information about COVID-19 vaccines particularly on social media platforms should be monitored.[40,48] Taken together, general public education about the safety and efficacy of the COVID-19 vaccine improves the acceptance of COVID-19 vaccines. In COVID-19 policy learning is critical to regulate proper policies and apply them accordingly Iran has made many attempts to end the outbreak, but a more coherent, timely, and efficient implementation is needed, now, more than ever, to save lives and decrease the spread of the COVID-19 pandemic.[49]

### Limitation and recommendation

The present study had some limitations. First, the smaller sample size did not allow for robust conclusions. Moreover, due to limitations in funding, we couldn't include participants from other provinces. However, despite the aforementioned limitations, there were several strengths that merit acknowledgment. Indeed, using multivariable logistic regression in three different models and the use of an ecological approach (to our knowledge for the first time) provided a robust platform to interrogate the incumbent data. Understanding the reasons for not getting the COVID-19 vaccine can help to increase acceptability and tackle vaccine hesitancy and consequently reach high coverage for this new vaccine. Future studies with interventional design addressing vaccine hesitancy are needed to evaluate health education to resolve barriers to vaccination in larger populations.

## Conclusions

In the present cross-sectional study, more than half of the participants did not have the intention to take the COVID-19 vaccine in the future. Women, however, had higher vaccination intentions than men. We found that scores of "interpersonal" and "Group and organization" factors were associated with vaccine hesitancy. It is important to provide strategies to increase vaccine acceptance to fight against the COVID-19 pandemic.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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