

# Determinants of COVID-19 Vaccine Acceptance in Healthcare Workers in Iran: National Survey

**Koorosh Kamali**

Zanjan University of Medical Sciences

**Zarrintag Hoseinzade**

The Second Floor of Vice Chancellor for Research and Technology Building, Zanjan University of Medical Sciences

**Khadijeh Hajimiri**

Zanjan University of Medical Sciences

**Soodabeh Hoveidamanesh**

Iran University of Medical Sciences

**Seyed Mohsen Zahraei**

Ministry of Health and Medical Education, Tehran, Islamic Republic of Iran.

**Mohammad Mehdi Gouya**

Iran University of Medical Sciences

**Sousan Mahmoudi Bavandpouri**

Kermanshah University of Medical Sciences

**Tahereh mohamadi**

Zanjan University of Medical Sciences

**Soraya Mohamadi**

Zanjan University of Medical Sciences

**Zohre Bigdeli**

Zanjan University of Medical Sciences

**Azam Maleki**

Zanjan University of Medical Sciences

**Mahboubeh Shirzad**

Tehran University of Medical Sciences

**Zahra Heidari**

Zanjan University of Medical Sciences

**Mahya Farsadegi**

Zanjan University of Medical Sciences

**Alireza Shogli** (✉ [shoghli@zums.ac.ir](mailto:shoghli@zums.ac.ir))

Zanjan University of Medical Sciences

## Research Article

**Keywords:** COVID-19, vaccine Acceptance, trust, Healthcare Workers, Iran

**Posted Date:** October 1st, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-923059/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

# Abstract

**Background and Aim:** Acceptance of a vaccine is the most effective way to tackle the COVID-19 pandemic. Health care providers are the most determining group in danger of COVID-19 more than others. They are among the first group to uptake vaccination. This study aimed to assess the level of COVID-19 vaccine acceptance and their determinants among Health Care Workers in Iran.

**Methods:** A cross-sectional survey was carried out among 3600 Healthcare Workers (HCWs) in Iran. Data were collected through a self-administered questionnaire by a trained team from February to March 2021. A multi-stage cluster sampling method was used to select respondents. A Multivariate Logistic regression analysis was used to determine the key determinants of COVID-19 vaccine acceptance among participants. P-value <0.05 was considered statistically significant.

**Results:** Out of the 3536 respondents, 2191 (62.1 %) intended to uptake the COVID-19 vaccine, only 660 (18.7 %) reported hesitancy towards the COVID-19 vaccine. Only about 10% of participants said they did not trust any vaccine (domestic and foreign vaccines). Willing to accept a COVID-19 vaccine is relatively high among males, doctors, and who have a history of hospitalization due to COVID-19 infection. In multivariate models, respondents who were 40-50 years (aOR: 1.56; 95% CI: 1.47–1.66), had a history of COVID-19 infection (aOR: 0.85; 95% CI: 0.83–0.88), and hospitalized due to COVID-19 infection (aOR: 2.18; 95% CI: 1.97–2.39) were significantly associated with vaccine acceptance ( $p < 0.05$ ).

**Conclusion:** Our study showed moderate acceptance of covid-19 vaccination in the HCWs in the Islamic Republic of Iran with less acceptance in nurses. This needs more attention and implementation of educational programs for awareness and reassurance of healthcare workers.

## Introduction

Beyond dispute, our life has been twinned with a newly emerged respiratory disease (covid-19) since 2019. The pandemic has posed a significant threat to the human lives and well-being of billions of people worldwide which caused a plethora of death around the world (1). Various strategies have been implemented to tackle the COVID-19 pandemic, such as physical distancing measures and movement restrictions (lockdowns) in various countries, but the pandemic is still ongoing despite such efforts (2). In order to combat this unknown disease, World Health Organization (WHO) declared that the most effective way to tackle this problem is vaccination (3). In other words, vaccines are critical to preventing and controlling infectious disease outbreaks, which can save millions of lives (4). Whereas vaccinating most people around the world with a COVID-19 vaccine is a controversial issue among people (5). Vaccine acceptance among the general public plays a fundamental role in successfully controlling the pandemic (6). There could be found many reasons why some people cannot trust the vaccine and still refuse to take it despite the availability of vaccination services (6). One of those associated with the attitude towards acceptance of vaccination includes complacency, convenience, and confidence (6). Therefore, vaccination was deemed unnecessary.

Health care providers are the most determining group in danger of COVID-19 more than others because they are in touch with COVID-19 patients (7). Consequently, achieving a high vaccination coverage rate in this important target group is mandatory (8), and there is a pressing need to consider. Also, this group has one of the strongest influences in vaccination decisions, which can be vital in helping the acceptance of vaccines (9). Besides, health care providers are a vital source of information for acceptance of vaccines, and their communication can improve adherence to vaccination recommendations among the public (10). According to studies that have been conducted during this pandemic, revealed delay acceptance in vaccination is a common phenomenon among the public. Perceived risks vs. benefits, certain religious beliefs and lack of knowledge and awareness are extracted as a common reason for it (11–13).

A study has shown that acceptance of a COVID-19 vaccine in the USA is 67%. However, before introducing a COVID-19 vaccine for massive, lawmakers and the Ministry of health should plan a program to educate people on the effective COVID-19 vaccine acceptance (10).

The most effective program to combat COVID-19 is immunization programs with high rates of acceptance and coverage. To accomplish this, it is crucially significant to understand the health care provider's perceptions about acceptance of a COVID-19 vaccine. This study aimed to describe the determinants of COVID-19 Vaccine Acceptance in Health Care Workers in Iran.

## **Subjects And Methods**

### **Design and sample:**

As part of a large research project, this national cross-sectional survey was conducted to assess the COVID-19 Vaccine acceptance in HCWs in Iran from February to March 2020. To ensure a sufficient level of accuracy of the survey results, an adequate sample must be drawn from the target population, and the sample must be representative of the country. For this purpose, the multi-stage cluster sampling method was selected. To calculate the sample size, the prevalence of participants willing to receive a COVID-19 vaccine set at 50%, confidence interval 95%, and design effect 1.7 was considered. The final estimated sample size was 3600.

From the list of the medical sciences universities of Iran, nine universities were selected randomly. Then, two general hospitals from each university, one of which was Corona Center, and ten primary healthcare centers (rural and urban) were randomly selected. Respondents were selected by random sampling method according to healthcare worker statistics for gender and occupation from each university of medical sciences (n= 400). Participants who were willing to participate in the study, those who worked in primary health care centers and hospitals, with at least three months of experience, were included.

### **Procedures:**

Data were collected through a self-administered questionnaire by a trained team in a private office setting. Before data gathering, the purpose of the study was explained in detail for all participants by the

research team. The anonymous questionnaires with no identifiable information were delivered to the participants, and they were assured that their participation was entirely voluntary. It should be noted that informed consent was obtained from each participant.

### **Data Collection Instruments:**

Data was collected through a questionnaire consisting of four parts. This scale had been piloted by a sample of 50 participants. They assessed the content of the items, their comprehensibility, and suitability. The results of the pilot study were not included in the survey. The first part of the questionnaire consisted of Individuals' socio-demographic and general characteristics of participants such as age, gender, marital status, level of education, profession, workplace, work experience (years), location of health care service, history of COVID-19 infection, and history of hospitalization due to COVID-19 infection.

In the second part, participants' likelihood to receive a COVID-19 vaccine was assessed by one question "If COVID-19 vaccine is available, I will take it". Their agreement was rated on a 5-point Likert scale, with strongly agree =1 to strongly disagree=5. Responses were merged into a ternary outcome: if participants answered "strongly agree" and "agree" equaled 'Intended to uptake COVID-19 vaccine', if participants answered "disagree" and "strongly disagree" equaled 'COVID-19 vaccine refusal', and if participants answered "uncertain" equaled 'COVID-19 vaccine hesitancy'.

In the third part, participants who were Intended to the uptake COVID-19 vaccine or hesitate for vaccine uptake were asked to determine which type of vaccine they prefer to Uptake: Vaccines produced abroad, domestically produced vaccine or both of them. Also, we are asking them whether they trusted the domestic and foreign COVID-19 vaccine. The range of answers to this question included: 1- Approved by the Ministry of Health of Iran; 2- Scientific documentation is available, and the Ministry approves it of Health of Iran; 3- Only approved by reputable international authorities; 4- Approved by reputable international authorities and the Ministry of Health of Iran; 5- I do not trust the COVID-19 vaccine.

In the final part, to assess the respondents' source of information on COVID-19, they were asked to identify which sources they use from a variety of potential information sources: Instructions of the Ministry of Health, Treatment and Medical Education of Iran- Authentic medical, scientific resources, and sites-social networks- TV& Radio- Internet, etc.; and also asked to indicate who, as a reference, influences their decision to receive the vaccine. The respondents were able to indicate more than one answer regarding these questions.

### **Data Quality Control:**

After giving training for data collectors, the data were collected under regular supervision. Data were entered into an excel datasheet. Before analysis, to ensure its authenticity, the data had double-checked by another team. In this stage, a number of 64 defective questionnaires were excluded from the analysis. Finally, the analysis was performed on the data of 3536 participants.

### **Data Processing and Statistical analysis:**

For analysis, the data were checked, cleaned for completeness, and exported to IBM® SPSS® Statistics version 22 (IBM® Corp., Armonk, NY, USA). Then, the data were analyzed using appropriate descriptive statistics and were presented by frequency, percentage, and mean. Moreover, a Chi-squared test was performed to examine the intention distribution to uptake the COVID-19 vaccine with participants' socio-demographic characteristics. Also, Multivariate Logistic Regression Model was performed to tabulate odds ratios (OR) and their 95% confidence intervals (95% CI). The P-value <0.05 was considered statistically significant.

### **Ethical Consideration:**

This study was conducted following the principle of the Declaration of Helsinki. Ethical approval was granted for the study protocol and procedures by the institutional Research Ethics Committee (IR.ZUMS.REC.1399.455), Zanzan University of Medical Sciences of Iran. In addition, informed consent was taken before participation in the study from all participants.

## **Results**

A total of 3600 study participants were enrolled in this study. Nevertheless, the analysis was performed on the data from 3525 respondents. Table 1 shows the socio-demographic characteristics of participants. The mean (SD) of age and work experiences of respondents was 37.09 (8.54) and 11.9 (8.35) years, respectively. Most of the participants, 1336 (37.7%), were aged between 30 to 40 years; and the majority (54.9%) of them were female. 55.1% of participants had received bachelor education, 75.8% were married, and 35.5% reported a history of COVID-19 infection, and 3.7% hospitalized due to COVID-19 (Table 1).

The study's findings show that the majority of the participants (40.4%) preferred to uptake the vaccines produced abroad. Only 30.9% of them showed no difference between domestic and foreign vaccines to receive the vaccine (Fig1).

Near 50% of the participants stated that they trust a vaccine (both domestic and foreign vaccine) that has been approved by reputable international authorities and the Iranian Ministry of Health. Only about 10 % of participants said they did not trust any vaccine (both domestic and foreign) (Fig2).

The association between intent to uptake the COVID-19 vaccine and socio-demographic characteristics was examined by Chi-squared test. Of the 3525 respondents, 2191 (62.1 %) intended to uptake the COVID-19 vaccine, only 660 (18.7 %) reported hesitancy towards the COVID-19 vaccine, and 678 (19.2 %) of them refused up taking the COVID-19 vaccine (Table 2). Of the 1582 participants who were male, 1063 (67.4%) of them showed a willingness to uptake the COVID-19 vaccine if it was available. Of the 2709 participants who were married, 1683 (62.3%) reported being willing to uptake the COVID-19 vaccination. While, 62.4% (n = 790) of respondents who had a history of COVID-19 infection stated that they were willing to receive a COVID-19 vaccine, and 20.2% (n = 256) named that they would refuse the vaccination. (Table 2).

Table 3 displays multivariate Logistic regression for socio-demographic prediction of intent to uptake the COVID-19 vaccine among health care workers. This finding indicates that respondents who were 40-50 years were 1.56 times more likely to accept the vaccine (aOR: 1.56; 95% CI: 1.47–1.66). Similarly, participants with a history of COVID-19 infection were 0.85 times less likely to accept the vaccination (aOR: 0.85; 95% CI: 0.83–0.88). Respondents who were hospitalized due to COVID-19 were 2.18 times more likely to accept the vaccination infection (aOR: 2.18; 95% CI: 1.97–2.39) (Table 3).

This study showed that instructions of the Ministry of Health of Iran, Authentic medical, scientific resources and sites, Radio & television, and Social Networks were the primary sources of information about COVID-19 in participants (Fig3). Meanwhile, the recommendations of Iranian health managers and officials, international managers and health officials, and academics were influential in their decision to receive the vaccine, respectively (Fig4).

## Discussion

Vaccination is vital for the prevention and elimination of the COVID-19 disease. The success of a vaccine relies on its efficacy and acceptance, primarily among health care workers (HCWs) who are at high risk of infection (14) with the essential role in the general population's vaccination behaviors through their consultation (15). Thus, we surveyed different HCWs to measure their willingness to accept receiving the COVID-19 vaccine and assess the respondents' source of information on COVID-19.

Out of the 3536 study participants, over 60 percent intended to uptake the COVID-19 vaccine, and each of the hesitancy towards the COVID-19 vaccine and refusing up taking the COVID-19 vaccine was reported about 19 percent. While in other studies, almost refused persons were less than those who did not decide (15–17). In different studies, acceptance rates in HCWs ranged from almost 20–80% (15–21).

The COVID-19 vaccine acceptance in our participants (62%) was less than Gagneux-Brunon et al., study (76%), which maybe was related to less proportion of nurses in our study. Whereas, in both and other studies, the acceptance of covid-19 vaccine was less in nurses (18, 22). K. Wang et al. and Fares et al. also reported that only 40.0% and 11.24% of nurses, respectively, intended to accept COVID-19 vaccination (15, 23).

Similar to several studies, in our study, older age and male gender showed more willingness to uptake the COVID-19 vaccine (21, 22, 24), and by increasing years of education, acceptance of the COVID-19 vaccine increased (15, 18). The highest chance of vaccine acceptance in our study and Qattan et al. (21) was in HCWs aged 40-50 years. However, in Elhadi et al. and Fares et al. studies, the younger population was ready to receive the vaccine (15, 19). This finding was not far-fetched, as HCWs were well aware that age is one of the influential risk factors for COVID-19 mortality (25–27). Therefore, it was more probable that elder HCWs accept the COVID-19 vaccine. We also found that in bivariate analysis, Doctors of Medicine were the most willing group to receive vaccination against COVID-19 (71.9%). Also, in multivariate logistic regression analysis, they were 1.77 times more likely to accept the vaccination (aOR: 1.77; 95% CI: 1.67–

1.88). This finding was consistent with other studies, which found that compared to other HCWs, Medical doctors were more likely to accept the COVID-19 vaccines if the vaccination was available (28–32).

Our results suggested that the domestic and foreign vaccine products must be provided for better healthcare workers' adherence. As 28.7% of HCWs stated that they would prefer to receive the domestic vaccine. Fu et al. demonstrated that 52.5% of Chinese HCWs believed that the domestic COVID-19 vaccine would be better than those produced abroad (9).

The study finding indicated that only about 10% of HCWs said they did not trust any vaccine. However, trust in a vaccine is associated with vaccine uptake (33), and it is one of the critical attributes of vaccine hesitancy (33). Quinn et al. (2019) reported that trust was a strong and independent predictor of taking the flu vaccine (34). On the other hand, many of those who refused or hesitated COVID-19 vaccination could accept vaccination in the future on the condition that they could trust (35). In this regard, trust in authorities was a key factor (28). Thus, the government and decision-makers had a critical role in creating and maintaining confidence, not only in the safety but also in the effectiveness of the vaccines during mass vaccination programs (36). It seems that by offering the appropriate information about vaccines, decision-making would be facilitated, and the rate of vaccine acceptance would be increased as well.

On the other hand, a population survey of adults indicated that if the healthcare provider recommended vaccination, individuals would be more likely to receive a COVID-19 vaccine (37), which emphasized the role of health providers in the general acceptance of vaccines. So, health care providers and government officials should perform much effort to promote public trust and sincerity (36). Shekhar et al. showed that HCWs who were vaccinated were more likely to recommend vaccines to others (17). On the other hand, intent to be vaccinated was associated with trust in the health care system (38).

We also investigated the relationship of history of infection and hospitalization due to COVID-19 with vaccine uptake in HCWs. So that, in the multivariate logistic regression analysis, our results suggested that participants who had a history of COVID-19 infection were 0.85 times less likely to accept the vaccination (aOR: 0.85; 95% CI: 0.83–0.88). These results were similar to the study of Martin et al., in which they indicated that staff with a history of positive PCR were significantly less likely to be vaccinated. Maybe they believe that they have adequate immunological protection against COVID-19 infection. While, according to the evidence, the risk of infection may increase over time due to concerning waning humoral immunity (39). So, given that HCWs are at the forefront of the fight against COVID-19, offering evidence-based information, they could influence others to decide to receive the vaccine. Also, we found that respondents who were hospitalized due to COVID-19 were 2.18 times more likely to accept the vaccination (aOR: 2.18; 95% CI: 1.97–2.39). Probably, the perceived risk of HCWs who had an experience of hospitalization was higher than when COVID-19 infected them with low severity.

Our result demonstrated that the HCWs who had fewer work experiences were 1.23 times more likely to accept the vaccination; this finding was in agreement with the study by Papagiannis et al. They found that fewer work experiences enhanced the intention of HCWs to uptake the COVID-19 vaccine (40).

Studies indicated that trust in information sources was critical to vaccination acceptance (41). The finding of this study showed that the most trustful sources of information about the COVID-19 vaccine in HCWs were the instructions of the Ministry of Health and authentic medical, scientific resources and sites. Regarding the sources of information in the Fares et al. (15) study, those who used the media as the source of information had the most negative COVID-19 vaccination perception. While, those who obtained information from published scientific articles had the most positive perception, although the difference between these groups was insignificant.

We found that the recommendations of Iranian health managers and officials, international managers and health officials, and academics were influential in HCWs decision to receive the vaccine. Meanwhile, Rozek et al. indicated that individuals who had confidence in international organizations such as WHO was more likely to accept vaccine than those who reported no confidence in the WHO. Trust in health scientists and local and national health ministries were also predictive of reduced vaccine hesitancy (42). Research on the vaccination of HCWs against pandemic H1N1 showed that they were influenced by positive external cues to action, such as physicians and supervisors(43).

### **Strengths and limitations:**

There are several strengths in the present study. First, participants were recruited and surveyed in face-to-face interviews. A multi-stage cluster sampling method by random sampling method was used according to healthcare worker statistics for gender and occupation from each medical sciences university, which led to less bias than online surveys. Second, the sample size was large, and data from a multicenter could affect the generalizability. Third, our study had many findings, which would help policymakers in the national Covid -19 vaccination program. Forth, in the present study, we focused on hospital health workers and primary HCWs (urban and rural).

There were some limitations in the present study. It should be considered that all surveys were snapshots taken at a point in time. Furthermore, we sought to evaluate the intention of HCWs toward accepting a vaccine while the vaccination program was not started yet. Hence, as more information becomes attainable on the effectiveness and safety of COVID-19 vaccines and access to various vaccines, participants might change their attitudes regarding vaccination.

## **Conclusion**

In total, 62% of our participants were willing to uptake vaccination against COVID-19 as soon as it was available. This study showed a moderate acceptance of covid-19 vaccination in the HCWs in the Islamic Republic of Iran with less acceptance in nurses. Several factors influenced their level of acceptance of them.

It needs more attention and implementation of educational programs for awareness and reassurance of HCWs. Health promotion strategies need to address the vast misinformation about COVID-19 vaccines. Moreover, clear communication about vaccine safety and effectiveness will increase HCWs trust in

COVID-19 vaccination programs. It is suggested that by targeting HCWs, the organizational culture of vaccination in the workplace creates and is strengthened through strong messages from managers, health officials, and academics in Iran.

## **Declarations**

### **Ethics approval and consent to participate**

This study was conducted following the principle of the Declaration of Helsinki. Ethical approval was granted for the study protocol and procedures by the institutional Research Ethics Committee (IR.ZUMS.REC.1399.455), Zanzan University of Medical Sciences of Iran. informed consent was taken before participation in the study from all participants.

### **Consent for publication**

Not applicable

### **Availability of data and materials**

Not applicable

### **Conflict of Interest**

No conflict of interest to declare.

### **Funding:**

UNICEF has financially supported this study. The funder's roles were to monitor the interpretation of results and data management.

## **AUTHOR CONTRIBUTIONS**

A.Sh. Devised the main conceptual idea and designed and supervised this project. K. K., Z.H., and KH. H. Developed the theoretical concept of this study.

SM.Z. , MM.G., and S.MB. Helped supervises the project. K.K. , S.M., and Z. B. Analyzed the data. Z.H., A.M., and M.F. Participated in the data cleaning. T.M. Participated in the management of the data gathering. M.SH., KH.H., and S.H. Took the lead in writing the manuscript. All authors discussed the results and contributed to the final manuscript.

### **Acknowledgment**

The authors would like to thank the Iranian Ministry of Health and UNICEF for their support of this research. We also appreciate universities that participated in this study, especially from the Deputy

Minister of Health's colleagues who helped us collect data. The authors would like to thank all HCWs and people who participated in this study.

## References

1. Machida M, Nakamura I, Kojima T, Saito R, Nakaya T, Hanibuchi T, et al. Acceptance of a COVID-19 Vaccine in Japan during the COVID-19 Pandemic. *Vaccines*. 2021;9(3):210.
2. He H, Harris L. The impact of Covid-19 pandemic on corporate social responsibility and marketing philosophy. *Journal of Business Research*. 2020;116:176-82.
3. Pan SL, Zhang S. From fighting COVID-19 pandemic to tackling sustainable development goals: An opportunity for responsible information systems research. *International Journal of Information Management*. 2020;55:102196.
4. Kwok KO, Li K-K, Wei WI, Tang A, Wong SYS, Lee SS. Influenza vaccine uptake, COVID-19 vaccination intention and vaccine hesitancy among nurses: A survey. *International journal of nursing studies*. 2021;114:103854.
5. Askarian M, Fu L, Taghrir MH, Borazjani R, Shayan Z, Taherifard E, et al. Factors Affecting Covid-19 Vaccination Intent Among Iranians: COVID-19 Vaccination Acceptance. 2020.
6. Sallam M. COVID-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates. *Vaccines*. 2021;9(2):160.
7. Kose S, Mandiracioglu A, Sahin S, Kaynar T, Karbus O, Ozbel Y. Vaccine hesitancy of the COVID-19 by health care personnel. *International Journal of Clinical Practice*. 2021;75(5):e13917.
8. Saied SM, Saied EM, Kabbash IA, Abdo SAEF. Vaccine Hesitancy: Beliefs and Barriers Associated with COVID-19 Vaccination among Egyptian Medical Students. *Journal of Medical Virology*. 2021.
9. Fu C, Wei Z, Pei S, Li S, Sun X, Liu P. Acceptance and preference for COVID-19 vaccination in healthcare workers (HCWs). *MedRxiv*. 2020.
10. Malik AA, McFadden SM, Elharake J, Omer SB. Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine*. 2020;26:100495.
11. Karafillakis E, Larson HJ. The benefit of the doubt or doubts over benefits? A systematic literature review of perceived risks of vaccines in European populations. *Vaccine*. 2017;35(37):4840-50.
12. Pelčić G, Karačić S, Mikirtichan GL, Kubar OI, Leavitt FJ, Tai MC-t, et al. Religious exception for vaccination or religious excuses for avoiding vaccination. *Croatian medical journal*. 2016;57(5):516.
13. Yaqub O, Castle-Clarke S, Sevdalis N, Chataway J. Attitudes to vaccination: a critical review. *Social science & medicine*. 2014;112:1-11.
14. Wang K, Wong ELY, Ho KF, Cheung AWL, Chan EYY, Yeoh EK, et al. intention of nurses to accept coronavirus disease 2019 vaccination and change of intention to accept seasonal influenza vaccination during the coronavirus disease 2019 pandemic: A cross-sectional survey. *Vaccine*, Volume 38, Issue 45, 21 October 2020, Pages 7049-7056.

15. Fares S, Elmnyer MM, Mohamed SS, Elsayed R. COVID-19 Vaccination Perception and Attitude among Healthcare Workers in Egypt. *Journal of primary care & community health*. 2021;12:21501327211013303.
16. Di Gennaro F, Murri R, Segala FV, Cerruti L, Abdulle A, Saracino A, et al. Attitudes towards Anti-SARS-CoV2 Vaccination among Healthcare Workers: Results from a National Survey in Italy. *Viruses*. 2021;13(3).
17. Shekhar R, Sheikh AB, Upadhyay S, Singh M, Kottewar S, Mir H, et al. COVID-19 Vaccine Acceptance among Health Care Workers in the United States. *Vaccines*. 2021;9(2).
18. Dzieciolowska S, Hamel D, Gadio S, Dionne M, Gagnon D, Robitaille L, et al. Covid-19 vaccine acceptance, hesitancy, and refusal among Canadian healthcare workers: A multicenter survey. *American journal of infection control*. 2021.
19. Elhadi M, Alsoufi A, Alhadi A, Hmeida A, Alshareea E, Dokali M, et al. Knowledge, attitude, and acceptance of healthcare workers and the public regarding the COVID-19 vaccine: a cross-sectional study. *BMC public health*. 2021;21(1):955.
20. Kabamba Nzaji M, Kabamba Ngombe L, Ngoie Mwamba G, Banza Ndala DB, Mbidi Miema J, Luhata Lungoyo C, et al. Acceptability of Vaccination Against COVID-19 Among Healthcare Workers in the Democratic Republic of the Congo. *Pragmatic and observational research*. 2020;11:103-9.
21. Qattan AMN, Alshareef N, Alsharqi O, Al Rahahleh N, Chirwa GC, Al-Hanawi MK. Acceptability of a COVID-19 Vaccine Among Healthcare Workers in the Kingdom of Saudi Arabia. *Frontiers in medicine*. 2021;8:644300.
22. Gagneux-Brunon A, Detoc M, Bruel S, Tardy B, Rozaire O, Frappe P, et al. Intention to get vaccinations against COVID-19 in French healthcare workers during the first pandemic wave: a cross-sectional survey. *The Journal of hospital infection*. 2021;108:168-73.
23. Wang K, Wong ELY, Ho KF, Cheung AWL, Chan EYY, Yeoh EK, et al. intention of nurses to accept coronavirus disease 2019 vaccination and change of intention to accept seasonal influenza vaccination during the coronavirus disease 2019 pandemic: A cross-sectional survey. *Vaccine*. 2020;38(45):7049-56.
24. Verger P, Scronias D, Dauby N, Adedzi KA, Gobert C, Bergeat M, et al. Attitudes of healthcare workers towards COVID-19 vaccination: a survey in France and French-speaking parts of Belgium and Canada, 2020. *Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin*. 2021;26(3).
25. Yanez ND, Weiss NS, Romand J-A, Treggiari MM. COVID-19 mortality risk for older men and women. *BMC Public Health*. 2020;20(1):1-7.
26. Mehraeen E, Karimi A, Barzegary A, Vahedi F, Afsahi AM, Dadras O, et al. Predictors of mortality in patients with COVID-19—a systematic review. *European journal of integrative medicine*. 2020:101226.
27. Sepandi M, Taghdir M, Alimohamadi Y, Afrashteh S, Hosamirudsari H. Factors Associated with Mortality in COVID-19 Patients: A Systematic Review and Meta-Analysis. *Iranian Journal of Public*

- Health. 2020;49(7):1211.
28. Agyekum MW, Afrifa-Anane GF, Kyei-Arthur F, Addo B. Acceptability of COVID-19 vaccination among health care workers in Ghana. *Advances in Public Health*. 2021;2021.
  29. Shaw J, Stewart T, Anderson KB, Hanley S, Thomas SJ, Salmon DA, et al. Assessment of US health care personnel (HCP) attitudes towards COVID-19 vaccination in a large university health care system. *Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America*. 2021.
  30. Dror AA, Eisenbach N, Taiber S, Morozov NG, Mizrachi M, Zigran A, et al. Vaccine hesitancy: the next challenge in the fight against COVID-19. *European journal of epidemiology*. 2020;35(8):775-9.
  31. Nzaji MK, Ngombe LK, Mwamba GN, Ndala DBB, Miema JM, Lungoyo CL, et al. Acceptability of Vaccination Against COVID-19 Among Healthcare Workers in the Democratic Republic of the Congo. *Pragmatic and observational research*. 2020;11:103.
  32. Gagneux-Brunon A, Detoc M, Bruel S, Tardy B, Rozaire O, Frappe P, et al. Intention to get vaccinations against COVID-19 in French healthcare workers during the first pandemic wave: a cross-sectional survey. *Journal of Hospital Infection*. 2021;108:168-73.
  33. Latkin CA, Dayton L, Yi G, Konstantopoulos A, Boodram B. Trust in a COVID-19 vaccine in the U.S.: A social-ecological perspective. *Soc Sci Med*. 2021;270:113684-.
  34. Quinn SC, Jamison AM, An J, Hancock GR, Freimuth VS. Measuring vaccine hesitancy, confidence, trust and flu vaccine uptake: Results of a national survey of White and African American adults. *Vaccine*. 2019;37(9):1168-73.
  35. Dzieciolowska S, Hamel D, Gadio S, Dionne M, Gagnon D, Robitaille L, et al. Covid-19 vaccine acceptance, hesitancy, and refusal among Canadian healthcare workers: A multicenter survey. *American journal of infection control*. 2021.
  36. Vergara RJD, Sarmiento PJD, Lagman JDN. Building public trust: a response to COVID-19 vaccine hesitancy predicament. *Journal of Public Health*. 2021;43(2):e291-e2.
  37. Reiter PL, Pennell ML, Katz ML. Acceptability of a COVID-19 vaccine among adults in the United States: How many people would get vaccinated? *Vaccine*. 2020;38(42):6500-7.
  38. Tran VD, Pak TV, Gribkova EI, Galkina GA, Loskutova EE, Dorofeeva VV, et al. Determinants of COVID-19 vaccine acceptance in a high infection-rate country: a cross-sectional study in Russia. *Pharmacy practice*. 2021;19(1):2276.
  39. Martin CA, Marshall C, Patel P, Goss C, Jenkins DR, Ellwood C, et al. Association of demographic and occupational factors with SARS-CoV-2 vaccine uptake in a multi-ethnic UK healthcare workforce: a rapid real-world analysis. *MedRxiv*. 2021.
  40. Papagiannis D, Malli F, Raptis DG, Papathanasiou IV, Fradelos EC, Daniil Z, et al. Assessment of knowledge, attitudes, and practices towards new coronavirus (SARS-CoV-2) of health care professionals in Greece before the outbreak period. *International journal of environmental research and public health*. 2020;17(14):4925.

41. Viswanath K, Bekalu M, Dhawan D, Pinnamaneni R, Lang J, McLoud R. Individual and social determinants of COVID-19 vaccine uptake. *BMC Public Health*. 2021;21(1):1-10.
42. Rozek L, Jones P, Menon AR, Hicken A, Apsley S, King E. Understanding Vaccine Hesitancy in the Context of COVID-19: The Role of Trust and Confidence in a Seventeen-Country Survey. *International Journal of Public Health*. 2021;66:48.
43. Corace K, Prematunge C, McCarthy A, Nair RC, Roth V, Hayes T, et al. Predicting influenza vaccination uptake among health care workers: what are the key motivators? *American journal of infection control*. 2013;41(8):679-84.

## Tables

Table 1 Socio-demographic Characteristics of HCWs, Iran (N=3536)

Variables	Frequency (%)	Weighted percentaget
Sex		
Male	1582(44.8)	45.1
Female	1953(55.2)	54.9
Marital status		
Married	2709(76.7)	75.8
Unmarried & widowed	824(23.4)	24.2
Age group, years old		
<30	980(27.7)	27.6
30-40	1336(37.9)	37.7
40-50	977(27.6)	27.4
>50	241(6.8 )	7.2
Education level		
High school diploma	715(20.2)	20
Bachelors	1956(55.3)	55.1
Master degree	306(8.7)	8.8
MD	555(15.7)	15.9
Profession		
Doctor	480(13.6)	13.5
Nurse	838(23.7)	23.4
Dentist	123(3.5)	3.4
Paramedical staff	308(8.7)	8.3
Practical nurse	249(7)	7.1
Administrative staff of Hospital	312(8.8)	8.6
Health care personnel	436(12.3)	12.7
Behvarz++	789(22.4)	23
History of COVID-19		
Yes	1270(36)	35.5
No	2261(64)	64.5

History of hospitalization due to COVID-19		
Yes	130(3.7)	3.7
No	3403(96.3)	96.3
Work experience, year		
>10	2013(57.4)	57.5
≤10	1492(42.6)	42.5
Service location		
Hospital	1811(51.2)	50.8
Primary health care center (Urban)	876(24.8)	24.4
Primary health care center (rural)	847(24)	24.8

† Note: Data in the weighted sample were weighted to the proportions of health care workers at each university obtained from the Ministry of Health of Iran.

††Iranian rural health workers (Behvarz)

**Table 2.** Bivariate Associations Between Socio-demographic Characteristics and Intent to Uptake COVID-19 Among Iranian HCWs (N=3536)

Variables	"If COVID-19 Vaccine is Available, I Will Take It"			
	Intended to Uptake COVID-19 Vaccine (n=2191,62.1 %)	COVID-19 vaccine refusal (n=678, 19.2 %)	COVID-19 vaccine hesitancy (n=660, 18.7 %)	p-value
Sex				
Male	1063(67.4)	242(15.3)	272(17.2)	<.001
Female	1128(57.8)	436(22.3)	387(19.8)	
Marital status				
Married	1683(62.3)	522(19.3)	498(18.4)	.763
Unmarried & widowed	506(61.5)	156(19)	161(19.6)	
Age group, years old				
<30	574(58.6)	193(19.7)	212(21.7)	.084
30-40	845(63.3)	248(18.6)	242(18.1)	
40-50	614(63.1)	195(20)	164(16.9)	
>50	158(65.8)	42(17.5)	40(16.7)	
Education level				
High school diploma	453(63.6)	132(18.5)	127(17.8)	<.001
Bachelors	1165(59.7)	400(20.5)	387(19.8)	
Master degree	89(55.9)	78(25.5)	57(18.6)	
MD†	399(71.9)	67(12.1)	89(16)	
Profession				
Doctor	343(71.5)	64(13.3)	73(15.2)	<.001
Nurse	490(58.5)	188(22.5)	159(19)	
Dentist	87(70.7)	16(13)	20(16.3)	
Paramedical staff	191(62)	61(19.8)	56(18.2)	
Practical nurse	164(65.9)	47(18.9)	38(15.3)	
Administrative staff of Hospital	163(52.6)	75(24.2)	72(23.2)	

Health care personnel	257(58.9)	88(13)	91(20.9)	
Behvarz††	495(63.1)	139(17.7)	151(19.2)	
Previous history of COVID-19				
Yes	790(62.4)	256(20.2)	221(17.4)	.286
No	1399(62)	422(18.7)	436(19.3)	
History of hospitalization due to COVID-19				
Yes	97(74.6)	20(15.4)	13(10)	.007
No	2093(61.6)	658(19.4)	645(19)	
Work experience, year				
≤10	1233(61.4)	407(20.3)	368(18.3)	.238
>10	939(63)	268(18)	283(19)	
Place delivery of Service				
Hospital	1145(63.3)	346(19.1)	317(17.5)	
Primary health care center (Urban)	515(58.8)	173(19.7)	188(21.5)	.211
Primary health care center (rural)	529(62.8)	159(18.9)	155(18.4)	

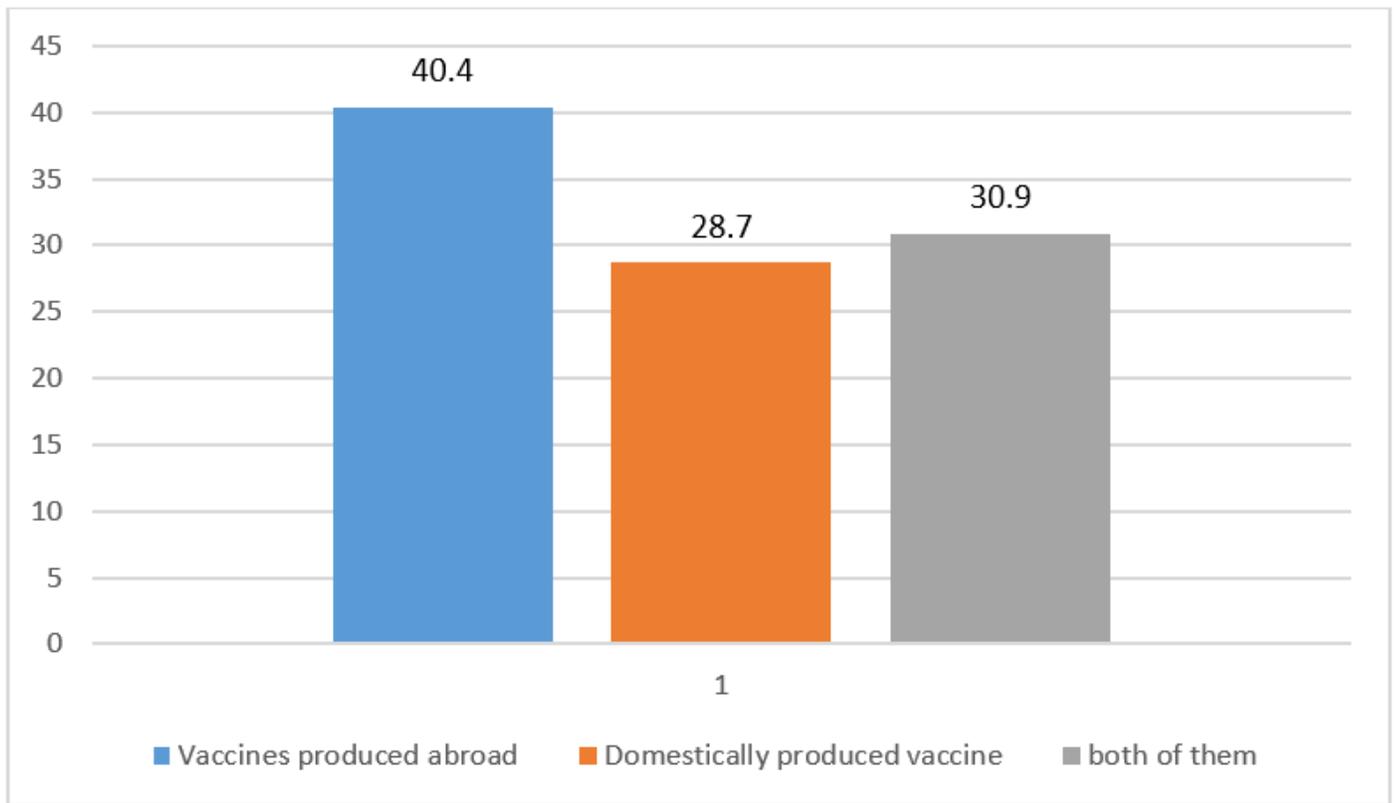
†MD: Doctor of Medicine,

††Iranian rural health workers (Behvarz)

Table 3 Multivariate Logistic Regression Analysis for Socio-demographic Prediction of Intent to Uptake COVID-19 among Iranian HCWs (N=3536)

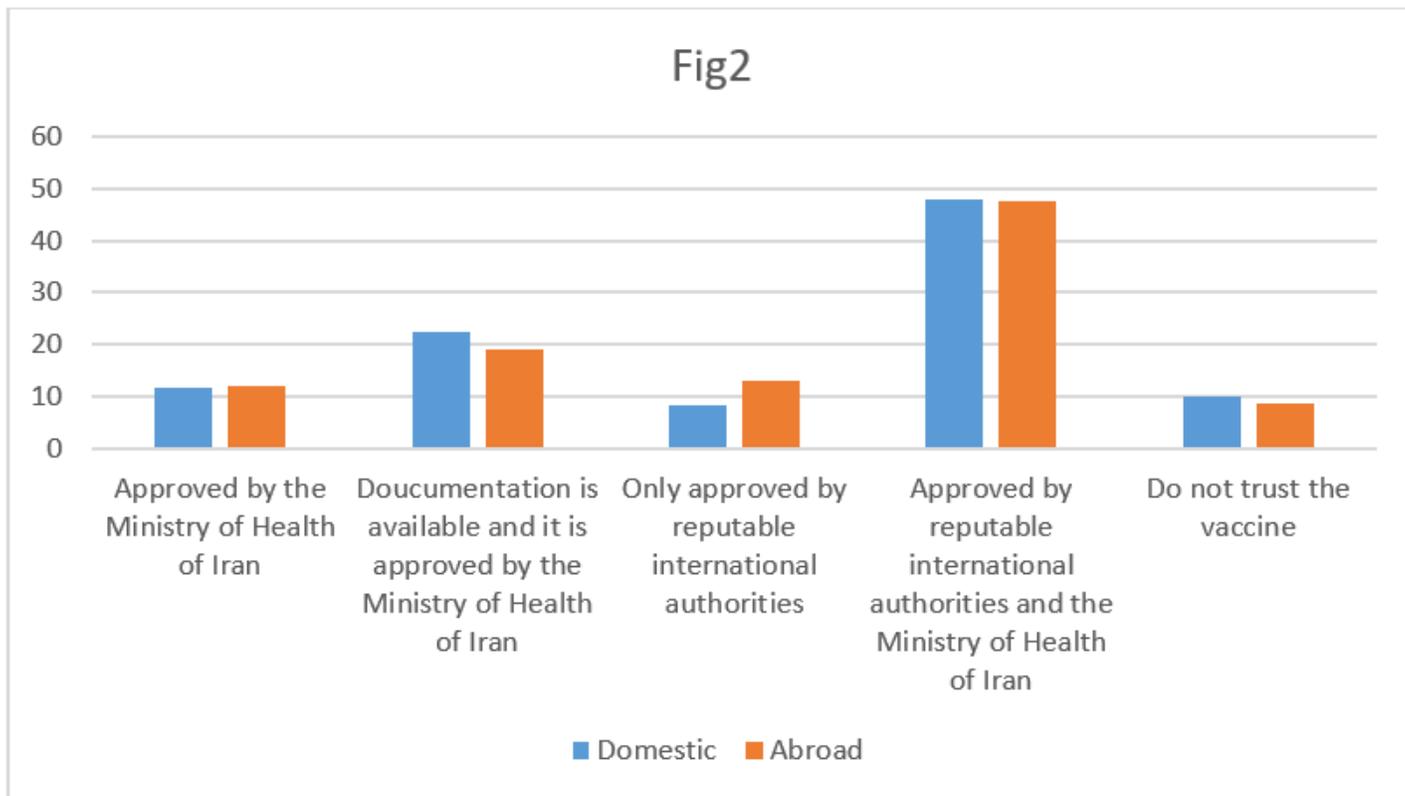
Variables	"Intended to Uptake COVID-19 Vaccine"			
	OR [95% CI]	p-value	aOR [95% CI]	p-value
Sex				
Female	0.57 (0.55-0.59)	<0.001	0.59 (0.57-0.61)	<0.001
Male	Ref		Ref	Ref
Marital status				
Married	1.09 (1.05-1.13)	<0.001	0.99 (0.95-1.03)	0.56
Unmarried & widowed	Ref	Ref	Ref	Ref
Age group, years old				
<30	Ref	Ref	Ref	Ref
30-40	1.29 (1.24-1.34)	<0.001	1.46 (1.39-1.53)	<0.001
40-50	1.34 (1.29-1.4)	<0.001	1.56 (1.47-1.66)	<0.001
>50	1.49 (1.39-1.59)	<0.001	1.32 (1.21-1.43)	<0.001
Education level				
High school diploma	Ref	Ref	Ref	Ref
Bachelors	0.86 (0.83-0.9)	<0.001	0.87 (0.84-0.91)	<0.001
Master degree	0.7 (0.66-0.74)	<0.001	0.68 (0.64-0.72)	<0.001
MD	1.85 (1.75-1.96)	<0.001	1.77 (1.67-1.88)	<0.001
Work experience, year				
≤10	0.97 (0.94-0.99)	0.043	1.23 (1.17-1.29)	<0.001
>10	Ref	Ref	Ref	Ref
Previous history of COVID-19				
Yes	0.92 (0.87-0.95)	<0.001	0.85 (0.83-0.88)	<0.001
No	Ref	Ref	Ref	Ref
History of hospitalization due to COVID-19				
Yes	1.96 (1.78-2.15)	<0.001	2.18 (1.97-2.39)	<0.001
No	Ref	Ref	Ref	Ref

# Figures



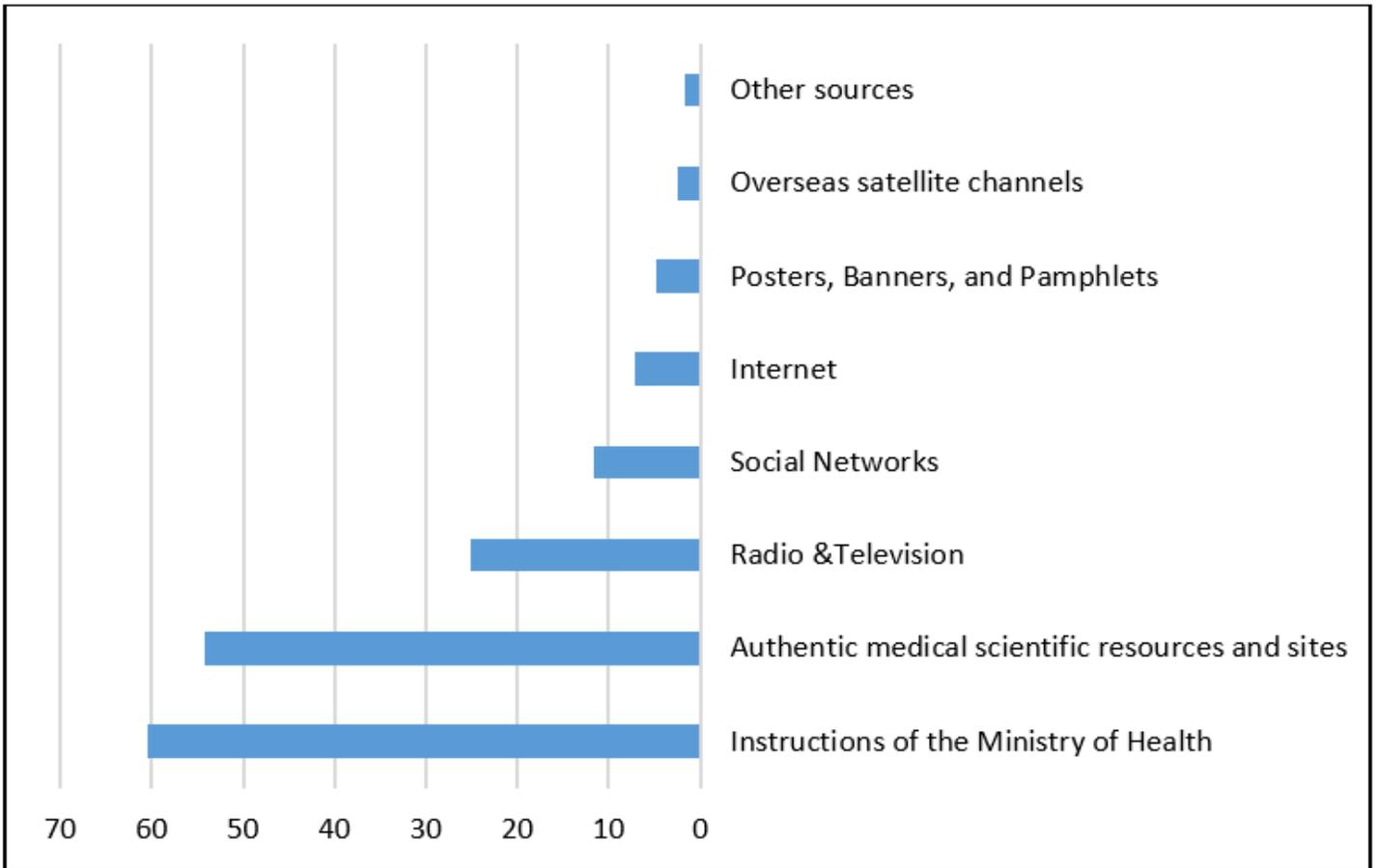
**Figure 1**

Type of COVID-19 vaccine preference among Iranian HCWs, Iran (N=2851)



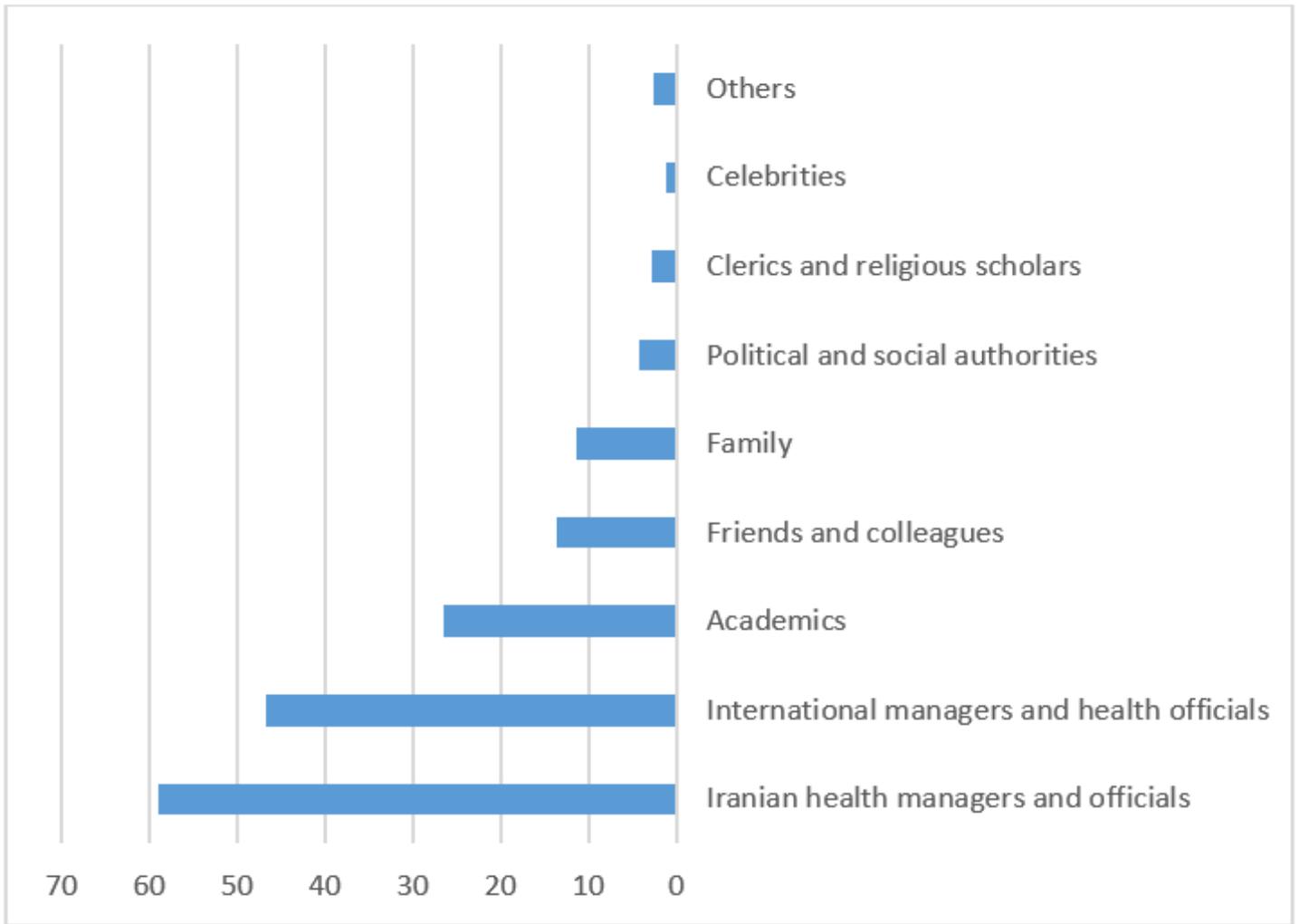
**Figure 2**

Condition of trust to Uptake the COVID-19 vaccine based on the place of production Among Iranian HCWs (N=3536)



**Figure 3**

The distribution of source of information on COVID-19 vaccine Among Iranian HCWs (N=3536)



**Figure 4**

The distribution of people who as a references influence on participant's decision making to receive the COVID-19 vaccine (N=3536)