Int Clin Neurosci J. 2022;9:e19 Review Article

doi:10.34172/icnj.2022.19

Determinants of Public Acceptance of the COVID-19 Vaccine: A Systematic Review

Farzin Bagheri[1], **Hojjatollah Farahani**[1*], **Parviz Azadfallah**[1]

[1]Faculty of Humanities, Tarbiat Modares University, Tehran, Iran

Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic can be considered as a global unity that has forced all countries to work together to treat it. Consistent with ongoing efforts to reduce the prevalence of COVID-19, building a safe and effective vaccine against COVID-19, which is recognized as a major achievement, is a priority for many developed countries around the world. In this regard, we aimed to investigate the determinants of public acceptance of COVID-19 vaccine.

Methods: In this review, published articles on the determinants of public acceptance of COVID-19 vaccine during 2020-2021 were reviewed. To obtain related scientific documents, the following keywords were searched in the title and abstract of published articles: Coronavirus 2019, COVID-19, and Vaccine acceptance, Resistance, Doubt, Vaccination, Determinants and Pandemics. Scientific databases such as Google Scholar, PubMed, Science Direct, Scopus and ProQuest were searched and all relevant English articles were listed. The PRISMA checklist was used to review and control the quality of articles.

Results: Initially, 372 English articles were retrieved and finally 19 articles were finally selected for comprehensive review and data extraction. The results showed that most people were more receptive to vaccines that produce 90%-95% efficacy and safety levels. Also, being a woman, low age, low-income level, being single, low education and lack of trust in the government were among the factors that reduced the acceptance of people for the COVID-19 vaccine. The most common reasons for people not participating in the vaccination process were fear of vaccine side effects, lack of confidence in vaccine efficacy, and safety levels.

Conclusion: Considering that a significant number of people in the world have a high acceptance of vaccines with 90%-95% safety levels. Measures need to be taken to speed up the vaccination process. Also, since most people are only afraid and anxious about the side effects caused by vaccines, it is necessary to increase people's awareness and knowledge about the positive and negative consequences of vaccination.

Keywords: COVID-19 vaccine; Acceptance; Determinants; Coronavirus 2019; Systematic review

***Correspondence to**
Hojjatollah Farahani, Assistant Professor of Psychology, Faculty of Humanities, Tarbiat Modares University, Tehran, Iran
Tel: 9121727491
Email: h.farahani@modares.ac.ir

Published online July 12, 2022

Citation: Bagheri F, Farahani H, Azadfallah P. Determinants of public acceptance of the covid-19 vaccine: a systematic review. Clin Neurosci J. 2022;9:e19. doi:10.34172/icnj.2022.19.

Introduction

The coronavirus disease 2019 (COVID-19) originated in Wuhan, Hubei province, China, and soon spread throughout China and many other countries. On March 11, 2020, it was introduced as a pandemic globally.[1] COVID-19 has a wide variety of symptoms such as high fever, dry cough, body aches, shortness of breath, etc. Rumors and misinformation about the origin of the disease, failure of various therapies and high transmission power has increased concerns about the physical and mental health of afflicted individuals.[2] The COVID-19 pandemic has caused fear, insecurity, and general anxiety in many parts of the world.[3]

The lack of an effective vaccine or an effective treatment option has imposed a difficult challenge on all countries of the world. In this regard, several measures were taken, including house quarantine, social distancing, masking, closure of schools, universities and high-risk jobs by governments to control and prevent the outbreak of COVID-19; But until an effective vaccine against COVID-19 is developed; The global COVID-19 pandemic cannot be expected to decline significantly.[4] Despite the fact that 18 months have passed since the global outbreak of COVID-19, we are still witnessing the mutation of this virus, and many efforts have been made by reputable companies in the world to produce a vaccine for COVID-19.[5] The COVID-19 pandemic can be considered as a global unity that has forced all countries to work together to treat COVID-19. The World Health Organization (WHO) is currently organizing countries as a global advocate for the early prevention, treatment, and development of drugs that are effective in treating this deadly virus.[6] In parallel with ongoing efforts to reduce the prevalence of COVID-19; The development of a safe and effective vaccine against COVID-19, which is recognized as an important achievement, is a priority for

many developed countries in the world.[7]

Although many people believe that getting vaccinated can be a global solution to end COVID-19, sometimes even the best vaccines may not be good for the body and do not provide the right level of immunity. In contrast, some vaccines, such as the measles vaccine, are highly effective and reduce infection by about 98%. Regarding the COVID-19 vaccine, the Food and Drug Administration (FDA) has stated that it will approve a vaccine that is at least 50% effective compared to the placebo group.[8] Despite the limited opportunity to produce the COVID-19 vaccine, initial reports indicate that the Pfizer-BioNTech and Moderna vaccines provide a 95% level of safety against COVID-19.[5,6] Also, the results of the third phase of Sputnik V vaccine in Russia show that it is up to 91.6% effective on COVID-19 and does not cause any serious side effects.[9] It should be noted, however, that the efficacy and safety of the vaccine produced outside the laboratory is often less than that initially. Also, this level of safety and performance is based on a relatively short follow-up period and it is not clear how it will operate during the global implementation time.[10]

The success of the global vaccination process depends in part on people's perceptions of the benefits and risks of the vaccine, as well as how much trust they have in their government and country. Researchers believe that refusing or delaying vaccination is attributed to a lack of knowledge and awareness of the safety of the vaccination process.[11] This situation has been defined by the WHO in the field of immunization as vaccine resistance, which in 2019 has been identified as the most important public health threat in the world.[12] Doubt in getting vaccinated is not a new phenomenon. It has been observed a lot throughout medical history. But the rise of misinformation about the vaccination process through the media and social networks has caused confusion and resistance among many people around the world.[13] Especially COVID-19, which is more sensitive to it. The role of social media in raising doubts about vaccination is very significant and alarming, to the extent that studies conducted from the early 2000s to 2019 show that a significant portion of popular social media messages (such as Facebook, Instagram, Telegram, and Twitter) have anti-vaccination content.[14] In this regard, Wilson and Wiysonge[15] in a study examined the role of social networks in skepticism about vaccination. The findings showed that the misinformation that is spread on social networks plays a significant role in increasing people's resistance and skepticism towards universal vaccination. One study examined the representation of vaccine side effects by the media and the role it plays in the vaccination process. Of the 429 participants, 68.2% who had heard about vaccine side effects were reluctant to get vaccinated, and 12.4% gave up altogether. Receiving accurate information from medical staff, friends and colleagues was negatively associated with skepticism and resistance to the vaccine.[16]

However, it should be noted that all vaccines challenge the immune system and increase inflammatory markers within a few hours after vaccination, as well as in people with severe allergies. Vaccination causes unusual reactions, so the individual's medical record should be reviewed before starting universal vaccination.[17] This can increase people's confidence in the vaccine and reduce their doubts about getting the vaccine safely. Mesch and Schwirian[18] examined vaccine skepticism during the Ebola pandemic. The findings showed that people were afraid to get vaccinated against the Ebola virus, and only 48% of respondents were willing to be vaccinated. Also, the more people trusted the government, the more they participated in the vaccination process. In another study, the role of social and political factors in people's skepticism about getting the swine flu (H1N1) vaccine was examined. The results showed that 36.1% of the respondents were willing to be vaccinated. 43.4% of the people who had the most trust in the government, were more interested in getting vaccinated. Also, 15.8% of those who did not trust the government did not want to be vaccinated. Among the medical staff, 38.4% trusted the vaccination process in the country, but 23.5% did not want to be vaccinated.[19]

But sometimes after the vaccination process, we may see various side effects in the body. In fact, all vaccines challenge a person's immune system and increase inflammatory markers within hours of vaccination. A large study showed that allergic reactions to vaccines generally occur at a rate of 1.31% per million doses of vaccine, with no fatalities.[20] According to preliminary studies, the Pfizer-BioNTech vaccine can also cause mild to moderate side effects after the first and second doses, including muscle pain, redness or swelling at the injection site, fatigue, headache, joint pain, and fever. Of course, these symptoms can indicate the effort of the immune system to fight the virus.[21] In this regard, reports from the Centers for Disease Control and Prevention show that anaphylactic reactions to Pfizer-BioNTech vaccines (11 cases per million doses) and Moderna (2.5 cases per million doses) are more common compared to other vaccines.[22]

Overall, studies indicate the importance and important role of vaccines in preventing and controlling the spread of pandemics in the world.[23,24] For this reason, in addition to all the resistance that people have to the global vaccination process, it is necessary for the countries of the world to take measures to build trust and acceptance of the COVID-19 vaccine among their population. In this regard, we aimed to review and investigate the determinants of public acceptance of COVID-19 vaccine.

Methods

The present study is a review study in which the determinants of people's acceptance of the COVID-19 vaccine were examined and for this purpose, articles indexed in scientific databases such as internationally recognized scientific databases such as Google Scholar, PubMed, Science Direct, Scopus and ProQuest were used. In this study, using the specified keywords, the researchers searched and extracted valid English articles published in 2020 and 2021 from reliable electronic sources, and by examining the complete texts of these articles, categorized the obtained data. The title of the article was searched for the word Coronavirus 2019 (COVID-19); The terms vaccine acceptance, resistance, doubt, vaccination, determinants and pandemics were also searched and evaluated in the titles and abstracts of articles. After collecting the articles, irrelevant and duplicate items were removed by the researchers. In the next step, the complete texts of the remaining articles were examined and after removing the irrelevant items, the results related to the selected articles in the final stage were classified and examined. In this study, the PRISMA Systematic Review Reporting Guide was used.[25] Research articles were purposefully selected based on the inclusion criteria: relevance to the purpose of the research, having a structured research framework, full text of the article and publication in a reputable journal for review. The quality of articles were checked as follows using the article review checklist: matching the structure of the article with the type of research, the purpose of the research, the research community, the sample selection process, data collection tools, data analysis using statistical tests related to the objectives, specified inclusion and exclusion criteria, observance of ethics in research, presentation of findings in accordance with the objectives of the research and discussion of the findings. The quality of articles was evaluated using the criteria provided by Gifford et al.[26] Based on the criteria provided for quantitative (6 criteria), qualitative (11 criteria), quasi-experimental (8 criteria) and experimental (7 criteria) studies, the articles were evaluated on a two-point scale (zero and one). The cut-off point was 4 or less for quantitative articles, 6 points or less for experimental and quasi-experimental studies, and 8 points or less for qualitative studies. Finally, after review and evaluation (Figure 1), 19 selected articles remained in the review.

Results

In this study, 19 eligible research articles in English were reviewed. Table 1 shows the findings of the reviewed articles in the field of examining the determinants of public acceptance of COVID-19 vaccine.

Out of 372 articles related to the determining factors in public acceptance of COVID-19 vaccine, at the end, 19 articles were reviewed and selected and reviewed with a population of 47275 based on inclusion and exclusion criteria. Also, in this systematic review 22 countries (Saudi Arabia, Turkey, Kuwait, Indonesia, Bangladesh, USA, Congo, Italy, Japan, China, Russia, France, Germany, Ecuador, Pakistan, Malaysia, Thailand, Benin, Uganda, Malawi, Mali, and Brazil) were present, which shows the importance of examining the determining factors in public acceptance of the COVID-19 vaccine worldwide. Studies show that most people were more receptive to vaccines that produce 90-95% efficacy and safety levels. Also, being a woman, low age, low-income level, being single, low education and lack of trust in the government were among the factors that reduced the acceptance of people for the COVID-19 vaccine. The most common reasons for people not participating in the vaccination process were fear of vaccine side effects, lack of confidence in vaccine efficacy, and safety levels.

Discussion

The present review study was conducted to investigate the determinants of acceptance of COVID-19 vaccine in the world. The results of the present study showed that people around the world resisted vaccines that did not produce high levels of safety and efficacy and did not show confidence in their government.[28-31] In contrast, most people were highly receptive to vaccines that produced 90-95% efficacy and safety levels.[7] In this regard, Bono and colleagues[36] examined the factors affecting public acceptance of the COVID-19 vaccine. Studies have shown that the acceptance rate for vaccines that provide 90%-95% safety levels was 76.4% and 88.8%, respectively. Among the countries surveyed, only Brazil had the lowest acceptance of COVID-19 vaccine. Age, income and high education were among the factors that increased people's acceptance of the COVID-19 vaccine. Fear of death (42.2%) and uncertainty about the effectiveness of the vaccine (15.1%) caused hesitation and resistance to the COVID-19 vaccine. In another study, Jaramillo-Monge and colleagues[32] examined people's acceptance of the COVID-19 vaccine. Findings showed that 91% of people accepted the vaccine with a 95% safety level. 68.5% accepted a vaccine with a 90% immunity level and 40.5% accepted a vaccine with a 70% immunity level. Also, 55.5% were afraid of the side effects of the vaccine and 19.4% did not believe in the effectiveness of the vaccine.

On the other hand, studies have shown that men, people in their 30s and 50s, people with good incomes, married people, people with a college education and people who trusted their government are more likely to get the COVID-19 vaccine accepted and participated in the nationwide vaccination process.[4] The most common reasons for people not participating in the vaccination process were fear of vaccine side effects, lack of confidence in vaccine efficacy and safety levels.[21] In this regard, Shekhar and colleagues[17] examined the acceptance of hospital staff to the COVID-19 vaccine. The results

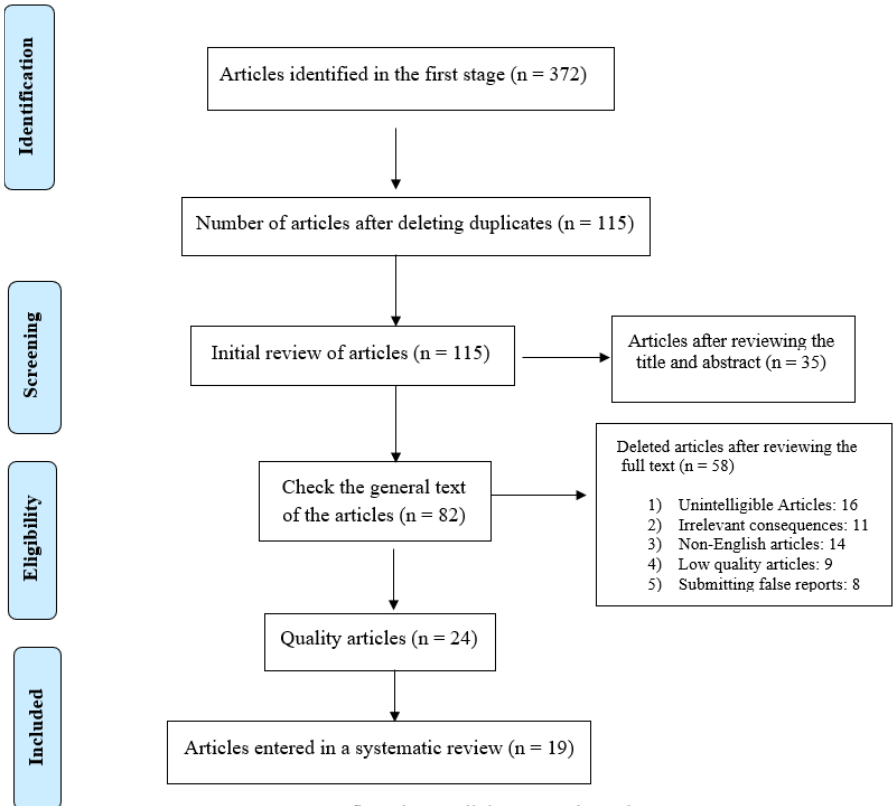

Figure 1. PRISMA Checklist for Selecting Studies.

Table 1. Characteristics of the Selected Studies

Authors	Purpose	Sample	Country	Results
Al-Mohaithef & Padhi[4]	Determinants of COVID-19 vaccine acceptance	992	Saudi Arabia	65.8% of the participants were female. 64.72% were interested in getting vaccinated. Also, being married (69.3%), university education (68.8%), public sector employment (68.9%) had a significant and positive relationship with acceptance of COVID-19 vaccine.
Alqudeima et al[6]	Acceptance of a COVID-19 vaccine and its related determinants	2368	Kuwait	53.1% of participants had a good acceptance of the vaccine. Men were more likely than women to be vaccinated than women. People who have had the flu vaccine in the past were more likely to get the COVID-19 vaccine.
Harapan et al [7]	Acceptance of a COVID-19 vaccine	1359	Indonesia	93.3% of the subjects accepted the vaccine with 95% efficacy. In contrast, 67% of people accepted the COVID-19 vaccine with a 50% safety level. Hospital staff showed a strong desire to receive the vaccine. Elderly people were also skeptical about being vaccinated.
Mahmud et al[10]	Acceptance of COVID-19 vaccine and its determinants	647	Bangladesh	61.16% of the participants showed a high acceptance of COVID-19 vaccine. Of these, only 35.14% were willing to be vaccinated for a short period of time. While 64.86% delayed the vaccination process. Also, age, gender, level of education, previous experience of vaccination, COVID-19 infection and good knowledge about the vaccination process had a significant effect on people's acceptance of the vaccine.
Malik et al[11]	Determinants of COVID-19 vaccine acceptance	672	USA	67% of people were well received with the vaccine. Men (72%), people 55 years and older (78%), people with university education (75%) had a higher acceptance than the COVID-19 vaccine compared to other people.
Reno et al[13]	COVID-19 vaccines Acceptance	1011	Italy	31.1% of the participants were skeptical about getting the COVID-19 vaccine. Age between 35 and 54 years, female gender, low level of education, low income and concerns about the effectiveness and safety of the vaccine were among the factors that led to increased skepticism and resistance to vaccination.
Shekhar et al[17]	COVID-19 vaccine acceptance among health care workers	3479	USA	36% wanted to get vaccinated very quickly. In contrast, 56% were skeptical despite access to the vaccine and waited for more results. Only 8% of people did not accept the vaccine. There was a significant positive correlation between age, education and income with the acceptance rate of COVID-19 vaccine. Creating the right level of immunity, effectiveness against coronary heart disease and possible side effects were the most common concerns after vaccination.

Table 1. Continued.

Authors	Purpose	Sample	Country	Results
Ditekemena et al[23]	COVID-19 vaccine acceptance	4131	Congo	The mean age of the subjects was 32 years, 68.4% of whom were women. 24.1% believed that COVID-19 did not exist and denied vaccination. 55.9% of the subjects accepted the vaccine. The high-income middle class, university education, and access to highly effective vaccines increased people's acceptance of the vaccination process.
Machida et al[24]	Acceptance of a COVID-19 vaccine	2956	Japan	62.1% of people had a good acceptance of the COVID-19 vaccine. Women, people between the ages of 20 and 49, and people with low levels of education and income were also resistant to the COVID-19 vaccine. On the other hand, psychological factors such as the level of anxiety and fear were influential in the vaccination process.
Wang et al[27]	Accept and hesitancy COVID-19 vaccine	2047	China	The willingness and acceptance of people to get COVID-19 vaccine in the third wave (34.8%) had decreased compared to the fourth wave (44.2%). Due to the widespread mutation of coronavirus 2019 and the increase in the number of cases, a resistance and suspicion was created among the people.
Tran et al [28]	Determinants of COVID-19 vaccine acceptance	876	Russia	41.7% of the participants were shown to be accepted for the COVID-19 vaccine. Also, 63.2% high acceptance is suitable for vaccines with efficient and safe level. Vaccine acceptance rates are observed among men and people who are more confident in the country's health care system.
Tavolacci et al[29]	COVID-19 vaccine acceptance, hesitancy, and resistancy	3089	France	The average age was 20 years. 58% of people accepted the COVID-19 vaccine. 17% of them reported not receiving the vaccine and 25% were skeptical. Being a woman, age, low level of education and lack of trust in the vaccine were among the factors that influenced the acceptance of the vaccine.
Nohl et al[30]	Acceptance of COVID-19 vaccination among front-line health care workers	1296	Germany	57% were receptive to the COVID-19 vaccine, but 27.6%t were skeptical about the vaccination process. Also, older men and physicians with higher levels of education were more likely to get the COVID-19 vaccine.
Holzmann-Littig et al[31]	COVID-19 vaccination acceptance and hesitancy	4500	Germany	91.7% of participants accepted the COVID-19 vaccine. People who doubted the safety and efficacy of the COVID-19 vaccine were less likely to participate in the vaccination process.
Jaramillo-Monge et al[32]	COVID-19 vaccine acceptance	1219	Ecuador	The average age was 32 years, 57% of whom were women. 91% of people accepted the vaccine with a 95% level of immunity. 68.5% accepted a vaccine with a 90% immunity level and 40.5% accepted a vaccine with a 70% immunity level. Also, 55.5% were afraid of the side effects of the vaccine and 19.4% did not believe in the effectiveness of the vaccine.
Kaadan et al[33]	Determinants of COVID-19 vaccine acceptance in the Arab world	870	22 Arab league countries	69.9% of the participants lived in their own country. 59.3% were men. The acceptance rate of COVID-19 vaccine was 62.4%. Vaccination rates were higher in men and people living abroad.
Yigit et al[34]	COVID-19 vaccine acceptance of healthcare providers in a tertiary Pediatric hospital	343	Turkey	The results showed that more than 10 years of work experience and being a man had a positive effect on the acceptance rate of COVID-19 vaccine. Also, people with lower ages and incomes were less likely to be vaccinated.
Malik et al[35]	Acceptance of COVID-19 vaccine	5237	Pakistan	70.2% accepted COVID-19 vaccine. 24.5% were also resistant to vaccination. Also, the vaccine acceptance rate was 76% in young people and 63.3% in women.
Bono et al[36]	Factors affecting COVID-19 vaccine acceptance	10183	Malaysia, Thailand, Bangladesh, Congo, Benin, Uganda, Malawi, Mali, Brazil	Studies have shown that the acceptance rate for vaccines that provide 90 and 95% safety levels was 76.4% and 88.8%, respectively. Among the countries surveyed, only Brazil had the lowest acceptance of the COVID-19 vaccine. Age, income and high education were among the factors that increased people's acceptance of the COVID-19 vaccine. Fear of death (42.2%) and uncertainty about the effectiveness of the vaccine (15.1%) caused hesitation and resistance to the COVID-19 vaccine.

showed that 36% of people wanted to get the COVID-19 vaccine very quickly. In contrast, 56% were skeptical despite access to the vaccine and waited for more results. Only 8% of people did not accept the vaccine. There was a significant positive correlation between age, education and income with the acceptance rate of COVID-19 vaccine. Creating the right level of immunity, efficacy against coronary heart disease, and possible side effects were the most common concerns after vaccination. In another study, Reno et al[13] examined public acceptance of the COVID-19 vaccine. The results showed that 31.1% of the participants were skeptical about getting the COVID-19 vaccine. Age between 35 and 54 years, female sex, low level of education, low income and concerns about the effectiveness and safety of the vaccine were among the factors that led to increased skepticism and resistance to vaccination.

The process of vaccinating and immunizing people around the world against disease is recognized as one of the greatest achievements of public health. Immunization programs have significantly reduced mortality and the incidence of infectious diseases, including the eradication of the polio virus worldwide.[35] To be successful in reducing the incidence and treatment of

vaccine-preventable diseases, immunization programs must be integrated into the global vaccination process. Not only does this provide direct protection for vaccinated individuals, but the over 70% rate of the vaccination program provides indirect protection for other individuals.[29] However, public vaccination cannot be guaranteed even after public access to safe vaccines since people are hesitant to get vaccinated.[34] Because past research has shown that adaptation to vaccines is variable and contradictory, achieving public acceptance requires extensive training in the safety and efficacy of different vaccines.[30] It should also be noted that vaccination does not mean the end of the corona outbreak in the world and may have many side effects and consequences. In fact, the efficacy and safety that the vaccine provides outside of the laboratory environment is often less than its initial effect. Also, this level of safety and performance is based on a relatively short follow-up period, and it is not clear how it will perform during the global implementation time. Especially the elderly and patients with chronic diseases who are at a lower physical level and may not see adequate immunity in the body after the injection of COVID-19 vaccine and need special care.[4] Also, since safe and effective vaccines are limited and a significant population of people are over the age of 60, it is necessary to pay attention to points in prioritizing people. Elderly people with a chronic illness, living alone, having a high-risk activity, mental disorders, and less physical activity are among the groups that should be given priority for the COVID-19 vaccine.[33]

One of the limitations of the present review study is the unavailability of the full text of some articles, which led to the non-inclusion of these articles in the review process. Also, due to the filtering of some scientific databases, we could not access them. Moreover, some studies were descriptive and should be cautious in generalizing their results. In this regard, it is suggested that descriptive studies be conducted to investigate the determinants of acceptance of COVID-19 vaccine in Iran to witness the maximum presence of people in the global vaccination process.

Conclusion

Studies have shown that people around the world are more receptive to safe vaccines and are only concerned about the side effects of the vaccine. On the other hand, 18 months after the global outbreak of COVID-19, we are still witnessing the mutation of this deadly virus, and no definite date can be set for the post-corona period. To this end, it is necessary for people to trust their governments and participate in the global vaccination process, based on the scientific results obtained on effective vaccines. Each vaccine has its own consequences and side effects and we should consult our doctor before getting the vaccine. Especially the elderly and people with specific and underlying diseases should be more careful. But we should not be afraid of the vaccine, and by studying and researching, we should choose the best vaccine that suits our immune system. In the country, on February 9, 2021, the national vaccination with Sputnik vaccine was started. It is hoped that this will be the beginning of the eradication of COVID-19 domestically and worldwide. On the other hand, from the earliest days, Iranian scientists and physicians are striving to produce an efficient and safe vaccine against COVID-19. Fortunately, after a year, we are seeing good results from domestic vaccines, which shows the potential of Iranian youth. For this purpose, it is necessary to participate in the global vaccination process with confidence in the knowledge of Iranian physicians.

Authors' Contribution

All authors contributed to the conception, design of the study and data acquisition.

Conflict of Interest Disclosures

The authors declare that they have no conflict of interests.

Ethical Statement

Not applicable.

Funding/Support

This study did not receive any grant or funding from any private or academic research center.

References

1. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. N Engl J Med. 2020;382(16):1564-7. doi: 10.1056/NEJMc2004973.
2. Alhazzani W, Møller MH, Arabi YM, Loeb M, Gong MN, Fan E, et al. Surviving Sepsis Campaign: guidelines on the management of critically ill adults with coronavirus disease 2019 (COVID-19). Intensive Care Med. 2020;46(5):854-87. doi: 10.1007/s00134-020-06022-5.
3. Peeri NC, Shrestha N, Rahman MS, Zaki R, Tan Z, Bibi S, et al. The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: what lessons have we learned? Int J Epidemiol. 2020;49(3):717-26. doi: 10.1093/ije/dyaa033.
4. Al-Mohaithef M, Padhi BK. Determinants of COVID-19 vaccine acceptance in Saudi Arabia: a web-based national survey. J Multidiscip Healthc. 2020;13:1657-63. doi: 10.2147/jmdh.s276771.
5. Meo SA, Bukhari IA, Akram J, Meo AS, Klonoff DC. COVID-19 vaccines: comparison of biological, pharmacological characteristics and adverse effects of Pfizer/BioNTech and Moderna Vaccines. Eur Rev Med Pharmacol Sci. 2021;25(3):1663-9. doi: 10.26355/eurrev_202102_24877.
6. Alqudeimat Y, Alenezi D, AlHajri B, Alfouzan H, Almokhaizeem Z, Altamimi S, et al. Acceptance of a COVID-19 vaccine and its related determinants among the general adult population in Kuwait. Med Princ Pract. 2021;30(3):262-71. doi: 10.1159/000514636.
7. Harapan H, Wagner AL, Yufika A, Winardi W, Anwar S, Gan AK, et al. Acceptance of a COVID-19 vaccine in Southeast Asia: a cross-sectional study in Indonesia. Front Public

Health. 2020;8:381. doi: 10.3389/fpubh.2020.00381.
8. Kesselheim AS, Darrow JJ, Kulldorff M, Brown BL, Mitra-Majumdar M, Lee CC, et al. An overview of vaccine development, approval, and regulation, with implications for COVID-19: analysis reviews the Food and Drug Administration's critical vaccine approval role with implications for COVID-19 vaccines. Health Aff (Millwood). 2021;40(1):25-32. doi: 10.1377/hlthaff.2020.01620.
9. Jones I, Roy P. Sputnik V COVID-19 vaccine candidate appears safe and effective. Lancet. 2021;397(10275):642-3. doi: 10.1016/s0140-6736(21)00191-4.
10. Mahmud S, Mohsin M, Khan IA, Mian AU, Zaman MA. Acceptance of COVID-19 vaccine and its determinants in Bangladesh. arXiv [Preprint]. March 28, 2021. Available from: https://arxiv.org/abs/2103.15206.
11. Malik AA, McFadden SM, Elharake J, Omer SB. Determinants of COVID-19 vaccine acceptance in the US. EClinicalMedicine. 2020;26:100495. doi: 10.1016/j.eclinm.2020.100495.
12. Aranda S. Ten Threats to Global Health in 2019. World Health Organization (WHO); 2019. p. 1-18.
13. Reno C, Maietti E, Fantini MP, Savoia E, Manzoli L, Montalti M, et al. Enhancing COVID-19 vaccines acceptance: results from a survey on vaccine hesitancy in Northern Italy. Vaccines (Basel). 2021;9(4):378. doi: 10.3390/vaccines9040378.
14. Hoffman BL, Felter EM, Chu KH, Shensa A, Williams D, Himmel R, et al. The emerging landscape of anti-vaccination sentiment on Facebook. J Adolesc Health. 2019;64(2):S136. doi: 10.1016/j.jadohealth.2018.10.283.
15. Wilson SL, Wiysonge C. Social media and vaccine hesitancy. BMJ Glob Health. 2020;5(10):e004206. doi: 10.1136/bmjgh-2020-004206.
16. Tran BX, Boggiano VL, Nguyen LH, Latkin CA, Nguyen HLT, Tran TT, et al. Media representation of vaccine side effects and its impact on utilization of vaccination services in Vietnam. Patient Prefer Adherence. 2018;12:1717-28. doi: 10.2147/ppa.s171362.
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 (Basel). 2021;9(2):119. doi: 10.3390/vaccines9020119.
18. Mesch GS, Schwirian KP. Vaccination hesitancy: fear, trust, and exposure expectancy of an Ebola outbreak. Heliyon. 2019;5(7):e02016. doi: 10.1016/j.heliyon.2019.e02016.
19. Mesch GS, Schwirian KP. Social and political determinants of vaccine hesitancy: lessons learned from the H1N1 pandemic of 2009-2010. Am J Infect Control. 2015;43(11):1161-5. doi: 10.1016/j.ajic.2015.06.031.
20. McNeil MM, Weintraub ES, Duffy J, Sukumaran L, Jacobsen SJ, Klein NP, et al. Risk of anaphylaxis after vaccination in children and adults. J Allergy Clin Immunol. 2016;137(3):868-78. doi: 10.1016/j.jaci.2015.07.048.
21. El-Shitany NA, Harakeh S, Badr-Eldin SM, Bagher AM, Eid B, Almukadi H, et al. Minor to moderate side effects of Pfizer-BioNTech COVID-19 vaccine among Saudi residents: a retrospective cross-sectional study. Int J Gen Med. 2021;14:1389-401. doi: 10.2147/ijgm.s310497.
22. Shimabukuro TT, Cole M, Su JR. Reports of anaphylaxis after receipt of mRNA COVID-19 vaccines in the US-December 14, 2020-January 18, 2021. JAMA. 2021;325(11):1101-2. doi: 10.1001/jama.2021.1967.
23. Ditekemena JD, Nkamba DM, Mutwadi A, Mavoko HM, Siewe Fodjo JN, Luhata C, et al. COVID-19 vaccine acceptance in the Democratic Republic of Congo: a cross-sectional survey. Vaccines (Basel). 2021;9(2):153. doi: 10.3390/vaccines9020153.
24. 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 (Basel). 2021;9(3):210. doi: 10.3390/vaccines9030210.
25. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Int J Surg. 2010;8(5):336-41. doi: 10.1016/j.ijsu.2010.02.007.
26. Gifford W, Davies B, Edwards N, Griffin P, Lybanon V. Managerial leadership for nurses' use of research evidence: an integrative review of the literature. Worldviews Evid Based Nurs. 2007;4(3):126-45. doi: 10.1111/j.1741-6787.2007.00095.x.
27. Wang K, Wong EL, Ho KF, Cheung AW, Yau PS, Dong D, et al. Change of willingness to accept COVID-19 vaccine and reasons of vaccine hesitancy of working people at different waves of local epidemic in Hong Kong, China: Repeated Cross-Sectional Surveys. Vaccines (Basel). 2021;9(1):62. doi: 10.3390/vaccines9010062.
28. 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. Pharm Pract (Granada). 2021;19(1):2276. doi: 10.18549/PharmPract.2021.1.2276.
29. Tavolacci MP, Dechelotte P, Ladner J. COVID-19 vaccine acceptance, hesitancy, and resistancy among university students in France. Vaccines (Basel). 2021;9(6):654. doi: 10.3390/vaccines9060654.
30. Nohl A, Afflerbach C, Lurz C, Brune B, Ohmann T, Weichert V, et al. Acceptance of COVID-19 vaccination among front-line health care workers: a nationwide survey of emergency medical services personnel from Germany. Vaccines (Basel). 2021;9(5):424. doi: 10.3390/vaccines9050424.
31. Holzmann-Littig C, Braunisch MC, Kranke P, Popp M, Seeber C, Fichtner F, et al. COVID-19 vaccination acceptance and hesitancy among healthcare workers in Germany. Vaccines (Basel). 2021;9(7):777. doi: 10.3390/vaccines9070777.
32. Jaramillo-Monge J, Obimpeh M, Vega B, Acurio D, Boven A, Verhoeven V, et al. COVID-19 vaccine acceptance in Azuay province, Ecuador: a cross-sectional online survey. Vaccines (Basel). 2021;9(6):678. doi: 10.3390/vaccines9060678.
33. Kaadan MI, Abdulkarim J, Chaar M, Zayegh O, Keblawi MA. Determinants of COVID-19 vaccine acceptance in the Arab world: a cross-sectional study. Glob Health Res Policy. 2021;6(1):23. doi: 10.1186/s41256-021-00202-6.
34. Yigit M, Ozkaya-Parlakay A, Senel E. Evaluation of COVID-19 vaccine acceptance of healthcare providers in a tertiary Pediatric hospital. Hum Vaccin Immunother. 2021;17(9):2946-50. doi: 10.1080/21645515.2021.1918523.
35. Malik A, Malik J, Ishaq U. Acceptance of COVID-19 vaccine in Pakistan among health care workers. medRxiv [Preprint]. February 24, 2021. Available from: https://www.medrxiv.org/content/10.1101/2021.02.23.21252271v1.
36. Bono SA, Faria de Moura Villela E, Siau CS, Chen WS, Pengpid S, Hasan MT, et al. Factors affecting COVID-19 vaccine acceptance: an international survey among low-and middle-income countries. Vaccines (Basel). 2021;9(5):515. doi: 10.3390/vaccines9050515.