Original Article

Underlying Factors Associated with COVID-19 Vaccine Hesitancy and Refusal among the Iranian Population: A Qualitative Content Analysis

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Abstract
Background: COVID-19 vaccination is one of the most successful ways to control the ongoing pandemic and prevent severe diseases, hospitalization, and death. Current evidence suggests COVID-19 vaccine hesitancy (a delay in accepting or rejecting the vaccine despite the availability of vaccination services) is a barrier to successful vaccination programs worldwide. This study aimed to explore the underlying factors associated with COVID-19 vaccine hesitancy among the Iranian population.
Methods: This qualitative content analysis study was conducted using in-depth semi-structured interviews. A total of 32 Iranian participants with diverse ethnicity, language, age, and gender were selected through purposive sampling. Interviews were analyzed using Graneheim and Lundman's qualitative content analysis method. MAXQDA software was used for data analysis.
Results: Three themes and eight subthemes emerged from the qualitative interviews. Individual underlying factors included knowledge, beliefs, and the fear of COVID-19 infection. Social factors included social media, the health system, and governance. Institutional factors included vaccine opponents and health experts that fueled COVID-19 vaccine hesitancy and refusal among the participants.
Conclusion: Poor knowledge, misbelief, and fear were the most commonly reported causes of vaccine hesitancy and refusal among Iranians. Therefore, targeted interventions are recommended to address misinformation among the Iranian population.
Keywords: COVID-19, Qualitative research, Vaccination refusal, Vaccination hesitancy, Iran

Introduction

According to the World Health Organization (WHO) statistics, since the first reported case of COVID-19 in December 2019, there have been over 480 million confirmed cases of COVID-19, with 6.1 million deaths across the globe (1). The pandemic has posed major unprecedented challenges to public health systems and negatively impacted the global economy. In this situation, broad vaccination has been recognized as one of the most successful strategies for changing the trajectory of the pandemic and achieving the fastest and fullest recovery possible. Therefore, substantial efforts by scientists, pharmaceutical industries, and governments have been directed toward developing, manufacturing, and deploying safe and effective vaccines. These efforts have been presented by the expedited approval of ten

vaccines and more than 150 vaccine candidates which are in clinical development. Besides, there are over 190 COVID-19 vaccine candidates that are in the preclinical development phase (2,3).

Over 11 billion doses of the COVID-19 vaccine have already been administered, and global production has already reached 1.5 billion doses per month (3-5). However, according to the WHO, only 57.5 million people were fully vaccinated against COVID-19, and the emerging rate of vaccine hesitancy stands as a major barrier to successful global vaccination. Vaccine hesitancy is defined as a delay in acceptance or refusal of vaccination despite the availability of vaccination services (4-8). Previous studies reported that 78% of respondents from Iran (9), 76% of respondents from China (10), and approximately 68% of respondents from the United States

would accept COVID-19 vaccines (11-13). In addition, an online survey of citizens from the UK and Turkey indicated that one-third of the participants in Turkey and 14% in the UK were unsure about getting the COVID-19 vaccine (14).

Vaccine hesitancy is a common phenomenon across the world, but the reasons behind the refusal of vaccines are variable. The most common reasons for vaccine hesitancy include risk perception (perceived risks vs. benefits), certain religious beliefs, and lack of knowledge and awareness of the importance of vaccination (15-17). Current evidence suggests that distrust, fear of developing side effects, fear of COVID-19 infection, negative experiences with vaccines in the past, low knowledge about vaccines, and wrong attitude and risk perceptions are among the reasons that may be related to COVID-19 vaccine hesitancy (18,19). Furthermore, a recent research project conducted in high-income countries developed a framework called "the 5C model of the drivers of vaccine hesitancy". According to this framework, major individual person-level determinants for vaccine hesitancy include confidence (not trusting the vaccine or provider), complacency (not perceiving a need for the vaccine, not valuing the vaccine), convenience (access to the vaccine), risk calculation, and collective responsibility (20).

COVID-19 vaccine hesitancy is a complicated and multifaceted phenomenon, influenced by a range of cognitive, psychological, sociodemographic, and cultural factors (5-8), varying across time, place, and type of vaccine (4). Therefore, analysis of such factors is required to critically address COVID-19 vaccine hesitancy.

In Iran, the vaccination of frontline healthcare workers and high-risk groups was initiated in December 2020. Subsequently, vaccination against COVID-19 infection in Iran was available to people aged over 18 years and then to those aged 3–11 years. As of March 19, 2022, a total of 145 million vaccine doses were administered (21), and 58.6 million people (67.6%) were fully vaccinated (21). Based on the current knowledge, high population immunity requires full vaccination of about 70% of the country's population, including adults, adolescents, and high-risk groups. Despite the effectiveness and safety of available COVID-19 vaccines, Iranian residents still have some degree of vaccine hesitancy, which hinders the success of vaccination programs. In this context, studies on vaccine hesitancy are required to explore the factors underlying vaccine delay or refusal among the general population. Therefore, this study aimed to explore the factors influencing COVID-19 vaccine hesitancy among the Iranian population.

Methods

This qualitative content analysis study was conducted using in-depth semi-structured interviews with a sample of Iranian individuals to explore the underlying factors associated with COVID-19 vaccine hesitancy and refusal among the Iranian population. Interviews were carried out from November 1 to December 31, 2021, during the fifth wave of the pandemic in Iran. Due to social distancing measures, the first two authors conducted all interviews in the Farsi language via telephone.

A total of 32 individuals aged 18 years and older who were reported as "not registered" in the national COVID-19 vaccination database (22) participated in this study. Participants were recruited in two steps. First, individuals who had not received COVID-19 vaccination were identified through government-sponsored public health authorities in Kerman province, providing COVID-19 control and prevention services such as vaccination, COVID-19 testing, and free counseling. Individuals from different communities and geographical areas of Kerman were contacted (five people from each major geographical area in Kerman-rural/marginal or urban areas) and invited to participate in an interview or introduce others who would. Snowball sampling was used to recruit further participants. The samples were selected with maximum diversity in terms of age, gender, and place of residence. Finally, 21 individuals (10 females, 11 males) from different communities and areas of Kerman province participated in qualitative interviews.

Second, an invitation letter was sent to a group of administrators and followers of the COVID-19 anti-vaccination channels. Subsequently, 11 social media users accepted to participate in the study. Table 1 presents the participants' demographic information. All participants were required to maintain distance communication (online or via telephone) with the researcher.

Eventually, 14 women and 18 men participated in the study. Most of the participants had academic education. The participants lived in six different geographical areas. In terms of ethnicity, four ethnic groups were identified, including Fars (24 participants), Gilaki (2 participants), Turk (4 participants), and Lor (2 participants). About half of the participants reported having a history of chronic diseases, including diabetes or hypertension.

Open-ended, semi-structured interviews were employed for data collection. An interview guide (Supplementary file 1) was developed based on model (4) developed by the SAGE working group on vaccine hesitancy. The interview guide comprised two sections: (*a*) general information, mainly including the participants' age, gender, marital status, education level, occupation, and clinical history of the COVID-19 disease and (*b*) health experiences and beliefs about the COVID-19 vaccine hesitancy. The questionnaire included three components with a total of 10 open-ended questions. The components were: (*a*) personal awareness and perception of the COVID-19 disease and vaccination, (*b*) contextual influences, and (*c*) other people's influence. The interview

Table 1. Participants' demographic characteristics

Variable	Frequency
Source of sampling	
The general population (citizens)	21
Social media users	11
Age (Mean±SD)	36.6±8.1
Gender	
Female	14
Male	18
Education	
High school	4
Diploma	13
University	15
City of residence	
Kerman	21
Tehran	6
Bandar-Abbas	1
Sari	2
Qum	1
Isfahan	1
Ethnicity	
Fars	24
Turk	4
Gilaki	2
Lor	2
History of chronic underlying diseases	
Yes	14
No	18
History of COVID-19 disease	
Yes	22
No	10
History of mental issues during the COVID-19 outbreak	
Fear of COVID-19	18
Depression/ anxiety	8
No	6
Vaccine hesitancy status	
Acceptance with a degree of uncertainty	3
Delay in vaccination	17
Refusal of vaccination	12

guide was primarily assessed by two expert reviewers and pre-tested with three target population members before implementation. These early (pilot) interviews were then included in the study as they were reasonably comparable to the subsequent interviews in terms of content and the questions asked.

The interviews lasted from 12 to 45 minutes, with an average length of 32 minutes. Data were collected up to the point of saturation i.e., when no new data were obtained.

The qualitative content analysis method proposed by Graneheim and Lundman was used for data analysis (23). In the first step, each interview was transcribed verbatim and read through several times to obtain an overall understanding of the content. Second, the text was divided into meaning units that were condensed. Each meaning unit was comprised of words and sentences containing aspects related to each other. Third, the meaning units were condensed and labeled with codes. In the fourth step, the codes were classified into subcategories and categories based on similarities and differences. Each category consisted of similar codes at the manifest level. Finally, the underlying meanings and content of the data were extracted, and themes were formulated as the expression of the latent meaning of a text.

During data collection and analysis, the researcher wrote down any reflections or hints related to the data in a memo to be used for future interviews. The trustworthiness of the study was tested using the criteria proposed by Guba and Lincoln, as cited in Amankwaa (24). Credibility and trustworthiness of the data were ensured by checking the codes with the participants and having supervisors revise the codes as well as long-term involvement with the data. The researcher talked with each participant before the interview to build trust and create the grounds for an in-depth interview. A portion of the text along with the initial coding was shown to the participants to compare the degree of homogeneity between the ideas extracted by the researcher and the participants' original opinions. The corresponding author translated the categories and quotations from the interviews from Farsi into English, and the results were then fine-tuned by professional editors. Sample quotes from the study participants were presented throughout the results section to ensure the trustworthiness of the results. MAXQDA 12 (VERBI GmbH, USA) was used for textual coding and thematic analysis.

This study was approved by the Research Ethics Committee of Kerman University of Medical Sciences in October 2021(IR.KMU.REC.1400.379). Oral consent was obtained before the start of the interviews. One participant signed a written consent and sent it via post. All interviews were digitally recorded and transcribed verbatim. Participants were free to withdraw from the study and were assured of the confidentiality of the information. Participants were allowed to call or email the researcher in case of any questions or further information.

Results

Most participants reported having a positive COVID-19 test or experiencing clinical symptoms of the coronavirus infection during the last six months. All of them reported having close contact with positive COVID-19 patients among their family members. Over half of the

participants experienced excess fear and panic about the COVID-19 disease during the pandemic. About one-third of the participants reported death due to COVID-19 among their family members or neighbors. Delay in vaccination was mostly reported due to physical (pregnancy, comorbidities, or recent diagnosis with COVID-19), occupational (hard work shifts and lack of time), and vaccine-related conditions (waiting for better or safer vaccines).

Factors associated with the experience and health beliefs of the Iranian population regarding the COVID-19 vaccine were described through a set of themes and subthemes (Figure 1). The "individual determinants" theme encompassed personal factors, including beliefs, trust, knowledge, experiences, and fears of COVID-19. The "social determinants" theme encompassed the influence of social/environmental factors, including vaccine opponents and health experts. The "institutional determinants" theme encompassed the influence of institutional and organizational authorities, including social media, the health system, and governance, on the Iranian household perceptions of the COVID-19 vaccination.

Theme 1: Individual determinants
Personal knowledge
Poor knowledge about the coronavirus infection, the epidemiology of the COVID-19 disease, and the immunological mechanism of vaccination were frequently reported by the participants. Most respondents indicated a poor understanding of side effects, immunological response, and vaccine physiology.

Nine participants believed that no robust and

Figure 1. Factors influencing COVID-19 vaccine hesitancy among the Iranian population

rigorous evidence supported the effectiveness of vaccines in protecting against the coronavirus infection and the COVID-19 disease. They referenced some national incidence data published by the World Health Organization to indicate that they were right and vaccines caused dramatic increases in COVID-19 incident cases during a short period after vaccination. However, the statistical inference of respondents to support their belief was poor and unscientific. One participant who was a middle-aged man said,

"*If we look at a country before and after vaccination, we see that the statistics have gone up instead of going down. For example, incidence cases in Singapore have gone up since the vaccination. In contrast, in countries with low vaccination rates, such as Iraq and Afghanistan, their cases are much lower than in Iran*".

Fears
Fears of COVID-19 infection were one of the most influential factors contributing to vaccine hesitancy. Fear of developing severe side effects after vaccination was generally reported by all respondents. Since most respondents had observed severe and fatal side effects among their family members or friends or had heard shocking news about the prevalence of severe side effects or deaths due to COVID-19 vaccination, they refused COVID-19 vaccines. They tried to decrease their chance of acquiring COVID-19 disease through social isolation and disruption of everyday life. Respondents frequently reported a wide range of severe side effects of using COVID-19 vaccines, including heart failure, blood clots, embolism, infertility, pain, paraplegia, vitiligo, and inflammation of limbs. Death caused due to vaccination was also considered enormous, inflicting a sense of fear among the Iranian population.

Some respondents believed that viral shedding after the COVID-19 vaccine could infect others and spread the virus person by person. Four participants reported that fear of getting COVID-19 after vaccination and subsequently infecting their family members, such as older adults, women, and children, caused them to avoid the COVID-19 vaccines. Three respondents reported that the vaccine spike proteins could contribute to cellular damage and cause health problems. They stated that the vaccine spike proteins could invade healthy cells and cause disease after vaccination. A middle-aged woman said,

"*General vaccination has individual side effects because it causes the production of spike protein and the body becomes a source of corona production*".

Fear of unknown materials and controversial substances in vaccines caused some respondents to avoid COVID-19 vaccines and refuse vaccination. Nanoparticles, implants, microchips, or tracking devices were regarded by some respondents as suspicious materials that could alter a
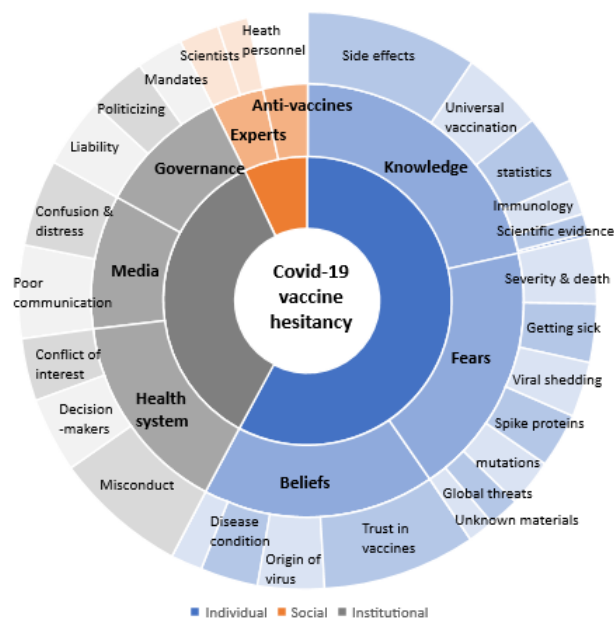
person's genetic makeup and cause health problems, or bad social behaviors such as violence. A young man said,

"No one is accountable. Many scientists worldwide and conscientious physicians say that the COVID vaccines contain graphene or graphene oxide, which causes blood to clot ... but no one has commented on these claims".

Some participants reported that they had heard claims from the mass media and online social networks about detecting graphene oxide or graphene hydroxide in COVID-19 vaccines. These respondents stated that the emergency use authorization allowed pharmaceutical industries to withhold the complete list of the ingredients of COVID-19 vaccines as secret, and nobody knows the truth.

Beliefs

Misbeliefs about the coronavirus and the COVID-19 disease were among the most influential factors contributing to vaccine hesitancy. Distrust in different types of vaccines, the effectiveness of vaccines, and the process for developing, authorizing, and approving COVID-19 vaccines were generally considered by all respondents as one of the most frequent factors contributing to vaccine hesitancy. Most respondents doubted if the vaccines effectively protected people against the disease, and why health protocols such as distancing, hand washing, quarantining, and wearing face masks were recommended by health officials. A middle-aged man said,

"When you get the measles vaccine, you become completely safe, and if you go to a place where everyone has measles, you cannot get measles. This means that the vaccine makes you completely immune. So how did you get the disease when you have already received the COVID-19 vaccine? If I was supposed to get the disease and you get the disease after vaccination, why should we get the vaccine? What is the reason for this vaccination?"

Some respondents raised severe concerns about the safety and effectiveness of domestic vaccines developed in the country in recent months, including the COVIran Barekat vaccine, an inactivated virus-based vaccine with emergency use authorization in Iran. A few respondents believed that these vaccines were just distilled water, dexamethasone, or other pharmaceutical compounds without any immunological response and effectiveness. These respondents argued that reporting no or mild adverse effects in people who had been vaccinated with homemade vaccines such as COVIran Barekat confirmed that these vaccines contained no effective materials or chemical agents. These respondents believed in the effectiveness of imported vaccines such as Pfizer, Moderna, AstraZeneca, and Sinopharm BIBP vaccines that were not available to all age groups at the time of the interviews. A middle-aged woman said,

"It is important to me that the vaccine is tested on a large population and that almost all of its side effects are identified and then I am certain that it has the fewest side effects. I would rather wait for better vaccines to come, get more people vaccinated, and get more valid vaccines like Pfizer".

In contrast, some respondents were worried about the safety of imported vaccines due to political reasons and trusted the homemade vaccines as compatriot scientists and researchers produced these vaccines. Some respondents followed the supreme leaders' statements using homemade vaccines such as COVIran Barekat. These respondents preferred domestic productions and said that they will delay vaccination until homemade vaccines become publicly accessible. It is worth mentioning that this vaccine was under clinical investigation during the time we were interviewing the participants.

Overall, vaccine skepticism was reported by some well-educated people as the main reason behind vaccine hesitancy. Twelve respondents indicated their serious concerns and disagreement about the safety and effectiveness of all vaccines (regardless of the target disease). These respondents persisted that COVID-19 vaccines were dangerous with long-term health problems such as infertility and refused to use vaccines for themselves and their families. An adult woman said,

"I did not even vaccinate my son; who should have gone to school. I did not even go to receive diphtheria, pertussis [whooping cough], and tetanus [also known as DPT] vaccines; if I had enough information at that time, I would not have vaccinated any of the children".

Some respondents did not trust the process for developing, authorizing, and approving the COVID-19 vaccines in the world. For example, they raised some debates about the speed the vaccines were developed. They assumed that in Iran, authorities rushed to inoculate the entire population without a reasonable belief in the vaccines' safety and efficacy. In addition, they argued that the emergency use authorization process did not justify the use of vaccines for all people, particularly older aged people, children, and people with chronic diseases. They believed that the emergency use authorization increased the risk of developing severe side effects in the community, as long-term consequences and health dangers of the recent vaccines have not been strictly specified which may be different from case to case and should not be generalized. In addition, a few respondents indicated their serious concerns about the poor quality control of homemade vaccines, as they had heard some news about the contamination of COVID-19 vaccines across the world. They referenced some news on social media that some people had died from contaminated vaccines and consequently, pharmaceutical companies responsible for producing COVID-19 vaccines had thrown out a million doses of vaccines. These respondents preferred to wait for at least three years to become sure about the quality and

effectiveness of COVID-19 vaccines.

Some participants believed in the artificial origin of the novel coronavirus and thought that it is human-made. These participants also thought that "a government created a deadly virus and spread it intentionally". In other words, they believed that the COVID-19 pandemic was a planned and organized phenomenon. These participants believed in conspiracy theories as someone acts in the shadow with evil intentions. They saw themselves as victims and Truth-Sayers and tried to convince the interviewer that they were right. They also referred to several COVID-19 conspiracy theories to indicate their concerns about the origin of the novel coronavirus. For example, three participants stated that vaccine materials contained RFID chips or microchips that the global elites want to use to control our thoughts and behaviors using the new 5G technology. These participants referred to a wide range of examples such as "Freemasonry", "the new slavery system", "Zombie", "globalism", "bioterrorism," and "population control programs" as reasons and justifications to support their ideas and beliefs. An adult man said,

"*The possibility of bioterrorism in the corona pandemic is very high. [They want] to reduce the world's population by this vaccine and the disease*".

Additionally, a middle-aged man said,

"*Now is the time when science is in the service of the devil and at the service of the powerful people of the global mafia. It cannot be trusted anymore, especially the science that the media propagates and wants to force people to be vaccinated*".

Some participants believed that the incidence of COVID-19 disease did not follow an acute and serious trend to justify its universal vaccination. Four participants stated that preventing COVID-19 disease was extremely easy and never required any health protocols or vaccination. A middle-aged woman said,

"*I do not accept corona [as a serious disease] at all. Corona is a flu, like other cases of flu. Death is not high enough to make a person need to be vaccinated*".

However, three participants stated that health protocols were ineffective in fighting against the coronavirus infection, and people who did not follow health protocols and did not use any face masks never got the COVID-19 disease. In addition, they thought using a face mask and following health protocols such as using disinfectants increased the chance of people getting the coronavirus infection. Therefore, they rejected health protocols and vaccination to protect against COVID-19. An adult man said,

"*When we compare the hospitalization statistics, we see that many people who did not follow the health protocols got better results, or those who were treated under the supervision of a traditional medicine doctor or even at home were much better than those who followed the*

protocols of the Ministry of Health".

Some participants who had previously been infected with COVID-19 refused to get a vaccine. Five respondents believed those who have been infected with COVID-19, do not need a vaccine anymore. Four respondents believed that the novel coronavirus was like the influenza virus and its mortality rates in different countries were much lower than other communicable diseases. Therefore, the risk of dying from the COVID-19 disease was not noticeable in the community. One participant challenged the nature of the COVID-19 vaccines and insisted that the available vaccines were just immunoprotective compounds that improved the function of the human immune system to better fight against the coronavirus infection. In contrast, two participants believed that vaccines were toxic compounds that were strongly harmful to the body and would produce severe and long-term side effects in the future.

Theme 2: Social determinants
Medical professionals
Seven respondents referenced healthcare workers refusing COVID-19 vaccines. They had learned from healthcare workers and medical professionals around the country and the world reporting they would not get a COVID-19 vaccine. These respondents believed that the healthcare workers refusing vaccines had more information about vaccines and knew something others did not. Therefore, by observing their vaccine hesitancy, people were persuaded to refuse COVID-19 vaccines. An adult man said,

"*Many experts and scientists do not accept this vaccine. For example, in France, many doctors protested by taking off their medical gowns and breaking their medical oath*".

Vaccine opponents
Six respondents indicated their interest in and willingness for COVID-19 vaccination but were discouraged by vaccine opponents within their family (spouse or children). These respondents were generally housewives with lower levels of education and poor knowledge about the novel coronavirus infection and COVID-19 vaccination. In addition, two respondents reported that anti-vaccine colleagues or employers discouraged them.

Eight respondents referenced the influence of anti-vaccine movements in online social networks on their willingness to do COVID-19 vaccination. According to these respondents, public disclosures and enlightenment about the negative consequences and health dangers of COVID-19 vaccines had convinced them to refuse COVID-19 vaccines. In this line, a wide range of Instagram channels from different fields, including traditional medicine, were broadcasting narratives, claims, videos, online debates, and preliminary evidence

questioning vaccine safety. These respondents believed that anti-vaccine movement leaders knew more than medical experts. According to their statements, the COVID-19 pandemic opened the door for vaccine opponents to peddle alternative therapies and cures and spread their success stories through their online social network channels. A young man said,

"The state media is always judging one-sidedly and does not talk about vaccine side effects. In contrast, there are a huge number of online social network users who message me daily appreciating truthful news about vaccines; they have consequently resisted being vaccinated by health officials".

Theme 3: Institutional determinants
Mass media

Poor communication of information about severe side effects and deaths after vaccination was one of the important contributing factors to vaccine hesitancy. Most respondents believed that not presenting anti-vaccine justifications and reasons via mass media such as television, radio, and newspapers had increased doubts about the COVID-19 vaccines. In other words, mass media have already focused on news and information confirming the effectiveness of available vaccines and do not publish any contrary statements. These respondents believed that the state media underreported the number of deaths due to COVID-19 vaccines to convince people to get COVID-19 vaccines.

The avalanche of information surrounding COVID-19 had left many of the respondents feeling overwhelmed and confused. Respondents received contradictory information about the COVID-19 pandemic from various sources, including mass media, the internet, online social networks, and information sources such as family, friends, and neighbors. In this context, some respondents felt unsure about the trustworthiness of the information. Three respondents reported that they had decided to stop or limit reading or watching news about COVID-19 because it was too stressful. A middle-aged woman said,

"I do not listen to the news at all, I do not turn on the TV at all, I do not know what the situation is like from the first time corona came".

Health system

Poor performance of the national healthcare system in managing the COVID-19 pandemic in the country was reported as a contributing factor to vaccine hesitancy. Seven respondents believed that the response of the healthcare system and decision-makers to the pandemic was rather bewildering. Therefore, they thought that most of the regulations and guidelines provided by the healthcare system or healthcare workers were contradictory or hypocritical. According to the respondents, lack of transparency in reporting COVID-19 disease data and vaccine side effects fueled public distrust of the healthcare system and policymakers. Four respondents indicated their strong dissatisfaction with and distrust of the healthcare system's decisions by breaking the rules and instructions of healthcare workers and medical experts by not using face masks, following health protocols, and getting vaccines. A middle-aged man said,

"Everyone knows that the vaccine is medicine and may have side effects; it may even kill. But saying that everyone vaccinated is 100% safe and does not die is a lie. One of the reasons I do not get vaccinated is that the Minister of Health is a liar, and I do not trust a liar, and I will not do anything he says".

Another middle-aged man said,

"The doctors and physicians who work in the Ministry of Health benefit from the fact that corona does not get eradicated and people become sicker and need more of the medicines they import or make".

Governance

The politicization of COVID-19 health-protective behaviors and vaccination were factors that influenced threat perceptions and associated health-protective behaviors among the participants. According to four participants, statements and visual cues by leading politicians and some members of parliament about the COVID-19 pandemic were reported as examples of politicizing COVID-19 issues in the country. From the earliest alarm, the growing number of COVID-19 cases and death tolls were censored by politicians until the parliament election in February 2020. According to respondents, some members of the parliament downplayed the coronavirus infection threat by appearing in public without wearing a face mask during the first wave of the pandemic in Iran. In addition, rejecting US-manufactured vaccines was another important issue that proved the politicizing of public health in the country. A middle-aged man said,

The issue of making corona vaccine has become a political issue, and mostly at the behest of governments and the president, and others. Scientists are forced to produce and market the vaccine without completing the research process".

A young woman also said,

"The Ministry of Health, which mandates vaccination, does not accept responsibility for vaccination complications".

Finally, another young woman said,

"Mandatory vaccination is a vulgar argument. There is no logic in forcing people to vaccinate. If vaccination is good, people will get vaccinated themselves, and there is no need to force them".

Discussion

The present study explored a range of individual, social, and institutional factors that were related to COVID-19 vaccine hesitancy and refusal among the Iranian population.

This study highlighted the role of individual factors such as poor knowledge, fears, and misbeliefs about coronavirus infection and COVID-19 vaccines in vaccine hesitancy and refusal. According to findings, vaccine hesitancy and refusal were commonly reported in participants with diverse educational levels. Hence, it seems that vaccine hesitancy and refusal are mostly associated with poor knowledge about vaccines rather than formal education and literacy. Vaccination decisions are frequently associated with a lack of awareness about "where" and "when" one should be vaccinated. In other words, a relationship exists between vaccination knowledge and vaccine acceptance. Moreover, self-estimated sufficiency of information about vaccination or satisfaction with information on vaccination is frequently associated with vaccination decisions (25). Poor knowledge about coronavirus infection and available vaccines is common in many countries, as indicated by studies conducted earlier in China (26) and the United States (27). Fear of COVID-19 infection and vaccine side effects were among the most common reasons behind vaccine hesitancy and refusal in the participants. Concerns about COVID-19 vaccine side effects have been reported by recent investigations conducted in the United States (28), Europe (29), China (30) and India (31). These concerns usually range from the high risk of developing severe side effects or death to transmitting the infection to others due to targeted global threats rooted in conspiracy theories.

Respondents also reported misbeliefs about the coronavirus infection and available vaccines as the next contributing factor in vaccine hesitancy. Misbeliefs about the origin of the virus, COVID-19 disease consequences including mortality, treatment, and mistrust of vaccines safety and effectiveness were the most frequent factors that influenced the participants' perceptions of vaccination. Belief in conspiracy theories related to COVID-19 was observed in the present study. The role and impact of conspiracy theories in vaccine hesitancy and refusal have been investigated in previous studies as well (32,33), and it is evident that conspiracy beliefs are likely to undermine the motivation and willingness to take action in the current pandemic, in part because they are difficult to deny (34,35).

The present study revealed the role of misinformation in COVID-19 vaccine hesitancy. Researchers have shown the impact and role of misinformation in vaccine hesitancy (36-38). The dissemination of misleading information about the novel coronavirus infection and COVID-19 vaccines through the internet, online social networks, and other communication outlets have influenced individual health beliefs and perceptions (39). Existing research suggests that misinformation causes confusion and distress (40,41) as well as fear (42), and thrives on vaccine hesitancy and resistance, mask refusal, and utilization of medications and remedies with insignificant scientific data (39). The participants' narratives in the present study also conveyed a sense of fear and misbelief about COVID-19 vaccines.

According to participants, fear of severe side effects or death, distrust in COVID-19 vaccine safety, and effectiveness are generally related to the information they received from different sources. As people increasingly use the internet, social media, and online social networks for seeking health information and decision-making, there is a substantial potential risk of encountering and receiving targeted harmful misinformation usually propagated via contemporary anti-vaccination movements. In addition, recent social distancing and isolation have intensified the use of social media and online social networks as most people try to stay connected with their families and peer groups. In this context, emerging concerns about the targeted spread of misinformation and unsubstantiated rumors threatening public health have highlighted the emergence of social media interventions to improve health literacy and build public trust in vaccination. Several strategies have been suggested to counter misinformation (43), including providing accurate health information (44) by circulating and communicating knowledge on COVID-19 vaccines to the general public; tracking and tackling emerging and circulating misinformation, fake news, and rumors; training frontline health workers to educate and effectively deal with public concerns (45); and equipping celebrities and politicians with scientific information to ensure the quality of the messages they communicate.

The unidirectional and poor performance of mass media in communicating reliable information about vaccine side effects, effectiveness, and health dangers has caused significant confusion, distress, and mistrust and has fueled vaccine resistance among the audiences. According to existing evidence, the use of mass media with low awareness of vaccine effectiveness appears to be effective for some individuals and groups, but not all (46). Therefore, communicating reliable information through other channels, including social media and online social networks, may improve the success of interventions. Social media platforms are considered the most influential source of misinformation and anti-vaccine messages. As combatting misinformation and disinformation on social media platforms is crucial to reversing the growth in vaccine hesitancy, targeted interventions to address the spread of anti-vaccine messages and misinformation on social media platforms are highly recommended. In this context, healthcare workers, health agencies, health-

related non-profit organizations, NGOs, and government websites are recommended to improve their overall social media presence and foster partnerships with social media platforms to improve evidence-based communication of health information between healthcare providers and consumers (47).

This study had several limitations. As cultural and ethnic contexts influence the health beliefs and behaviors of people in using COVID-19 vaccines, qualitative interviews needed to be conducted with populations from different ethnic groups and cultural areas in Iran, but they may not be representative of the general population in those cities. Hence, investigating the underlying factors of vaccine hesitancy among other cultural and ethnic groups is highly recommended to address this limitation. Online social network users can also be subject to bias and may not truly represent the general population (48). As some respondents were interviewed online, they tend to have better internet access and higher socioeconomic status than the general population (48), particularly older adults. Moreover, comparisons between cities should be avoided as samples were smaller in cities except for Kerman. Another substantial limitation is that willingness to be vaccinated changes over time (49). These qualitative interviews were collected during the fifth wave of the pandemic, before the widespread vaccination of the Iranian population.

Conclusion

This study highlighted the role of individual, social, and institutional underlying factors that are associated with COVID-19 vaccine hesitancy and refusal among the Iranian population. Poor knowledge, misbeliefs, and fears about COVID-19 were the most reported causes of COVID-19 vaccine hesitancy and refusal among individuals. Fear and distrust during the pandemic are related to poor communication and insufficient response of the health system and government to the COVID-19 vaccine skepticism and contemporary anti-vaccine movements. Implementing targeted strategies and local responses to address misinformation and misperception on social media platforms and improving the communication of transparent, true, and responsive information through healthcare providers, trusted agencies, and community networks to facilitate social climate change and reverse the growth of vaccine hesitancy among the general public, are highly recommended.

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Competing Interests
The authors declared no conflict of interest.

Supplementary Files
Supplementary file 1. Interview guide.

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