BMC Health Services Research

RESEARCH

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Exploring the factors influencing the adult population's reluctance to accept the COVID-19 vaccine in Tehran

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Abstract

Background While evidence of efficacy, safety, and technical feasibility is crucial when introducing a vaccine, it is equally important to consider the psychological, social, and political factors influencing vaccine acceptance. This study aims to identify the factors contributing to COVID-19 vaccine hesitancy among adults in Tehran, Iran.

Methods The study employed a descriptive and analytical cross-sectional design carried out from 2021 to 2022. It involved 260 eligible individuals residing in the catchment areas of Tehran and Shahid Beheshti Universities of Medical Sciences who declined to receive the COVID-19 vaccine, selected through systematic sampling. Data collection was accomplished through a researcher-developed questionnaire and analyzed using SPSS 26 software. The analysis utilized descriptive statistics and non-parametric tests including Mann-Whitney U, Kruskal-Wallis, and Multiple Linear Regression, to examine the relationships between variables.

Results The average scores (SD) across dimensions were as follows: the individual's health status and perceived risk, 15.53 (1.70); contextual and social effects, 17.68 (2.53); awareness, 14.81 (2.34); and beliefs and concerns. 14.91 (2.64), indicating a concerning situation regarding contextual and social impacts and a moderate status as to other areas. The primary reasons for vaccine refusal included fear, lack of belief in the vaccine, concerns about its reliability, illness, and lack of access or time. Acceptance of the vaccine was associated with education, occupation, marital status, number of children at home, and income reduction due to COVID-19.

Conclusion The findings indicate that fear, lack of belief in the vaccine, concerns regarding its reliability, illness, and lack of access or time were the most important factors influencing reluctance to receive the vaccine. Health organizations should consider these factors when encouraging the population to receive the COVID-19 vaccine.

Keywords COVID-19, Vaccine, Acceptance, Heath policy, Inequality, Iran

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Background

In December 2019, an outbreak of COVID-19, caused by the acute respiratory syndrome coronavirus (SARS-CoV-2), was reported in Wuhan, China. Subsequently, on March 11, 2020, the World Health Organization declared COVID −19 as a pandemic due to the alarming levels of spread and severity of the infection [1]. To slow down the spread of the disease and reduce its effects on health, countries implemented various control actions such as social distancing, partial and comprehensive quarantine, school and business closures, and using masks in public spaces. Although such actions helped to reduce the slope of the epidemic curve, a resurgence of COVID-19 was reported following the reopening of communities and economies [2, 3]. Consequently, vaccination of a large portion of the population was considered as the best solution to resolve this crisis, as achieving herd immunity through natural infection would be catastrophic and unfair in terms of disease and mortality. According to available evidence, 70% of the population needed to be immune to COVID-19 to stop transmission. Although vaccination provided protection against the disease, vaccinated individuals could still become infected and transmit the virus. The promising point in this regard is that as population immunity rises to a protective threshold, vaccinated individuals may receive some degree of protection until widespread uptake of the vaccine can reduce its spread and reduce the overall severity of the disease [4].

In this regard, the race to produce safe and effective vaccines for COVID-19 proceeded at an unprecedented pace [5]. In less than a year, more than 300 candidate vaccines were developed [6]. As of December 23, 2020, 61 COVID-19 vaccine candidates were awaiting clinical evaluation, while 172 candidates were in the preclinical evaluation stage [7]. Vaccines developed by Pfizer, BioNTech and Moderna were reported to be effective [8]. While the rapid development of vaccines against COVID-19 was an extraordinary achievement, the successful vaccination of the world's population posed many challenges from production to distribution, deployment and, most importantly, acceptance [9]. Therefore, it is very important to identify the factors affecting the acceptance or non-acceptance of the vaccine by people and to identify the effective strategies to encourage them to receive the vaccine. Meanwhile, hesitancy regarding the COVID-19 vaccines is considered an important challenge for public health [10] such that vaccine hesitancy, which is described as "delay in acceptance or refusal of vaccination despite the availability of vaccination services", can disrupt the future efforts of vaccination against COVID-19 [11], delay implementation, and increase refusal rates in society. There is strong evidence that vaccine hesitancy can reduce vaccination coverage and increase the risk of outbreaks of vaccine-preventable diseases [12].

Several factors may influence willingness to be vaccinated in a population. Previous studies have shown that demographic characteristics, socio-cultural factors, misconceptions or rumors about vaccine effectiveness, safety concerns, and price may affect people's willingness [13]. For instance, Chan et al.'s (2015) study showed that personal anxiety, previous vaccination history, and insufficient knowledge about the A/H7N9 influenza vaccine led to a 50% decrease in its acceptance among respondents in a Hong Kong survey [14]. However, due to cultural diversity, levels of acceptance and associated determinants may vary across countries [12]. Negative perceptions surrounding the rapid development of vaccines, combined with concerns about frequent side effects, may reinforce the belief that vaccines could cause illness rather than prevent it [15].

Our literature review revealed that, prior to this study, no research had been conducted specifically on the reasons for vaccine hesitancy regarding the COVID-19 vaccine in Iran. However, studies on other vaccines have been undertaken in the country. For instance, Askarian et al. investigated the acceptance of the influenza vaccine and found that only 2.5% of the participants had received the vaccination. The primary reasons for vaccine non-acceptance included limited access to the vaccine, insufficient information regarding its safety, and the perception that influenza is not a serious illness [16]. Another study identified several factors that hinder influenza vaccination, including a lack of trust in the vaccines available on the market, fear of potential side effects, insufficient information about the vaccines, and a perceived lack of time to receive the vaccination [17]. Similarly, Al-Shamari et al. found that the most common reasons for unwillingness to receive the influenza vaccine were the fear of vaccine-related diseases and the belief that young, healthy individuals were not at risk [18].

As vaccine preferences and hesitancy determinants vary by time, location, and vaccine type [19], understanding the factors influencing COVID-19 vaccine acceptance in the current context is essential. Therefore, in order to better understand and inform public health officials, the present study sought to identify the factors affecting the non-acceptance of the COVID-19 vaccine among the unvaccinated population in Tehran province, Iran. It is noteworthy that addressing COVID-19 vaccine hesitancy is a critical public health challenge as it could hinder future vaccination efforts against COVID −19, delay implementation, and increase refusal rates in the community. Therefore, the findings of our study can help health policymakers take necessary measures to encourage vaccination and expand coverage by understanding the factors contributing to the non-acceptance of the vaccine.

Methods

This quantitative descriptive-analytical study was conducted from 2021 to 2022, targeting the population of Tehran province. The study population comprised all eligible individuals for receiving the COVID-19 vaccine who resided in Tehran and had not yet received the COVID-19 vaccine at the time of the study. The inclusion criteria comprised individuals over 18 years of age, of Iranian nationality, residing in the mentioned geographical areas, unvaccinated against COVID-19, and willing to participate in the research. The exclusion criteria included children, non-Iranian nationals, residents of other geographical areas in Tehran province, individuals who had received at least one dose of the COVID-19 vaccine, and those unwilling to participate in the research. It is worth noting that individuals who were unresponsive after three phone contact attempts were also excluded from the study.

Sample size and sampling method

The sample size was determined based on a pilot study involving 30 participants. In the pilot study, the standard deviation for each dimension of the questionnaire (perceived health and risk, contextual effects, knowledge and awareness, beliefs and concerns) was examined. Using the maximum standard deviation observed, which was associated with the contextual effects dimension (SD=2.4), the sample size was calculated using the following formula, considering a 5% margin of error and d=0.3. The minimum required sample size was 246 participants, which was increased to 260 to account for potential sample loss.

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} s^2}{d^2} = \frac{3.8416 \times 5.76}{0.09} \simeq 246$$

A systematic sampling method was employed. To do this, a list of all unvaccinated individuals residing in the areas covered by Tehran and Shahid Beheshti Universities of Medical Sciences was obtained from the health deputy systems of the mentioned universities. Each individual was then assigned a number, and a random starting number was selected. Subsequent participants were then chosen at intervals of five until the required sample size was reached.

Data collection tool

The data collection tool was a researcher-developed questionnaire formulated through a literature review. By reviewing relevant studies, all reasons for willingness or unwillingness to receive the COVID-19 vaccine were extracted. Subsequently, with the research team's input, distinct items were included in the questionnaire. The designed questionnaire consisted of sections on demographic information (9 questions), socio-economic status (4 questions), individual health status and perceived risk of COVID-19 infection (8 questions), contextual factors (environmental and social impacts) (11 questions), awareness of COVID-19 and available vaccines (7 questions), and beliefs and concerns about COVID-19 and potential vaccine side effects (7 questions). The designed questionnaire is presented in Appendix 1. Depending on the type of questions, the response options and the scoring methods varied: "Yes" = 2 and "No" =1 (questions 2, 3,4,5,7,9,10,11,13,15,16,17), Five-point Likert scale ("Very much" =1, "Much" =2, "Medium" =3, "Low" =4, and "Very low" =5) (questions 8,14,19,27,28,31), and "No" =3, "I'm not sure" =2, and "Yes" =1 (questions 18,20,21,22,23,24,25,26,29,30). Higher scores in each area indicated a weaker status in that area and a greater impact on the inclination towards not receiving the vaccine in the study population. Table 1 below presents the minimum and maximum scores achieved, along with the cut-off points for each dimension.

To validate the questionnaire, opinions from expert respondents were sought. The questionnaire was emailed to 10 experts from relevant fields including public health, health care management, health policy, epidemiology, clinical medicine, infectious disease microbiology, and statistics. The experts were asked to evaluate the transparency, relevance, and necessity of the questions. They were also requested to provide feedback on the design of the questions. Subsequently, the content validity ratio (CVR) and the content validity index (CVI) were calculated using relevant formulas. The CVI for all 41 questions exceeded the minimum acceptable value of 0.79 [20]. Additionally, the CVR for each question was

Table 1 Questionnaire axes and scores in each axis

Axes (Dimensions)	Range (The minimum and maximum score that can be obtained)	Desirable status	Average status	Undesirable status
Health status and perceived risk of contracting COVID-19	(8–22)	<11	(11–15/4)	> 15/4
Contextual factors (environmental context and resources; social impacts)	(10–25)	<12/5	(12/5–17/5)	> 17/5
Awareness of COVID-19 disease and available vaccines	(7–23)	<11/5	(11/5–16/1)	> 16/1
Beliefs and concerns about COVID-19 disease and potential vaccine side effects	(6–24)	<12	(12–16/8)	> 16/8

calculated, and all 41 questions were found to have a CVR higher than the recommended threshold, with more than 65% of the experts agreeing on the necessity of each item. Then, the face validity of the tool was accessed through rating of questions by respondents based on clarity and comprehensiveness. finally, a Face Validity Index (FVI) above 0.83 was considered acceptable [20]. It should be noted that 5 questions were revised during these steps. The reliability of the questionnaire was assessed using the Cronbach's alpha test, yielding a value of 0.70, which indicated satisfactory reliability.

A pilot test was conducted with a small sample representative of the target population to identify any ambiguities or issues with the questionnaire items, leading to further revisions to improve clarity and relevance. Exploratory factor analysis was employed to assess the underlying structure of the questionnaire. This analysis confirmed that the items grouped together in a manner consistent with our theoretical constructs, providing evidence for the questionnaire's construct validity. For convergent validity, the questionnaire items were compared with established measures that assess similar constructs. The tools examined included the "Beck Anxiety Inventory" [21]. strong correlations ($r=0.70$, $p<0.01$) was found between the questionnaire items and the already established measures, indicating that they are measuring the same underlying constructs. In terms of divergent validity, the questionnaire was assessed against measures designed to evaluate different, unrelated constructs. For example, the "Big Five Personality Inventory" [22] was used and a low correlation coefficient ($r=0.15$, $p>0.05$) was observed between our questionnaire and these measures, which supports the distinction between the constructs. For discriminant validity, we ensured that our questionnaire did not correlate strongly with unrelated constructs, indicating that it measures distinct factors. The rigorous development and validation process undertaken for our questionnaire, including expert reviews, pilot testing, factor analysis, and reliability assessments collectively support its construct validity. This ensures that our findings regarding factors influencing COVID-19 vaccine acceptance are both reliable and meaningful.

Data collection method

After obtaining ethical approval (IR.TUMS.NIHR.REC.1400.013) from the Ethics Committee of the Tehran University of Medical Sciences Research Center for Justice in Health, the researchers accessed the information of unvaccinated individuals including their name, sex and telephone number, from the health departments of Tehran University of Medical Sciences and Shahid Beheshti University of Medical Sciences. It should be noted that information on the population covered by each university is available in health systems (SIB software), and vaccination information is recorded for each individual once vaccinated. Thus, unvaccinated individuals were clearly identified. After receiving the list of unvaccinated people, each individual was assigned a number, and sampling was conducted using a systematic sampling method. Data was collected using the designed questionnaire through telephone interviews conducted by trained interviewers. Before administering the questionnaire, participants were informed about the study objectives, data usage, and the confidentiality of their information. Informed consent was obtained verbally from the participants.

Data analysis

Data analysis was performed using SPSS 26 software. The normality of the data was assessed using the Kolmogorov-Smirnov test, which indicated non-normal distribution. Descriptive statistics including frequency, mean, and standard deviation were used to describe the variables. Non-parametric tests such as Mann-Whitney U, Kruskal-Wallis, and multiple linear regression were employed to examine the relationships between variables.

Results

As shown in Fig. 1, statistics from the Ministry of Health, Treatment and Medical Education indicates that 10,981,727 individuals received the first dose of the COVID-19 vaccine, 9,957,518 individuals received the second dose, and 5,497,456 individuals received the third dose.

Table 2 presents the demographic information of the participants. Of the participants, 58.2% were male and 41.8% were female. Most of the participants were in the age range of 36–45 years (38.7%), married (81.0%), had a diploma-level education (43.7%), and were employed (39.8%).

Based on Table 3, the mean (standard deviation) scores of the research participants in each of the dimensions were as follows: health and perceived risk, 15.53 (1.70); contextual effects, 17.68 (2.53); awareness, 14.81 (2/34); and beliefs and concerns, 14/91 (2/64). It should be noted that the questions raised in each of the mentioned dimensions and the percentage (frequency) of answering each question are given in Appendix 1. Based on the findings presented in Table 2, the health status and the perceived risk scores varied by age ($p<0.001$) and occupation ($p=0.004$), with significantly higher scores observed among participants aged 26–35 years and those who were unemployed or retired. Also, the score for contextual effects differed based on education ($p<0.001$), occupation ($p=0.024$), the number of children 0–12 years of age at home ($p=0.009$), and income reduction due to COVID-19 ($p=0.024$). Participants with lower educational levels, those who were self-employed, those with

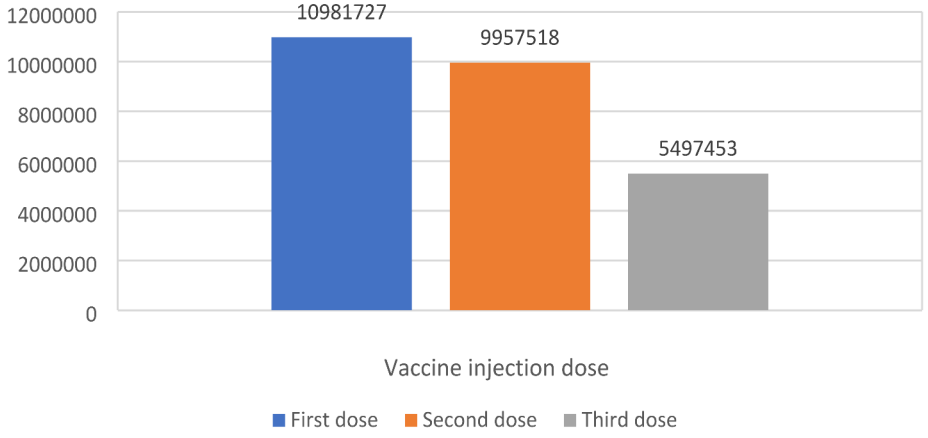

Fig. 1 Vaccination coverage percentage in Tehran province based on injection dose schedule

Table 2 Frequency (percentage) of participant's demographic information

Variables		Frequency (Percent)
Age	18–25	24 (9/2)
	26–35	79 (30/3)
	36–45	101 (38/7)
	46–55	43(16/4)
	> 55	57 (5/4)
Gender	Female	109 (41/8)
	Male	152 (58/2)
Education	High school	60 (23/0)
	Diploma	114 (43/7)
	Bachelor's degree	72 (27/6)
	Masters degree and higher	15(5/7)
Number of children aged 0 to 12 at home	0	86(33/2)
	1to 2	156(60/2)
	> 3	17(6/6)
Income	< 80 dollars	113 (44/1)
	80–140 dollars	55(21/5)
	145–200 dollars	79(30/9)
	> 200 dollars	9(30/5)
Occupation	Unemployed or retired	21 (8/0)
	Housewife	76(29/2)
	Self employed	104 (39/8)
	Employee	50(19/2)
	Student	10 (3/8)
Decrease in income due to COVID-19	No	155 (59/4)
	Yes	106 (40/6)
Marital status	Single	49 (19/0)
	Married	212(81/0)
Number of family members	1–2	14(5/4)
	3	43 (16/6)
	4	109(42/1)
	5	70(27/0)
	> 6	23(8/9)

Table 3 The mean score of the investigated dimensions at different levels of demographic characteristics

Dimensions		Health status and perceived risk of contracting COVID-19		contextual effects (context and environmental resources; social effects)		Awareness about COVID-19 disease and available vaccines		Beliefs and concerns about the disease of COVID-19 and possible consequences of vaccination	
Variables		**Mean (SD)**	***p*-value**	**Mean (SD)**	***p*-value**	**Mean (SD)**	***p*-value**	**Mean (SD)**	***p*-value**
Age	18–25	15/75(1/70)	0/001	18/48(2/76)	0/055	14/38(1/95)	0/419	15/04(2/46)	0/461
	26–35	15/87(1/54)		18/19(2/44)		15/25(2/47)		15/19(3/05)	
	36–45	15/61(1/49)		17/33(2/42)		14/74(2/31)		14/92(2/49)	
	46–55	14/50(1/86)		17/07(2/64)		14/53(2/45)		14/26(1/99)	
	> 55	15/79(2/33)		17/58(2/39)		14/36(1/91)		15/08(3/50)	
Education	High school	15/71(2/08)	0/423	18/78(2/71)	< 0/001	15/27(2/23)	0/152	15/08(2/76)	0/289
	diploma	15/61(1/57)		17/86(2/40)		14/87(2/28)		15/06(2/65)	
	Bachelor's degree	15/39(1/56)		16/94(2/19)		14/47(2/42)		14/70(2/69)	
	Masters degree and higher	14/86(1/51)		15/73(2/25)		14/08(2/56)		13/93(1/59)	
Number of children aged 0 to 12 living at home	0	15/38(1/60)	0/353	16/95(2/37)	0/009	14/05(2/26)	0/001	14/55(2/53)	0/144
	1to 2	15/59(1/76)		18/01(2/55)		15/12(2/30)		15/10(2/72)	
	> 3	15/76(1/71)		18/20(2/65)		15/41(2/35)		14/94(2/66)	
Occupation	Unemployed or retired	16/95(1/83)	0/004	17/90(2/34)	0/024	14/14(1/71)	0/025	15/95(3/84)	0/148
	housewife	15/21(1/44)		17/64(2/53)		15/21(2/45)		14/51(2/32)	
	Self employed	15/62(1/78)		18/21(2/47)		15/02(2/31)		15/19(2/62)	
	Employee	15/30(1/67)		16/68(2/57)		14/33(2/43)		14/71(2/67)	
	student	15/10(0/88)		17/44(1/94)		13/30(1/16)		13/90(1/66)	
Decrease in income due to COVID-19	No	15/43(1/42)	0/280	17/34(2/28)	0/028	14/89(2/43)	0/478	14/40(2/38)	< 0/001
	Yes	15/67(2/05)		18/16(2/79)		14/68(2/18)		15/64(2/84)	

three or more children at home, and those who experienced a decrease in income due to COVID-19 had higher contextual effects scores. Moreover, the awareness scores varied based on the number of children aged 0–12 at home ($p=0.001$), occupation ($p=0.025$), and marital status ($p=0.026$), such that the awareness scores were significantly higher in people with 3 or more children at home, married people, and the housewives. The score for beliefs and concerns differed significantly based on income reduction due to COVID-19 ($p=0.001$), being higher in those who faced a decrease in income. Other variables including gender, marital status, income, and the number of family members were not significant in any of the studied dimensions.

Figure 2 illustrates the main reasons for unwillimgness to receive the vaccine, presented as percentages and frequencies. The primary identified reasons were fear, lack of belief, unreliability, illness, and lack of access or time, respectively.

Figure 3 illustrates the reasons for vaccine non-receipt by gender. Lack of belief, fear, and lack of access or time were reported more frequently by men, while concerns about unreliability and illness were reported more often by women.

Figure 4 presents the reasons for refusing the vaccine by age group. The most frequently reported reasons were lack of belief and fear among those aged 55 years and above, concerns about unreliability in the 36–45 age group, lack of access or time in both the 36–45 and 46–55 age groups, and sickness in the 18–25 age group.

Discussion

According to our findings, the mean score of the individuals' health status and the perceived risk of contracting COVID-19 among the participants is 15.53, which indicates a moderate ststus in this dimension. Most of the participants had a normal body mass index (BMI), no underlying disease, no food or drug allergies, no history of hospitalization, and no smoking history. Additionally, most had the experience of contracting COVID-19 and had reported an average risk in terms of contracting this disease. These finding aligns with Crawshaw et al.'s study, which found that the hesitancy of people to the injection of COVID-19 vaccine was related to the perceived lack of need and a sense of good health [23]. In Alqudeimat et al.'s study, acceptance of the COVID-19 vaccine was related to several factors, including lifestyle, self-assessed

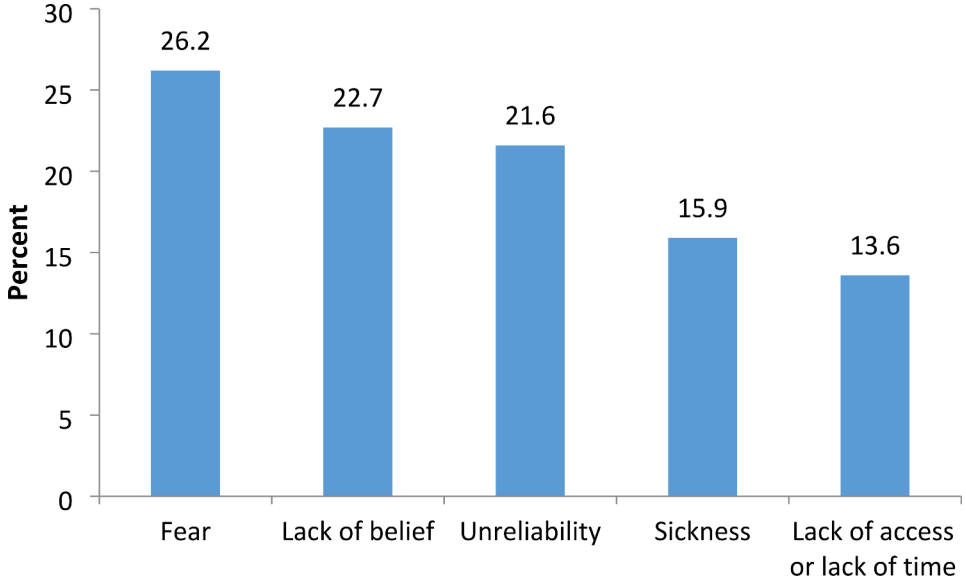

Fig. 2 The five main reasons for refusing the vaccine in the participants

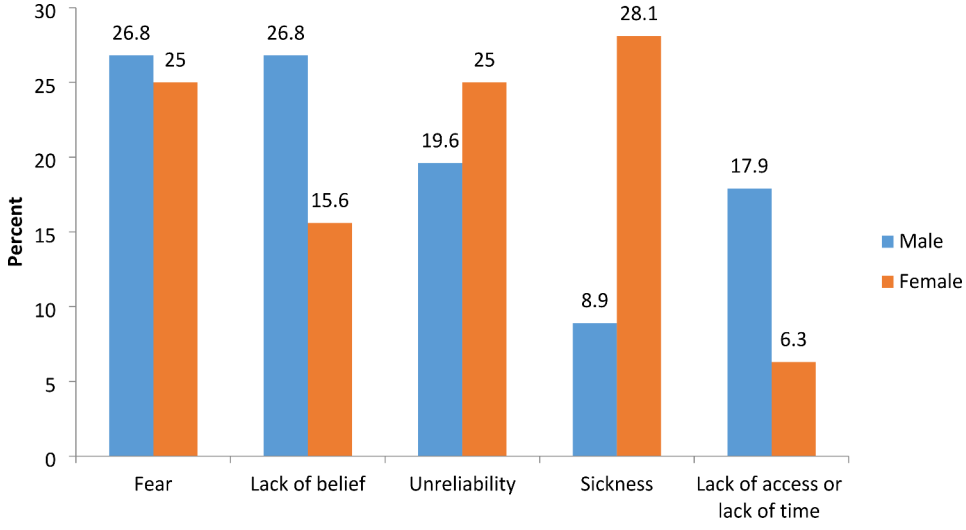

Fig. 3 Frequency of reasons for not receiving the vaccine by gender

health status, and the chance of contracting COVID −19 from the person's point of view [11].

Based on our findings, the mean score of contextual and social effects in non-vaccinated people is 17.68, which indicates an unfavorable status in this dimension as well as a negative impact of contextual and social factors on the decisions of non-vaccinated people. Most participants reported hearing about negative experiences, such as serious complications following vaccination among relatives or friends. Additionally, the absence of recommendations from healthcare providers regarding vaccine use further influenced their decisions. What is more, having not experienced the deaths of friends or family due to COVID-19 contributed to a false sense of safety, leading participants to underestimate the severity of the disease; they did not feel the deaths caused by the disease in the level of society. Crawshaw et al. similarly reported a significant relationship between social factors and lower acceptance of the COVID-19 vaccine [23]. In another study, Kamal et al. emphasized the role of social, demographic and health system factors in vaccine acceptance. According to their study, doctor's recommendation to receive the vaccine was one of the motivating factors for people's willingness to receive the vaccine [13]. In Jones et al.'s study, hesitancy to get the vaccine was related to the effects of the media, other people's experiences with the vaccine, and people's opinions on social networks [24].

Regarding the awareness dimension, the mean score is 14.8, which indicates a moderate level of awareness

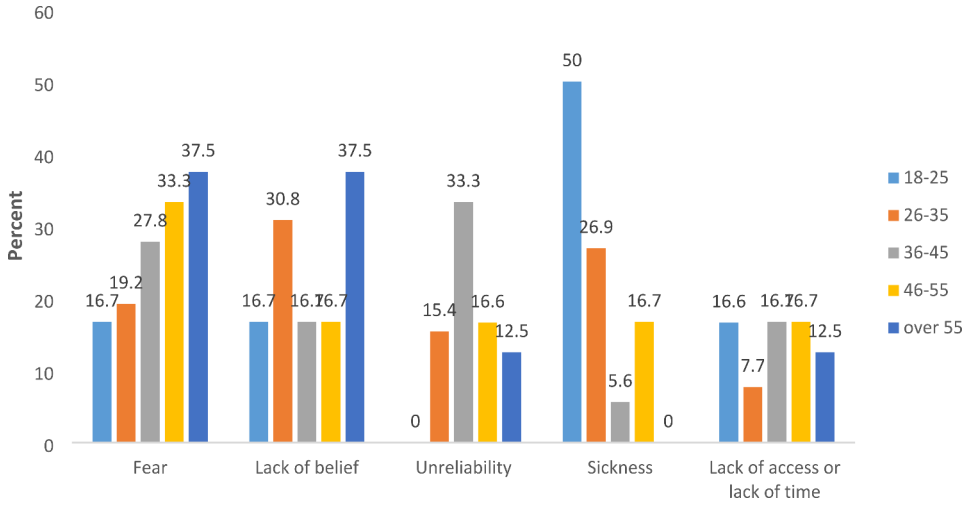

Fig. 4 Frequency of reasons for not receiving the vaccine by age

of the participants about the COVID-19 disease and the available vaccines. Many participants did not perceive COVID-19 as a serious illness and lacked sufficient information about how vaccination provides immunity and protects against infectious diseases. In four studies, including a qualitative study as well, lack of general knowledge about COVID-19 vaccines was mentioned as a barrier to vaccine acceptance [25–28]. The results of Alqudeimat et al.'s study also showed that the participants who believed that vaccines generally provide protection against infectious diseases were more likely to accept vaccination than those who were uncertain or believed vaccines posed health risks. Also, the participants who reported that vaccines have associated health risks were the least likely to accept COVID-19 vaccination compared to those who believed that vaccines were not associated with health risks. Additionally, the participants who disagreed with the development of natural immunity (i.e., developing immunity to infection and recovery) were more likely to accept vaccination against COVID-19, compared to those who agreed with the development of natural immunity [11]. Overall, these results showed the need to improve public knowledge and trust in the effectiveness and safety of vaccines in fighting infectious diseases.

In the dimension assessing the beliefs and concerns about the COVID-19 disease and the potential consequences of vaccination, the mean score is 14.91, which indicates a moderate status. In terms of trusting the effectiveness of the available COVID-19 vaccines, our findings reveal that most participants have expressed their concern about possible or unknown side effects of the COVID-19 vaccine and the confidence in the information, actions and policies of the government, the Ministry of Health, and the World Health Organization at an average level. Participants also exhibited uncertainty regarding conspiracy theories, such as the belief that COVID-19 was created by politicians and the pharmaceutical industry, as well as doubts about whether vaccination would reduce their fear of the disease. In many studies, conspiracy theories and mistrust have been identified as potential factors of vaccine non-acceptance [29–32]. In thie regard, Beleche states in his study that many Americans were skeptical about the available COVID −19 vaccines due to concerns about possible side effects, distrust of government oversight to ensure the safety of the vaccines, and concerns about the newness of the vaccines [33]. In Jones et al.'s study, the primary factors for increasing vaccine skepticism include mistrust of the vaccine in terms of safety and content, mistrust in the government and those who encourage the vaccine; concerns about known and unknown side effects (including fertility), and the belief that vaccination is unnecessary for those who are at low risk from the virus [24].

Our findings suggest that the acceptance of the COVID-19 vaccine is rather related to education, occupation, marital status, the number of children aged 0–12 living at home, and income reduction due to COVID-19 disease. In Al-Mansour et al.'s study, refusal to accept the vaccine was associated with age, nationality, monthly income, and chronic diseases. Their study showed that younger participants were more likely to express refusal or hesitation than older participants [34]. Conversely, Thanapluetiwong et al. did not find a negative correlation between age and vaccine refusal but noted a direct relationship between lower education levels and vaccine hesitancy [35], which is consistent with the findingd in our study. However, gender of the participants in the above-mentioned studies did not affect their refusal or hesitation [34, 35], which is consistent with our study. While some studies have shown greater acceptance of the vaccine among men [11], other studies have shown that

men are more reluctant to seek medical care [36, 37] and women are more willing to engage in preventive health behaviors [38, 39]. Therefore, the effect of gender on vaccine acceptance still remains a debated topic.

In general, the main reasons for not receiving the vaccine in our study included fear, lack of belief, unreliability, sickness, and lack of access or time. For instance, Jones et al. found that public distrust of vaccines, primarily due to concerns about side effects (especially unknown long-term effects), rapid vaccine development, lack of knowledge about vaccine ingredients, and skepticism towards government recommendations were the prevalent themes of skepticism [24]. In the study by Al-Mansour et al., concerns about the COVID-19 vaccines were significantly associated more with the refusal to receive the vaccine and the level of skepticism towards vaccinations. Most of these concerns have been mentioned about the safety and effectiveness of vaccines and lack of trust in pharmaceutical companies [34]. Also, in some studies, potential access issues in terms of education, time, convenience, and cost have been linked to lower vaccination acceptance [40–42].

Identifying community preferences and barriers to vaccination is essential for health providers to develop effective strategies for promoting vaccine acceptance, creating incentives for vaccination, and disseminating information to engage the public in achieving collective immunity. To address these barriers, practical measures at the system or policy level should be implemented, including enhancing transparency in the review process for vaccine safety and efficacy data, and publicly sharing information about the approval process. Additionally, communication strategies should prioritize the inclusion of minority voices, ensure equitable access to vaccines for all individuals regardless of their financial means, define priority groups or areas for vaccination, strategically plan the locations of vaccination sites, and conduct ongoing monitoring to ensure that equity remains central to allocation programs.

Conclusion

The findings of the currect study reveal that fear, lack of belief, unreliability, sickness, and lack of access or time are the most important factors influencing individuals' reluctance to accept the vaccine. To encourage COVID-19 vaccination, health organizations should consider the role of the mentioned factors in people's reluctance to accept the vaccine. To enhance public awareness, to acknowledge the fear associated with vaccination, and to reduce the fear of available vaccines, it is essential to provide comprehensive education and information about the available vaccines, including their benefits and potential side effects. Additionally, launching vaccination campaigns and strengthening inter-sectoral cooperation can improve vaccine accessibility. Involving non-governmental organizations can help build trust and encourage vaccination within communities. Furthermore, it is crucial to prevent competition among vaccine manufacturers and ensure a unified approach. Establishing telephone consultation units can provide support, and healthcare providers, including doctors, should be encouraged to advise their clients on the importance of vaccination. By implementing these strategies, health organizations can effectively promote vaccine acceptance and improve public health outcomes.

Strengths and limitations

This study represents a pioneering effort to conduct a comprehensive analysis of the factors influencing individuals' likelihood of receiving the COVID-19 vaccine. However, our study had limitations, including the non-generalizability of the results to other times and places due to the inherent limitations of cross-sectional studies, the prolongation of the data collection process due to the difficulty of getting the cooperation of non-vaccinated people to participate in the research, limited access to relevant institutional data, and lack of access to any study on the vaccinated population, preventing a comparative analysis between the two groups. Additionally, as we mentioned in the Method section, the list of unvaccinated individuals was obtained from the Health Department of Tehran and Shahid Beheshti Universities of Medical Sciences. Notably, this list indicated that the number of unvaccinated men was significantly higher than that of women, which influenced our sampling process. As our study focused exclusively on unvaccinated individuals, rather than those who referred to health centers, the gender distribution in our sample reflects this demographic characteristic. Therefore, the higher participation of males in our study should not be interpreted as indicative of health center referrals, where women may be more commonly represented.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12913-024-11880-6.

Supplementary Material 1.

Acknowledgements

The authors acknowledge the Tehran and Shahid Beheshti Universities of Medical Sciences for participate in the study.

Authors' contributions

OA, EF, AT and AO designed this study and determined its methods. OA, HM and MM conducted the collection, analysis and interpretation of the data with assistance from AO and AT for revising the analytical approach. All authors discussed the results and contributed to the final manuscript. OA, HM and EM wrote the manuscript. All authors contributed to the development and approval of the final manuscript. AO is the guarantor.

Funding
This research was funded by Health Equity Research Centre (HERC), Tehran University of Medical Sciences.

Data availability
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Prior to conducting telephone interviews, necessary information regarding the study and its objectives were given to the participants and informed consent was obtained verbally, with audio recordings made for verification. The current study is approved by the Ethics Committee of the Tehran University of Medical Sciences Research Center for Justice in Health (IR.TUMS.NIHR.REC.1400.013). All the used methods were performed in accordance with the relevant guidelines and regulations. It should also be noted that written consent was not necessary for this study because the names of the interviewees were not mentioned in the findings. Moreover, the participants were assured that their information would remain confidential and the data of the study would be analyzed anonymously.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 20 February 2024 / Accepted: 5 November 2024
Published online: 11 November 2024

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