



## Factors Associated with COVID- 19 Vaccine Acceptance Worldwide: A Rapid Review

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### Abstract

**Background:** While vaccines are acknowledged as one of the most successful public health measures, an increasing number of people doubt the safety or necessity of vaccines. We aimed to assess and identify the factors associated with COVID- 19 vaccination acceptance worldwide.

**Materials and Methods:** In this review, a systemic search of online databases (Medline, EMBASE, Scopus, Web of Science, Cochrane Library, CIVILICA, and Google Scholar search engine) was conducted for related studies with no time limit up to December 2021.

**Results:** The percentage of individuals willing to receive a COVID-19 vaccine across worldwide studies ranged from 23.1% to 92%. Willingness to vaccinate was dependent on factors such as male gender, older age groups (aged 65 or older), race (Asian race), higher income, ethnicity (Hispanic ethnicity), specialists' recommendations, access barriers (location of vaccine delivery, relative cost, time and distance to access vaccine), and a higher level of education. Hesitancy was mostly driven by vaccine safety concerns, perceived effectiveness, distrust in health officials or public health experts to ensure vaccine safety, lack of vaccine offer or lack of communication from trusted providers and community, vaccine characteristics (i.e., ways the vaccine will be administered and where the vaccine is made), and speed of vaccine development and was associated with fear of known or unknown long-term side effects.

**Conclusion:** The top three reasons people agree to vaccinate were "to protect themselves and others", "belief in vaccination and science", and "to help stop the virus spread". Willingness to vaccinate differed by age, gender, race, income status, ethnicity, specialists' recommendations, access barriers (including the location of vaccine delivery, relative cost, time, and distance to access a vaccine), and education.

**Key Words:** Acceptance, COVID-19, Hesitancy, Vaccination, Worldwide.

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## 1- INTRODUCTION

There is a general consensus that the only way to ensure safety is to control the global epidemic in a large percentage of the population, and the vaccine is one of the best and least dangerous methods of immunization of large populations in a short time (1, 2). Previous experiences in the world and the country confirm that the high level of acceptance and coverage of vaccination are important elements in the success of immunization programs (3-5). According to available estimates on achieving group, safety with vaccination, and assuming the vaccines are 100% effective, between 60 and 70 percent of the population should be immunized against COVID-19 (6, 7). Due to the lower level of effectiveness of vaccines currently available in the world, this percentage needs to be higher. The World Health Organization (WHO) has identified skepticism about vaccination, unwillingness for or refusal to vaccinate despite its availability as one of the top ten global health threats in 2019 (8-10). Doubts about vaccination are influenced by many factors. One of these key factors is distrust in the vaccine. According to the results of some studies, concerns about the efficacy and safety of the vaccine (11), fake news on social media and the Internet (10, 8), publication of false and misleading scientific results by anti-vaccine activists on social networks (12), negative perceptions of the rapid development of the vaccine along with recurrent side effects can reinforce the belief that vaccines can cause disease rather than prevention (13), and increase distrust in the vaccine. Knowing the effective factors in accepting the COVID-19 vaccine in the target population and identifying barriers are important strategies to improve the coverage of vaccination among the population. Therefore, the aim of the present study was to assess and identify the factors associated with

COVID-19 vaccination acceptance worldwide.

## 2- MATERIALS AND METHODS

### 2-1. Data sources

In this review study, a systemic search of electronic databases of Medline (via PubMed), SCOPUS, Web of Science, EMBASE, Cochrane Library, CIVILICA, and Google Scholar search engine was performed with no time limit up to December 2021, using the following keywords alone or in combination: "Corona or Coronavirus", "COVID-19", "Factors Associated", "Affecting Factors", and "Acceptance". The studies were written in English or Persian. The search was done independently and in duplication by two reviewers, and any disagreement between the reviews was resolved by the supervisor.

### 2-2. Inclusion and exclusion criteria

Inclusion criteria were all qualitative and survey (observational) data; cross-sectional, experimental, prospective, and cohort study designs in English or Persian. Studies that collected data in the period since COVID-19 vaccine approval were included. Animal studies, case reports, letters to the editor, and studies without access to the required statistical data were excluded.

### 2-3. Study selection

Database search was done for suitable studies, abstracts of the studies were screened for identification of eligible studies, full-text articles were obtained and assessed, and a final list of eligible studies was made. This process was done independently and in duplication by two reviewers, and any disagreement was resolved by a third reviewer. References were organized and managed using EndNote software (version X8).

### 3- RESULTS

Willingness to receive a COVID-19 vaccine upon availability varied considerably across countries during the pandemic.

#### Iran

1. The results of a study on 10,843 people in Qazvin showed that 19.4% of the population would not inject any vaccine, and 29.5% stated that they would only inject a foreign-made vaccine. The findings also showed that the willingness for vaccination was higher in men, married people, people with university education, and rural residents (2).

2. According to the results of a study on 384 adults over 18 years in Bushehr, the average trust in the vaccine product was estimated at  $3.34 \pm 1.08$ , trust in vaccine manufacturers  $3.12 \pm 0.29$ , trust in government and health officials  $3.24 \pm 0.38$ , and overall trust at  $3.23 \pm 0.48$  (total score= 5) (14).

3. In a cross-sectional study on 850 people in Tehran and Kermanshah, the frequency of willingness to receive the COVID-19 vaccine in participants was 66.47%. Of these, 86.02% reported that they will receive any vaccine approved by the Ministry of Health (Iranian / foreign), and 98.13% stated that they would use only the foreign-made vaccine (if available). The variables of age and socio-economic status were significantly related to the tendency to receive the vaccine. According to the results of this study, the tendency to accept the COVID-19 vaccine was moderate (15).

4. The results of a study with a target population of 370 Iranians showed that 65.7% of the population were willing to pay for the vaccine. In this study, people were willing to pay for vaccinations, which shows its importance from the people's point of view (16).

#### USA

1. A review of 40 studies showed that the percentage of individuals willing to accept a COVID-19 vaccine across North American studies (15/40) ranged from 40% to 92%. Factors associated with vaccine acceptance focused predominantly on Opportunity and Motivation. Capability factors focused on 'Knowledge'; Opportunity factors identified included 'Environmental context and resources' and 'Social influences', and Motivation factors included 'Beliefs about consequences', 'Social/professional role and identity', 'Reinforcement', and 'Emotion'. Across studies, mistrust in governments and public health agencies was related to lower vaccination acceptance. Overall, 10/40 studies assessed whether vaccine acceptance was associated with race and ethnicity (e.g., Black, Latino, and Asian participants were less likely to express vaccine acceptance vs. white respondents) (17).

2. In a national survey of 1,000 people in 2020, results showed that only about a third of the US population reported that they were highly likely to receive a vaccination for the coronavirus and about one in five adults reported that they are very unlikely to take the vaccine under any circumstances (18).

3. A cross-sectional online survey of 1,425 parents with children under 18 years aimed to compare COVID-19 vaccine hesitancy (VH) in socio-demographic groups living in Chicago and Cook County, USA (2020). The results showed that 33% of parents reported VH for their children. Non-Hispanic Black parents, parents with lower income, and parents of children with public health insurance had higher levels of VH than compared peers. Additionally, the researchers found lower levels of VH in parents who used family, internet, and health care providers as sources of information about COVID-19 compared to parents who did not use these sources (19).

4. Results of an analysis (survey data from the US Census Bureau's Household Pulse Survey) in the USA showed that the largest declines in vaccine hesitancy were observed among those aged 18-24 and Blacks. The results indicated that differences in the intent to get vaccinated for COVID-19 still exist between racial and ethnic groups (20).

5. Results of the analyzed data from the US Census Bureau's Household Pulse Survey of 459 235 US households in 2021 showed that overall, 10.2% would probably not receive a vaccine and 8.2% would definitely not receive a vaccine. Income, education, and state political leaning strongly predicted vaccine hesitancy. The prevalence of vaccine hesitancy was the highest among younger age groups, black Americans, those of  $\geq 2$  races, those with lower education, those with lower income, and those living in Republican-leaning states. Also, two of the top three reasons cited by those who would "definitely NOT" receive a vaccine were related to distrust: 49.0% did not trust the COVID-19 vaccine and 40.0% did not trust the government (21).

6. A study including clinical and non-clinical staff, researchers, and trainees (2020) in a medical university in the US showed that 80.4% of scientists and physicians agreed they would receive the vaccine if offered, but 33.6 percent of registered nurses, 31.6 percent of allied health professionals (physical, occupational, and respiratory therapists, radiology technicians), and 32 percent of Master's level clinicians were unsure whether they would receive the vaccine (22).

7. In an online survey data from 1,062 college students in South Carolina (USA) in 2020 aimed to explore COVID-19 vaccine acceptance among college students, 60.6% of college students were likely or definitely to receive a COVID-19 vaccine, 24.3% were considered as refusal

group, and 15.1% were considered as hesitant. Duration of vaccine protection, vaccine accessibility, and authoritative advice (e.g., if vaccination is recommended by schools, government, or doctors) were considered important among the acceptance group. Negative consequences of vaccination and vaccine characteristics (i.e., ways the vaccine will be administered, and where the vaccine is made) were considered important by the refusal group (23).

### **Turkey**

A cross-sectional study in Turkey among 384 people aimed to estimate the frequency of vaccine refusal against COVID-19 vaccines and to identify the underlying factors for refusal or hesitation. The results showed that 45.3% of the participants were hesitant about receiving the COVID-19 vaccine and 89.6% of the participants were hesitant about getting their children vaccinated. Those who do not consider COVID-19 disease as a risk to their health were 22.9%, and 32.8% thought that they would be protected from the disease by natural and traditional ways (24).

### **Middle-income countries**

In a study, using data from 20,176 respondents in 13 studies in ten middle-income countries (LMICs) in Africa, South Asia, and Latin America, acceptance averaged 80.3%, ranging between 66.5% and 96.6% compared with the United States (mean 64.6%), and Russia (mean 30.4%). Vaccine acceptance in LMICs was primarily explained by an interest in personal protection against COVID-19, while concern about side effects was the most common reason for hesitancy. The personal protective benefit of vaccination was the most frequently cited reason for vaccine acceptance. Concern about side effects was the most commonly cited reason for vaccine hesitancy (25). The

acceptance rate in every LMIC sample is higher than in the United States (64.6%, 95% CI: 61.8–67.3%), and Russia (30.4%, 95% CI: 29.1–31.7%).

### Australia

1. Results of an Australian longitudinal study showed that in June, 87% (1195 of 1371) of the participants said they would receive the COVID-19 vaccine if it became available (26); in July 2020, this percentage was 90% ( $p=0.030$ ,  $n=997$ ).

2. The results of a content analysis showed that the most common reasons for willingness or reluctance to receive a COVID-19 vaccine included "to protect themselves and others" (29% [817 of 2859]), "belief in vaccination and science" (16% [448 of 2,859]), and "to help stop the virus spread" (15% [419 of 2,859]). Willingness to vaccinate differed by both age and education ( $p<0.05$ ) (27).

### China

Results of a study aimed to estimate the COVID-19 vaccine demand and hesitancy in China with a total of 3,541 complete responses, showed that 83.5% reported vaccination intent, of which only 28.7% stated a definite intent. Perceived benefits have a strong and positive effect on vaccination intention. Concerns of side-effects and efficacy negatively influenced the vaccination intention. Knowing the vaccine has been received by many in the public may serve as a cue to action for vaccination intent. Nearly two-thirds reported a preference for a domestically-made over foreign-made COVID-19 vaccine (28).

### UK

1, 2. Results from the UK Household Longitudinal study showed that 82% of participants were willing to receive the COVID-19 vaccine. Females were more likely to be vaccine-hesitant compared to males. Younger people were more likely to

be vaccine-hesitant. The highest intention to vaccinate was in the 75+ age group with 96% stating that they would be likely/very likely to be vaccinated. Vaccine hesitancy was the highest in Black or Black British groups, with 72% stating they were unlikely/very unlikely to be vaccinated. Pakistani/Bangladeshi groups were the next most hesitant ethnic group with 42% being unlikely/very unlikely to be vaccinated. Any other groups with White background (including Eastern European groups) also had a higher chance of unwillingness to be vaccinated. Barriers to vaccinating include perception of risk, low confidence in the vaccine, distrust, access barriers, inconvenience, socio-demographic context, and lack of endorsement, lack of vaccine offer, or lack of communication from trusted providers and community (29, 30).

3. In a non-probability online survey with 5,114 UK adults (18+ years old) in 2020, results showed that 71.7% ( $n=3,667$ ) were willing to be vaccinated, 16.6% ( $n=849$ ) were highly unsure, and 11.7% ( $n=598$ ) were strongly hesitant. Hesitancy was associated with younger age, female gender, lower income, and ethnicity (31).

### USA and UK

1. Around 36% in the UK and 51% in the US reported they are either uncertain or unlikely to be vaccinated against COVID-19. The anti-vaccination group is heterogeneous, with misinformation characterized by 1) distrust in science and the selective use of expert authority, 2) distrust in pharmaceutical companies and government, 3) simplistic explanations, 4) use of emotion and anecdotes to impact rational decision-making, and 5) development of information bubbles and echo chambers (32).

2. In another study, 36% and 51% of respondents in the UK and US, respectively, reported they were

‘uncertain’ or unlikely to be vaccinated (33).

### **Canada**

1. The results of a study based on a Statistics Canada crowdsourcing online questionnaire conducted in 2020 showed that 57.5 percent of the population indicated that they would very likely receive a COVID-19 vaccine, whereas 19 percent reported they are somewhat likely to receive vaccinated. Canadians who were aged 65 or older and had higher levels of education (higher than a bachelor’s degree) were more likely to receive a COVID-19 vaccine. Results showed that Canadians who are unlikely to vaccinate are mostly concerned about vaccine safety, risks, and side effects. The top two reasons were a lack of confidence in the safety of the vaccine (54.2%), and concerns about its risks and side effects (51.7%) (34).

2. Another study reported that 48 percent of Canadians would get immunized immediately. People older than 65 were most likely to get immunized. People reporting they would wait to get vaccinated or not receive a vaccine expressed concern for long-term side effects (35).

3. The Social Contours and COVID-19 survey in Saskatchewan (Canada) reported those who showed vaccine hesitancy (did not know if they would accept the vaccine) had lower education, were female, newcomers (last 20 years), or Indigenous, and reported high or moderate risk to exposure in the past seven days (36).

4. Another study reported that 74 percent of Calgarians (Canada) intended to receive a COVID-19 vaccine when available to the public. Older people (aged 65 or older) were more likely to receive a COVID-19 vaccine compared to younger Calgarians (37).

5. A review by Mondal et al. (2021) showed that a higher willingness to

vaccinate was associated with factors of the male gender, older age, being a physician, less work experience, comorbidities, acceptance of seasonal influenza vaccination, higher confidence in the vaccine, positive attitude towards a COVID-19 vaccine, fear about COVID-19, individual perceived risk about COVID-19, and contact with suspected or confirmed COVID-19 patients. Hesitancy was mostly affected by vaccine safety concerns, perceived effectiveness, distrust in the ministry of health or public health experts to ensure vaccine safety, speed of vaccine development, and associated side effects (38).

### **US and Canada**

A cross-sectional study across the US and Canada reported that 20 percent of Canadians would not get vaccinated if the vaccine was available. The most significant correlation was between vaccine refusal and mistrust of the benefit of a COVID-19 vaccine. Female gender, completed or partial college education compared incomplete education, being unemployed, and minority status were all significant factors for vaccine refusal (39).

### **Pakistan**

Results of a study in Pakistan (with 318 participants) showed that concern for serious side effects was the most common issue (154, 48.42%) among all groups of people. The participants reported that they might be convinced to get vaccinated if more published data related to vaccine efficacy and safety is available (118, 37.1%), they observe no side effect in vaccine recipients (90, 28.3%), or if higher government officials receive the same vaccine (39, 12.3%). The main reason for hesitancy was the fear of known or unknown long-term side effects (48.42%). Other important concerns included doubts over vaccine efficacy and past COVID-19 infection being considered protective

against reinfection. The participants reported that they might be convinced to receive the Sinopharm vaccine if more published data related to vaccine efficacy and safety is available, if they observe no serious side effects among vaccine recipients or if higher government officials receive the same vaccine (40).

### France

A survey in France among healthcare workers (2020) reported 'high' acceptance in 48.6 percent and hesitancy/reluctance in 28.4 percent (41) of the participants.

### Portugal

A study on 1,943 individuals to assess and identify factors associated with COVID-19 vaccine hesitancy in Portugal (2020-21) showed that 35% of the participants would receive the vaccine as soon as possible, 56% would wait before receiving the vaccine, and 9% would not receive the vaccine. Younger age, loss of income during the pandemic, no intention of receiving the seasonal flu vaccine, low confidence in the COVID-19 vaccine and the health service response during the pandemic, worse perception of government measures, perception of the information provided as inconsistent and contradictory, and answering the questionnaire before the release of information regarding the safety and efficacy of COVID-19 vaccines were associated with both refusal and delay (42).

### South Africa

Burger et al. analyzed from Wave 4 of the NIDS-CRAM Wave 4 and reported that 29% of South African adults were hesitant about vaccines. The main reasons for low vaccine intent were being worried about side effects (31%), disbelief in their effectiveness (21%), distrust in vaccines or being against vaccines in general (18%), and being afraid or feeling unsure about

the safety of the new vaccine (14%). Results showed that younger individuals (18–24 years), and Africans/Blacks (74%) were significantly more likely to be vaccine-hesitant than older individuals. Also, of adults with tertiary education, 75% were willing to receive a COVID-19 vaccine (43).

### Other studies

**1.** In a rapid review, results showed that a community-level vaccine coverage of 80+% will be required to protect the community from infection, depending on the vaccine efficacy and duration of protection (44).

**2.** In recent studies in 19 countries, the percentage of people reporting they would receive a 'proven, safe, and effective vaccine' ranged from 90% in China to 55% in Russia (45).

**3.** A systematic review of 11 studies (2020) on Health Care Workers' intention to accept COVID-19 vaccination reported that the acceptance for vaccination was 55.9 percent (46).

**4.** Between April and July 2020, willingness to vaccinate has ranged from 58% in the USA (47) to 64% in the UK (48), and 74% in New Zealand (49).

**5.** Results of a national cross-sectional survey using an internet panel of 957 people (606 Jews, 351 Arabs), aged 30 and over in 2020 showed that 27.3% of the Jewish men and 23.1% of the Arab men wanted to be vaccinated immediately, compared with only 13.6% of Jewish women and 12.0% of Arab women. Higher education was associated with less vaccine hesitancy. Also, the ethnic and gender differences persisted after controlling for age and education. Other factors associated with vaccine hesitancy were the belief that the government restrictions were too lenient and the frequency of socializing before the pandemic (50).

**6.** Results of 1,941 questionnaires (healthcare workers and members of the general Israeli population) regarding the acceptance of a potential COVID-19 vaccine showed that healthcare staff involved in the care of COVID-19 patients and individuals considering themselves at risk of disease were more likely to self-report acceptance to COVID-19 vaccination. In contrast, parents, nurses, and medical workers not caring for COVID-19 patients expressed higher levels of vaccine hesitancy. Vaccine acceptance among doctors (78%) was significantly higher than nurses (61%;  $p < 0.01$ ). There was a significantly higher intended COVID-19 vaccine compliance (96%) among responders who lost their job during the crisis or who stayed home but were confident about returning to work when possible ( $p < 0.01$ ). Of greatest concern to both physicians and the general population alike were fears of the vaccine's safety, especially given its rapid development (51).

#### 4- CONCLUSION

The percentage of individuals willing to accept a COVID-19 vaccine across worldwide studies ranged from 23.1% to 92%. The top three reasons for agreeing to vaccinate were "to protect themselves and others", "belief in vaccination and science", and "to help stop the virus spread". Willingness to vaccinate differed by age, gender, race, lower income, ethnicity, specialists' recommendations, access barriers (including the location of vaccine delivery, relative cost, time, and distance to access vaccine), and education. Hesitancy was mostly caused by vaccine safety concerns, perceived effectiveness, distrust in the ministry of health or public health experts to ensure vaccine safety, lack of vaccine offer or lack of communication from trusted providers and community, vaccine properties (i.e., ways the vaccine will be administered and where the vaccine is made), speed of vaccine

development, and associated side effects. Being younger (<25 years), female gender, loss of income during the pandemic, no intention of taking the seasonal flu vaccine, low confidence in the COVID-19 vaccine and the health service response during the pandemic, worse perception of government measures, perception of the information provided as inconsistent and contradictory, and answering the questionnaire before the release of information on the safety and efficacy of COVID-19 vaccines were associated with both refusal to and delay in vaccination.

#### 5- AUTHORS' CONTRIBUTIONS

Study conception or design: AF, and HA; Data analyzing and draft manuscript preparation: MM, and HA; Critical revision of the paper: AF, and HA; Supervision of the research: AF and HA; Final approval of the version to be published: AF, MM, and HA.

**6- CONFLICT OF INTEREST:** None.

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