



REVIEW ARTICLE

The willingness of COVID-19 vaccination and associated factors: A systematic review

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Abstract

Aim: Vaccination is an effective approach to avoid infection and reduce morbidity and mortality of infectious diseases. However, in previous infectious disease vaccination programs, some people were hesitant to get vaccinated. To develop an effective vaccination program or policy, the government or public health officials need to understand the factors that influence the willingness of COVID-19 vaccination from the various studies.

Methods: Between 1-18 December 2020, articles were searched from PubMed and ScienceDirect with the following key terms: Willingness, Acceptance, Acceptability, COVID-19 vaccine, and COVID-19 vaccination. Eligibility for article inclusion criteria was determined by PRISMA.

Results: 20 studies were included in this review. All studies were conducted in the early days of the COVID-19 pandemic. The willingness of COVID-19 vaccination ranged from 60-97% among the general population, 28-63% among healthcare workers, 56-65% among parents or caregivers, and 73% among factory workers. The common factors that affected the willingness of COVID-19 vaccination: gender, age, education, individual perception about diseases and the vaccine, trust in the government, statements of public health officials and health providers.

Conclusion: Concerns about disease risk, effectiveness, and side effects are important factors associated with vaccination willingness. To avoid vaccination hesitancy in the community, public health officials need to disseminate detailed information about the vaccines like efficacy level and side effects, and continue to provide information about the risks of COVID-19 for personal health and others through various online media to avoid vaccination hesitancy.

Keywords: *COVID-19, determinants, vaccination willingness.*

Conflicts of interest: None declared.

Introduction

Until the end of 2020, there was no cure or herd immunity for the COVID-19 outbreak. The pandemic is a serious threat to public health and welfare (1). Vaccination is an effective approach to stop and prohibit infection and reduce morbidity and mortality of infectious diseases (2). In 2020, several countries had developed and distributed COVID-19 vaccines to reduce and eradicate the COVID-19 outbreak (3). During a disease pandemic such as the COVID-19 pandemic, vaccines must be developed and distributed effectively and efficiently. Some people were still hesitant to get vaccinated in previous infectious disease vaccination programs (2). Therefore, it is necessary to formulate a vaccination program or policy that can encourage people to get vaccinated. To develop an effective vaccination program or policy, the government or public health officials need to understand the factors that influence people's decisions to accept or reject vaccines. In 2020, several surveys have examined the acceptance or willingness of the COVID-19 vaccine and the determinant factors. Therefore, this systematic review of published articles combined data from related surveys and identified factors that influence COVID-19 vaccination willingness in the general and specific populations.

Methods

Search Strategy

We searched for articles indexed in the electronic databases of PubMed and Sciondirect with the following key terms: Willingness, Acceptance, Acceptability, COVID-19 vaccine, and COVID-19 vaccination. Articles were searched 1-18 December, 2020. The search terms were combined with the Boolean operator as follows: “(willingness OR acceptance OR acceptability) AND (covid-19 vaccine OR covid-19 vaccination)”.

Furthermore, relevant articles had extracted from the references section of the manuscripts found in the initial search.

Selection criteria

We searched articles that examine the willingness or acceptance of COVID-19 vaccination. We included observational research articles; research on the prevalence of willingness to take the COVID-19 vaccine, and COVID-19 vaccination willingness/acceptance factors. We excluded articles: systematic reviews, narrative reviews, data articles, letters to editors, and published on pre-print or pre-proof servers; articles published in languages other than English; information about COVID-19 vaccination acceptance or hesitancy was unclear. Eligibility for article inclusion and exclusion criteria determined by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) according to the diagram in Figure 1.

Results

Study Selection

822 articles were found in the electronic database PubMed and Sciondirect. From the search results, 20 articles met the selection criteria for further analysis (Figure 1).

Study Characteristics

The studies included in the analysis observed general populations (70%) (4-17) healthcare workers (15%) (18-20) parents and caregivers (10%) (11,21) and factory workers (5%) (22). All surveys in reviewed articles were self-administered (based on online surveys), and the sample size ranged from 613 to 13,426 respondents. The studies mostly surveyed in China, US and European Countries and were mostly conducted in the early days of the pandemic before the COVID-19 vaccine availability in the respective countries. 40% articles were published in journals on vaccines (Table 1).

Vaccination Willingne

The reported willingness to participate in the COVID-19 vaccination ranged from 60.0% to 97.0% among general population respondents (4-7,9,10,12-17,23), 27.7% to

63.0% among healthcare workers (18-20), 55.8%-65.0% among parents or caregivers (11,21), and 72.6% among factory workers (22).

Figure 1. PRISMA diagram of studies selected

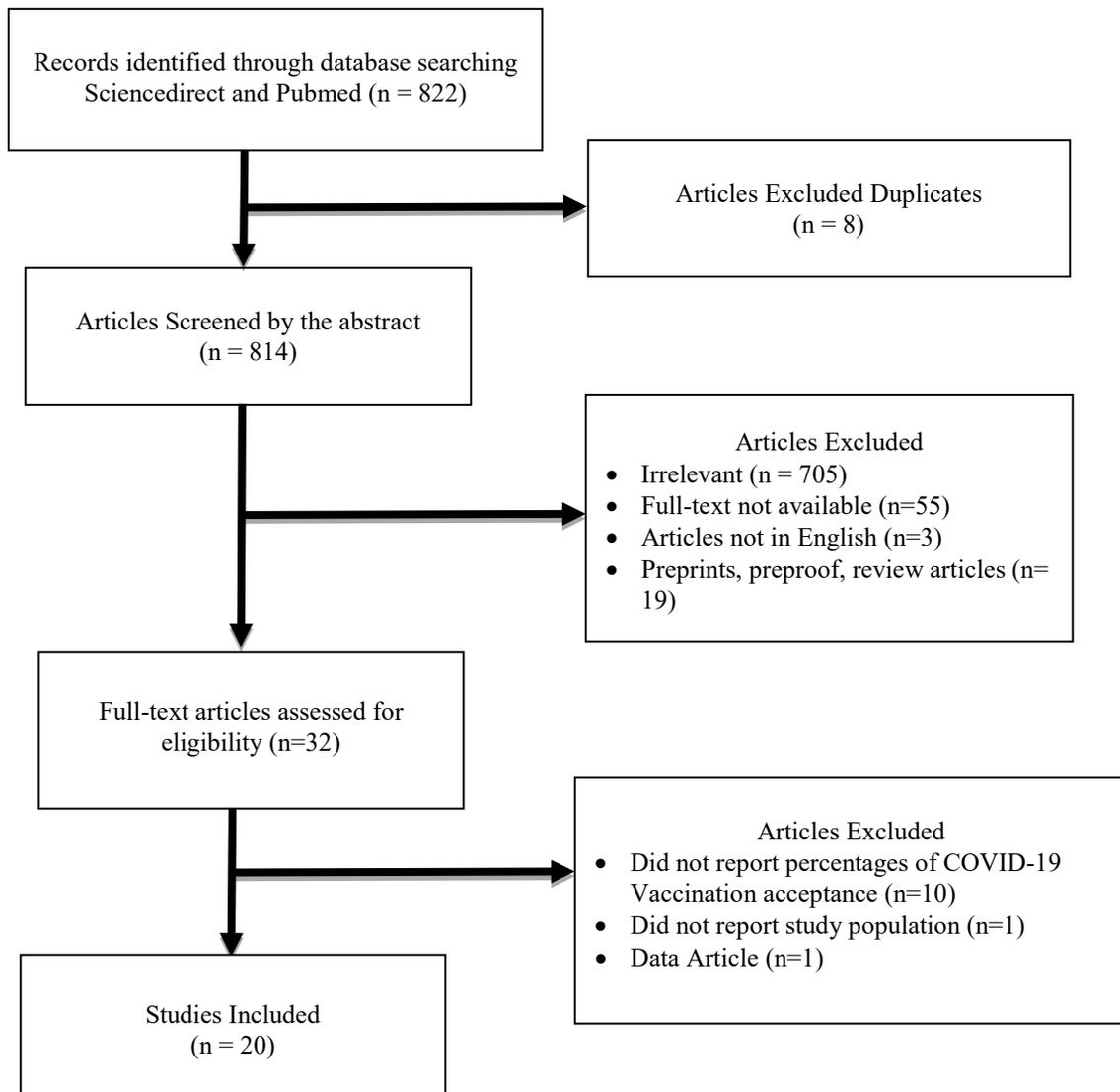


Table 1. Study characteristics

Study	Journal	Year	Country	n	Time of Study	Data Collection Method	Characteristic of Participants	COVID-19 Vaccination Willingness
Kwok, Kin On et al (18)	International Journal of Nursing Studies	2020	China	1205	mid-March and late April 2020	Online survey	Nurses with mean age = 40.79, mostly female nurses (90%).	63%
Bell, Sadie et al (21)	Vaccine	2020	England	1252	April 19 and May 11, 2020	Online survey and structure interview	parent or guardian of a child aged ≤18 months, England residents, and aged above 16 years.	Definitely Accept: 55.8%; Unsure but leaning towards yes: 34.3%
Guidry et al (4)	American Journal of Infection Control	2020	US	788	Jul-20	Online survey	General Populations above 18 years	60% definitely or probably willing to take COVID-19 vaccine.
Karlsson et al (5)	Personality and Individual Differences	2020	Finland	1325	3rd and 17th of April 2020	Online survey	General Populations whose Facebook users	¼ of respondents (21.83% likely, 51.1% very likely)
Malik et al (10)	EClinical Medicine	2020	US	672	May-20	Online survey	General Populations above 18 years	67%
Goldman et al (11)	Vaccine	2020	Canada, USA, Japan, Spain, Switzerland, Israel.	1541	March 26- May 31, 2020	Online survey	Caregivers and their children arrive to 16 pediatric Emergency Departments (ED)	65%
Sarasty et al (12)	Vaccine	2020	Ecuador	1,050	April 2 to 7, 2020	Online survey	General Populations	97%
Detoc et al (23)	Vaccine	2020	France	3259	March 26 to April 20, 2020	Online survey	General Populations above 18 years and adult patients in France.	77.6% (general populations) 81.5%, (healthcare workers) 73.7% (non-healthcare workers)
Leng et al (13)	Vaccine	2020	China	1883	Not reported	Online survey	General Population in some Chinese provinces.	84.77%
Reiter et al (14)	Vaccine	2020	United States	2,006	May-20	Online survey	US General Populations aged ≥18 years	69%
Wang K. et al (19)	Vaccine	2020	China	806	26 February and 31 March 2020	Online survey	Nurses	40.0%
Wang J. et al (15)	Vaccine	2020	China	2058	Mar-20	Online survey	General Populations above 18 years in China	91.3%
Harapan et al (16)	Frontiers in Public Health	2020	Indonesia	1,359	March 25 and April 6, 2020	Online survey	General population in Indonesia	93.3% (95% effective vaccine), 67.0% (50% effectiveness)
Lazarus et al (17)	Nature Medicine	2020	19 countries	13,426	Jun-20	Online survey	General populations in 19 countries	46.8% and 24.7% Completely and somewhat agree.
Palamenghi et al (6)	European Journal of Epidemiology	2020	Italy	968	Not reported	Online survey	General Populations	59%
Al-Mohaithef et al (7)	Journal of Multidisciplinary Healthcare	2020	Saudi Arabia	992	Not reported	Online survey	General population in 4 major cities (Dammam, Jeddah, Riyadh, and Abha) in Saudi Arabia	642 have an interest to accept the COVID-19 vaccine
Salali et al (8)	Cambridge University Press	2020	UK and Turkey	UK: 1088 Turkey: 3936	May-20	Online survey	General Populations above 18 years	Not reported
Nzaji et al (20)	Pragmatic and Observational Research	2020	Congo	613	March to April 30, 2020	Online survey	HCWs in some referral Hospital and University Hospital in Lubumbashi, Mbuji-Mayi, and Kamina towns	27.7%
Zhang et al (22)	JMIR Pediatrics And Parenting	2020	China	1052	September 1 to 7, 2020	Online survey	Factory workers in Shenzhen who had at least 1 child under 18 years	72.6%
Neumann-Böhme, Sebastian et al (9)	The European Journal of Health Economics	2020	Germany, Italy, Denmark, France, Portugal, the Netherlands, UK	7664	2 and 15 April, 2020	Online survey	General populations	73.9%

Socio-Demographic Factors

Several studies have reported that socio-demographic factors influence a person's decision to take the COVID-19 vaccine. Most studies show that men were more interested to participate in the COVID-19 vaccination than women, both in the general populations and among healthcare workers (4,8-11,14,15,17,19,20,23). Several studies have shown that age is related to the decision to take the COVID-19 vaccine. People in the older age groups (≥ 40 years) were more willing to take the COVID-19 vaccine (5-7,9-11,13,17,20,23), but one study showed the opposite (18). Meanwhile, in the young and middle age groups, there was no consistency, several studies reported that the younger (< 24 years) (6,18) or middle age groups (24- < 40 years) (17) were more willing to take the vaccine, other studies reported opposite results (6,17). Four articles reported that the education level is associated with the willingness to participate in COVID-19 vaccination, but there was inconsistency in the results. Three articles reported that people showed more willingness with higher education (4,10,17) to get COVID-19 vaccine, while one article reported this for people with lower education (13). Other demographic variables related to willingness to participate in vaccination against COVID-19 are being married, marital status (7,15), working as a healthcare workers (20,23), working in private services (19), and household income (13,14,17,21).

Determinant of willingness

The factors or reasons that influence the general population's willingness to participate in Covid-19 Vaccination vary considerably. Common factors or reasons to accept COVID-19 vaccination are perceptions to contract more likely COVID-19 (5,7,8,13-15) and COVID-19 as a severe/dangerous disease (5,14,23), those

who had a higher perceived-risk level of COVID-19 infection (10,14,16,23), those who had been vaccinated against influenza (11,15,19), those who had higher trust that the vaccine is safe (5,6,13,20), living in a country or place with a higher number of COVID-19 cases (14,15,17) or if vaccine was free, cheap, or convenient (13,15,16), other factors are less frequently named in the selected literature. Among parents or caregivers, the factors that influence the willingness to get COVID-19 vaccination for their children were: age of the child (11,22), family support, perceived behavioral control about COVID-19 vaccination in children, had a higher exposure to positive information about COVID-19 vaccination, avoiding social gatherings with other people or crowded places (22), having children that were up-to-date on their vaccines and had no chronic illness; caregiver/parents that have concerns about their child and others (11), and having 2-3 children (21). Several factors that make people refuse to be vaccinated are: those who are concerned about the vaccine safety and side effects (9,11,13-15,17,19), concerns related to vaccines that are new or developed rapidly (11,19), concerns about the effectiveness of vaccines to prevent transmission of COVID-19 (16,19), if vaccines have a short protection duration (≤ 2 years), and required higher doses (13).

Discussion

Before the COVID-19 vaccine was available, all affected countries found it difficult to control the spread of COVID-19 by enforcing quarantine, lockdowns, social distancing, and mandatory use of face masks while in public places, and travel restrictions. The current pandemic has caused tremendous physical and psychosocial health impairments for society and has driven massive problems in the global economy. Therefore, various

countries have started to develop vaccines. Vaccines are an effective way to control the transmission of communicable disease outbreaks (24). There has been a lot of research to determine the vaccine acceptance/willingness and its associated factors. Based on this review, the willingness to get the COVID-19 vaccine varies considerably among general populations and healthcare workers. Most studies report a willingness to be vaccinated in the range of 50-70%. These results need essential consideration to support vaccination programs in the general populations and particular groups.

Socio-demographic factors that most frequently affected the decision-making regarding COVID-19 vaccination were gender, age, and education in the general population and certain sub-groups. Men were more likely willing to get the COVID-19 vaccine than women. Several systematic reviews reported that during the 2009 pH1N1 pandemic, pertussis, hepatitis B, and influenza vaccination met a consistently higher acceptance in males than females worldwide (2,25,26). Women were more concerned about vaccine side effects and getting infected by the novel disease. Therefore, women were more willing to use protective measures during epidemics or pandemics (27,28). Older age and higher educated people were more likely to have vaccine intentions. Older age groups had more willingness because they had higher incidence and mortality than a younger age. In addition, comorbidity as a higher COVID 19 risk factor is common among older people (29). Even though age, education, occupation, and household income were associated with covid 19 vaccine uptake intentions, the results were still inconsistent between the selected studies. Other factors and category differences in the selected studies may affect these inconsistent results.

Personal perception regarding the risk of disease and the COVID-19 vaccine is an essential factor in vaccine acceptance. In previous vaccination programs, vaccine side effects and efficacy were the main considerations for vaccine acceptance (2,27,30). Vaccination acceptance was relatively high when people perceived that the vaccine has very high effectiveness, safety, and no adverse side effects. This review also found that vaccine acceptance was affected by personal perceptions of the severity, adverse effects (5,14,23), and disease transmission risks of COVID-19 (5,8,14-16,23,31,32). Concerns related to vaccine side effects and safety (6,9,11,13-15,17,19,20), the effectiveness of the COVID-19 vaccine (14-16,19), vaccines that were new or developed rapidly (11,19) affected COVID-19 vaccine uptake. Some studies reported the duration of vaccine protection and vaccine doses also affected the willingness of COVID-19 vaccination (13). Several countries have distributed vaccines to the community. Several types of vaccines have an efficacy >90%, like Pfizer-BioNTech (95%), Moderna (94.5%), Russia's Sputnik V Vaccine (92%). Several vaccines with an efficacy rate <90% also were distributed in countries. For example, AstraZeneca with 70% average from a combination of two analyses. Sinovac Biotech (based on late-stage clinical trials in Brazil) a vaccine efficacy rate of 50.4%. However, recently other tests conducted by Butantan Institute, Brazil showed a 78% efficacy rate of Sinovac Biotech in mild cases and 100% in moderate and severe cases (33). After distribution, there were reports of vaccine side effects in patients after vaccine injection. Apart from the typical side effects of vaccines (muscle pain, headache, and fatigue), some cases reported severe/rare effects after vaccination. Uncommon reported side effects include

anaphylactic shock, facial paralysis, and even death after a few days of being injected with certain types of vaccines. Even so, it still needs further exploration (34).

People were more likely to uptake the COVID-19 vaccine if the vaccines were free, cheap, or convenient (3,15,16). In this review, several studies reported healthcare provider recommendations on vaccination (14,15), people who trusted their government (8,17), and the health system in their respective country (7,35) affected vaccination acceptance. Nowadays, people access health information from various sources, including social media platforms that gain popularity globally. Social media popularity grows public health concerns regarding the impacts of anti-vaccination or conspiracy theory contents (36). A study showed that about 50% of the population has little evidence of conspiracy thinking about coronavirus. The conspiracy beliefs lead to mistrust, less compliance with government guidelines, and unwillingness to participate in future tests or treatment. The holders of coronavirus conspiracy beliefs were more likely to share their opinions with others (37). Therefore, misinformation about COVID-19 and vaccines will spread in the community. Misinformation about the efficacy and side effects of the vaccine lead to vaccine hesitancy. Public health officials should disseminate complete information about the vaccines like efficacy level and side effects through various online media. Providing detailed information about vaccines to the public is essential to avoid vaccine hesitancy due to widespread misinformation. The government and health providers also need to follow up on the widespread of misinformation about the vaccine.

Limitations

Hardly any studies with specific populations (health workers, parents or child caregivers,

and factory workers) were selected in this review. Several factors and reasons related to the willingness of COVID-19 vaccination were inconsistent because the questions regarding the determinants in the selected studies varied. In addition, the article selection process did not consider the reported study bias in the reviewed articles.

Conclusion

The factors that consistently affected the willingness of COVID-19 vaccination include gender, age, and educational level, individual perception about the disease and the vaccine, as well as trust in the government, public health officials, and health providers. Concerns about disease risk, effectiveness, and side effects are the most important factors. Therefore, to avoid vaccination hesitancy in the community public health officials need to disseminate detailed information about the vaccines like efficacy level and side effects and continue to provide information about the risks of COVID-19 for personal health and others through various online media. The government and health providers also need to follow up on the widespread misinformation about the vaccine. Further research needs to explore health promotion methods in the vaccination program and health literacy in general populations.

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