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Contextualizing Vaccine Hesitancy: A Scoping Review of Factors Influencing COVID-19 Vaccine Uptake

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Abstract

Background: The development of COVID-19 vaccines is crucial in the fight against the pandemic; however, vaccine hesitancy was a growing concern amplified by the rapid development of COVID-19 vaccines. This review aims to explore the underlying factors influencing vaccine acceptance and hesitancy, including socio-demographic characteristics and health beliefs.

Methods: We conducted a scoping review to examine literature and major factors impacting people's willingness to take COVID-19 vaccines. A literature search was performed using four major literature databases: Medline®, Embase®, CINAHL®, and Scopus®. A total of 30 articles fit the predetermined criteria for this sample search. The articles were independently screened to identify the study location, sampling method, study design, and enablers and barriers to vaccination.

Results: Studies were included from five different continents and the findings indicating the following six main areas had significant impact on COVID-19 vaccine acceptance: (1) vaccine safety and efficacy, (2) trust in government and political views, (3) COVID-19 risk perception, (4) cultural factors, (5) knowledge about COVID-19 and public health messaging, and (6) income level and vaccine cost. Various studies had conflicting results highlighting the influence of environmental factors and the need for unique and targeted public health interventions.

Conclusion: Identifying and understanding factors that affect vaccine uptake can aid in the development of effective strategies to improve public health. Our findings suggest that additional efforts should be made by healthcare personnel and public health officials in terms of educating the public and understanding the influence of environmental and personal belief factors. Financial barriers should also be carefully considered to overcome accessibility issues in countries where healthcare is not funded by the government.

Keywords: COVID-19; vaccine acceptance; vaccination hesitancy; review

Introduction

The development of COVID-19 vaccines has been critical in the fight against the pandemic. The efficacy of primary series vaccines in preventing SARS-CoV-2 infection was demonstrated to be 83% (95% CI 80–86), with a corresponding effectiveness of 92% (88–94) in preventing severe disease leading to hospitalization or death [1]. However, vaccine hesitancy, defined as the delay in acceptance or refusal of vaccines despite their availability, is a growing concern in many countries [2,3].

The most widely distributed COVID-19 vaccines employ a new mRNA technique, instead of a particle or a pseudo-particle of the virus, which introduces a mRNA segment that corresponds to a viral protein. Aside from that, vaccine hesitancy is not a new phenomenon, but it has been amplified during the COVID-19 pandemic due to the rapid development and accelerated authorization of COVID-19 vaccines [4,5]. It was the first time that mRNA vaccine being introduced to the public. However, this approach is not developed enough to pass comprehensive validation from the scientific community. Vaccine hesitancy, in general, has been associated with several factors, including perceived risks and benefits, cost verses effectiveness, the government roll-out plan, seasonal influenza vaccine uptake history, education, and cultural and religious beliefs [4]. Coverage rates and vaccine hesitancy vary across populations, and can be linked to geography, culture, and socioeconomic status. Because so many factors are involved, addressing vaccine hesitancy is a difficult task [6]. But understanding the obstacles beforehand would facilitate policymakers to tailor promotion efforts to various target groups.

Understanding the drivers of vaccine hesitancy and willingness to be vaccinated against COVID-19 is critical in identifying the appropriate intervention options and controlling the spread of the virus [6]. Although the pandemic has almost come to an end, the SARS-CoV-2 variant is continuously mutating and new threats are

imminent. As a result, we believe it was critical to reveal the reasoning behind this behavior and provide the people with enhanced herd immunity by designing adapted educational programs. In this review, we will examine the existing literature on COVID-19 vaccine hesitancy and willingness to be vaccinated. We will explore the underlying factors influencing vaccine acceptance and refusal, including socio-demographic characteristics and health beliefs. vaccine hesitancy and willingness to be vaccinated, which can inform public health policy and communication strategies aimed at increasing vaccine uptake and controlling the pandemic.

Methods

This review was performed following PRISMA guidelines [7].

Eligibility Criteria and Database Search

We conducted a scoping review on studies investigating the factors affecting the willingness of people to get the COVID-19 vaccine. A literature search was performed in 4 databases: Medline®, Embase®, CINAHL®, and Scopus®. We evaluated full-text articles that were available in English and focused on the adult population. To evaluate diverse motivations and obstacles to COVID-19 vaccination we included studies from any country.

Search Strategy

A total of four distinct set of search terms were used in our search strategy to capture the most relevant articles: COVID-19, vaccine, willingness, and survey. We have included the full details of our search strategy in Appendix A.

Inclusion and Exclusion Criteria

We included all studies that directly reported participant factors that influenced either the acceptance or rejection of COVID-19 vaccinations. For inclusion the sample population had to be 18 years old or older. The studies also had to report vaccine acceptance or vaccine intention rates explicitly or implicitly. Vaccine intention is defined similarly in relevant studies as the willingness to get vaccinated in a situation where the COVID vaccine is available. We excluded studies where participants reported indirectly on causes, they believe influence other people (ex/ healthcare workers reporting on why patients may reject the vaccine), or participants reporting on factors influencing the vaccination of others (ex/ parents reporting on factors influencing COVID vaccination of children). Grey literature, commentaries and conference proceedings were also excluded. Our search was restricted to studies published after 2019.

Article Selection

The articles that were retrieved from the 4 databases were imported into Covidence systematic review software (www.covidence.org; Veritas Health Innovation; Melbourne, Australia), with duplicated citations removed by the software prior to screening. The article screening was completed by three reviewers (LA, KB, SM) independently. Given that the team aimed for a scoping review, each reviewer screened approximately 500 abstracts (a total of 1550 articles) and then started synthesizing results. Conflicts were resolved through group discussions and consultation with a senior supervising author (XM). We did not perform a formal critical appraisal for this scoping review.

Data Extraction and Synthesis of Results

Once a final list of articles for extraction was compiled, a Microsoft Excel data collection sheet was used to record the relevant data. Recorded information included: the name of the author, publication year, the title of study, target population, sample size, characteristics of the sample population, sample method, survey method, vaccination acceptance/intention rate, enabling factors for vaccination, factors that were barriers to vaccination, article recommendations. We used descriptive statistics to summarize all the characteristics and tables were used to present the results. The vaccine acceptance rate was extracted from the studies and are defined according to the descriptions presented in each study. If solely vaccine hesitancy rates were reported, the acceptance rates were calculated by subtracting 100% from the hesitancy rate. If vaccine acceptance or hesitancy rates were not reported, vaccine intention rates were extracted. Enabling factors were identified in the studies as factors that had a positive impact on the vaccine acceptance/intention rates. Similarly, factors that were barriers to vaccination were identified as characteristics that had a negative impact on the vaccine acceptance/intention rate. The results were then described in a narrative summary and organized into six major themes: vaccine safety and efficacy; trust in government and political views; COVID risk perception; cultural factors; knowledge about COVID and public health messaging; and socioeconomic status.

Results

Using the search string provided in Appendix A we identified a total of 30 studies with our article screening parameters. Figure 1 illustrates the process as per the PRISMA guidelines.

The selected studies were based in 22 different countries from 5 different continents (Table 1). The sample size ranged from 314 to 29,925. The majority of the studies were cross-sectional and included adults over the age of 18 from the general population as their target population, however some studies had more specific targets such as refugees, students and healthcare professionals. Convenience sampling was the most used method for sampling. All studies implemented surveys with 18 studies using online or web-based surveys. The responses of participants were collected in various ways from Likert scales to multiple part questionnaires with free form answers.

The vaccine acceptance or alternatively vaccine intention rates ranged from 21% in a study based in Egypt [8] to 93.4% in a study based in Indonesia [9]. It is important to note significant differences were seen in multiple studies from the same country. For example, two different studies from Malaysia reported vaccination acceptance/intention rates as 64.5% and 83.3% [10,11]. Similarly, four studies from China reported rates of 84.4%, 53.89%, 64.01% and 89.4% [12-15]. Researchers utilized various techniques such as binary logistic regression and bivariate analysis to identify determinants of vaccine acceptance or intention.

The studies reported multiple factors that can be categorized into four main types: a) demographic factors (i.e., sex, age, income, education, employment), b) vaccine-specific factors (i.e., side effects, safety, efficacy), c) personal belief factors (i.e., political beliefs, religiosity, belief in traditional medicine, risk perception, knowledge about COVID) d) Environmental factors (i.e., rural vs city, vaccine cost, public health messaging). These factors are not mutually exclusive to one category, and we must acknowledge they are interrelated and influence each other. Factors that were found to be enablers or barriers to vaccination in each study are described in Table 2.

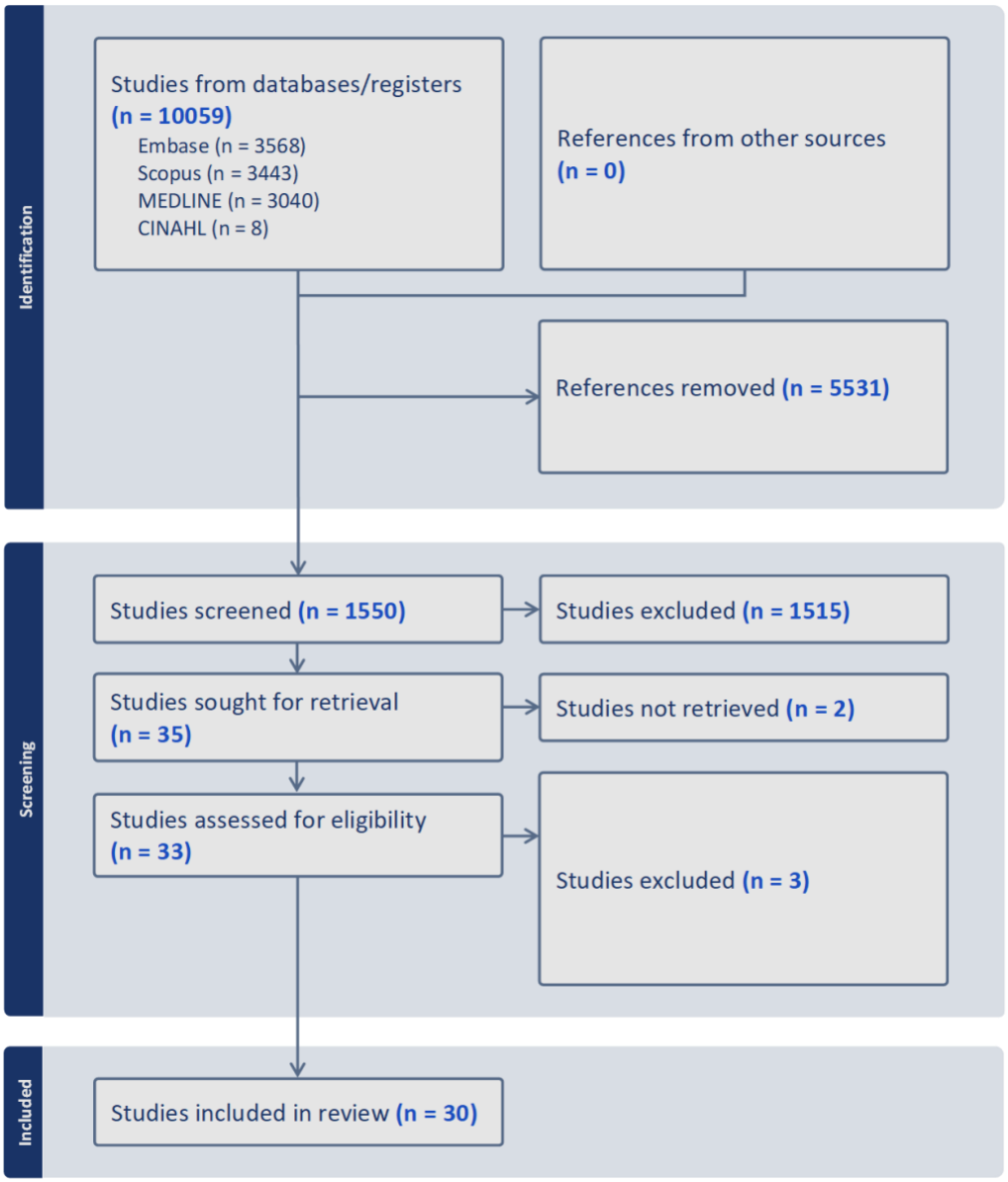

Figure 1. PRISMA Diagram, (created by Covidence.com).

Table 1. Characteristics of included studies

Article ID	The First Author (Year of Publication)	Country	Age	Target Population	Sample Size	Sample Method	Survey Method
1	Agustarika (2022)[16]	Indonesia	≥ 18	West Papua residents, can read Indonesian and have access to internet	314	Snowball sampling	Online questionnaires dispersed through social media
2	AkifulHaque (2021)[17]	Bangladesh	≥ 18	General population	7,357	Convenience sampling	Face-to-Face and self-administered semi-structured questionnaire
3	Askarian (2022)[18]	Iran	≥ 18	General population	4,933	Convenience sampling	Online questionnaire
4	ElSalibi (2021)[19]	Lebanon	≥ 50	Syrian refugees	1,037	Voluntary sampling	Phone interview
5	Fakonti (2021)[20]	Cyprus and Greece	Not indicated	Nurses and midwives in direct contact with patients in public or private healthcare	437	Snowball sampling	Online questionnaire dispersed through social media
6	Fares (2021)[8]	Egypt	≥ 17	Egyptian healthcare workers	385	Convenience sampling	Web-based anonymous survey
7	Gray (2022)[21]	United States	≥ 18	Montgomery residents	1000	Random stratified probabilistic sampling	Automated telephone interviewing and short message service
8	Huang (2022)[12]	China	≥ 18	4 groups: Chinese students, public health professionals, medical workers and general population	4,227	Snowball sampling	Online survey
9	Jacob (2021)[22]	India	≥ 18	Adult Indian Citizens who could read and understand English	2,032	Snowball sampling	Online survey
10	Jaramillo-Monge (2021)[23]	Ecuador	≥ 18	General population	1,219	Snowball sampling	Online survey
11	Joshi (2022)[24]	India	≥ 18	Individuals residing in the urban/rural settings of Tamil Nadu	3,130	Non-probability complete enumeration sampling	In person questionnaire
12	Kabagenyi (2022)[25]	Uganda	≥ 18	Adults in the districts of Mukono, Kiboga, Kumi, Soroti, Gulu, Amuru, Mbarara and Sheema	1,042	Stratified multistage sampling followed by systematic random sampling	Face-to-Face interview structured questionnaire
13	Lei (2023)[13]	China	Not indicated	Men and women preparing for pregnancy in Southwest China	2,878	Snowball sampling	Self-designed questionnaire
14	Lopez-Cepero (2021)[26]	Puerto Rico	≥ 18	General population	1,911	Convenience sampling	Anonymous web-based questionnaire
15	Mohamed (2021)[10]	Malaysia	≥ 18	General population	1,406	Convenience sampling	Online semi-structured questionnaire dispersed through social media

16	Mubarak (2022)[27]	Saudi Arabia	≥ 18	Healthcare professionals	332	Convenience sampling	Online survey
17	Nizigiyimana (2022)[28]	Canada	≥ 18	French speaking participants in Quebec	1,599	Quota sampling	Web-based survey
18	Oyekale (2022)[29]	Nigeria	≥ 18	General population	1,700 house holds	Used nationally representative sample data from COVID-19 NLPS	Telephone surveys
19	Park (2021)[30]	South Korea	≥ 18	General population	1000	Quota sampling	Computer-assisted telephone interviews
20	Paschoalotto (2021)[31]	Brazil	≥ 18	General population	1,623	Snowball sampling	Online survey
21	Raciborski (2021)[32]	Poland	≥ 18	General population	1,131	Random sampling	Computer-assisted personal interviewing, computer-assisted telephone interviewing and computer-assisted web interviewing
22	Ramonfaur (2021)[33]	Mexico	≥ 18	General population	3,768	Snowball sampling	Online survey
23	Sun (2021)[14]	China	≥ 18	Fluent in Chinese and currently enrolled in a Chinese university	1,912	Purposive sampling	Online survey
24	Syed Alwi (2021)[11]	Malaysia	≥ 18	Malaysian adults who can read and understand Bahasa Malaysia or English	1,411	Snowball sampling	Online questionnaire
25	Unal (2021)[34]	Turkey	≥ 18	General population	1,546	Convenience sampling	Online questionnaire
26	Utami (2022)[9]	Indonesia	18-76	Capable of communicating well, and living permanently in the study area for at least 6 months	506	Multistage sampling: cluster random sampling followed by non-probability sampling	Questionnaire (self-administered by some participants; others were helped by enumerators)
27	Wong (2022)[35]	Malaysia	18-70	Malaysian Muslim residents	1,856	Snowball sampling	Web-based anonymous survey
28	Wu (2022)[15]	China	≥ 18	Healthcare professionals	29,925	Snowball sampling	National cross-sectional online survey
29	Yohannes (2023)[36]	Ethiopia	≥ 18	Adults living in Hawassa City Administration, Sidama region or South Ethiopia kebeles for at least 6 months	622	Multi-stage sampling: purposive sampling and random sampling	Interviewer-administered questionnaire
30	Zhang (2021)[37]	China	Not indicated	Chinese outpatients	522	Multi-stage random sampling method	Self-administered computer questionnaire

Table 2. Summary of factors influencing COVID-19 vaccine acceptance or intention

Article	Author (year)	Country	Vaccine Acceptance/ Intention Rate	Enabling Factors for Vaccination	Factors that are Barriers to Vaccination
1	Agustarika (2022)[16]	Indonesia	43.6%	- Female - Employed - Low COVID-19 knowledge - Low worry about vaccine	- Higher education - Single or widowed - High COVID-19 knowledge
2	AkifulHaque (2021)[17]	Bangladesh	79.85%	- Older adult - Higher education - Belief COVID is serious illness - Recommendation by government - Free vaccine - Had affected family members	- Belief they are immune - Belief COVID is not dangerous - Having comorbidities
3	Askarian (2022)[18]	Iran	64.2%	- Male - Healthcare worker - Belief in prosocial norms	- Female - Increased age
4	ElSalibi (2021)[19]	Lebanon	66%	- Belief in vaccine safety - Belief in vaccine effectiveness - Living in informal tended settlements - No vaccine cost	- Fear of vaccine novelty - Belief vaccine is not essential - Fear of side effects - Lack of trust in the system
5	Fakonti (2021)[20]	Cyprus and Greece	30%	- Male - Working in private sector - Increased work experience - Having had flu vaccine in last 5yrs - Vaccines recommended for HCPs	- Female - Fear of side effects - Concerns about quality of vaccine - Concerns about approval of vaccine - Belief they are not high-risk - Belief COVID is not dangerous - Support natural immunization - Do not like injections
6	Fares (2021)[8]	Egypt	21%	- Male - Belief they are at risk for COVID - Belief in vaccine safety - Belief in vaccine effectiveness - Sense of community - Dealt directly with COVID-19 patients - Took non-compulsory vaccines before - Recommended vaccine to others - Trust in vaccine - Trust in authorities	- Low trust in pharma companies - Fear of side effects - Hearing about negative vaccine reactions - Belief there is lack of clinical trials
7	Gray (2022)[21]	United States	62%	- Motivated to end pandemic quickly - Wanting to protect self - Wanting to protect those around them - Trust in HCP - Trust in government - Belief in vaccine effectiveness - Good public health messaging	- Female - Hard to access - High trust in social media info - Wanting to let high-risk patients receive it first - Fear of side effects
8	Huang (2022)[12]	China	84.4%	- Belief in vaccine effectiveness - Doctor recommendation	- Female - Older age - Previous hesitation for vaccines

					- Belief they are healthy - Lack of trust in available info - Receiving negative vaccine info - high score on Vaccine Hesitancy Scale
9	Jacob (2021)[22]	India	78.6%	- Low income - Trust in authority - Perceive COVID is a risk - Belief vaccine is necessary - No history of COVID infection	- Fear of side effects - Low trust in authority - Belief vaccine is not necessary
10	Jaramillo-Monge (2021)[23]	Ecuador	91% *(if vaccine min. 95% effective), 68.5% (in min 90% effective) 40.5% (if 70% effective)*	- Older age - Having postgrad education - History of negative COVID test - High worry about COVID - Belief in vaccine effectiveness	
11	Joshi (2022)[24]	India	46%	- Male - Higher education - Higher income - Employed	- No education - Low income - Urban residence - Fear of side effects
12	Kabagenyi (2022)[25]	Uganda	41.4%	- Higher educations - Knowledge about COVID	- Urban areas, Eastern or Northern region - Belief they are not at risk - Limited knowledge about COVID - Fear of side effects - Belief alcohol as a cure
13	Lei (2023)[13]	China	53.89%		- Female - Never having received influenza vaccine - Trying to conceive - Negative attitude toward vaccine - Low score on injunctive norms - Low score on descriptive norms
14	Lopez-Cepero (2021)[26]	Puerto Rico	82.5%	- Belief COVID would cause serious illness	- Belief they are at low risk for COVID infection - Unafraid of getting COVID - Belief COVID complication are not serious - Fear of vaccine novelty - Concerns about vaccine effectiveness - Fear of side effects/safety
15	Mohamed (2021)[10]	Malaysia	64.5%	- Female - Younger age - Higher education	
16	Mubarak (2022)[27]	Saudi Arabia	83.7%	- Working in medical field - Good knowledge about COVID - Belief in vaccine safety	- Fear of needles - Fear of side effects - Belief vaccine isn't necessary

17	Nizigiyimana (2022)[28]	Canada	88.9%	- Age 40-59 and ≥ 60 years - Higher education - Higher income - Fear of COVID - Faced acute disease in family - Higher sense of coherence	- Smokers
18	Oyekale (2022)[29]	Nigeria	85.29%	- Rural area - No formal education - Belief COVID is a threat	- <50 or 60+ yrs old - urban area - COVID not viewed as threat
19	Park (2021)[30]	South Korea	79.2%	- Trust in government - Belief in COVID risks	- Female - Younger age - Concerns about vaccine safety - Liberal or no political opinion - Low trust in government
20	Paschoalotto (2021)[31]	Brazil	70%	- Male - Higher education - Being retired - Low trust in government - Center-left political ideology	- Female - <25 or >65 yrs old - Lower education - Fear of side effects - Far-right political ideology - Positive perception of government
21	Raciborski (2021)[32]	Poland	70%		- Female - Lack of higher education - Older age (60-74yrs) - Right-wing politics - Rural area - Active internet users - Passivity towards religious practices
22	Ramonfaur (2021)[33]	Mexico	85% *(if vaccine min 90% effective)*	- Male - Having comorbidities - Living with someone >60yrs - Received influenza vaccine in past 3 yrs	- Older age - Higher education - Right-wing politics - Middle or high income - Religion: Catholicism - Fear of injections - Taking supplements to prevent infection - History of adverse effect due to a vaccine
23	Sun (2021)[14]	China	64.01%	- Female - Low income - COVID-19 prosocial behaviors - Belief they are at risk for COVID	- Fear of side effects - Perceived COVID-19 societal stigma
24	Syed Alwi (2021)[11]	Malaysia	83.3%		- 60ys+>30-59yrs>18-29yrs - Married or divorced - Fear of side effects - Concerns about vaccine effectiveness - Lack of info about vaccine - Anti-vaccination attitude - Belief COVID is not a risk - Fear of injection - Belief in traditional remedies - Having comorbidities

					- Religion: Buddhists > hesitant compared to Muslims
25	Unal (2021)[34]	Turkey	91%	- Older age - Higher education - Healthcare worker - Low concerns about vaccine - High Death Anxiety Score	- Concerns about vaccine safety - Concerns about vaccine effectiveness - Lack of reliable data on COVID vaccines - Belief in natural immunity
26	Utami (2022)[9]	Indonesia	93.4%	- Knowledge about COVID-19	- Being elderly - Lower education - Fear of side effects - Concerns about vaccine effectiveness - Belief vaccine is not halal - Having comorbidities - Poor knowledge about COVID
27	Wong (2022)[35]	Malaysia	57.3%	- Younger age (19-30) - High income - Pro-vaccine attitude	- Lower income - Requirement for vaccine to be certified halal - Belief there are alternatives to the vaccine - Anti-vaccination attitude
28	Wu (2022)[15]	China	89.4%	- Non-smoker - Physically active - Low social status - Belief COVID can be easily cured - No religious affiliation - Unchanged occupational status during pandemic	- Fear of side effects - Concerns about vaccine effectiveness - No availability of vaccine - Not eligible for vaccine
29	Yohannes (2023)[36]	Ethiopia	73.5%	- Older age - Wanting to protect self - Wanting to protect family and relatives - Getting advice of HCP - Belief there are no vaccine side effects	- Younger age (18-29yrs) - Fear of injections - Fear of side effects/safety - Preference for other prevention methods - Low knowledge about COVID - Belief vaccine caused COVID - Religion: Orthodox Christians compared to other religions - Negative attitude towards COVID vaccine
30	Zhang (2021)[37]	China	71.5%	- Higher income - Belief they are at risk for COVID - Belief in vaccines - Good health - Vaccine cost of 101-500 yuan	- Fear of vaccine novelty - Fear of side effects/safety - Low vaccine cost - Lower income - Bad self-rated health

Discussion

The results from the data the following six main areas had significant impact on COVID-19 vaccine acceptance: (1) vaccine safety and efficacy, (2) trust in government and political views, (3) COVID-19 risk perception, (4) cultural factors, (5) knowledge about COVID-19 and public health messaging, and (6) income level and vaccine cost.

Vaccine Safety and Efficacy

Twenty-five out of the thirty studies mentioned that concerns relating to vaccine safety and efficacy impacted people's willingness to get vaccinated. Overall, a belief of vaccine efficacy and safety increased people's willingness to get the COVID vaccine [8,12,19,21]. Meanwhile, concerns in the effectiveness and safety of the vaccine increased reluctance [9,11,26,34]. In one national cross-sectional online survey in China, the most frequently reported reason that participants did not get vaccinated was concern regarding the safety and efficacy of the COVID vaccine, while the second was the need for additional vaccine information [15]. This

indicates the need for increased education from public health and healthcare professionals regarding vaccines.

In terms of safety, fears of side effects were reported in numerous studies [8,19]. This may have been due to the novelty of the vaccine, the perceived lack of clinical trials, and information [8,11,19]. In fact, one study found that the most common reasons for non-vaccination was concern regarding the quality and procedures for vaccine approval due to its expedited development and approval, followed by fear of side effects [20].

Intriguingly uptake appeared to be affected by the reported efficacy of the vaccine [23,33]. In one study conducted by Jaramillo-Monge and colleagues [23], the self-reported rate of acceptance was proportional to the reported efficacy. That is, 91% of participants were willing to accept the vaccine if the vaccine is at least 95% effective, 68.5% if it is 90% effective, 40.5% if it is 70% effective and 27% if the vaccine is 27% effective.

Pro-vaccine and anti-vaccine attitudes also seemed to play a role. Individuals with a history of getting other vaccines, such as the influenza vaccine, seemed to be more willing to get the COVID-19 vaccine [13,33].

Trust in Government and Political Views

Eight out of thirty studies reported that participants' political views and trust in government influenced their willingness to receive a COVID-19 vaccination. Individuals may be accustomed to vaccines that have been mandated for many years; however, COVID-19 and its associated vaccine were novel; therefore, citizens' political ideologies (i.e. whether they defined themselves as "liberal," "left-wing, "center-left or "right-wing," "far- right," or as having "no political" ideology)and trust in government can influence their willingness to receive a COVID-19 vaccination.

In most studies, individuals who defined themselves as having a "right-wing" or "far-right" political ideology were more likely to demonstrate vaccine hesitancy [31,32]. However in South Korea, Park and colleagues [30] found that those who labelled themselves "liberal" or as having "no political opinion" demonstrated more vaccine hesitancy. In contrast, Paschoalotto [31] found that Brazilians with a center-left political ideology showed more vaccine hesitancy. This suggests cultural context and other political factors may be informing vaccine hesitancy.

A country's political atmosphere can influence one's willingness to receive a COVID-19 vaccine. For example, Brazil's Bolsonaro government continuously denied the pandemic's seriousness; therefore, a positive perception of the government and a far-right political ideology were barriers to vaccine uptake [31]. In contrast, Brazilian people who had low trust in the government and had a center-left political ideology were more likely to receive a COVID vaccine. In contrast, those who had more trust in the government displayed more vaccine hesitancy. Governments hat encouraged COVID vaccines and saw vaccine uptake by citizens who trusted it and reluctance by those who mistrusted it [8,19,21,22,30], This suggests that trust in government is an influential determinant for willingness for the COVID-19 vaccine.

COVID Risk Perception

The belief that one is either at risk or not of contracting COVID was an influencing factor in one third of the studies. This often aligned with other similar beliefs, for example in Lopez-Cepero and colleagues [26] the belief that one is at low risk for COVID infection, being unafraid of COVID, fear of vaccine side effects and the belief that COVID complications are not serious were all determined to be barriers to vaccination. Interestingly, having comorbid health conditions had varying effects on vaccine acceptance. In the Ramonfaur study [33], having any comorbidity was associated with a higher vaccine acceptance, likely due to participants wanting protection due to being at higher risk for COVID-associated complications. On the other hand, other studies found that having comorbid illnesses was associated with COVID vaccine hesitancy [9,11,17]. A proposed theory is that these participants may have felt they are at higher risk for serious vaccine side-effects due to their illnesses [17]. Medical experts have recommended those with comorbidities to have priority when it comes to vaccines due to the high risk of severe complications and mortality from COVID-19. It is therefore vital that health care services make sure any misconceptions are discussed with this high-risk population. The perceived risk to others was also a reason that was mentioned in some studies, this was demonstrated through vaccine enabling factors such as wanting to protect family and having a sense of community [8, 36]. Highlighting the risk of transmitting the virus to more vulnerable populations may serve as a unique approach in public health messaging for those populations who may believe they are at low risk.

Cultural factors

Various studies considered the effect of religiosity; however, the results were varied. Some studies demonstrated that belief in religions (Catholicism, Buddhism, Islam) were barriers to vaccination, but other studies found that passivity towards religious practices was also a barrier [11,32,33,36]. Various cultural practices and norms were also identified as factors. For example, in studies from Malaysia and Indonesia where the majority of the population follow Islam, wanting the vaccine to first be certified halal or the belief the vaccine was not halal were important factors that were associated with vaccine hesitancy [9,35]. Belief in traditional medicine and other local prevention methods was another cultural factor that was identified as a barrier to vaccine uptake [11,36]. These cultural factors are important topics to consider in public health messaging, especially in rural areas which were found to have strong cultural norms and belief in traditional medicines. In general, rural areas had lower vaccination rates not only due to accessibility but also various cultural norms and higher distrust in vaccines. Utilizing local media

platforms and messengers may be more effective in such areas with geographically bounded norms.

Knowledge About COVID and Public Health Messaging

Five out of thirty studies reported that knowledge about COVID-19 impacted vaccine uptake. Generally, having a greater knowledge of COVID-19 was associated with higher acceptance [25,27]. Having a high trust in social media also played an important role. In one study by Gray and colleagues [21], individuals that had high trust in social media providing accurate information regarding COVID-19 were less likely to accept the vaccine. Researchers believe that this was related to the disinformation campaign from anti-vaccine efforts. Therefore, in order to increase vaccine uptake, people must be knowledgeable on accurate health information.

In some studies, knowledge of COVID-19 was thought to be related to education level. In fact, one study examined the association between knowledge of COVID-19 information and education level, finding the two were positively correlated [10]. Therefore, education level and health literacy are important considerations when aiming to increase the public's knowledge of COVID-19. This finding is consistent with another study that found that healthcare workers were more likely to accept the vaccine [18,34]. In fact, it was found that 92% of healthcare workers were willing to accept the COVID-19 vaccine [34]. This makes sense as most healthcare workers would have access to more knowledge about COVID-19, and most of them require some level of higher education.

Alternatively, one Indonesian study found that high COVID-19 knowledge was a barrier to vaccination [16]. The authors stated that higher education was associated with greater agility with using social media to access information. However, as previously discussed, social media tends to circulate misleading information. Therefore, although individuals seemed to be getting more knowledge of COVID-19, it may not have been accurate.

Income level and Cost

In Mexico, Ramonfaur et al. (2021) found that a higher socioeconomic status (including higher education and middle to high income) was associated with vaccine hesitancy. In contrast, four out of thirty studies reported a higher income as an enabler to vaccine willingness [24, 28, 35, 37]. Potential theories were discussed above, but it is vital to understand the interrelatedness of all the social determinants of health; a higher income is often also associated with higher education, higher healthcare access, less health risk, better housing conditions, good nutritional status and so on [38].

The influence of the vaccine cost was mentioned in three out of thirty studies, and a lower cost or free vaccine was mostly related to higher vaccine uptake [17,19]. The specific price point of the vaccine was found to play a role in vaccine acceptance. In China, participants were more willing to get a moderately priced vaccine compared to a lower cost vaccine. This was due to the lower cost causing participants to doubt the vaccines quality and effectiveness [37]. Alternatively, in Bangladesh and Lebanon free vaccination was an enabling factor [17,19]. Experts recommend that the COVID-19 vaccine should be made a free public health product for all due to the severity and spread of the disease. The decreased ability of those with lower socioeconomic status to spend on one's health and their reduced access to health care have created significant health inequities in many countries during the COVID-19 pandemic.

Limitations

The primary limitation of this scoping review is that most included studies employed predominantly online surveys which may be influenced by self-selection bias. It also excludes populations with limited access to the internet or with low technology literacy. We intentionally chose studies with different methodologies and from various geographical regions to highlight unique factors, however this also leads to increased heterogeneity that can prevent comparative analysis. Additionally, we did not perform a critical appraisal of the included literature and cannot determine the quality of the evidence reported. Another limitation is that we excluded non-English language papers and both grey literature and papers from pre-print servers were not searched.

Conclusions

In this review, we summarize some key factors that influence peoples' willingness to receive COVID-19 vaccines around the world. Other unique factors that have been highlighted in earlier vaccine reluctance research include the influence of celebrity medical experts, vaccine work policies and fear of judgement [39,40]. It is important to understand there is no "one size fits all" approach and tailored strategies that consider unique contextual factors must be implemented to increase vaccine uptake and improve overall public health. For example, providing more clear information about the effects of COVID vaccination in those with specific comorbid conditions or increasing targeted educational initiatives in rural areas by local health leaders. The implications of these findings may also extend to improving the uptake of other vaccines, as many of the factors identified here have been linked to vaccine hesitancy more broadly [4].

Conflicts of Interest

The authors, Lotus Alphonsus, Kavita Bailey, and Sara Mojdehi declare that they have no conflict of interests.

Ethics Approval and/or Participant Consent

This study is exempt from ethical approval because only secondary data was used in results synthesis.

Authors' Contributions

LA: made contributions to the design of the study, collected and analysed data, drafted the manuscript, and gave final approval of the version to be published.
KB: made contributions to the design of the study, collected and analysed data, drafted the manuscript, and gave final approval of the version to be published.
SM: made contributions to the design of the study, collected and analysed data, drafted the manuscript, and gave final approval of the version to be published.

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