

Pro-Vaccination Attitude and Associated Factors Towards COVID-19 Vaccine among Healthcare Workers and Nonhealthcare Workers: “A Call for Action”-A Systematic Review

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Research Article

Keywords: knowledge, attitude, COVID-19, vaccine, associated factors, systematic review

Posted Date: November 23rd, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-1030439/v1>

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Abstract

Introduction: Coronavirus disease 2019 (COVID-19) pandemic hasn't been managed and controlled effectively, globally. The aim of this systematic review was to determine Pro-vaccination attitude and associated factors towards COVID-19 vaccine among healthcare workers (HCWs) and nonhealthcare workers (non-HCWs).

Methods: Different databases such as PsycINFO, HINARI, Cochrane Library, PubMed, EMBASE, African Journals OnLine, Web of Science, Scopus, and Google Scholar for the related articles.

Result: The levels of positive attitude towards COVID-19 vaccine among HCWs was ranged from 21% to 95%. Factors significantly associated with the attitude towards COVID-19 vaccine among HCWs were such as age, gender, race, work experience, home location, having no fear of injections, being a non-smoker, profession, presence of chronic illnesses, allergies, confidence in pharmaceutical companies, history of taking influenza vaccine, vaccine recommendation, perceived risk of new vaccines, perceived utility of vaccine, receiving a seasonal flu vaccination in the last 5 years, working in a private hospital, a high perceived pandemic risk index, low vaccine harm index, high pro-socialness index, being in close contact with a high-risk group, knowledge about the virus, confidence in and expectations about personal protective equipment and behaviors. The levels of positive attitude towards COVID-19 vaccine among non-HCWs was ranged from 21.4% to 91.99%. Factors associated with the attitude towards COVID-19 vaccine among non-HCWs were such as age, gender, educational level, occupation, marital status, residency, income, ethnicity, risk for severe course of COVID-19, direct contact with COVID-19 at work, being a health profession, being vaccinated against seasonal flu, perceived benefits, cues to actions, having previous history of vaccination, fear of passing on the disease to relatives, and the year of medical study, studying health-related courses, COVID-19 concern, adherence level to social distancing guidelines, history of chronic disease, being pregnancy, perceived vaccine safety, having more information about vaccine effectiveness, mandatory vaccination, being recommended to be vaccinated, lack of the confidence in the healthcare system to control epidemic, and believe in COVID-19 vaccines protection from COVID-19 infection.

Conclusion: The level of positive attitude towards COVID-19 vaccine among both HCWs and non-HCWs were unfavorable and comparable. Globally, there is a need for a call for action to cease the time and crisis of this pandemic.

Introduction

COVID-19 pandemic has spread swiftly over all countries [1]. COVID-19 remains to destroy the world [2]. This pandemic has put a challenge across all the countries [3], since it was described as a pandemic [4]. It is a worldwide public emergency [5]. It affected all persons globally[6]. COVID-19 put a significant burden comprising morbidity and mortality [7, 8]. It has also led to substantial economic disasters besides mortality and morbidity [9]. This pandemic has also led to mental health worsening of the families who had children [10], the entire population [11], and also massive effect mental health of the youth [12]. It has also incredibly affected the development of children [13], and markedly interrupted vaccination of the children [14]. Furthermore, this pandemic has also momentous stress on patients, healthcare systems, and HCWs [15]. It has also affected the treatment and prevention of chronic cases such as tuberculosis and human immunodeficiency virus [16]. COVID-19 put an extensive problem on the African continent [17], a poor and susceptible population [9].

Thus, these impacts need urgent measures across all countries [18]. Because of a lack of a vaccine, diverse prevention approaches were executed [19]. For instance; limits of large gatherings, travel bans, school closures, and country lockdown [9]. A vaccine offers the greatest hope for a permanent solution to control it [2]. Since COVID-19 is continuing its impact all over the countries, the government should be equipped to distribute a COVID-19 vaccine accordingly [20]. The intention for vaccine against COVID-19 is determined by the information concerning to the people variety, vaccine efficacy, and vaccine development [21]. Since there are controversies regarding a safety and efficacy of this vaccine, this may declines the vaccination rates [22]. Vaccine hesitancy may lead to the decrement in the need of the population for a COVID-19 vaccine [23]. Besides, the people unwillingness for this vaccine will determine the COVID-19 response and public health

benefits' of an effective vaccine [24]. The effectiveness of COVID-19 vaccine will be tested by vaccine hesitancy [25]. Only a small proportion of the parents had agreed to vaccinate for COVID-19 their children [26]. About one-third of the caregivers were reluctant to vaccinate their children [27]. The parents are not agreed to join their child, even in a clinical trial for this vaccine [28]. This would delay the time of the pandemic, because all these factors affect the attainment of herd immunity for this pandemic [29].

Knowing the intention for this vaccine will assist for the application of effective methods to improve this vaccination [30]. Lessening vaccination hesitancy concerning COVID-19 to control it may be as notable as determining a safe and effective vaccine [31]. It is an ethical and humanistic responsibility to approve that this vaccine is safe for the public [32]. It is vital to permit HCWs and the community to have access to reliable and satisfactory evidence about this vaccine to increase its acceptance rate [33]. The attitude of the HCWs regarding COVID-19 vaccine affects themselves to use the vaccine and their willingness to recommend for the patients. Therefore that, future education should prioritize for HCWs to the population to accept it [34]. HCWs who refuse to have vaccination are often accused of exposing their patients to a lethal infection [35]. It is acceptable that vaccines are a very significant population health measures to defend individuals from this pandemic. Besides, HCWs accounted for a considerable figure of infected individuals [36].

The development of SARS-CoV-2 virus vaccine puts in itself a new test for the governments and health authorities [37]. HCWs are at high risk of COVID-19 [38, 39]. The pandemic among these populations is a main worry for health authorities worldwide. While COVID-19 infection in HCWs would have an instant consequence on their occupation and the whole healthcare system [38]. Protecting the HCWs from COVID-19 would be critical to preserve healthcare systems [36]. A vaccine must be acknowledged and used by the population to be effective [2]. Developing a trust communities and intention to take COVID-19 vaccine is as significant as producing a safe and effective vaccine to control this pandemic [40]. The study revealed that the decreased in COVID-19 cases among HCWs started after anti-COVID-19 vaccination, which reveals that COVID-19 vaccines are effective in preventing infection [41].

Methods

Research Questions

1. What is the level of Attitude towards COVID-19 vaccine among HCWs and non-HCWs worldwide?
2. What are the factors associated with the level of Attitude towards COVID-19 vaccine among HCWs and non-HCWs?

Study Setting and Search Strategies

Studies done across worldwide were included in to this systematic review. Different databases such as PsycINFO, HINARI, Cochrane Library, PubMed, EMBASE, African Journals OnLine, Web of Science, Scopus, and Google Scholar were used to search the related articles. The search terms used were; "Attitude", "perception", "COVID-19", "SARS-CoV-2", "vaccine", "associated factors", "determinant factors", "factors", "healthcare workers", "Nurses", "Midwives", "Physician", "health professional", and "healthcare providers". To integrate these search terms; "AND" and "OR" boolean operators were used.

Eligibility Criteria

Inclusion criteria

Studies were included in to the systematic review if they fulfil: cross-sectional studies which reported outcome variables, articles done among adults, and articles published in English language, and articles published up to July 16, 2021 across all countries.

Exclusion criteria

Articles which didn't assess the outcome variables, articles which were not fully accessible, and articles with poor quality were excluded from this systematic review.

Outcome Interest

In this systematic review, the primary outcome was the prevalence of Pro-vaccination attitude towards COVID-19 vaccine among HCWs and non-HCWs. Pro-vaccination attitude was measured by using a "Yes" or "No" question. "Do you intend to have a COVID-19 vaccine in the future?" was the question asked to the participants. The secondary outcome was factors associated with Pro-Vaccination Attitude towards COVID-19 vaccine among HCWs and Non-HCWs which was reported within the included studies.

Data Extraction and Quality Assessment

The retrieved articles from all databases were exported to Thomson Reuters EndNote version 8. The title and abstract of all possible articles to be included in this systematic review were checked. The standardized data extraction format prepared in a Microsoft Excel worksheet was used to extract the data from the selected articles according to the pre-setted inclusion criteria. The names of the authors, publication year, study period, study country, participants, sample size, study design, prevalence, and factors were used for the extraction of data from each article.

This systematic review has only included cross-sectional studies. The Newcastle-Ottawa Scale (NOS) quality assessment criteria for cross-sectional studies were used to assess the included articles [42, 43], and the modified NOS for cross-sectional studies was used to include the articles. Whereas, all articles with ≥ 5 out of 10 were considered as a high quality score [44], and included in to this systematic review.

Data Synthesis and Reporting

This systematic review was conducted on Pro-Vaccination Knowledge, Attitude, and Associated Factors Towards COVID-19 Vaccine among HCWs and Non-HCWs. During this, the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) flowchart diagram [45, 46], and PRISMA checklist [46] were used for the study screening, selection, and inclusion in to this systematic review.

Ethics Approval and Consent to Participate

Not applicable. Since this is a systematic review, there was no data collected from the people.

Results

Search Results

All related studies done across the worldwide were identified by using diverse databases. Those databases used to search the related studies were PsycINFO, HINARI, Cochrane Library, PubMed, EMBASE, African Journals OnLine, Web of Science, Scopus, and Google Scholar. From the search made through all these databases, 9,325 studies were found. Due to the duplication found, 4,512 studies were excluded. From the remaining 4,813 studies, 3,835 and 876 studies were omitted because of the titles and abstracts, respectively after carefully checked for their relativeness. A total of 102 studies were screened for eligibility as the pre-setted eligibility criteria. From these, 29 studies were excluded due to lack of the full text, 17

studies were excluded due to the outcome of interest was not well defined, and 8 studies were excluded due to poor quality. Afterwards, 48 studies were met the predefined eligibility criteria and included in to this systematic review (**Figure 1**).

Study Characteristics

This systematic review focused on the studies conducted on Attitude regarding COVID-19 vaccine and its associated factors among the two major population categories, HCWs and non-HCWs. In this systematic review, a total of 48 studies were included, comprising the studies done on both HCWs and non-HCWs participants. There have been substantial differences concerning to the level of attitude towards COVID-19 vaccine among both populations (**Table 1**).

Attitude Towards COVID-19 Vaccine Among HCWs

From the total of 48 studies included in to this systematic review, only 19 studies were conducted among HCWs. The smallest and largest sample sizes were reported from Germany (200) [47], and United States (US) (5,287) [48], respectively. The smallest prevalence of a positive attitude towards COVID-19 vaccine among HCWs were reported as 21% from Egypt [49], while the largest prevalence was 95%, which was reported from Asia-Pacific [50]. Thus, the prevalence of a positive attitude towards COVID-19 vaccine among HCWs was ranged from 21% [49] to 95% [50].

Factors significantly associated with the attitude towards COVID-19 vaccine among HCWs were age, gender, race, work experience, home location, having no fear of injections, being a non-smoker, profession, presence of chronic illnesses, allergies, confidence in pharmaceutical companies, confidence in the management of the epidemic, history of taking influenza vaccine, vaccine recommendation, perceived risk of new vaccines, perceived utility of vaccine, receiving a seasonal flu vaccination in the last 5 years, working in a private hospital, a high perceived pandemic risk index, low vaccine harm index, high pro-socialness index, using Facebook as main information source about antiSARS-CoV-2 vaccination, being in close contact with a high-risk group, having undertaken seasonal flu vaccine during the 2019–2020 season, role within the hospital, knowledge about the virus, confidence in and expectations about personal protective equipment and behaviors (**Table 1**).

Attitude Towards COVID-19 Vaccine Among Non-HCWs

Concerning to the non-HCWs, a total of 29 studies were conducted among non-HCWs from 48 studies included in to this systematic review. The smallest and largest sample sizes were reported 90 from United states of America [51], and 32,361 from United kingdom [52], respectively. The smallest prevalence of a positive attitude towards COVID-19 vaccine among non-HCWs were reported as 21.4% from Lebanon [53], while the largest prevalence was 91.99%, which was reported from Poland [54]. Thus, the prevalence of a positive attitude towards COVID-19 vaccine among non-HCWs was ranged from 21.4% [53] to 91.99% [54].

Factors associated with the attitude towards COVID-19 vaccine among non-HCWs were age, gender, educational level, occupation, marital status, residency, income, ethnicity, risk for severe course of COVID-19, direct contact with COVID-19 at work, being a health profession, being vaccinated against seasonal flu, perceived benefits, cues to actions, having previous history of vaccination, fear of passing on the disease to relatives, and the year of medical study, studying health-related courses, COVID-19 concern, adherence level to social distancing guidelines, history of chronic disease, being pregnancy, perceived vaccine safety, having a close acquaintance who did not experience a vaccine-related adverse reaction, having more information about vaccine effectiveness, mandatory vaccination, being recommended to be vaccinated, lack of the confidence in the healthcare system to control epidemic, heard about COVID-19 vaccines, believe in COVID-19 vaccines protection from COVID-19 infection, those who encouraged their family members and friends to get vaccinated (**Table 1**).

Discussion

Despite the fact that more than a year has passed since the WHO stated a COVID-19 pandemic, there is no effective treatment yet. The only strategy to halt the virus from spreading is the vaccination of the population as per the recent evidence. However, more populations should be vaccinated to achieve herd immunity. This is a substantial contest for healthcare systems. Having an effective vaccine is not equivalent to using it, public acceptance is crucial [94]. Besides, despite the consideration of vaccination good achievements of the 20th century, there are remaining public health issues including insufficient, delayed, and unstable vaccination uptake [95]. Generally, the willingness to take the vaccine against COVID-19 will be the next main phase in fighting this pandemic. However, attaining significant uptake will be a contest [96]. Hence, this systematic review was intended to determine the Pro-vaccination attitude and associated factors towards COVID-19 vaccine among HCWs and Non-HCWs globally.

This systematic review has included cross-sectional studies done on the attitude towards COVID-19 vaccine and its associated factors among HCWs and non-HCWs. Recognizing the level of attitude towards COVID-19 vaccine and its associated factors among concerning these two major populations would have a substantial role in managing and controlling this pandemic. This is due to that this study provides critical evidences at the time of this global crisis, which is because of the adverse effects of the COVID-19 pandemic. This is supported by the study which explains that knowing the public needs and factors determining their attitudes towards vaccines would assist to plan for multilevel interventions depending on the evidence to improve vaccine uptake, globally [97]. Generally, to predict and be ready for the future epidemic and pandemic reply, it would be crucial to understand how populations approach the emerging infectious diseases [98].

From the total of 48 studies included in to this systematic review, only 19 studies were conducted among HCWs. The results of this systematic review showed that there was a substantial discrepancy on the level of attitude towards COVID-19 vaccine among HCWs and non-HCWs globally. The level of positive attitude towards COVID-19 vaccine among HCWs was ranged from 21% [49] to 95% [50]. This finding demonstrates that there is a crucial problem that needs to be addressed in high priority to cease the era of the current pandemic. This is due to that HCWs are at high risk of COVID-19 [39]. This infection in HCWs would have an instant consequence on their occupation and the entire healthcare system [38].

Factors associated with the attitude towards COVID-19 vaccine among HCWs were age [56, 58, 59, 64, 65, 67], gender [59, 64, 67], race [67], work experience [64], home location [67], having no fear of injections [64], being a non-smoker [64], profession [56, 65], presence of chronic illnesses [59], Allergy [59], confidence in pharmaceutical companies [55], confidence in the management of the epidemic [55], history of taking influenza vaccine [58], vaccine recommendation [58, 60], perceived risk of new vaccines [58], perceived utility of vaccine [58], receiving a seasonal flu vaccination in the last 5 years [60], working in a private hospital [60], a high perceived pandemic risk index [50], low vaccine harm index [50], high pro-socialness index [50], using Facebook as main information source about antiSARS-CoV-2 vaccination [65], being in close contact with a high-risk group [65], having undertaken seasonal flu vaccine during the 2019–2020 season [65], role within the hospital [67], knowledge about the virus [67], confidence in and expectations about personal protective equipment and behaviors [67].

Concerning to non-HCWs, the level of positive attitude towards COVID-19 vaccine among non-HCWs was ranged from 21.4% [53] to 91.99% [54]. Factors associated with the attitude towards COVID-19 vaccine among non-HCWs were age [70, 71, 77, 78, 88, 91], gender [53, 70, 73, 77, 78, 80, 87, 90], educational level [70, 90], occupation [70, 87], marital status [53, 90], residency [74, 90], income [77, 78], ethnicity [78], risk for severe course of COVID-19 [70], direct contact with COVID-19 at work [70], being a health profession [71, 80], being vaccinated against seasonal flu [70, 71, 90], perceived benefits [71], cues to actions [71], having previous history vaccination [73], fear of passing on the disease to relatives [54], and the year of medical study [54], studying health-related courses [74], COVID-19 concern [77], adherence level to social distancing guidelines [78], history of chronic disease [87], being pregnancy [87], perceived vaccine safety [91], having a close acquaintance who did not experience a vaccine-related adverse reaction [88], having more information about vaccine effectiveness [88], mandatory vaccination [88], being recommended to be vaccinated [88], lack of the confidence in the healthcare system to control epidemic [90], heard about COVID-19 vaccines [91], believe in COVID-19 vaccines protection from COVID-19 infection [91], those who encouraged their family members and friends to get vaccinated [91].

Generally, the findings of this systematic review showed that several factors have been associated with the attitude towards COVID-19 vaccine among both HCWs and non-HCWs. This is because of that even though the immunization coverage is described administratively across the world, no likewise vigorous monitoring system occurs for vaccine confidence. There is rising evidence of vaccine denial because of the lack of trust in the benefits, safety, and effectiveness of vaccines [99]. The acceptance of a COVID-19 vaccine was vastly affected by the effectiveness of the vaccine [100]. Besides, if people lack enough knowledge towards the vaccine, this might lead to negative attitudes about it, which will avoid it to accept the vaccine. If communication efforts fail to address vaccine-negative persons', the liberty-associated concerns may not be successful [101]. Even, the political talk was found to have a significant effect on the attitudes of individuals. For instance; this study showed that political talk plays a considerable role in shaping and polarizing attitudes on stem cell research [102]. The intention to accept this vaccine maybe affected by online misinformation, it is significantly associated with failures in vaccination intent [96]. Furthermore, vaccine-related conspiracy theories could affect the attitude of individuals towards the vaccine. This is supported by the experimental study conducted in China [103]. Moreover, according to the planned behavior theory, attitudes regarding to behavior, subjective norms of behavior, and perceived control over behavior forecast behavioral willingness, while this willingness together with perceived behavioral control accounts for a substantial proportion of variance in behavior [104]. Finally, even though, it is expected that the attitude towards COVID-19 vaccine among HCWs will be greater than that of non-HCWs, the findings of this systematic review indicated that the level of positive attitude towards COVID-19 vaccine among HCWs and non-HCWs was comparable.

Recommendations

The acceptance of vaccines against COVID-19 is a vital to fight this pandemic [105]. Hence, to rise the vaccination, considering the psychological science of action is suggested. It can be applied through; thoughts and feelings, social processes, and interventions can facilitate vaccination [95]. From the theory of normative conduct, norms have a substantial role in shaping human behavior. Thus, to improve the probability of socially beneficial behavior in others via norm activation would be well advised [106]. Vaccinations against COVID-19 pandemic might be a significant element of public health and fighting anti-vaccination attitudes may assist this efforts [107]. Preventing the attack on science, trust in scientists, and using nonconservative media for the better perception of COVID-19 vaccine is advised. The use of nonconservative media would rise the trust in scientists, whereas this would rise the certainty that COVID-19 vaccine could be a good solution for this pandemic. This is supported by the study conducted in United states of America [108]. Considering the power and impact of media usage on social trust and risk perception, more efforts are required to confirm a correct and balanced information is being spread, while the social media in particular [109]. Social norms and family discussion might be fundamental in qualifying the community for the acceptance of COVID-19 vaccine. This is supported by the study done among Asian Americans in United states of America [110]. The coupled monitoring vaccine attitudes and vaccination rates at the nationwide and subnational levels could support in identifying individuals with diminishing confidence and acceptance towards the vaccine [111]. Applying the protection motivation theory is also suggested for this pandemic. This is because, in the context of this theory, the individuals under threat would made their protection decisions and coping judgements. The more shocking the individuals danger appraisals and promising coping judgements, motivation for vaccine will be increased [112]. Lastly, since rumors and conspiracy theories may bring mistrust which contributes to vaccine hesitancy, following the misinformation regarding a COVID-19 vaccine in real-time and using social media to distribute accurate information can support to protect the population from misinformation [113]. The campaigns and messaging concerning taking the vaccine against COVID-19 should consider the risk of COVID-19 to others and the requirement for everybody to take the vaccine [114]. Evolving communication to avoid vaccine hesitancy is significant to control COVID-19. Forwarding the effective messages to the public concerning this vaccine is crucial to promote the acceptance of this vaccine [115]. Campaigns to disseminate information are also vital to promote participation in the immunization of COVID-19 pandemic [116].

Conclusions

Despite the substantial crisis made by COVID-19 pandemic worldwide, it hasn't been managed and controlled effectively. The vaccines against COVID-19 have been developed after a long wait and worldwide anxiety as the best solution for this pandemic. The acceptance of vaccines against COVID-19 is vital to fight this pandemic. According to this systematic review findings, the level of positive attitude towards COVID-19 vaccine among HCWs was ranged from 21% to 95%. Age, gender, race, work experience, home location, having no fear of injections, being a non-smoker, profession, presence of chronic illnesses, allergies, confidence in pharmaceutical companies, confidence in the management of the epidemic, history of taking influenza vaccine, vaccine recommendation, perceived risk of new vaccines, perceived utility of vaccine, receiving a seasonal flu vaccination in the last 5 years, working in a private hospital, a high perceived pandemic risk index, low vaccine harm index, high pro-socialness index, using Facebook as main information source about antiSARS-CoV-2 vaccination, being in close contact with a high-risk group, having undertaken seasonal flu vaccine during the 2019–2020 season, role within the hospital, knowledge about the virus, confidence in and expectations about personal protective equipment and behaviors were factors significantly associated with the attitude towards COVID-19 vaccine among HCWs.

The level of positive attitude towards COVID-19 vaccine among non-HCWs was ranged from 21.4% to 91.99%. Factors associated with the attitude towards COVID-19 vaccine among non-HCWs were age, gender, educational level, occupation, marital status, residency, income, ethnicity, risk for severe course of COVID-19, direct contact with COVID-19 at work, being a health profession, being vaccinated against seasonal flu, perceived benefits, cues to actions, having previous history of vaccination, fear of passing on the disease to relatives, and the year of medical study, studying health-related courses, COVID-19 concern, adherence level to social distancing guidelines, history of chronic disease, being pregnancy, perceived vaccine safety, having a close acquaintance who did not experience a vaccine-related adverse reaction, having more information about vaccine effectiveness, mandatory vaccination, being recommended to be vaccinated, lack of the confidence in the healthcare system to control epidemic, heard about COVID-19 vaccines, believe in COVID-19 vaccines protection from COVID-19 infection, those who encouraged their family members and friends to get vaccinated.

Lastly, the levels of positive attitude towards COVID-19 vaccine among both HCWs and non-HCWs were unfavorable and comparable. The unfavorable attitude regarding COVID-19 vaccine among both HCWs, and non-HCWs would significantly reduce the role of vaccination in dropping the burden of the COVID-19 pandemic throughout the community. Globally, there is a need for call for action to cease the time and the associated crisis of this pandemic. This is because HCWs are the major source of health-related information for their communities. Thus, we need to equip them with the most truthful and reliable knowledge to improve their attitude towards COVID-19 vaccine.

Abbreviations

COVID-19; *Coronavirus* disease 2019, HCWs; healthcare workers, non-HCWs; nonhealthcare worker, PRISMA; Preferred Reporting Items for Systematic reviews and Meta-Analyses, US; United States, NOS; Newcastle-Ottawa Scale.

Declarations

Consent for Publication

Not applicable.

Availability of Data and Materials

The data used to support the findings of this study are included in the manuscript.

Competing Interest

The author declares no conflicts of interest for this work.

Author Contributions

The author has contributed to the conception of the study, drafting or revising the article, writing the manuscript, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work.

Acknowledgments

Not applicable.

Funding

None.

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Tables

Table 1: Characteristics of the studies included in the Systematic Review on the level of positive Attitude Regarding COVID-19 vaccine among HCWs and non-HCWs over different countries.

Authors	Year	SP	Country	Participants	SS	SD	Level	Factors
Vignier et al. [55]	2021	January 22 to March 26, 2021	France	HCWs	579	CS	65.6%	Confidence in pharmaceutical companies, and Confidence in the management of the epidemic.
Alle and Oumer [56]	2021	February 5 to March 20, 2021	Ethiopia	Health professions	319	CS	42.3%	Age, and profession.
Kaur et al. [57]	2021	Not explained	India	medical and dental professionals	520	CS	65%	NA
Verger et al. [58]	2021	October and November 2020	France and French speaking parts of Belgium and Canada	HCWs	2,678	CS	48.6%	Age, history of taking influenza vaccine, vaccine recommendation, perceived risk of new vaccines, and perceived utility of vaccine.
Ahmed et al. [59]	2021	Not explained	Saudi Arabia	healthcare providers	236	CS	55.5%	Sex, age, presence of chronic illnesses, and allergy.
Fakonti et al. [60]	2021	December 8 to 28, 2020	Cyprus	Nurses and midwives	437	CS	30%	Receiving a seasonal flu vaccination in the last 5 years, recommended vaccines for health professionals, and working in a private hospital.
Chew et al. [50]	2021	December 12 to 21, 2020	Asia-Pacific	HCWs	1720	CS	95%	A high perceived pandemic risk index, low vaccine harm index and high pro-socialness index.
Guangul et al. [61]	2021	Not explained	Ethiopia	HCWs	668	CS	72.2%	NA
Nasir et al. [62]	2021	In February 2021	Bangladesh	HCWs	550	CS	70.23%	NA
Paudel et al. [63]	2021	January 27 to February 3, 2021.	Nepal	HCWs	266	CS	38.3%	NA
Baghdadi et al. [64]	2021	July to September 2020	Saudi Arabia	HCWs	356	CS	61.16%	Gender, age (middle aged), work experience (<5 years), having no fear of injections, and being a non-smoker.
Di Gennaro	2021	1 October to	Italy	HCWs	1723	CS	67%	Being a non-MD

et al.[65]		1 November 2020						health professional, using Facebook as main information source about antiSARS-CoV-2 vaccination, being a younger, age (<30 years), being in close contact with a high-risk group, and having undertaken seasonal flu vaccine during the 2019–2020 season.
Elhadi et al. [66]	2021	December 1 to 18, 2020	Libya	Physicians and paramedic	2215	CS	58.19%	NA
Ciardi et al. [67]	2021	December 10, 2020 to January 5, 2021	New York	HCWs	428	CS	64%	Gender, age, race, home location, role within the hospital, knowledge about the virus, and confidence in and expectations about personal protective equipment and behaviors.
Fares et al. [49]	2021	December 2020 to January 2021	Egypt	HCWs	385	CS	21%	NA
Harsch et al. [47]	2021	Not explained	Germany	HCWs	200	CS	37.5%	NA
Szmyd et al. [68]	2021	December 22, 2020 to January 8, 2021	Poland	HCWs	2300	CS	82.95%	NA
Ledda et al. [69]	2021	September to December 20, 2020	Italy	Healthcare Personnel	787	CS	75%	NA
Shaw et al. [48]	2021	November 23 to December 5, 2020	US	Healthcare personnel	5287	CS	57.5 %	NA
Bauernfeind et al. [70]	2021	December 12 to 21, 2020	Germany	Hospital employees	2454	CS	59.5%	Age, gender, educational level, risk for severe course of COVID-19, occupation, direct contact with COVID-19 at work, flu shot in influenza 2019/2020, and flu shot in

								influenza 2020/2021.
Spinewine et al.[71]	2021	January 6 to 20, 2021	Belgium	Hospital staffs	1132	CS	62.9%	Being older, being a physician, being vaccinated against seasonal flu, perceived benefits, and cues to actions.
Mesesle [72]	2021	March 13 to April 10, 2021	Ethiopia	Adult Population	425	CS	24.2%	NA
Islam et al [73]	2021	December 2020 to February 2021	Bangladesh	Adult Population	1658	CS	78%	Being female, and having previous history vaccination.
Kasrine Al Halabi et al. [53]	2021	November to December 2020	Lebanon	Adult Population	579	CS	21.4%	Gender and marital status.
Szmyd et al. [54]	2021	December 22 to 25, 2020	Poland	Medical Students	632	CS	91.99%	Fear of passing on the disease to relatives, and the year of medical study.
Bai et al. [74]	2021	December 27, 2020 to January 18, 2021	China	college students	2,881	CS	76.3%	Residency (urban), and studying health-related courses.
Brodziak et al. [75]	2021	Not explained	Poland	Cancer patients	635	CS	73.7%	NA
Akarsu et al. [76]	2021	10/06/2020 and 10/07/2020	Turkey	Adult Population	759	CS	49.7%	NA
Ward et al. [77]	2020	Each week of April 2020	France	Adult Population	5018	CS	76%	Gender, age, COVID-19 concern, and HICU.
Szmyd et al. [54]	2021	December 22 to 25, 2020	Poland	Nonmedical Students	763	CS	59.42%	NA
Freeman et al. [78]	2021	September 24 to October 17, 2020	UK	Adult Population	5,114	CS	71.7%	younger age, female gender, lower income, ethnicity, and lower adherence to social distancing guidelines.
Pogue et al. [79]	2020	Not explained	United States	Adult Population	316	CS	68%	NA
Paul et al. [52]	2021	March 21/2020	UK	Adult Population	32,361	CS	84%	NA

Cordina et al. [80]	2021	30/10/2020 to 16/11/2020	Malta	Adult Population	2529	CS	50%	Gender(male), and being health profession.
Alabdulla et al.[81]	2021	October 15 to November 15, 2020	Qatar	Adult Population	7821	CS	79.8%	NA
Chen et al. [82]	2021	Not explained	China	Adult Population	3195	CS	76.6%	NA
La Vecchia et al. [83]	2020	September 16 to 28, 2020	Italy	15-85 years Population	1055	CS	53.7%	NA
Largent et al. [84]	2020	September 14 to 27, 2020	US	Adult Population	2730	CS	61.4%	NA
El-Elimat et al. [85]	2021	November 2020	Jordan	Adult Population	3,100	CS	66.5%	NA
Graeber et al. [86]	2021	June and July 2020	Germany	Adult Population	851	CS	70%	NA
Al-Marshoudi et al. [87]	2021	December 15 to 31, 2020	Oman	Adult Population	3000	CS	59.3%	Gender (male), history of chronic disease, pregnancy, perceived vaccine safety, education levels, and occupation.
Villarreal-Garza et al. [88]	2021	March 12 to 26, 2021	Mexico	Breast Cancer patients	540	CS	66%	Age, having a close acquaintance who did not experience a vaccine-related adverse reaction, having more information about vaccine effectiveness, mandatory vaccination, and being recommended by their oncologist to be vaccinated.
Jiang et al. [89]	2021	Mid-March 2021	China	nursing college students	1,488	CS	70.07%	NA
Omar and Hani [90]	2021	January 7 to March 30, 2021	Egypt	Adult population	1011	CS	46%	Gender (female), residence (urban), educational level (university/post graduate), marital status (married), having flu vaccine, and lack of the

								confidence in the healthcare system to control epidemic.
Cai et al. [91]	2021	November 27, 2020 and March 12, 2021	China	Adolescent population	1,057	CS	75.59%	Age (younger), heard about COVID-19 vaccines, believe in COVID-19 vaccines protection from COVID-19 infection, and those who encouraged their family members and friends to get vaccinated, and believing that vaccines are safe.
Kuhn et al. [51]	2021	December 2020 to January 2021	USA	PEH	90	CS	52%	NA
Petravić et al. [92]	2021	December 17 to 27, 2020	Slovenia	Residents >15 years	12,042	CS	33%	NA
Kumari et al. [93]	2021	March 13 to 25, 2021	India	≥18 years population	1294	CS	83.6%	NA

Notice: SP; study period, SS; sample size, SD; study design, CS; cross sectional, HCWs, healthcare workers, NA; not applicable, HICU, household income per consumption unit, PEH; People experiencing homelessness.

Figures

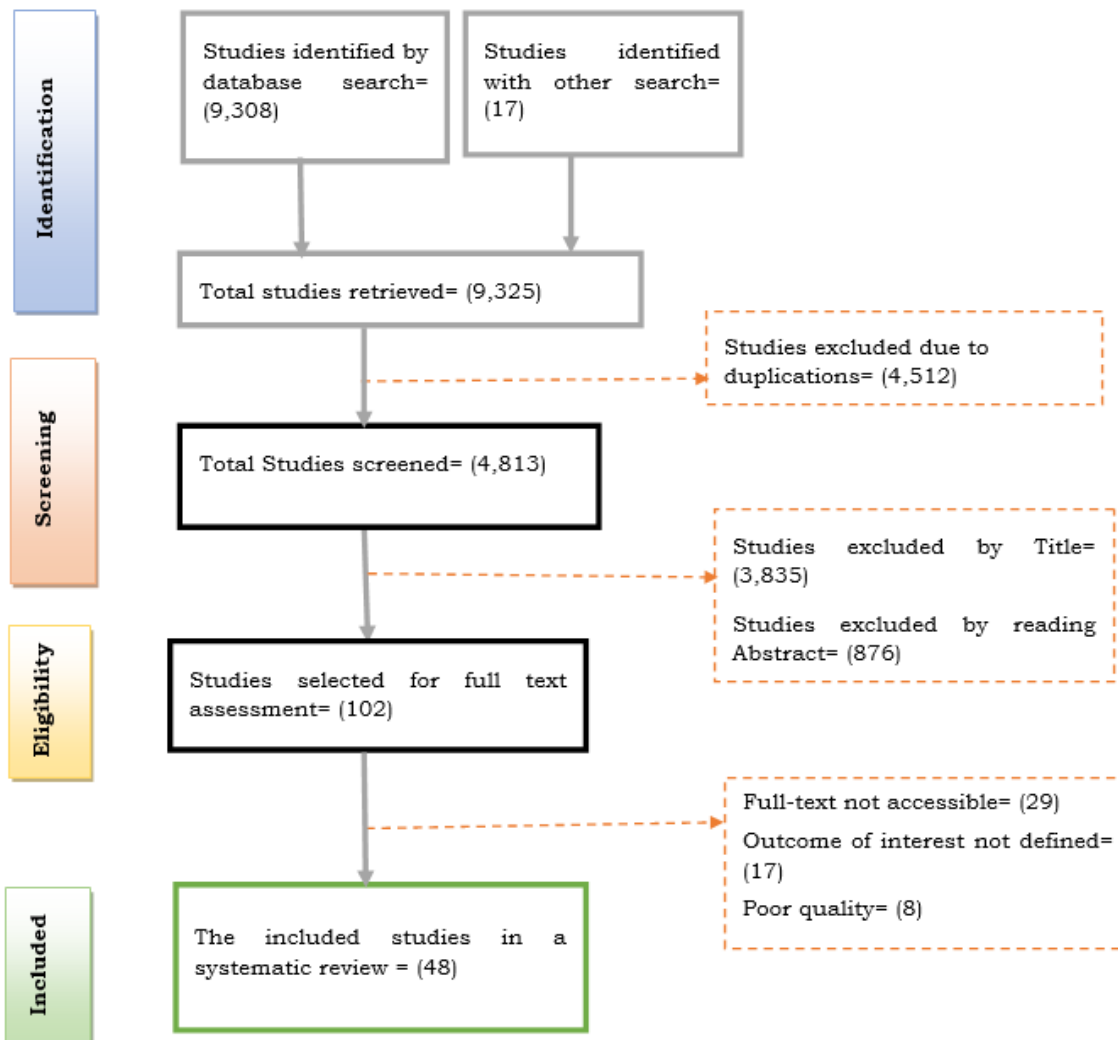


Figure 1

PRISMA Flowchart diagram of the study selection for Systematic Review on Pro-Vaccination Attitude, and Associated Factors Towards COVID-19 Vaccine among HCWs and Non-HCWs globally.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [PRISMA2009ChecklistforProVaccinationAttitudeandAssociatedFactorsTowardsCOVID19Vaccine.doc](#)