Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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COVID-19 vaccine acceptance and its associated factors in Ethiopia: A systematic review and meta-analysis

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ABSTRACT

Background: COVID-19 vaccination is considered as an effective intervention for controlling the burden of the pandemic. However, vaccine hesitation is increasing and hindering efforts targeting to reduce the burden of the COVID-19 disease. Hence, determining COVID-19 vaccine acceptance and identifying determinants that would hinder people to vaccinate against COVID-19 is crucial to effectively improve COVID-19 vaccine uptake. In Ethiopia, the pooled proportion of COVID-19 vaccine acceptance and its determinants is not well known. Thus, the aim of this study is to estimate the pooled proportion of COVID-19 vaccine acceptance and its determinants in Ethiopia.

Methods: A systematic search of articles was conducted from PubMed, Scopus, Web of Science, MEDLINE, CINAHL, Science Direct and Cochrane Library. Data were extracted using a data extraction tool which was adapted from the Joanna Briggs Institute. The quality of each included primary studies was evaluated using the Newcastle-Ottawa scale tool. Data analysis was performed using STATA 14. Heterogeneity in studies was assessed using Cochrane Q and I^2 test. Publication bias was assessed using visual inspection of funnel plots and Egger's test. A random effects model was applied to determine the pooled estimates if heterogeneity was exhibited; otherwise, a fixed-effects model was used.

Results: A total of 14 studies involving 6373 participants were included for the final analysis. The pooled proportion of COVID-19 vaccine acceptance in Ethiopia was 56.02% (95% CI: 47.84, 64.20). The likelihood of COVID-19 vaccine acceptance was higher among participants who had history of chronic disease (AOR = 1.33, 95% CI: 1.09, 2.97), good knowledge (AOR = 2.13, 95% CI: 1.59, 4.97), positive attitude (AOR = 2.23, 95% CI: 1.21, 4.66), good COVID-19 preventive practice (AOR = 1.97, 95% CI: 1.82, 2.12), and high perceived seriousness of COVID-19 (AOR = 3.21, 95% CI: 2.32, 5.98).

Conclusion: More than half participants were willing to accept COVID-19 vaccine. Thus, awareness creation battles about the efficacy and safety of the COVID-19 vaccine should be provided to the community. Besides, policy-makers, health planners and other stakeholders should encourage COVID-19 vaccine uptake behaviors by providing trusted information.

Systematic review and meta-analysis registration: PROSPERO CRD42021264708.

1. Background

The World Health Organization (WHO) began a global campaign of prevention, early diagnosis, and medical treatment of the coronavirus disease 2019 (COVID-19) following the outbreak that was declared as a pandemic in early 2020.[1] Subsequently, multiple COVID-19 vaccines were developed and tested across diverse populations in different clinical trials.[2,3]

Vaccination is considered as effective intervention for controlling pandemics and most preventable infectious diseases.[4] The vaccination utilization level must be high in order to be successful.[5] Additionally, distribution and equitable access of safe and effective vaccine strongly desires methods to improve vaccine acceptance and sufficient health system capacity.[6]

In recent times, several literatures have reported the effectiveness and safety of COVID-19 vaccines.[2,6,7] The efficacy of the mRNA-1273

Abbreviations: AOR, Adjusted odd ratio; CI, Confidence intervals; COVID-19, Coronavirus disease 2019; PRISMA, Preferred Reporting Items for Systematic review and Meta-analysis; SMP, self-medication practice; WHO, World Health Organization.

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vaccine was reported to be 94.1%,[8] the BNT162b2 mRNA vaccine has been documented to be 95%,[9] that of the ChAdOx1 nCoV-19 vaccine has been reported to be 70.4%,[10] and the Gam-COVID-Vac has been documented to be 91.6%.[11]

Public perceptions, misconceptions and rumors on the vaccines may result in vaccine hesitancy.[12,13] Over again, vaccine hesitancy would result decreasing vaccine coverage, which further could lead to disease outbreaks including COVID-19.[14] Hence, understanding vaccine acceptance is crucial as high vaccine hesitancy for existing vaccines could lead to relatively low vaccination coverage.[15]

Despite the efforts to control COVID-19 through vaccination, vaccine hesitation is increasing and hindering efforts targeting to reduce the burden of the disease.[16] Globally, vaccine hesitancy is considered as a major public health issue because of its substantial increase.[17] Wrong impression due to accelerated development the vaccine, misinformation, and multiple myths would potentially affect the willingness of population to accept COVID-19 vaccine.[18,19]

COVID-19 vaccination acceptance have been investigated and reported in previous studies.[20–23] A systematic review and meta-analysis has been reported that the pooled proportion of willingness to COVID-19 vaccination among the general population was 81.65%.[20] Another systematic review and meta-analysis conducted has revealed that the pooled proportion of COVID-19 vaccination willingness among healthcare workers was 51%.[21] However, these studies have not been included findings from Ethiopia.

Similar to all other parts of the world, many African countries have been implemented COVID-19 vaccines trials to contribute to the global search for vaccines against the COVID-19 pandemic.[24] Africa need about 1.5 billion doses of COVID-19 vaccine to vaccinate 60% of its population.[25] Most African countries including Ethiopia need COVID-19 vaccines from different donating countries to achieve the estimated target.[26]

Though Ethiopia is gaining vaccines from different donating countries, the proportion of COVID-19 vaccine acceptance in the general population is not well known. Except for fragmented studies with varying reports, there are no national prevalence studies conducted on COVID-19 vaccine acceptance in Ethiopia. Moreover, investigating determinants that would hinder people to vaccinate against COVID-19 is not well investigated. It is crucial to warrant the population to have access to reliable and sufficient information regarding this vaccine to raise its acceptance rate.[2] Hence, by determining COVID-19 vaccine acceptance and identifying associated factors, governments policy-makers, and health authorities, and other stakeholders can design specific vaccine campaigns and the development of evidence-based guidelines to effectively improve COVID-19 vaccine uptake. Thus, the aim of this systematic review and meta-analysis is to estimate the pooled proportion of COVID-19 vaccine acceptance and identify factors associated with COVID- 19 vaccine acceptance.

2. Methods

The methods adopted for this systematic review and meta-analysis are consistent with the guidelines detailed on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist.[27] The systematic review was prospectively registered on International Prospective Register of Systematic Reviews (PROSPERO) with unique of number CRD42021264708.

3. Eligibility criteria

The inclusion criteria for this study were the following[1]: Studies that investigated COVID-19 vaccine acceptance and/or its determinants in Ethiopia,[2] observational studies which contain relevant outcomes were included,[3] studies that had been performed on healthcare workers,[4] studies that had been conducted and reported in English language, and[5] articles that had a full-text article publicly available were included. The exclusion criteria of the study were the following[1]: studies that were qualitative studies, reviews, case reports and letters to editors, and[3] studies did not have full-text available publicly.

4. Information sources and search strategy

A comprehensive search and article retrieval strategy were performed to find potentially relevant articles in the following databases: PubMed, Scopus, Web of Science, MEDLINE, CINAHL, Science Direct and Cochrane Library. In addition, the reference lists of all articles that were considered and searched. Google Scholar, input of content experts and Institutional Digital Library were also searched for gray literature and unpublished papers. The full electronic search strategy was searched using the following search terms: 'COVID-19', 'SARS-CoV-2', 'Coronavirus', 'vaccine', 'vaccination', 'immunization', 'acceptance', 'willingness', 'intention', 'accept', 'factors', 'determinates', 'reasons', 'predictors' and 'Ethiopia'. A combination of appropriate Boolean operators (AND, OR), truncation, and the MeSH terms were used. The searching of articles was conducted from 20th of August to September 10th, 2021.

5. Study selection

EndNote X7 (Thomson Reuters, New York, USA) software was used to manage identified and retrieved studies. After removing the duplicated articles from EndNote Library, the titles and abstracts of the remaining articles were assessed independently by two reviewers (BDM and BAM). The full texts of articles were reviewed to confirm eligibility criteria match. Disagreements between the two reviewers were resolved by discussion. The PRISMA flow diagram was used to summarize the study selection processes.

6. Data extraction and main data items

All required data from included articles were extracted using a standardized, pre-piloted data extraction format. Two reviewers (BDM and BAM) independently extracted the data using the Joanna Briggs Institute (JBI) data extraction form.[28] Disagreement during data extraction was resolved by discussion and consensus. Relevant information was collected for each study, including: the first authors' name, region, study year, publication year, study design, study setting, participants, sample size, data collection methods, sampling method, response rate, outcome measures (COVID-19 vaccine acceptance), determinants of vaccine acceptance.

7. Quality assessment

The methodologic quality and risk of bias of each studies were assessed using the Newcastle-Ottawa scale (NOS) tool. Two authors (BDM and BAM independently evaluated the risk of bias and any disparity was resolved through discussion and reviewing the articles together. The quality assessment tool was adapted from a non-randomized study which developed for the quality assessments of meta-analytic results.[29] The quality appraisal tool has three main themes with a maximum of 10 stars: The first them of the tool focuses on selection (representativeness of the sample, sample size, response rate, sampling technique, ascertainment of the exposure of COVID-19 vaccine) with a maximum of 4 stars; the second them of the tool focuses on comparability (in the context of participant distribution and analyses) with a maximum of 2 stars; and the last them of the tool concerned with outcome (assessment of the outcome; and statistical tests assessment) with a maximum of 3 stars.

8. Measurement of outcomes

COVID-19 vaccine acceptance was the main outcomes of this study,

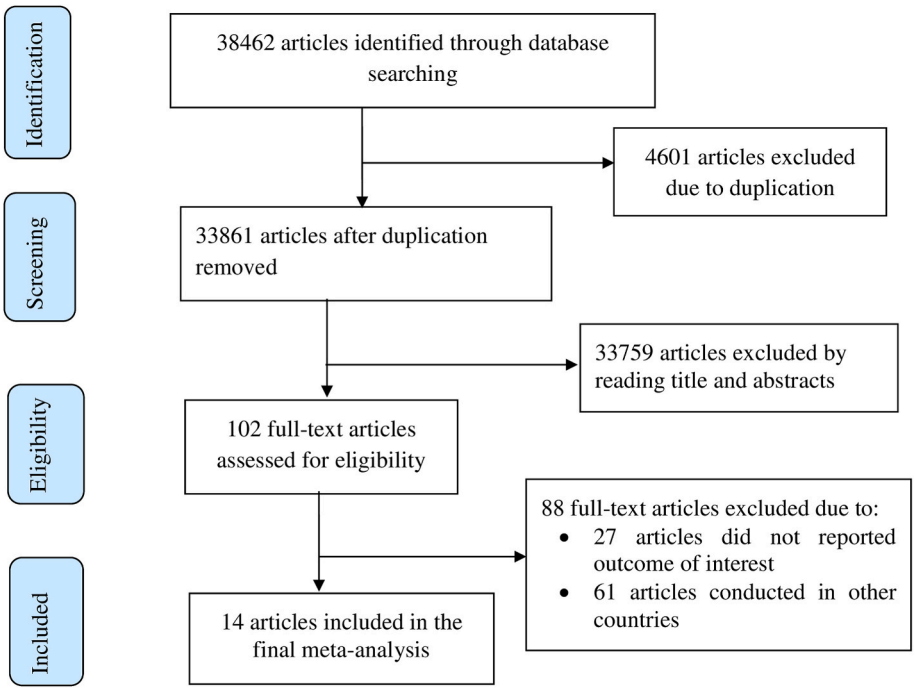

Fig. 1. Flow chart of study selection for systematic review and meta-analysis of COVID-19 vaccine acceptance in Ethiopia, 2021.

which is defined as the willingness to take the COVID-19 vaccine. In the primary studies, participants were asked their willingness to COVID-19 vaccination. Accordingly, participants who respond "yes" were considered as having the willingness to accept the COVID-19 vaccine, whereas participants who respond "No" were considered as having no willingness to accept the COVID-19 vaccine. In this study, identify factors associated with COVID-19 vaccine acceptance was the second outcome of interest, which were measured in the form of the odds ratio (OR). The odds ratio for each identified factor was calculated based on the binary outcome data reported by each original study.

9. Data processing and analysis

The individual primary studies were described succinctly using a summary table. Findings were presented using forest plot graphical representation with 95% confidence interval (CI). We used STATA version 14 statistical software to conduct this meta-analysis. A random-effects model was used to pool the estimate of COVID-19 vaccine

Table 1
Characteristics of studies included in the systematic review and meta-analysis of COVID-19 vaccine acceptance in Ethiopia, 2021.

Author	Year	Region	Study design	Study area	Study population	Data collection method	Sample size	Participants	Vaccine acceptance (%)	Quality of studies
Nebyu D et al.[43]	2021	Addis Ababa	Cross sectional	Akaki kality	Adult Population	Face to face interview	422	409	80.9	High
Berihun et al.[35]	2021	Amhara	Cross sectional	Dessie	Patients with chronic diseases	Self-administered	422	416	59.4	High
Mose A and Yeshaneh A[33]	2021	SNNPR	Cross sectional	Gurage zone	Pregnant women	Face to face interview	396	396	70.7	Medium
Abebe et al.[30]	2021	SNNPR	Cross sectional	Gurage zone	Adult Population	Self-administered	501	492	62.6	High
Molalegn Mesele[31]	2021	SNNPR	Cross sectional	Sodo town	Adult Population	Self-administered	424	415	45.5	High
Belsti et al.[40]	2021	Ethiopia	Cross sectional	Ethiopia	Adult Population	Online survey	1184	1184	42.2	High
Alle YF and Oumer[36]	2021	Amhara	Cross sectional	Debre tabor	Healthcare workers	Self-administered	327	319	42.3	Medium
Handebo et al.[39]	2021	Amhara	Cross sectional	Gondar	School teachers	Self-administered	323	301	54.8	Medium
Zewude B, Belachew A[41]	2021	Ethiopia	Cross sectional	Ethiopia	Healthcare workers	Self-administered	384	232	63.4	Medium
Guangul BA et al.[42]	2021	Ethiopia	Cross sectional	Ethiopia	Healthcare workers	Online survey	1110	668	72.2	Medium
Angelo et al.[32]	2021	SNNPR	Cross sectional	Mizan tepi	Healthcare workers	Self-administered	423	405	48.4	High
Taye BT et al.[37]	2021	Amhara	Cross sectional	Debre Berhan	Students	Self-administered	423	423	69.3	High
Hailemariam et al.[34]	2021	SNNPR	Cross sectional	Bench-sheko zone	Pregnant women	Self-administered	423	412	31.3	High
Shitu et al.[38]	2021	Amhara	Cross sectional	Gondar	School teachers	Self-administered	302	301	40.9	Medium

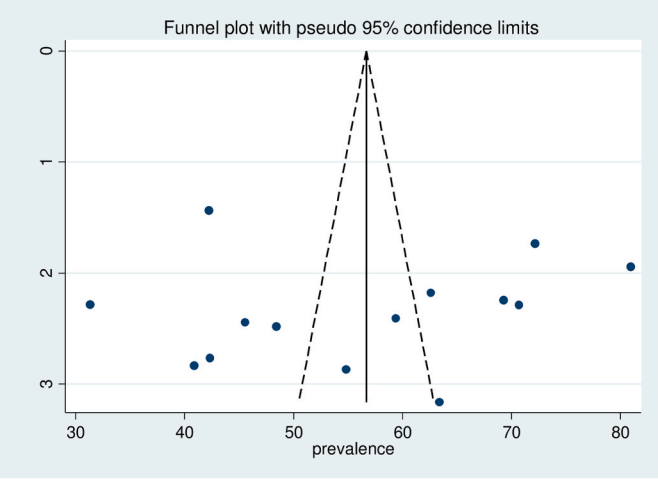

Fig. 2. Funnel plot assessed for publication bias in the studies conducted on of COVID-19 vaccine acceptance in Ethiopia, 2021.

acceptance if substantial heterogeneity was exhibited between studies; otherwise, a fixed-effects model was used. The Cochran's Q test and I^2 were used to detect heterogeneity between the studies. The variation in the pooled estimates of the proportion of COVID-19 vaccine acceptance was adjusted through subgroup analysis. As a result, subgroup analysis was done based on study region, study population, and data collection methods to reduce the random variations among the point estimates of the primary study. In addition, evidence of publication bias was checked using visual inspection of funnel plots asymmetry, and weighted Egger's regression test with p - value of less than 0.05 as a cutoff point to declare the presence of publication bias. The results indicated that evidence of publication bias was not observed. Furthermore, a sensitivity analysis was conducted to check the stability of the summary estimate.

10. Results

10.1. Study selection

Overall, 38462 potentially relevant articles were retrieved from which 33861 unique studies. Two reviewers (BDM and BAM) independently assessed articles based on their titles and abstracts which result in the exclusion of 33759 articles. One hundred two full-text articles were assessed for eligibility based on the inclusion and exclusion criteria, which result further exclusion of 88 articles. Finally, 14 articles were included in the final analysis (Fig. 1).

10.2. Study characteristics

All of the articles included in this meta-analysis were cross-sectional designs. Of fourteen studies included, 5 were from SNNPR region,[30–34] 5 were from Amhara region,[35–39] 3 were nationwide studies[40–42] and 1 was from Addis Ababa city administration.[43] All articles were published in 2021. In this study, a total of 6373 participants were included from an estimated 7064 sample size, yielding 90.2% response rate. The proportion of COVID-19 vaccine acceptance reported in the selected studies varied from 31.3% to 80.9%. As for the evaluation of COVID-19 vaccine acceptance, ten of the included studies utilized self-designed questionnaires, two studies used face to face interview, and the other two used online survey. More than half[8] of studies had high quality, and the remaining 6 studies had medium quality (Table 1).

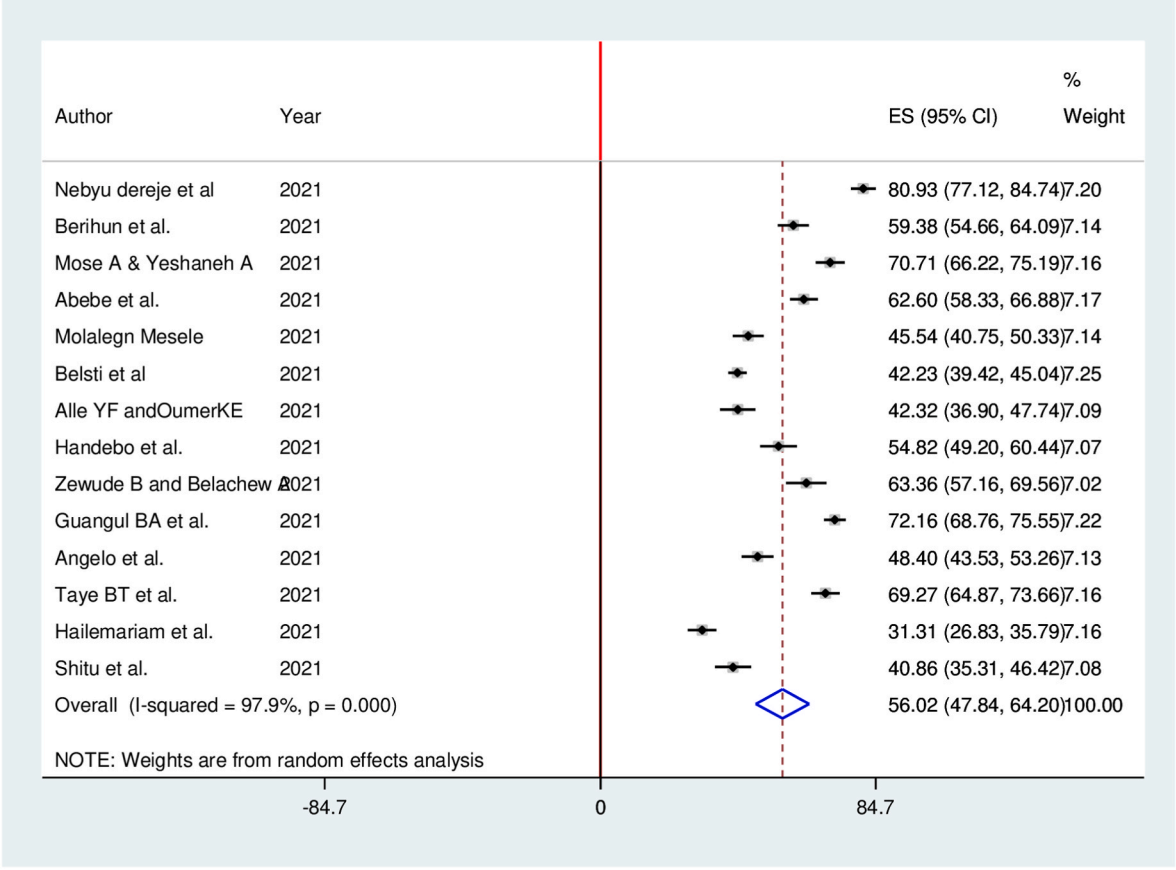

Fig. 3. Forest plot of the pooled proportion of COVID-19 vaccine acceptance in Ethiopia, 2021.

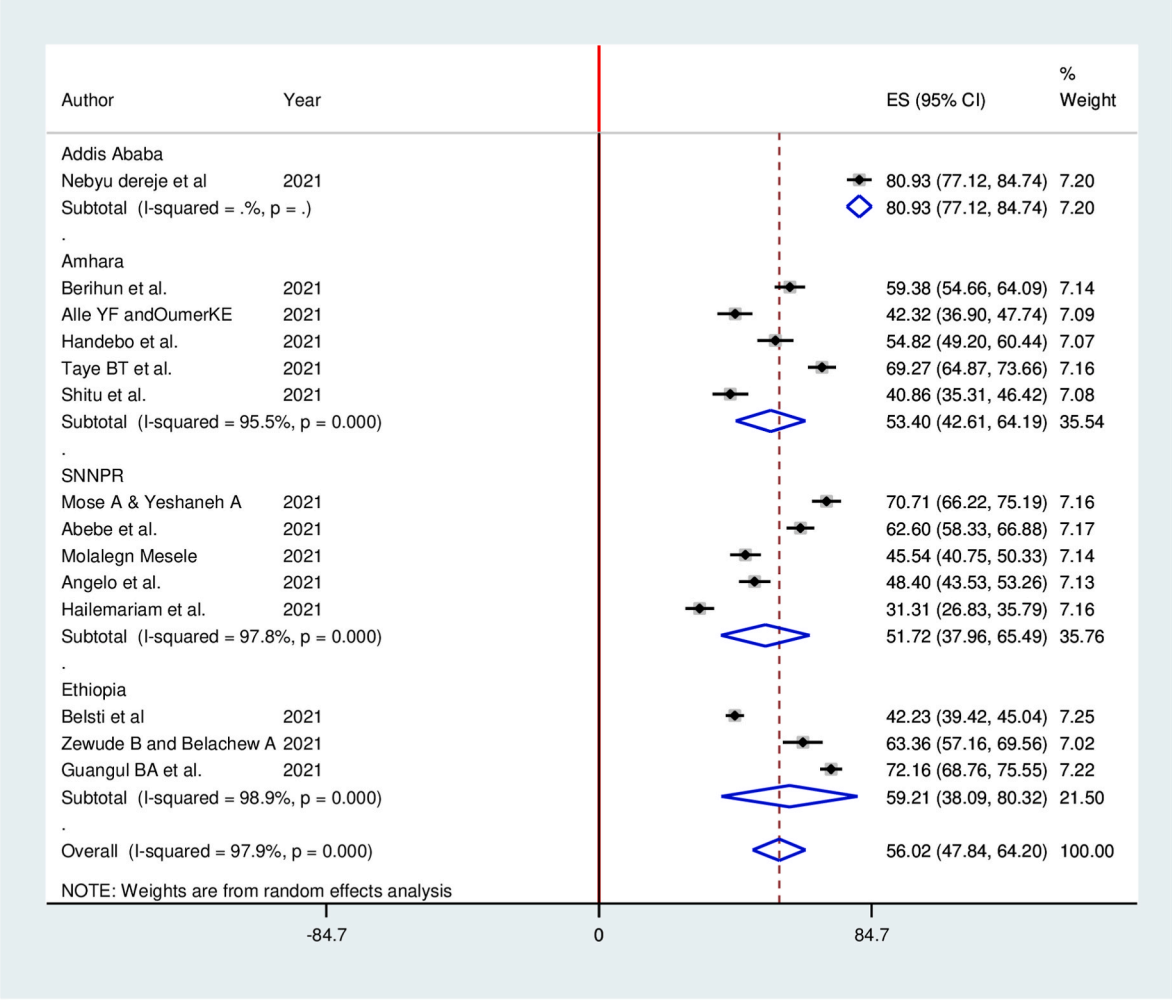

Fig. 4. Sub-group analysis (by region) of the pooled proportion of COVID-19 vaccine acceptance in Ethiopia, 2021.

10.3. Publication bias and sensitivity analysis

In this systematic review and meta-analysis, sensitivity analysis was conducted using the random-effects model for the estimates of COVID-19 vaccine acceptance. The results of the sensitivity analysis suggested that there is no influential study as none of the points estimate outside of the overall 95% confidence interval. Visual inspection of the funnel plot indicated that there is symmetrical distribution of studies included in the review, and Egger's test was not statistically significant (P = 0.821) suggesting the absence of publication bias for COVID-19 vaccine acceptance (Fig. 2).

10.4. Meta-analysis of COVID-19 vaccine acceptance

Fourteen studies reported the acceptance of COVID-19 vaccine in a total of **6373** study participants. The pooled proportion of COVID-19 vaccine acceptance in Ethiopia was found to be 56.02% (95% CI: 47.84, 64.20). In this meta-analysis, a random effects model was executed as high heterogeneity (I^2 = 97.9%, P ≤ 0.001) was detected within the included studies (Fig. 3).

10.5. Subgroup analysis of COVID-19 vaccination acceptance

Subgroup analyses for the meta-analysis was implemented to clarify the source of heterogeneity Because of severe heterogeneity observed among selected studies. The subgroup analysis was implemented based on study region, study population, and data collection methods. However, no considerable difference between subgroup heterogeneity and overall heterogeneity exhibited in subgroup analysis, indicating that the heterogeneity was not associated with study region, study population, and data collection methods (Fig. 4, Fig. 5, Fig. 6).

10.6. Meta-analysis of factors associated with COVID-19 vaccine acceptance

In this meta-analysis, variables common to all participants were pooled quantitatively to examine if they are significantly associated with COVID-19 vaccine acceptance. Nevertheless, some factors were not pooled because of inconsistent categorization in the primary studies. Those determinants reported in more than one original studies were included in this meta-analysis. Accordingly, having good knowledge of the COVID-19 vaccine, having a positive attitude towards COVID-19 vaccine, good preventive practices, history of chronic illness, and having high perceived seriousness of COVID-19 were significant factors associated with COVID-19 vaccine acceptance.

Study participants with a history of chronic disease were 1.33 times (AOR = 1.33, 95% CI: 1.09, 2.97) more likely to accept the COVID-19 vaccine than study participants without a history of chronic disease. Study participants who had good knowledge about the COVID-19 vaccine were 2.13 times (AOR = 2.13, 95% CI: 1.59, 4.97) more likely to accept the COVID- 19 vaccine as compared with study participants with poor knowledge. Study participants who had positive attitude towards the COVID-19 vaccine were 2.23 times (AOR = 2.23, 95% CI: 1.21, 4.66) more likely to accept the COVID- 19 vaccine than those study

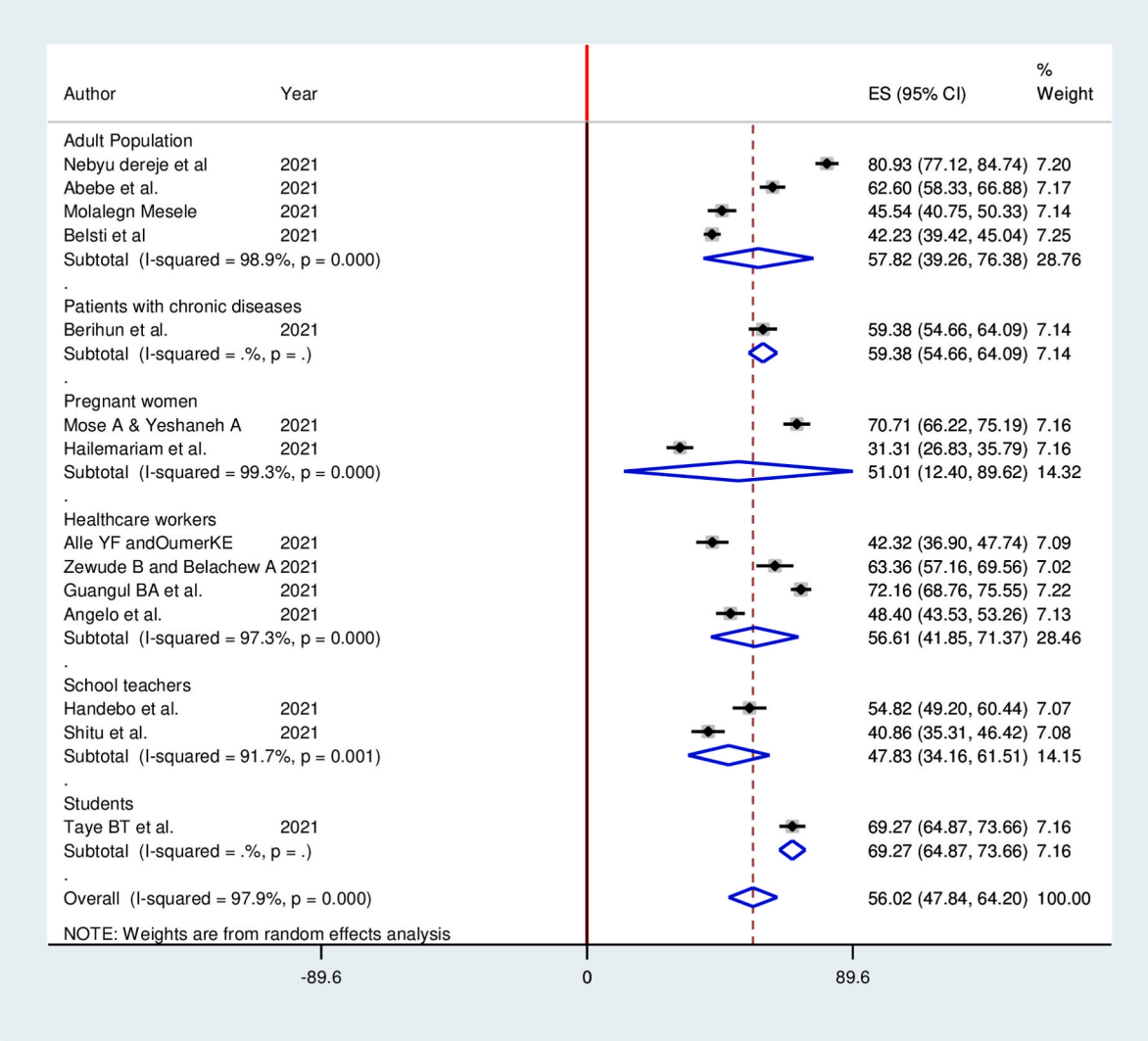

Fig. 5. Sub-group analysis (by study population) of the pooled proportion of COVID-19 vaccine acceptance in Ethiopia, 2021.

participants with negative attitude. The odds of COVID- 19 vaccine acceptance was 3.21 times (AOR = 3.21, 95% CI: 2.32, 5.98) among study participants who had high perceived seriousness of COVID-19 than those study participants who had low perceived seriousness of COVID-19. The likelihood of COVID- 19 vaccine acceptance was 1.97 times (AOR = 1.97, 95% CI: 1.82, 2.12) among study participants who had good preventive practice of COVID-19 than those study participants who had poor preventive practice of COVID-19 (Table 2).

11. Discussion

The findings of this study indicated that more than half of the participants were willing to accept COVID-19 vaccine. This observed low COVID-19 vaccine acceptance could attribute to public exposure to misconception and concerns over the safety of the COVID-19 vaccine. Evidence suggests that public exposure to misinformation and concerns over the safety of COVID-19 vaccines could be contributing to low intentions to be vaccinated.[44–46] It is believed that the wide uptake of COVID-19 vaccine could contribute to the development of herd immunity and guard the public against COVID-19.[47] Hence, this finding implies the need for better enactment to address public trust, acceptability, benefit and concern over the safety of the approved COVID-19 vaccine.

Results of this systematic review and meta-analysis indicated that the pooled proportion of COVID-19 vaccine acceptance in Ethiopia was found to be 56.02%. The result of this study was in line with different systematic review and meta-analysis which reported pooled proportion of COVID-19 vaccine acceptance as 60.1%[48] and 60%.[23] However, the finding was lower than a systematic review and meta-analysis that reported the pooled proportion of willingness to COVID-19 vaccination among the general population to be 81.65%.[20] This could attribute to variations in the spread and burden of the COVID-19 pandemic across the countries. The discrepancy could be also due differences in the respondents' local norms and cultures, and exposure to credible social media disseminating factual information regarding COVID-19 vaccine. Moreover, the variation could be explained by differences in awareness on the severity of COVID-19, access to health care service.

Results of the subgroup analysis indicated that the pooled proportion of COVID-19 vaccine acceptance among healthcare workers in Ethiopia was 56.61%. The result of this study was in line with a systematic review and meta-analysis which reported pooled proportion of COVID-19 vaccine acceptance as 51%.[21] This implies that a considerable proportion of healthcare workers were hesitant towards COVID-19 vaccine, which hinder their recommendation of vaccination to their patients. Evidence indicates that the attitude of the healthcare workers toward COVID-19 vaccine were found to influence their intention to suggest the vaccine to their patients and general population.[49] Hence, future prioritized education needs to involve healthcare workers to influence their own use of the vaccine and to be accepted by the population.

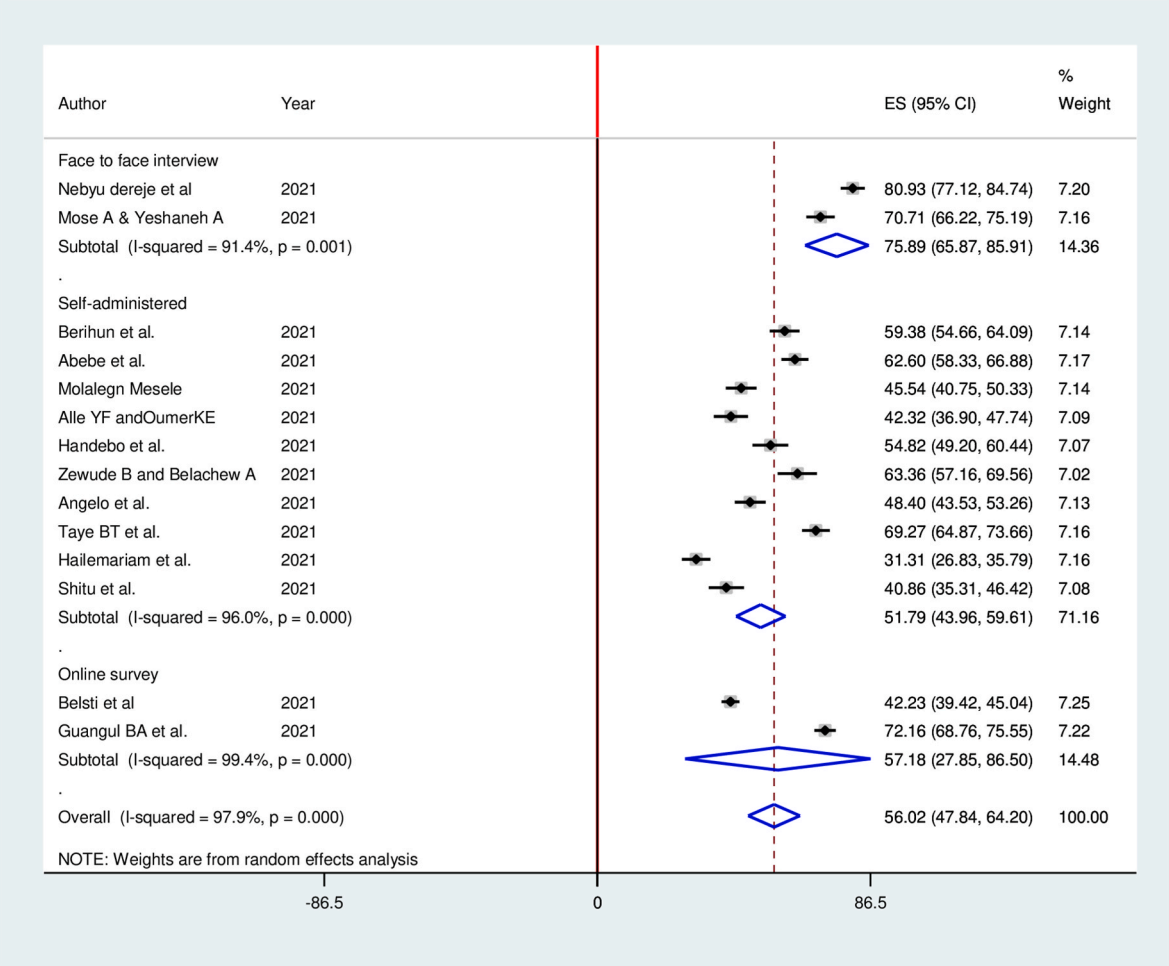

Fig. 6. Sub-group analysis (by data collection method) of the pooled proportion of COVID-19 vaccine acceptance in Ethiopia, 2021.

This study identified that having history of chronic disease had significantly associated with COVID vaccine acceptance. Participants with a history of chronic disease were more likely to accept the COVID-19 vaccine than study participants without a history of chronic disease. This result is supported by a report from WHO,[50] and a study conducted in Australia.[51] This finding highlights the need to create platform that could enable individuals with history of chronic disease to be vaccinated against COVID-19 vaccine.

Having good knowledge about the COVID-19 vaccine had significantly associated with willingness to accept the COVID vaccine. Participants who had good knowledge about the COVID-19 vaccine were more likely to accept the COVID- 19 vaccine as compared with study participants with poor knowledge. This finding implies that improving knowledge regarding the benefit, effectiveness and safety of the COVID-19 vaccine could be one of the strategies for achieving targeted vaccination coverage in the general population. This finding is also explained by having good knowledge considered as an engine to take actions regarding a certain behaviour, as it helps individuals to understand the seriousness of the disease, and to know the benefit of the vaccination program. This result is supported by survey carried out in England[52] and Southeast Asia.[53]

Positive attitude towards the COVID-19 vaccine was another significant factor associated with COVID-19 vaccine acceptance. Study participants who had positive attitude towards the COVID-19 vaccine were more likely to accept the COVID- 19 vaccine than those study participants with negative attitude. This implies that the role of positive attitude towards COVID- 19 vaccination is crucial. This study also identified that participants with high perceived seriousness of COVID-19 infection were more likely to accept the COVID- 19 vaccination than those with low perceived seriousness of COVID-19 infection. This finding is in line with studies reported from Indonesia[54] China.[55] This could be due to the fact that people would take measures to avoid any risk if they think they are vulnerable to it. Evidence indicated that individuals' readiness of taking the recommended action would be influence by their level of perception to the positive consequences that are caused by taking an action.[56]

Furthermore, having good preventive practice towards COVID-19 disease was significantly associated with COVID-19 vaccine acceptance. The likelihood of COVID- 19 vaccine acceptance was higher among study participants who had good preventive practice of COVID-19 than those study participants who had poor preventive practice of COVID-19. This finding is in line with studies reported from the Democratic Republic of the Congo[57] and Middle Eastern Population.[58] This could be due to individuals who had good practice knowing the burden of COVID-19 infection on the health of the general population.

Lastly, the study has the following limitations. First, generalizability of the finding may not be established as the representability of the sample size was uncertain in most studies, and uncertainty of Internet access to complete an online survey. Hence, subgroup analysis was performed according to the sampling method to have acceptable validity. Second, some determinants were not examined due to inconsistent categorization, and limitations of the data in the primary studies. Besides, temporal relationships between outcome variable and predictors couldn't be established as all included studies were cross sectional. Finally, the study may not be representative of the national reaction to the COVID-19 vaccine as it didn't include studies from all regions of the

Table 2
Factors associated with COVID-19 vaccine acceptance in Ethiopia: a systematic review and meta-analysis, 2021.

Variables	Included studies	OR (95% CI)	Pooled OR (95%CI)	Heterogeneity (I^2, p-value)
History Chronic disease	Abebe et al. Angelo et al.	1.40 (.07, 2.11) 1.15 (1.06, 2.10)	1.33 (1.09, 2.97)	0.0%, 0.667
Good knowledge	Berihun et al. Mose A & Yeshaneh A Abebe et al. Taye BT et al. Hailemariam et al.	1.93 (1.36, 2.45) 1.78 (1.38, 2.19) 2.41 (1.47, 3.87) 2.15 (1.32, 3.14) 1.52 (1.12, 3.14)	2.13 (1.59, 4.97)	75.6%, 0.003
Positive attitude	Berihun et al. Angelo et al.	2.06 (1.19, 3.83) 2.64 (1.77, 5.37)	2.23 (1.21, 4.66)	0.0%, 0.088
High perceived severity	Hailemariam et al. Shitu et al.	3.52 (2.41, 5.78) 2.42 (1.96, 5.88)	3.21 (2.32, 5.98)	0.0%, 0.397
Goo preventive practice	Mose A & Yeshaneh A Angelo et al. Taye BT et al.	2.21 (2.05, 2.38) 1.12 (1.06, 2.03) 1.12 (1.04, 2.86)	1.97 (1.82, 2.12)	96.1%, 0.000

country.

12. Conclusions

This study showed that more than half participants were willing to the accept COVID-19 vaccine. However, substantial number of people were not to be vaccinated against COVID-19, which indicated that vaccine acceptability still needs more attention. The likelihood of COVID-19 vaccine acceptance was higher among participants who had history of chronic disease, good knowledge, positive attitude, good COVID-19 preventive practice, and with high perceived seriousness of COVID-19. Thus, awareness creation battles about the efficacy and safety of the COVID- 19 vaccine should be provided to the community with collaboration effort of all COVID- 19 vaccine taskforce established by the Ethiopia's Ministry of Health, regional and zonal health offices, and public health institute. Besides, policy-makers, health planners and other stakeholders should encourage COVID-19 vaccine uptake behaviors by providing trusted information about the COVID-19 vaccine in all regions of Ethiopia. Moreover, better public health messaging and health education targeting increasing knowledge, and changing attitude towards COVID-19 vaccine should be disseminated to the general population.

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No funding has been received for this systematic review and meta-analysis.

Availability of data and materials

All relevant data generated and analyzed in the analysis process is included in this article.

Ethics approval and consent to participate

Not applicable, since this is systematic review and meta-analysis.

Consent for publication

Not applicable.

Declaration of competing interest

The authors declare that they have no competing interest.

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