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# Knowledge and Attitude towards COVID-19 and its Associated Factors among Health Care Providers in Ethiopia: A Systematic and Meta-Analysis

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## ABSTRACT

***Objective:*** *The main aim of this study is to determine the pooled estimate of good knowledge and positive attitude towards COVID-19 among health care providers in Ethiopia.*

***Methods:*** *This review was registered on PROSPERO with registration number CRD42020213000. PubMed, Advanced Google search, and Google Scholar databases were searched up to June 20, 2020, to identify relevant articles.*

***Result:*** *This research searched a total of, 126 articles, from this articles 19 from PubMed, 6 from advanced Google search, 45 from Google scholar databases, and 56 were pre-print unpublished sources. A total of 3752 study participants within 10 articles were used to pool the prevalence of Knowledge and attitude towards COVID-19 among health care providers in Ethiopia and the pooled prevalence of knowledge and attitude towards COVID-19 was 73.01% with 95% CI (65.8% - 80.21%) and 70.72% (59.68%-81.77%) respectively. Place of residence [AOR= 0.24, 95% CI (0.14– 0.43)], and social media use [AOR= 2.51, 95% CI (1.53–4.12)] for knowledge while educational status [AOR= 2.41, 95% CI (1.33–4.39)], and status of knowledge were also identified as factors affecting attitude towards COVID 19 among healthcare providers in Ethiopia.*

***Conclusion:*** *The level of knowledge and attitude towards COVID 19 among healthcare providers working in Ethiopia was very low and variables such as residence and social media use were factors affecting knowledge while educational status and knowledge were factors affecting attitude towards COVID 19 among healthcare providers.*

**KEYWORDS:** *COVID-19, Knowledge, Attitude, Health Care providers, Ethiopia.*

## BACKGROUND

Bad news all over the world was disseminated in late December 2019 from Wuhan, Hubei Province, China reporting a group of pneumonia cases of unknown causes. On 9 January 2020, China CDC reported a novel coronavirus as the causative agent of this outbreak, later named coronavirus disease 2019 (COVID-19) [1].

Coronavirus is one of the many viruses existing worldwide and it can be transmitted via birds and mammals. Human beings as being mammals are susceptible to infection and transmission of the virus [2, 3]. This virus is currently recognized to cause respiratory illnesses ranging from the mild common cold to severe acute respiratory syndrome (SARS) [4].

Regarding mode of transmission, this virus can infect humans by coming into close contact (about 6 feet or two arm lengths) with a person who has COVID-19 through respiratory droplets when an infected person coughs, sneezes, or talks. It may also able to get into by touching a surface or object that has a virus on it [5]. Human beings can get protected from this virus by avoiding being exposed to the virus using strategies such as stay at home as much as possible, physical distancing, wearing personal protective equipment (PPE), cleaning and disinfecting frequently touched surfaces, and washing hands often with soap and water for at least 20 seconds, or use an alcohol-based hand sanitizer that contains at least 60% alcohol [5, 6].

Everyone is at risk of acquiring COVID-19 [6] however, people most at risk of acquiring the disease are those who are in contact with or care for patients with COVID-19. This inevitably places health care workers (HCWs) at high risk of infection. Protecting HCWs is of paramount importance to the world health organization (WHO) [7]. Health care workers' knowledge and attitude towards COVID-19 infection prevention and control also play a significant role in line with efforts that would be taken by WHO to protect HCWs [7].

Expecting a positive attitude towards COVID-19 without having sufficient knowledge is like waiting for an egg while there is no chicken. Researches from Asian countries such as China, Vietnam, and India indicated a high number of health care workers had good knowledge and attitude towards COVID-19 which ranges from 86% to 89% for good knowledge and from 85%-94% for positive attitude [8-10]. However, a lower level of good knowledge was also observed from the other study in India [11].

A slightly lower level of knowledge ranging from 69% to 87 % and attitude which ranges from 80- 86% was documented by research from the Middle East Asian countries such as Saudi Arabia [12], United Arab Emirates (UAE) [13], and Yemen [14]. Literature regarding, the level of knowledge and attitude towards COVID-19 in African countries was also assessed and the good knowledge varies from 62% to 70% while the level of positive attitude was 21% in Ghana [15] and Uganda [16].

Inconsistent findings towards good knowledge and positive attitude were also observed in Ethiopia which ranged from 53.2% to 88.2% for good knowledge [17-26] and from 56.6% to 89.8% for attitude [17, 19, 21, 23-26] towards COVID-19.

### The Rationale of the Review

In Ethiopia, up to 18 October 2020, a total of 1,397,348 was screened for COVID-19, and 89, 137 of them were confirmed COVID-19 cases with a fatality rate of 15 deaths per 1000 population. Health care providers are at the highest risk of acquiring the infection [27- 29]. Understanding the natural history of the disease and healthcare workers being ready and interested to prevent themselves from exposure would largely reduce the rate of infection. Here, having knowledge and attitude towards the disease in question plays a critical role. Findings in Ethiopia indicated inconsistent findings against knowledge and attitude towards COVID 19 among healthcare providers. Bringing inconsistent findings to a pooled estimate would narrow this gap.

Lately, we found that a systematic and meta-analysis had been conducted and published in Ethiopia [30] but failed to include factor analysis. Therefore, the main aim of this study was to determine the pooled estimate of good knowledge and positive attitude and its associated factors towards COVID-19 among health care providers in Ethiopia.

## METHODS

### Protocol Registration

This review was conducted according to a priori published protocol on PROSPERO International Prospective Register of systematic reviews for publication registration number CRD42020213000 (available at https://www.crd.york.ac.uk/PROSPERO/#myprospero).

Literature search: Initially, databases were searched for the same systematic review done before to avoid duplications of efforts. Boolean operators were used for searching studies. PubMed, Advanced Google search, and Google Scholar databases were searched up to 18 October 2020 to identify relevant articles. The keywords and medical subject headings ((((Knowledge) AND/OR (Attitude)) AND (COVID 19)) AND (Healthcare providers)) AND (Ethiopia) were used to screen for potentially relevant studies.

### Eligibility Criteria

Studies were eligible for inclusion in the review if they met the following criteria: (1) published in the English language; (2) study participants were healthcare providers in Ethiopia; (3) studies which reported sufficient knowledge and attitude towards COVID 19: Studies of all design. Studies were excluded if they met the following criteria: (1) not an original study, such as a review paper (2) Studies difficult to access full text and studies which didn't report specific outcomes knowledge and attitude were excluded.

### Patient and Public Involvement

No patient involved

### Data Extraction and Study Quality Assessment

Data from eligible studies were extracted independently by two reviewers (Maru and Zegeye). The following data were extracted from all studies: author, study area (region), study setting, study year, publication year, and sample size, number of participants, study design, sampling technique, and prevalence. Disagreements between the two reviewers during data extraction were reconciled by a 3rd investigator (Gizaw). One author (Bayou) assessed the quality of the articles based on the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) adapted for both cross-sectional/case-control study design was used [31]. Disagreement raised by two quality assessors was repeated and further solved with the involvement of the third reviewer.

### Data Synthesis and Statistical Analysis

STATA 14 statistical software was used for meta-analysis. The existence of heterogeneity was assessed by testing publication bias using funnel plot and more objectively by Egger's regression test. I-squared statistics were used to check the heterogeneity of the studies. The random-effects model was employed to estimate the overall prevalence. Subgroup analysis based on the study area (region), number of study participants, and study year was conducted to see the variation in outcomes.

## RESULTS

### Search Results

This research searched a total of, 126 articles, from this articles 19 from PubMed, 6 from advanced Google search,

45 from Google scholar databases, and 56 were pre-print unpublished sources. Thirty eight studies title and abstract was irrelevant to the study, 78 studies were from countries other than Ethiopia and therefore removed from the study (Figure 1).

## Characteristics of Studies

A total of 10 studies were included in the analysis and 7 (70%) of them were institutional based, 1 (10%) community based and 2 (20%) online cross-sectional studies involving simple random sampling (6 studies), census (1 study), convenience (3 studies) sampling techniques. Nine (90%) studies were conducted during 2020 while 1(10%) was done during 2019. Out of all studies included in the meta-analysis, Amhara region accounts 6(60%) (Table1).

**Table 1.** Characteristic of included studies in systematic review and meta-analysis

| Ser. No | First author and study year | Region | Study design | Sampling technique | Study population | Participants | Knowledge Level (%) | Attitude Level (%) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Abay et al, 2020 | Amhara | Cross-sectional | SRS | Health care providers | 408 | 69.6 | 56.6 | [19] |
| 2 | Bedru, et al 2020 | Other | Cross-sectional | SRS | Health care providers | 397 | 88.2 | | [26] |
| 3 | Belayneh et al, 2020 | Amhara | Cross-sectional | SRS | Health care providers | 408 | 73.8 | 65.7 | [21] |
| 4 | Degena et al, 2020 | Other | Cross-sectional | SRS | Health care providers | 415 | 74 | 72 | [23] |
| 5 | Dejen et al, 2020 | Amhara | Cross-sectional | SRS | Health care providers | 166 | 84.9 | 63.3 | [24] |
| 6 | Mulusew et al, 2020 | Amhara | Cross-sectional | SRS | Health care providers | 398 | 70 | | [20] |
| 7 | Zelelam et al, 2020 | Other | Cross-sectional | Convenience | Health care providers | 295 | 53.2 | 89.8 | [17] |
| 8 | Hailemariam et al, 2019 | Amhara | Cross-sectional | Convenience | Health care providers | 191 | 86.4 | 76.4 | [25] |
| 9 | Henok et al, 2020 | Other | Cross-sectional | Census | Health care providers | 528 | 55.9 | | [18] |
| 10 | Yared et al, 2020 | Amhara | Cross-sectional | Convenience | Health care providers | 546 | 73.8 | | [22] |

## Pooled Prevalence of Knowledge and Attitude towards COVID-19

A total of 3752 study participants within 10 articles were used to pool the prevalence of Knowledge and attitude towards COVID-19 among health care providers in Ethiopia. Initially, a fixed-effect model was used to pool the prevalence and a higher level of heterogeneity was observed. Therefore, a random effect model was used to pool the effect size for both knowledge and attitude towards COVID-19 in Ethiopia. The pooled prevalence of knowledge towards COVID-19 was 73.01% with 95% CI (65.8% - 80.21%) while for attitude the pooled prevalence of attitude towards COVID-19 was 70.72% (59.68%-81.77%). Moreover, the forest plot for both knowledge and attitude towards COVID-19 showed that there was a high level of heterogeneity between studies indicated by I2=96.6% and 97.1% respectively (Figure 2 and 3).

## Sub-Group Analysis

This analysis tried to figure out the possible reasons for a higher level of heterogeneity between studies for both knowledge and attitude towards COVID-19. Therefore, subgroup analysis was conducted by region, publication status, and sample size for both variables. The finding showed the existence of significant association for both of the variables but all of them indicated the existence of a high level of heterogeneity suggesting that region, sample size, and study year were not the cause for heterogeneity (Figure 4, 5, 6, 7, 8 and 9).

### *Publication Bias*

Egger's test for small-study effects was performed to see the existence of publication bias. However, this test indicated that there was no publication bias with P = 0.201for knowledge and P=0.144. Moreover, the funnel plot also indicated that there was no publication bias suggesting that publication bias was not the cause for heterogeneity. Though funnel plot is usually interpreted subjectively, it is still a good tool to provide evidence. The existence of publication bias is usually evident if plots are fall symmetrically to the mean effect size within the funnel plot (Figure 10 &11).

### *Meta Regression*

meta-regression was further performed to find out cause of heterogeneity against region, year of study and sample size. None of the variables had a significant association with high level of heterogeneity for both knowledge and attitude towards COVID-19 (Table 2 and 3).

**Table 2.** Meta-regression output for assessing causes of heterogeneity among studies included in knowledge

| Variable | Coef | P>/t/ | 95%CI | |
|---|---|---|---|---|
| Region | -8.400084 | 0.297 | -25.76138 | 8.961209 |
| | Ref. | Ref. | Ref. | Ref. |
| Publication status | -2.959916 | 0.716 | -21.07083 | 15.151 |
| Sample size | -2.637075 | 0.768 | -22.52309 | 17.24894 |

**Table 3.** Meta-regression output for assessing causes of heterogeneity among studies included in attitude

| Variable | Coef | P>/t/ | 95%CI | |
|---|---|---|---|---|
| Region | 15.54566 | 0.133 | -7.398351 | 38.48967 |
| | Ref. | Ref. | Ref. | Ref. |
| Publication status | 16.27638 | 0.119 | -6.576025 | 39.12879 |
| Sample size | -12.13842 | 0.241 | -36.66718 | 12.39035 |

### Factors Affecting Healthcare Providers' Knowledge towards COVID 19

Originally, the odds of having adequate knowledge towards COVID-19 was higher among healthcare providers working in health facilities situating in urban areas compared to those health facilities situating in rural areas[ AOR= 0.44, 95% CI (0.26–0.70)] [20], and [AOR= 4.3, 95% CI (2.6–15.8)] [22]. Consistently, the pooled effect also revealed that the odds of having adequate knowledge towards COVID 19 was 76% less likely among healthcare providers working in health facilities of rural areas compared to those health facilities of urban areas[ AOR= 0.24, 95% CI (0.14–0.43)] (Figure 12).

Concerning the source of information, the research findings also showed that those healthcare providers who were getting information regarding COVID 19 from social media were more likely to have adequate knowledge towards COVID 19 compared to their counterparts [ AOR= 2.51, 95% CI (1.42–4.53)] [20], and [AOR= 3.41, 95% CI (1.56–7.43)] [26]. The pooled effect size also indicated that those healthcare providers who were getting information regarding COVID 19 from social media were 2.51 times more likely to have adequate knowledge of COVID 19 compared to their counterparts [ AOR= 2.51, 95% CI (1.53–4.12)] (Figure 13).

### Factors Affecting Healthcare Providers' Attitude towards COVID 19

Two research articles included in the review indicated that those healthcare providers with educational status of bachelor degree or above were more likely to have favorable attitude towards COVID 19 compared to those healthcare providers with educational status of diploma[ AOR= 0.27, 95% CI (0.17–0.42)] [19], and [AOR= 1.74, 95% CI (1.034–2.928)] [21]. The pooled estimate also revealed that those healthcare providers with educational status of bachelor degree or above were 2.41 times more likely to have favorable attitude towards COVID 19 compared to those healthcare providers with educational status of diploma[ AOR= 2.41, 95% CI (1.33–4.39)] (Figure 14).

It was also found that those health care providers with adequate knowledge regarding COVID 19 had a favorable attitude towards COVID 19 as well compared to those with unfavorable knowledge towards COVID 19 [ AOR= 0.31, 95% CI (0.19–0.48)] [19], and [AOR= 3.17, 95% CI (1.97–5.06)] [21]. Similarly, the pooled estimate suggests that health care providers with adequate knowledge regarding COVID 19 were 3.06 times more likely to have a favorable attitude towards COVID 19 compared to those with unfavorable knowledge towards COVID 19 [AOR= 3.06, 95% CI (2.23–4.19)] [21] (Figure 15).

## DISCUSSION

Worldwide, the burden of COVID 19 in terms of treating patients and educating the public at large rests on the shoulder of healthcare providers. Logically, healthcare providers are usually expected to have adequate knowledge and a favorable attitude towards COVID 19. So, in Ethiopia researches has been conducted to see healthcare providers' knowledge and attitude towards COVID 19. However, inconsistent findings ranging from 53.2% to 88.2% for knowledge [17-26] and from 56.6% to 89.8% for attitude [17, 19, 21, 23-26] were recorded. Therefore, the pooled estimate would make decisionmaking easier for healthcare administrators and other stakeholders.

Consequently, the pooled prevalence of knowledge towards COVID-19 among healthcare providers in Ethiopia was 73.01%. This finding is lower than the findings from China [8], India [10], Greece [32], but higher than the other findings from Bangladesh [33], India [11], Iran [34], Pakistan [35], Pakistan [36], Ghana [15], Uganda [16], and Nigeria [37]. Inconsistency was also observed with the pooled prevalence of attitude towards COVID-19 among healthcare providers in Ethiopia which was 70.72%. It was lower than the findings from China [8], Vietnam [9], India [10], Yemen [14], Pakistan [36], and Nigeria [37] but higher than the findings from Ghana [15], and Uganda [16]. The possible explanation for inconsistencies could be related to differences in tools

used to measure knowledge and attitude, study setting, and period.

Regarding Knowledge, the pooled estimates of this review indicated that the odds of having adequate knowledge towards COVID 19 were 76% less likely among healthcare providers working in health facilities of rural Ethiopia compared to those working in health facilities of urban Ethiopia. This was supported by a finding from Bangladesh [33]. In fact, the finding from Bangladesh [33] was conducted among internet users.

A positive association was also obtained regarding the source of information about COVID 19. Hence, healthcare providers who were using social media as a source of information were 2.51 times more likely to have adequate knowledge of COVID 19 compared to their counterparts. Similar evidence was observed in Uganda [16].

Healthcare providers who owned bachelor's degrees or above in their academics were 2.41 times more likely to have a favorable attitude towards COVID 19 compared to diploma holder healthcare providers in Ethiopia. Evidence from Yemen [14] suggested that there was a positive association between good educational status and good knowledge towards COVID 19.

Ethiopian healthcare providers who gained adequate knowledge of COVID 19 were 3.06 times more likely to develop a favorable attitude towards COVID 19 as well compared to those healthcare providers with inadequate knowledge of COVID 19. This was supported by evidence from Vietnam [9], Greece [32], and Nigeria [38].

Strengths and limitations of this review

- The main strength of this review was providing the pooled effect size hence it could help researchers and policy makers to concentrate on finding solutions to the identified gaps
- Research articles included in this review operationally defined knowledge and attitude in somewhat differing ways therefore might have its own implication on the pooled effect size.
- The pooled effect size reported in this review could change as time elapses because healthcare providers could learn about COVID 19 from their experience and trainings.

## CONCLUSION

The level of knowledge and attitude towards COVID 19 among healthcare providers working in Ethiopia is very low compared to literatures reviewed and variables such as residence and social media use were factors affecting knowledge towards COVID 19 while educational status and knowledge were factors affecting attitude towards COVID 19 among healthcare providers.

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## Appendex 1

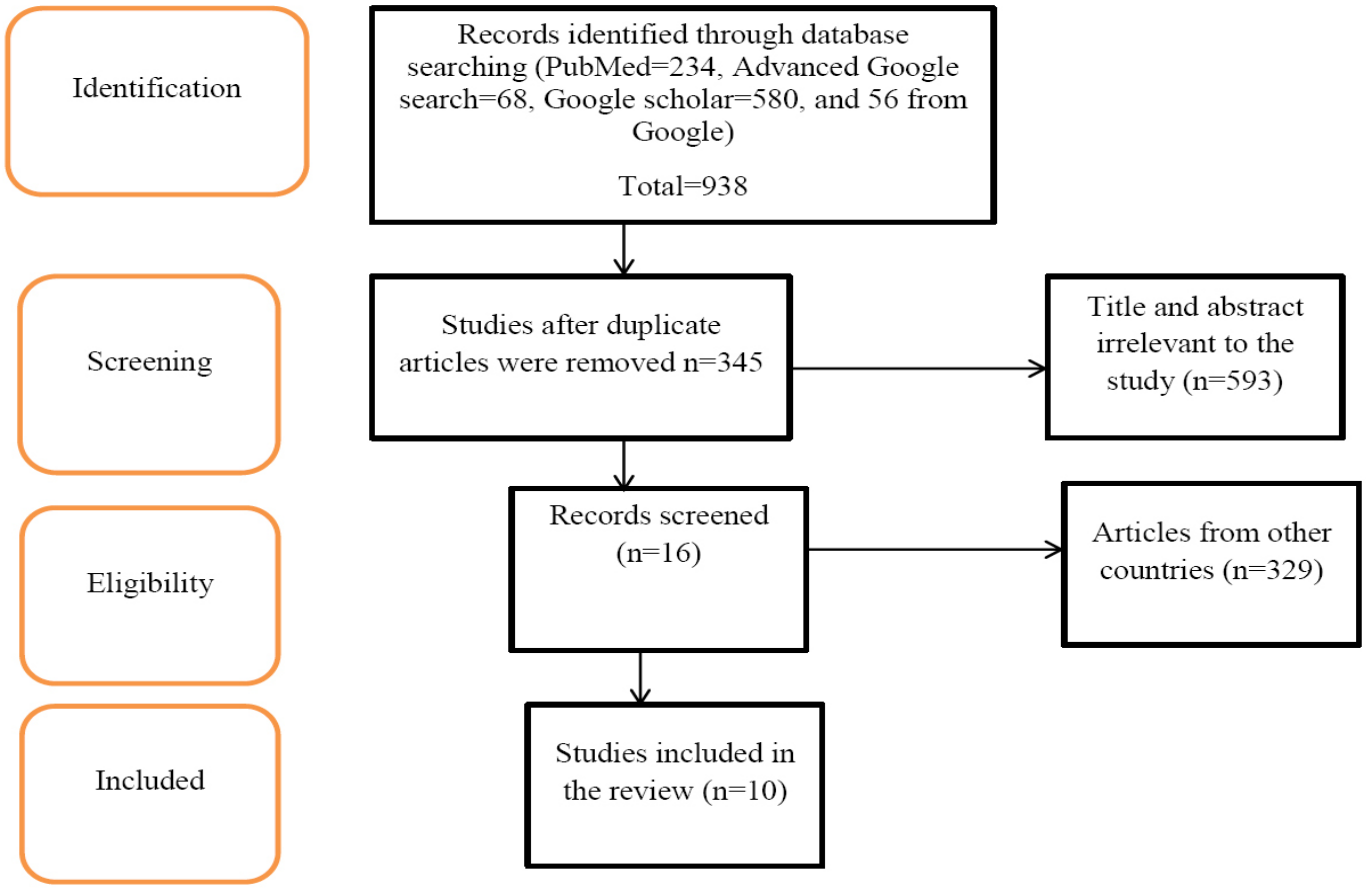


**Figure 1.** PRISMA flow-chart diagram describing the selection of studies.

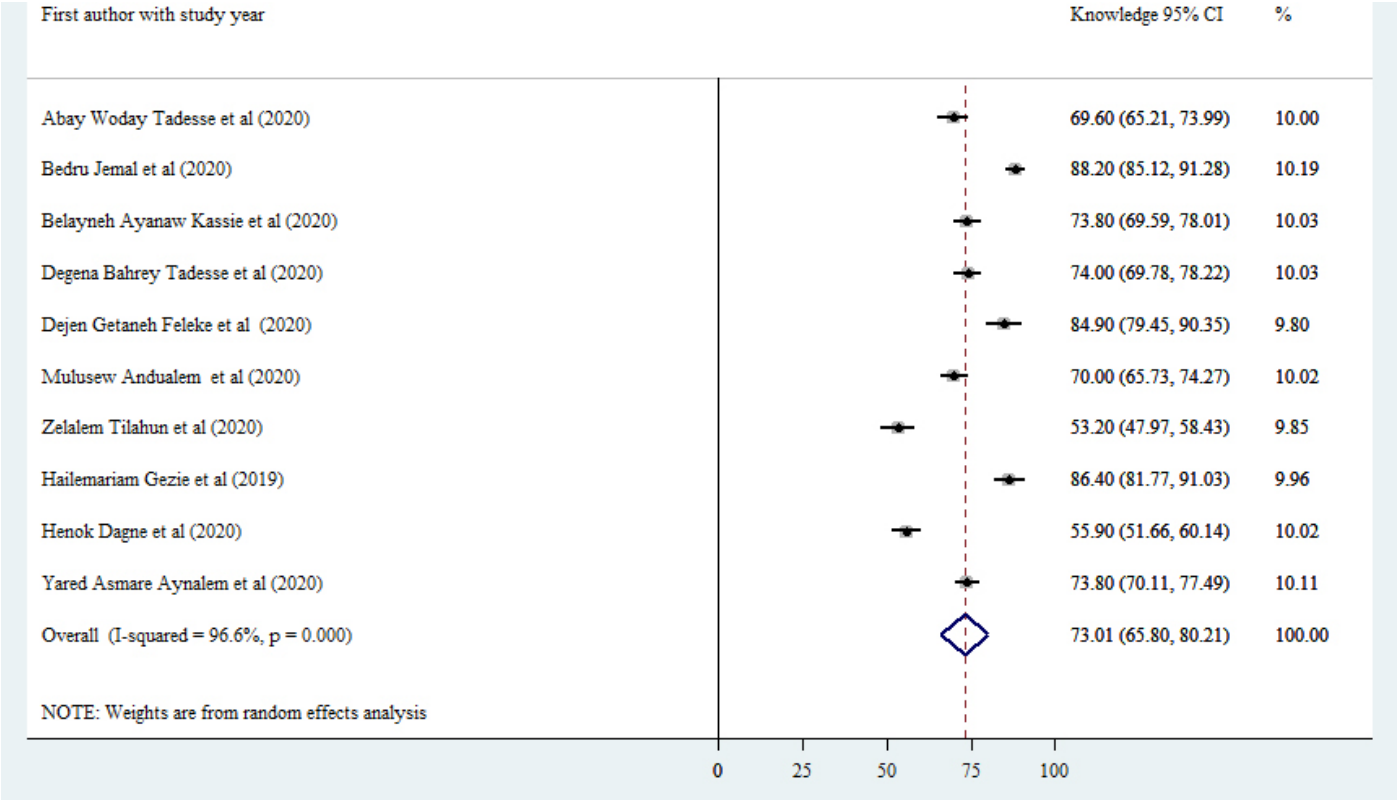


**Figure 2.** Forest plot showing the pooled prevalence of knowledge towards COVID-19 among health care providers in Ethiopia, 2020.

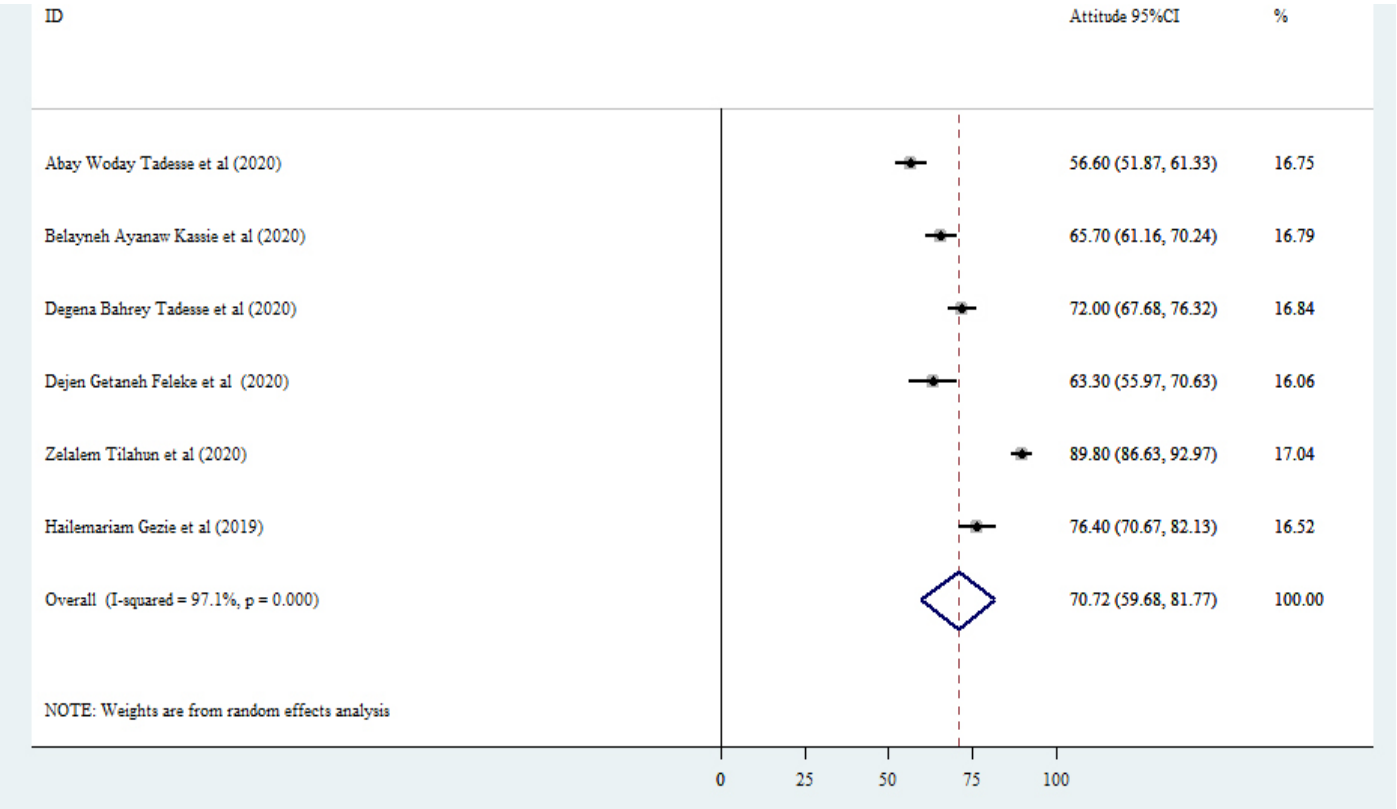


**Figure 3.** Forest plot showing the pooled prevalence of attitude towards COVID-19 among health care providers in Ethiopia, 2020.

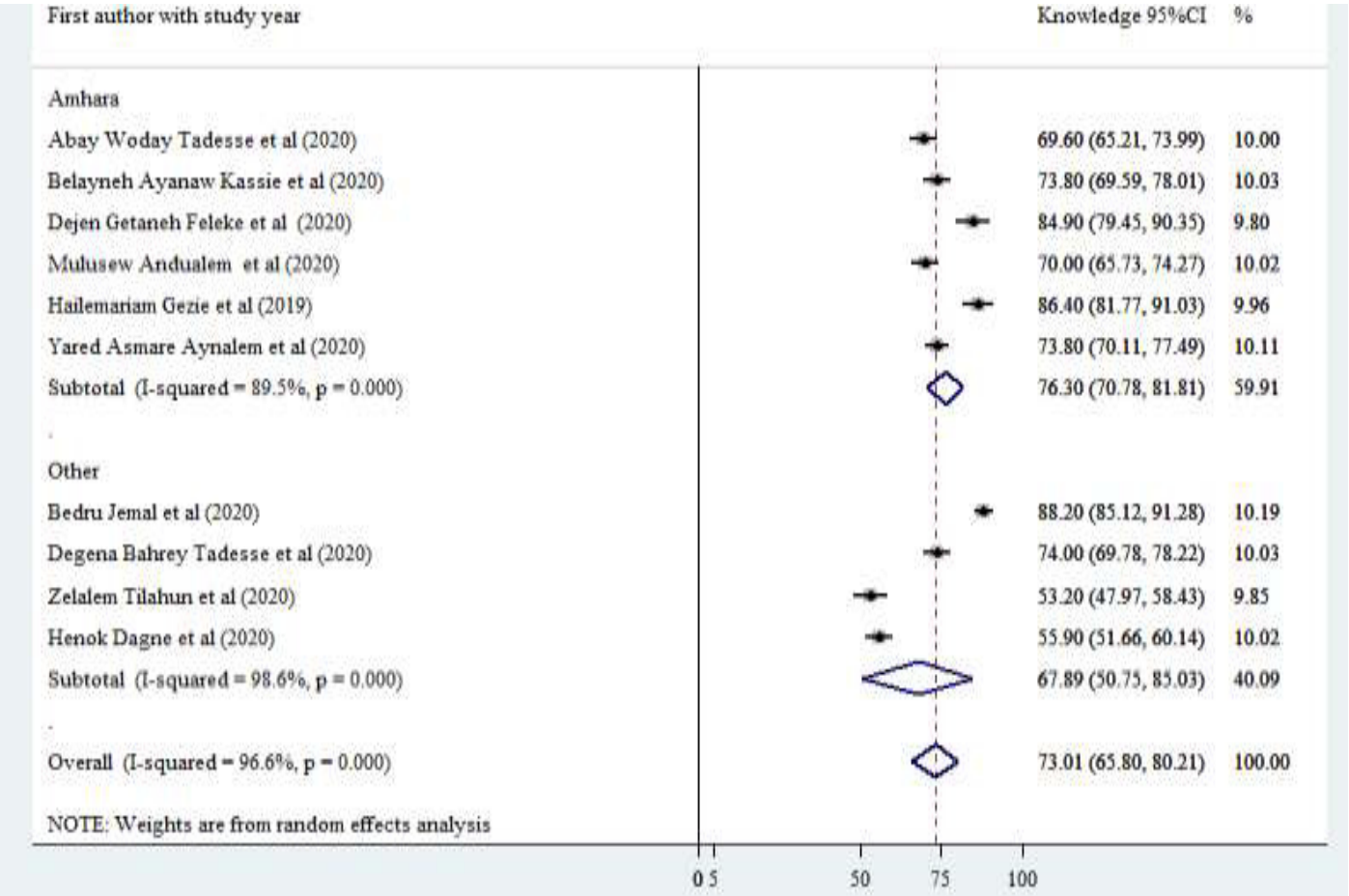


**Figure 4.** Sub-group analysis of knowledge by study region

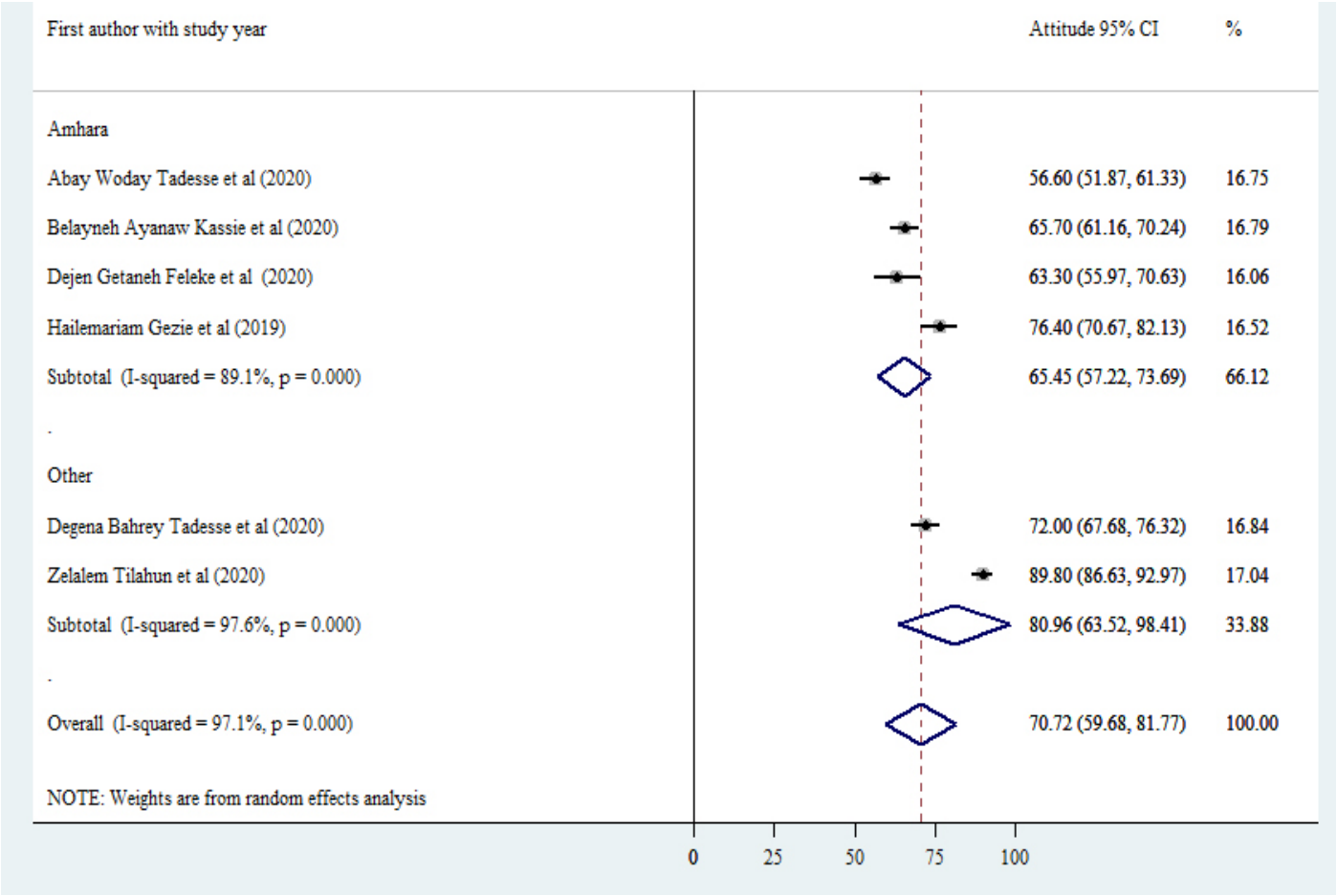


**Figure 5. Sub-group analysis of attitude by study region**

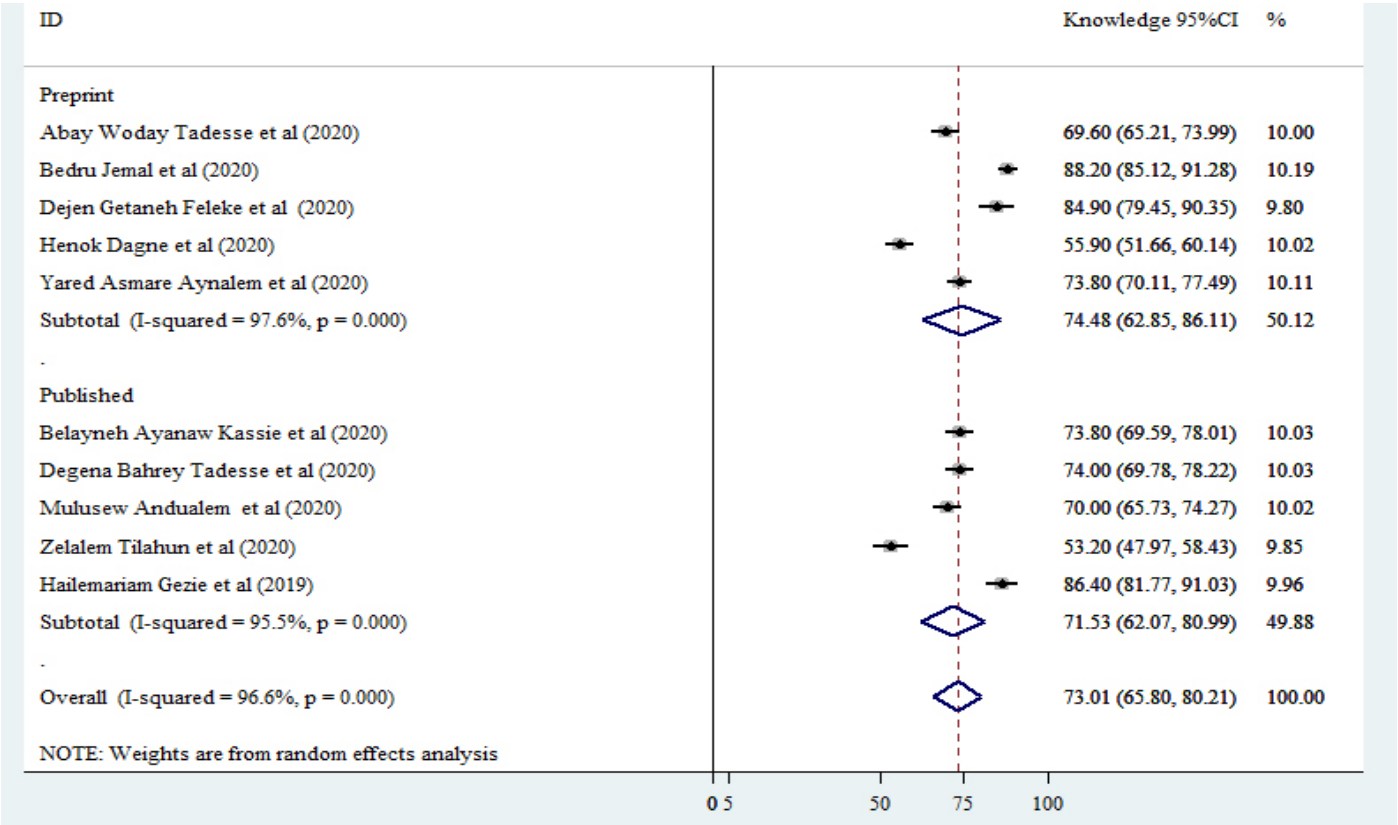


**Figure 6.** Sub-group analysis of knowledge by publication status

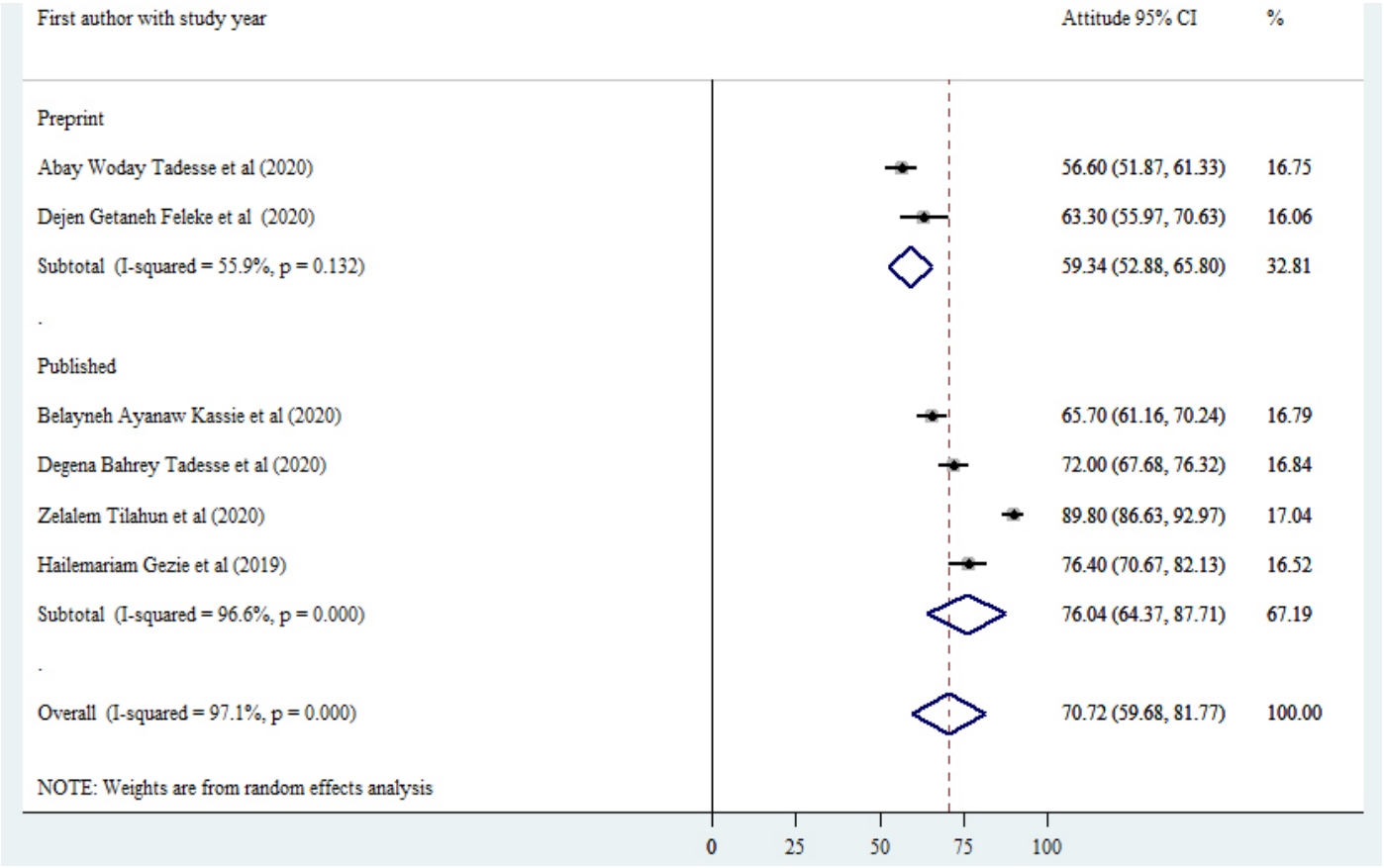


**Figure 7. Sub-group analysis of attitude by publication status**

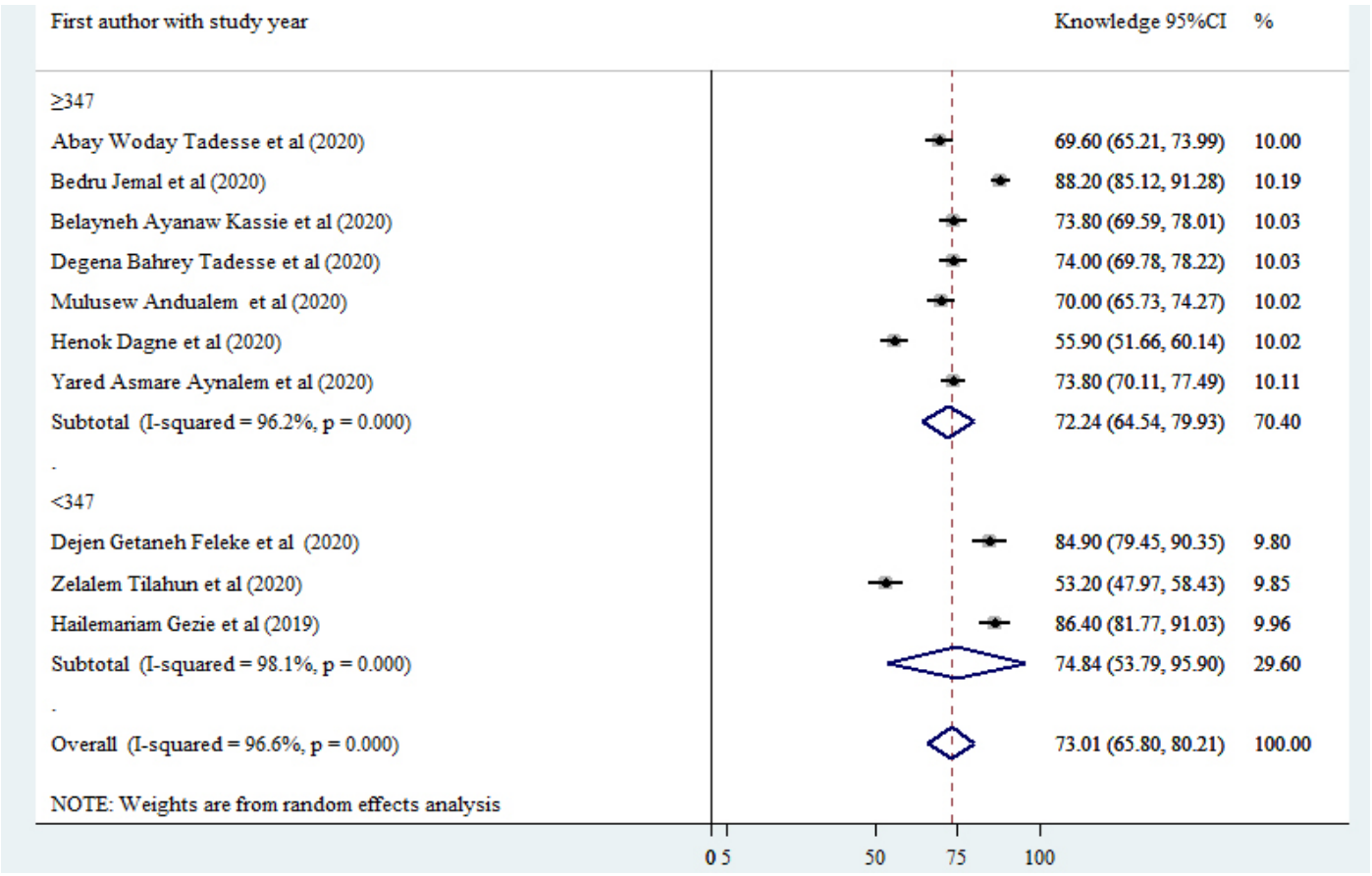


**Figure 8.** Sub-group analysis of knowledge by sample size

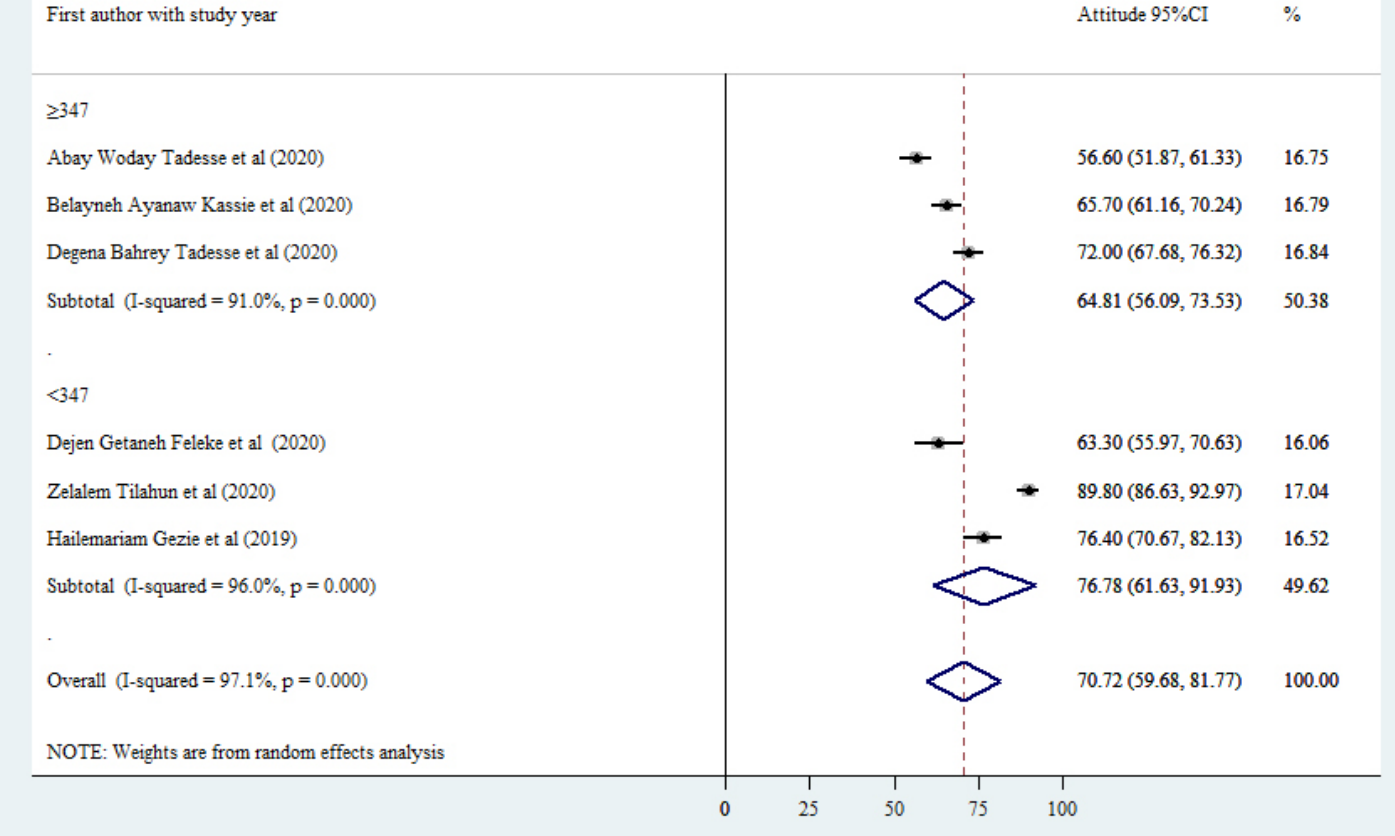


**Figure 9. Sub-group analysis of attitude by sample size**

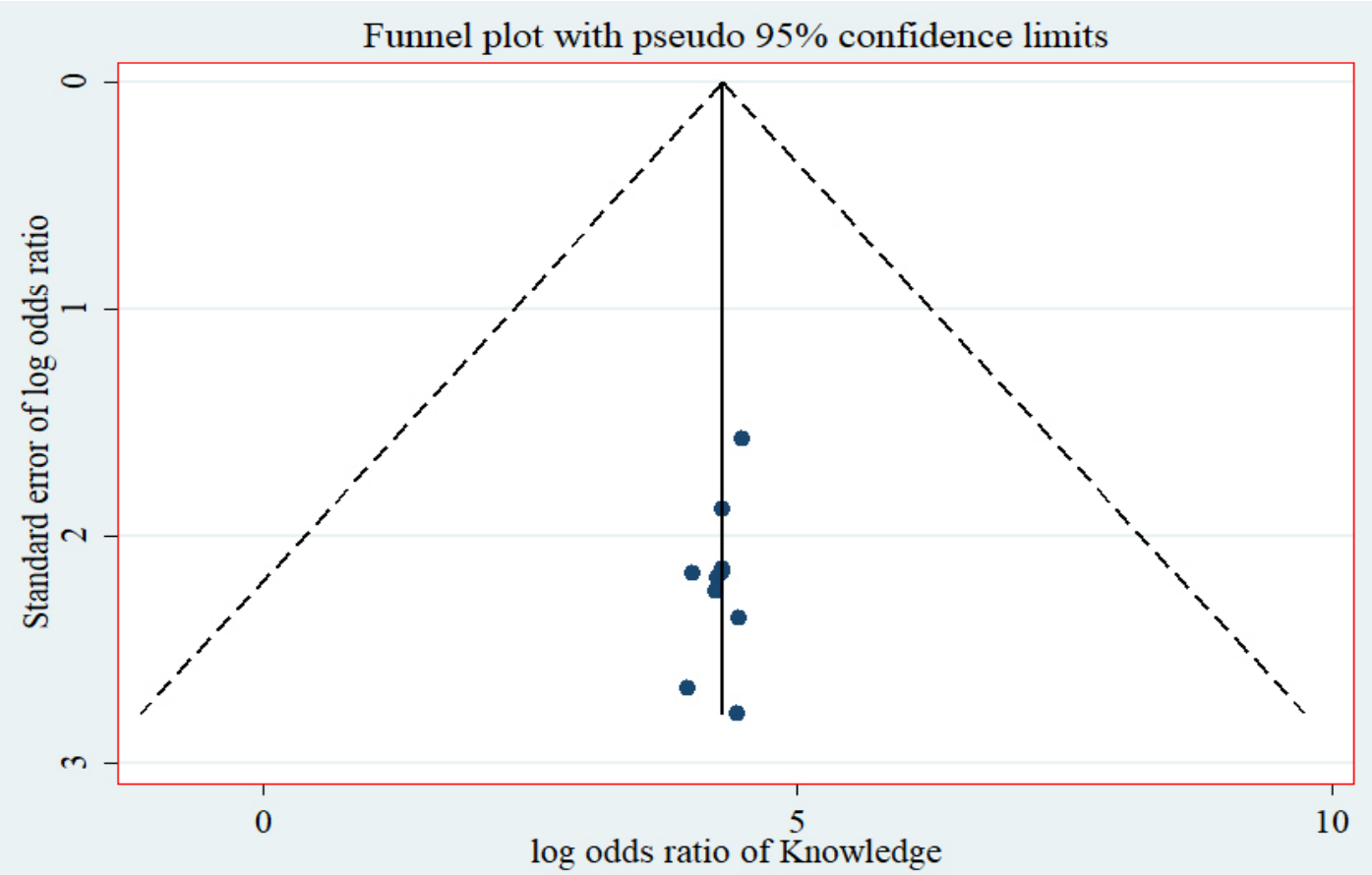


**Figure 10.** Funnel plot, in which the vertical line indicates the effect size whereas the diagonal line indicates the precision of individual studies with 95% confidence limit

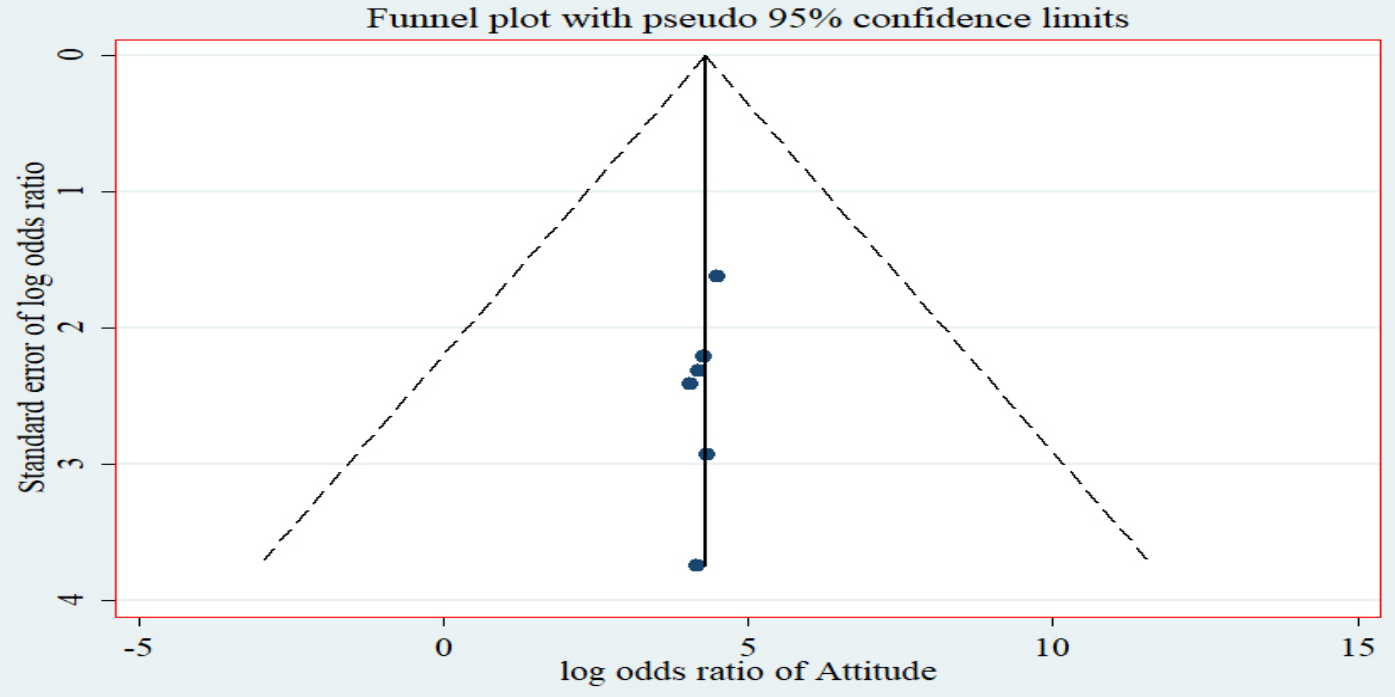


**Figure 11.** Funnel plot, in which the vertical line indicates the effect size whereas the diagonal line indicates the precision of individual studies with 95% confidence limit

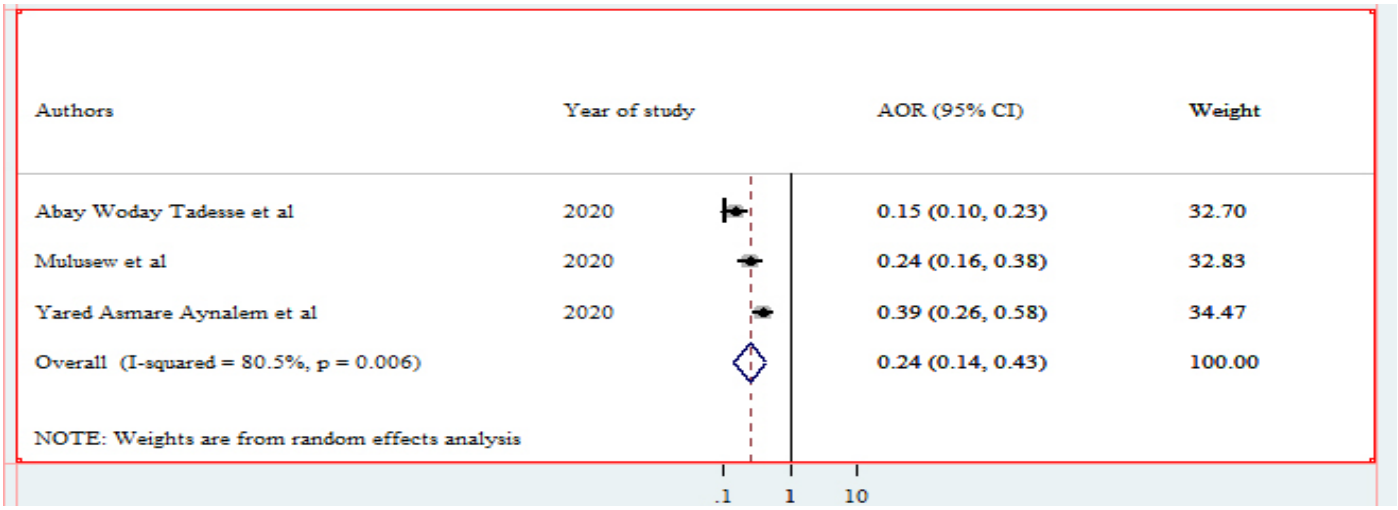


**Figure 12.** Forest plot of the adjusted odds ratios (AOR) with corresponding 95% CIs of studies on the association of residence and knowledge towards COVID 19

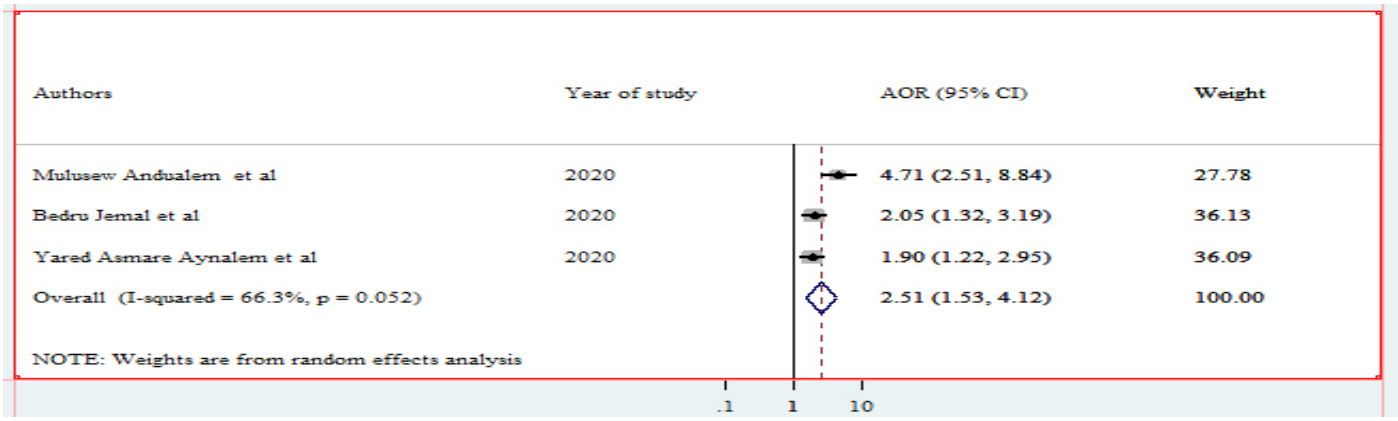


**Figure 13.** Forest plot of the adjusted odds ratios (AOR) with corresponding 95% CIs of studies on the association of social media use and knowledge towards COVID 19

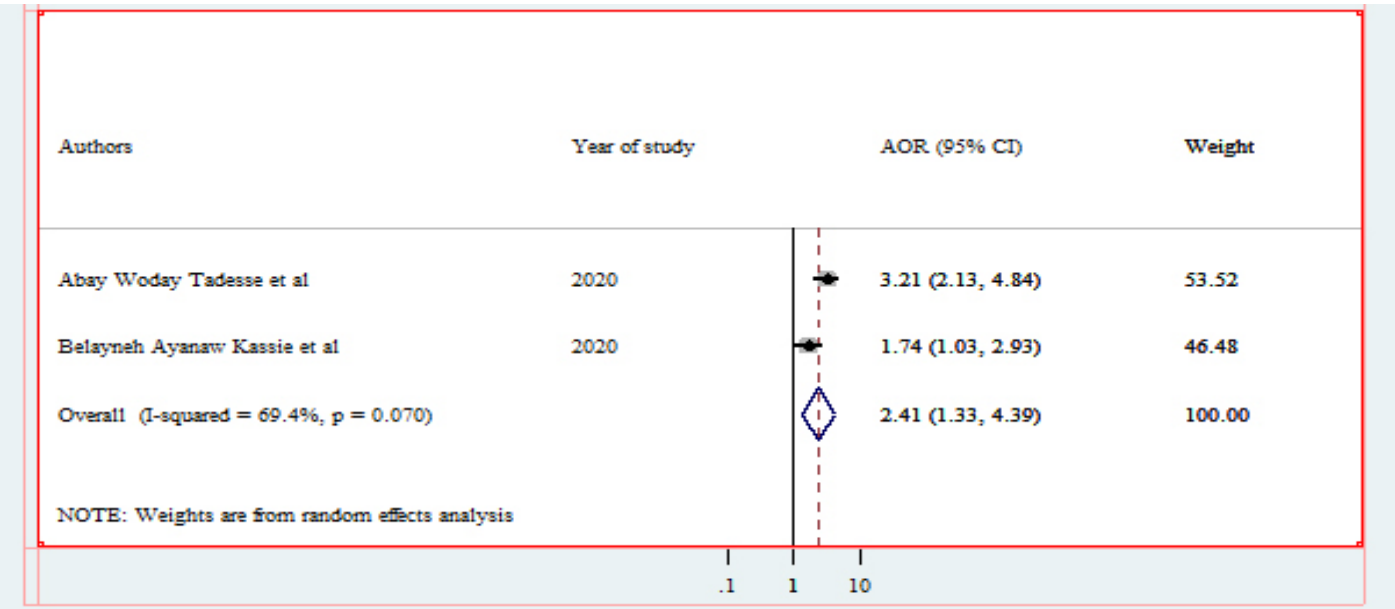


**Figure 14.** Forest plot of the adjusted odds ratios (AOR) with corresponding 95% CIs of studies on the association of educational status and attitude towards COVID 19

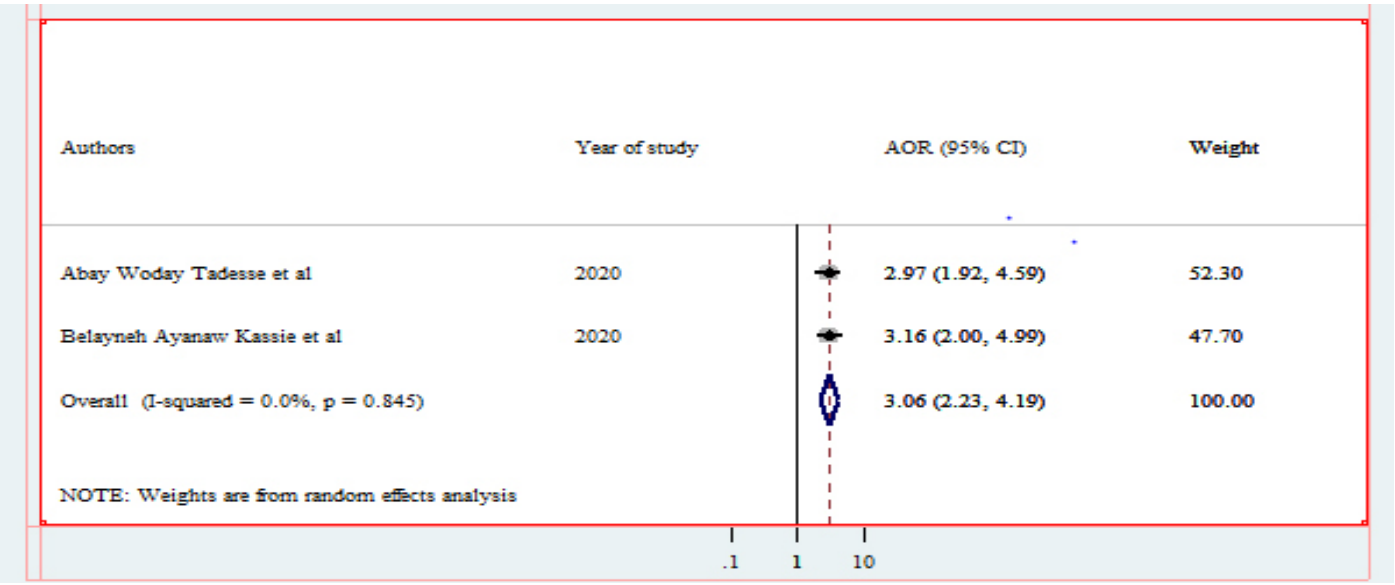


**Figure 12.** Forest plot of the adjusted odds ratios (AOR) with corresponding 95% CIs of studies on the association of knowledge and attitude towards COVID 19

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