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Knowledge, Attitude, and Prevention Practices Toward Coronavirus Disease 2019 in Ethiopia: A Systematic Review and Meta-Analysis

Abebaw Gedef Azene, MSc [1,*], Mekuanint Simeneh Workie, MSc [2], Abiba Mihret Aragaw, MSc [3]

[1] *Department of Epidemiology and Biostatistics, School of Public Health, College of Medicine and Health Science, Bahir Dar University, Bahir Dar, Ethiopia*
[2] *Department of Mathematical and Statistical Modeling (Statistics), Bahir Dar Institute of Technology–Bahir Dar University, Bahir Dar, Ethiopia*
[3] *Department of Statistics, College of Natural and Computational Science, Debre Markos University, Debre Markos, Ethiopia*

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ABSTRACT

Background: Coronavirus disease is a major global public health problem. The contagious disease caused by a newly discovered coronavirus, coronavirus disease 2019 (COVID-19), was declared a pandemic following the outbreak of cases of respiratory illness during 2019. Although studies assessed COVID-19 knowledge, attitude, and practice in Ethiopia the findings were highly variable and inconsistent.

Objectives: This study assessed the pooled status of knowledge, attitude, and prevention practices regarding COVID-19 in Ethiopia.

Methods: International and national electronic databases, including PubMed/MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature, Google Scholar, Science Direct, and Google, were systematically searched. All observational studies on COVID-19 knowledge, attitude, and prevention practices in Ethiopia were included. We assessed heterogeneity among the included studies using the Cochrane Q test statistics and I^2 test. Lastly, a random-effects meta-analysis model was fitted to estimate the pooled proportion of knowledge, attitude, and prevention practices toward COVID-19 in Ethiopia.

Results: Our search identified 206 studies, 13 of which were included in the final analysis. Adequate knowledge, good attitude, and good prevention practice toward COVID-19 in Ethiopia were observed in 70.25% (95% CI, 61.82%–78.02%), 69.08% (95% CI, 55.42%–81.24%), and 41.62% (95% CI, 27.77%–56.17%) of total participants across studies, respectively.

Conclusions: The results of this study revealed low proportions of adequate knowledge, attitudes, and preventive practices toward COVID-19 in Ethiopia. The lowest pooled proportion was observed in the Amhara region. These findings indicate the need to revise plans and policies to improve the knowledge, attitudes, and prevention practices of people toward COVID-19 in Ethiopia, especially in the Amhara region. (Curr Ther Res Clin Exp. 2021; 82:XXX–XXX) © 2021 Elsevier HS Journals, Inc.

Introduction

Several studies have assessed the knowledge, attitude, and practice regarding the novel coronavirus in Ethiopia.[1–4] Coronavirus disease 2019 (COVID-2019), a contagious disease caused by a newly discovered coronavirus, was declared a pandemic following the outbreak of cases of respiratory illness cases in Wuhan, China, during December 2019. Since that time, it has rapidly spread to other parts of China and worldwide to become a major global health concern.[5,6] Most people with COVID-19 experience mild to moderate respiratory illness from which they recover without requiring special treatment; however, others may develop severe complications characterized by acute respiratory distress syndrome, septic shock, and other metabolic and hemostasis disorders.[7] Older people and those with underlying medical problems such as diabetes, chronic respiratory disorder, and cancer are more likely to develop serious illness.[8]

According to the World Health Organization, as of December 13, 2020, there were 69,808,588 confirmed cases of COVID-19 and 1,588,858 deaths worldwide. The African continent reported 2,363,693 cases and 56,018 deaths; of these 115,000 people in Ethiopia were confirmed to have been infected with COVID-19. The

* Address correspondence to: Abebaw Gedef Azene, MSc, Department of Epidemiology and Biostatistics, School of Public Health, College of Medicine and Health Science, Bahir Dar University, Bahir Dar, pobox:79, Ethiopia.
E-mail address: abebaw2516@gmail.com (A.G. Azene).

disease affects all ages but its severity is higher among the elderly and people with underlying chronic diseases.

Health care providers are on the frontline of the fight against the COVID-19 pandemic, whereas most civil servants are staying at home. The general guidance has included regular handwashing, maintaining a secure distance from anyone who is coughing or sneezing, wearing a mask when physical distancing is not possible, avoiding touching the eyes, nose, or mouth, covering the nose and mouth along with an elbow or a tissue to cough or sneeze; and seeking medical attention for fever, cough, or difficulty breathing. However, thousands of health care providers worldwide have been contracted COVID-19 while delivering clinical services to patients with COVID-19; moreover, the risk is higher in developing countries with poor health care systems.[9]

Several studies have assessed the knowledge, attitude, and practice regarding COVID-19 in Ethiopia.[1-4] However, the findings of these studies are highly variable and inconsistent.[2,3] To our knowledge, this systematic review and meta-analysis is the first to assess the knowledge, attitudes, and prevention practices regarding COVID-19 at a national level. This study aimed to assess the pooled status of these factors regarding COVID-19 in Ethiopia to provide evidence for policymakers and health professionals to improve knowledge, attitudes, prevention practices, and control strategies regarding COVID-19 and improve the study designs and participants in future studies.

Methods

Search strategies

The articles reviewed in this meta-analysis were identified through electronic web-based database searches and reference-list reviews as described in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols checklist guidelines.[10] However, this study was not registered. Two authors (A.G. and M.S.) performed a comprehensive search of electronic databases, including PubMed/MEDLINE, EMBASE, Google Scholar, and Science Direct. In addition, national databases such as the *Ethiopian Medical Journal,* Addis Ababa University Digital Library, and Haramya University Digital Library, were also searched. The authors used the following key terms in the database searches: *knowledge*, *attitude*, *practice*, *COVID-19*, and *novel coronavirus*. These search terms were predefined to allow a comprehensive search strategy that included all fields within records and Medical Subject Headings. This study also used the Boolean operator (within each axis, we combined key words with the OR operator; we then linked the search strategies for the 2 axes with the AND operator) to search for publications on COVID-19 knowledge, attitude, and practice in Ethiopia. The searches were conducted on September 20, 2020, and November 20, 2020. After identifying potentially relevant studies using this search strategy, the studies were retrieved and managed using Endnote X8 software (Clarivate Analytics, Philadelphia, Pennsylvania).

Inclusion and exclusion criteria

The inclusion criteria were freely accessible full-text articles, written in English, and conducted in Ethiopia in 2020. Among studies published in peer-reviewed journals or found in the gray literature, all observational study designs (ie, cross-sectional, case–control, and cohort), studies involving human beings, and studies reporting the knowledge, attitude, and practice of COVID-19 in the full article, were eligible for inclusion in this systematic review and meta-analysis. Studies without accessible full texts after using all the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols[10] search strategies and studies that did not

quantitatively report specific proportions of good knowledge, attitude, and practice regarding COVID-19 were excluded.

Outcome measures

The primary outcome of this review was an estimate of the knowledge, attitudes, and practices surrounding COVID-19 in Ethiopia, which was expressed as the proportions of participants with good knowledge, a good attitude, and good practices regarding COVID-19.[11]

Operational definitions

- Good knowledge: Knowledge of COVID-19 signs, symptoms, prevention, and control, with the sum of the score for each participant greater than the mean/median of the questionnaire.
- Good attitude: Individual agreement or willingness to participate in combatting the COVID-19 epidemic and trust in the government and partners in winning the battle against COVID-19, with the sum of the score of each participant greater than the mean/median of the questionnaire.
- Good practice: Practices were assessed against those recommended for COVID-19 safety, infection prevention, and control guidelines, such as physical distancing, handwashing, and no handshaking, with the sum of the score of each participant greater than the mean or median of the questionnaire.

Data extraction

The 2 authors (A.G. and M.S.) used 2 stages of screening. First, we screened the titles and abstracts based on the criteria set in the protocol. Second, we identified potentially relevant articles using titles and abstracts for further screening of the full articles. The relevance of each article was evaluated based on the topic, objectives, and methodology, as listed in the abstract. The abstracts were also assessed to ensure agreement with the inclusion criteria. When it was unclear whether an abstract was relevant, it was included for retrieval. At this stage, articles deemed irrelevant or outside of the scope of the study were excluded, and the full texts were downloaded for a detailed review. Data were extracted following the JBI data extraction format,[12] which included the first author; publication year; study design; the proportions of participants with good knowledge, attitudes, and practices regarding COVID-19; and sample size. Any disagreements between the two reviewers during data extraction were resolved by discussion and with the third author (A.M.).

Risk of bias assessment

The risk of bias of the included studies was assessed using the 10-item rating scale developed by Hoy et al[13] for observational studies. The sampling, data collection, reliability, validity of the study tools, case definitions, and study periods were assessed. We categorized each study as having low ("yes" answers to the domain questions) or high ("no" answers to the domain questions) risks of bias. Each study was assigned a score of 1 (Yes) or 0 (No) for each domain; these domain scores were then summed to provide an overall study quality score. Scores of 8 through 10 were considered to have a low risk of bias, those with a score of 6 or 7 a moderate risk, and those with scores of 0 through 5 a high risk of bias (see the **Supplemental Appendix** in the online version at doi:10.1016/j.curtheres.2021.100633). Two independent reviewers (A.G. and M.S.) critically appraised each article. Disagreements between the reviewers were resolved through discussion. For the final risk of bias classification, discrepancies between the reviewers were resolved via discussion and consensus involving the third author.

Data processing and analysis

Information on the study characteristics (eg, time frame, study location, study design, sample size, proportion of good knowledge, proportion of good attitude, and proportion of good practice) was extracted from each study using an Excel (Microsoft, Redmond, Washington) spreadsheet template. These data were then transferred to R version 4 software (R Foundation for Statistical Computing, Vienna, Austria) to describe the pooled proportions of good knowledge, attitude, and prevention practices regarding COVID-19. Heterogeneity across studies was assessed using the inverse variance (I^2) and Cochran Q statistics, with 25%, 50%, and 75% indicating low, moderate, and severe heterogeneity, respectively.[14] I^2 values > 75 indicated severe heterogeneity.[15,16] Dersimonian and Liard's random-effects model was used for analysis owing to heterogeneity.[17,18] Subgroup and sensitivity analyses were conducted using the study location, study design, and risk of bias.[19] A forest plot was used to visualize the findings. We applied funnel plot asymmetry and Egger's test to check for publication bias.[20]

Results

Study identification

The database search and desk review yielded a total of 206 articles from the above-mentioned electronic sources. After reviewing the titles and abstracts, 46 articles were excluded due to duplication. One hundred forty-six articles were excluded for lack of relevance. Additionally, 1 article that did not report the outcome of interest (proportion of adequate knowledge, good attitude, and good prevention practice) was also excluded.[21] Finally, the final meta-analysis included 13 studies[1–4,22–30] (Figure 1).

Characteristics of the included studies

All 13 studies included in this review were published in 2020. Among these, only 4 were used community-based cross-sectional studies[3,22,26,27]; the rest employed institutional-based cross-sectional study designs. Of the 13 studies, 12 reported the proportions of participants with adequate knowledge of COVID-19 in Ethiopia. The number of participants in each study varied from 243 to 828.[3,25] Most of the participants in the included studies were health professionals. The lowest and highest proportions of participants with adequate knowledge of COVID-19 were 45.89% and 87.1% in studies conducted in the Amhara Region and Addis Ababa, respectively[2,3] (Table 1).

Risk of bias assessments of included studies

We assessed the quality of each study included in this review based on the JBI Critical Appraisal Tool. Of the included studies, 10 (76.9%) had a low risk of bias, 2 (15.4%) had a medium risk of bias, and 1 (7.7%) had a high risk of bias.

Proportions of participants with adequate knowledge of COVID-19

This meta-analysis included 12 studies in the estimation of the pooled proportion of participants with adequate knowledge of COVID-19 in Ethiopia. We observed significant heterogeneity in the fixed model ($I^2 = 98.21\%$; $P < 0.001$). Due to this heterogeneity, we applied the random-effects model by transforming the original data using double arcsine transformation and then transforming it to its original data form for interpretation. The results showed that 70.25% (95% CI, 61.82%–78.02%) of participants had adequate knowledge of COVID-19 (Figure 2). We further conducted subgroup

analyses to investigate how the proportion of participants with adequate knowledge varied across study regions and study design. The pooled proportion of adequate knowledge was 73.91% (95% CI, 64.82%–82.08%) for institutional-based cross-sectional studies and 62.60% (95% CI, 48.18%–75.98%) for community-based cross-sectional studies. This variation was not statistically significant and was not related to the heterogeneity ($Q = 1.841$; $P = 0.175$).

The subgroup analysis also revealed the highest pooled proportion of adequate knowledge in the Oromia region (83.07%; 95% CI, 78.10%–87.53%), followed by Tigray (75.37; 95% CI, 59.87%–88.10%) and Addis Ababa (71.79; 95% CI, 35.00%–96.77%). The lowest pooled proportion of adequate knowledge was reported in Amhara (61.50%; 95% CI, 48.76%–73.49%). This variation was significantly related to heterogeneity ($Q = 13.46$; $P = 0.009$); however, the heterogeneity was low ($I^2 = 0.00\%$) (Table 2). Egger's regression test of publication bias confirmed that no publication bias was related to the effect size ($P = 0.2785$).

Proportions of participants with good attitudes toward COVID-19

The analysis of the attitudes of people toward COVID-19 included 7 studies.[2,3,22,23,27–29] The pooled proportion of participants with a good attitude was 69.08% (95% CI, 55.42%–81.24%) (Figure 3). A subgroup analysis to evaluate the variations in the proportions of participants with good attitudes across the groups showed pooled proportions of 68.73% (95% CI, 50.45%–84.41%) and 69.99 (95% CI, 43.23%–90.95%) for institutional-based and community-based cross-sectional study designs, respectively. The highest and lowest pooled proportions were observed in Addis Ababa (89.80; 95% CI, 86.07%–93.01%) and Amhara (50.96; 95% CI, 23.06%–78.54%), respectively. In the subgroup analysis, only the region was significantly related to this heterogeneity. Although this heterogeneity was significant, I^2 was <25%, indicating minor attitude variations toward COVID-19 between regions (Table 3). The publication bias test (Egger's regression test) confirmed that no publication bias was related to the effect size ($P = 0.4793$).

Sensitivity analysis regarding attitudes toward COVID-19

We conducted a sensitivity analysis using the leave-1-out method to identify the possible source of heterogeneity in the estimation of the pooled proportions of attitudes toward COVID-19 in Ethiopia. We found that the pooled proportion did not depend on the outcome of a single study, and it was robust. After the stepwise removal of a single study, the pooled prevalence ranged from 64.98% (95% CI, 51.27%–77.53%) to 74.13% (95% CI, 64.26%–82.89%) (Table 4).

Proportion of participants with good COVID-19 prevention practices

We assessed the proportion of participants engaged in COVID-19 preventive practices based on 6 studies.[1,22,23,27–29] The pooled proportion of good prevention practices was 41.62% (95% CI, 27.77%–56.17%) (Figure 4). The subgroup analysis revealed good prevention practices in 44.40% (95% CI, 25.29%–64.41%) and 36.13% (95% CI, 16.55%–58.48%) of participants in institution-based and community based cross-sectional studies, respectively. The variation was not statistically significant because the between-group heterogeneity was not statistically significant ($P = 0.585$) (Table 5). Furthermore, the assessment of publication bias by Egger's regression test showed no publication bias ($P = 0.8167$).

Sensitivity analysis of COVID-19 prevention practices

We conducted a sensitivity analysis using the leave-1-out method to identify the possible source of heterogeneity in the esti-
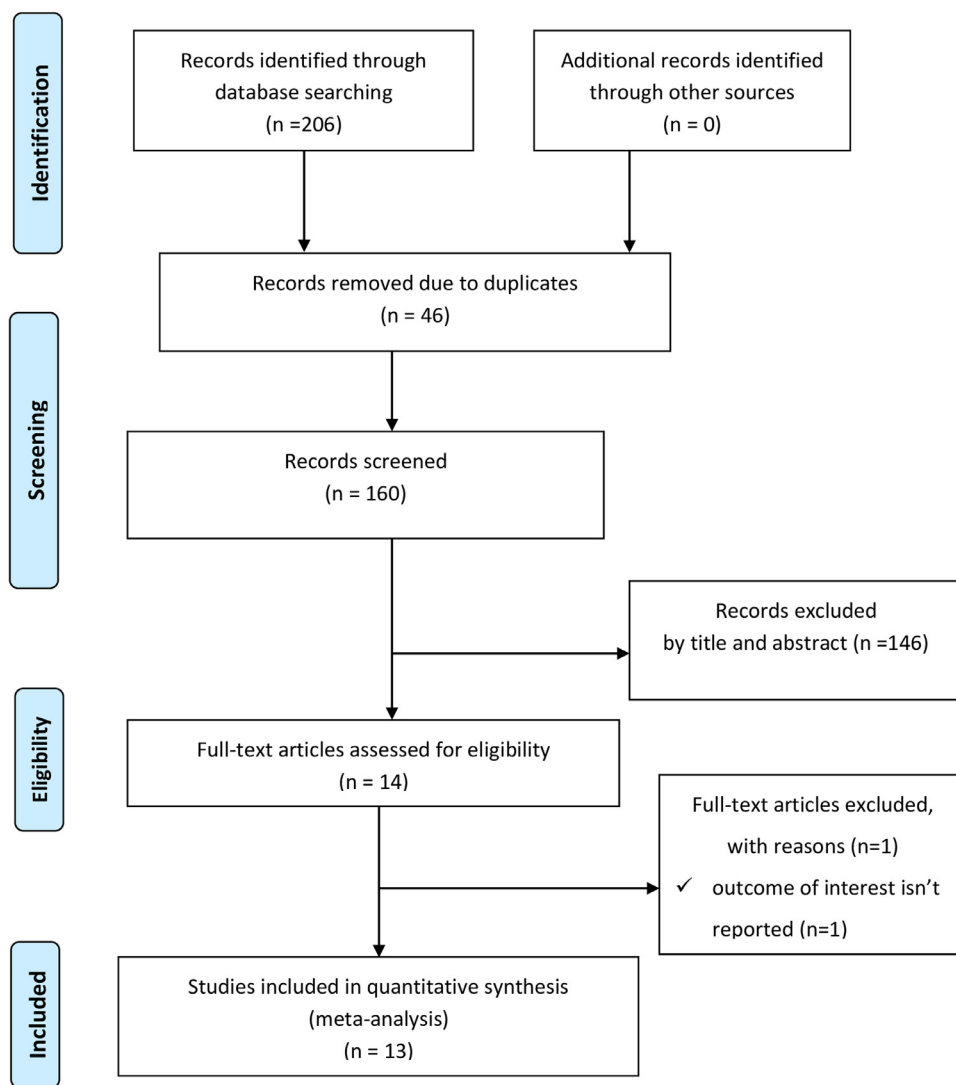
Figure 1. Flow diagram of the studies included in the meta-analysis

Table 1
Summary of characteristics of the included studies conducted in Ethiopia.

Author	Year	Region	Location	Participants	Study design	Sample size	Proportion of knowledge (%)
Kassie et al[4]	2020	Amhara	Central Gondar Zone	Health care providers	IBCS	408	73.8
Tesfaye et al[29]	2020	AA	Addis Ababa	Hospital and community pharmacists	IBCS	295	53.2
Mechessa et al[26]	2020	SNNP	Mizan-Aman Town		CBCS	393	64.6
Kebede et al[25]	2020	Oromia	Jimma University	hospital visitors	IBCS	243	83
Akalu et al[23]	2020	Amhara	Zemen Hospital	Hospital patients	IBCS	404	62.6
Asemahagn et al[1]	2020	Amhara	Amhara Region	Health care workers	IBCS	442	70
Girma et al[24]	2020	ET	ET	Health care workers	IBCS	273	
Azmach et al[27]	2020	SNNP	Arbaminch	All	CBCS	528	76.53
Tamire et al[30]	2020	AA	Addis Ababa	Health professionals	IBCS	526	87.1
Tadesse et al[28]	2020	Tigray	Northern Ethiopia	Health professionals	IBCS	415	74
Kassa et al[3]	2020	Amhara	Dessie and Kombolcha City	Household heads	CBCS	828	45.89
Haftom et al[2]	2020	Tigray	Tigray	Quarantined adults	IBCS	331	87.6
Adhena et al[22]	2020	Tigray	Korem District	High-risk age groups	CBCS	419	62.3

AA = Addis Ababa; CBCS = Community based cross-sectional; ET = Ethiopia; IBCS = Institutional based cross-sectional; SNNP = South Nation Nationality People.
*Prevalence values are presented as % (range).
†Heterogeneity are presented as % (*P* value).

Studies	Cases	Total	Proportion	95% C.I.
Kassie BA,et al, 2020	301	408	73.77	[69.39; 77.94]
Tesfaye, et al, 2020	157	295	53.22	[47.50; 58.90]
Mechessa, et al, 2020	254	393	64.63	[59.83; 69.29]
Kebede, et al, 2020	202	243	83.13	[78.14; 87.59]
Akalu, et al, 2020	253	404	62.62	[57.84; 67.28]
Asemahagn, et al, 2020	279	442	63.12	[58.57; 67.57]
Azmach, et al, 2020	404	528	76.52	[72.80; 80.04]
Tamire, et al, 2020	458	526	87.07	[84.06; 89.81]
Tadesse, et al, 2020	307	415	73.98	[69.64; 78.09]
Kassa, et al, 2020	380	828	45.89	[42.51; 49.30]
Haftom, et al, 2020	290	331	87.61	[83.83; 90.96]
Adhena, et al, 2020	261	419	62.29	[57.59; 66.88]
Random effects model		.		70.25 [61.85; 78.02]

Heterogeneity: $I^2 = 98\%$, $\tau^2 = 0.0239$, $\chi^2_{11} = 465.59$ ($p < 0.01$)

Proportion of adequate knowledge about covid-19

Figure 2. Forest plot of the proportion of participants with adequate knowledge regarding coronavirus disease 2019 (COVID-19) in Ethiopia.

Table 2
Subgroup analysis of studies included for proportion of adequate knowledge toward coronavirus disease 2019 in Ethiopia.

Variable	Subgroup	No. of studies	Prevalence	I^2 (%)	P value	Heterogeneity between groups
Region	Amhara	4	61.50 (48.76–73.49)	97.07	< 0.001	0.00 (~1)
	Addis Ababa	2	71.79 (35.00–96.77)	99.11	< 0.001	
	SNNP	2	70.81 (58.57–81.70)	93.52	< 0.001	
	Oromia	1	83.07 (78.10–87.53)	0.00	< 0.001	
	Tigray	3	75.37 (59.87–88.10)	97.01	< 0.001	
Study design	CBCS	8	0.73 (0.64–0.82)	96.75	< 0.001	0.00 (0.009)
	IBCS	21	0.62 (0.48–0.75)	97.94	< 0.001	

CBCS = Community based cross-sectional; IBCS = Institutional based cross-sectional; SNNP = South Nation Nationality People.
*Prevalence values are presented as % (range).
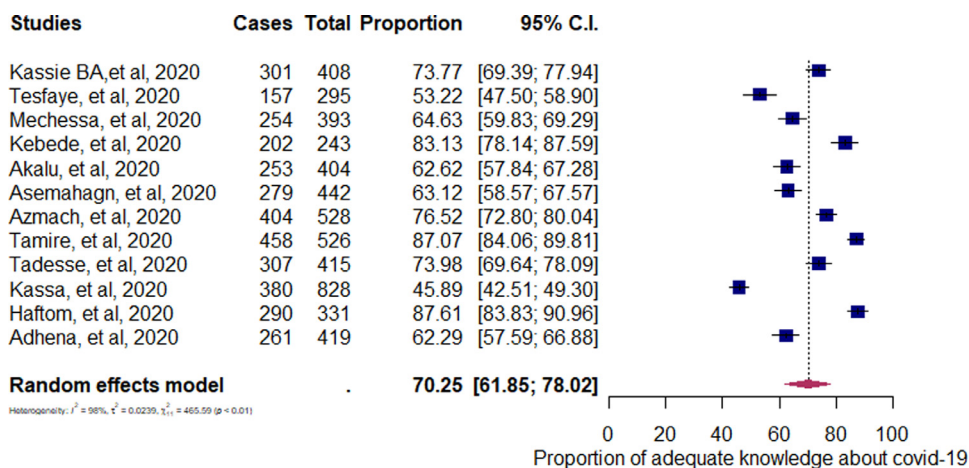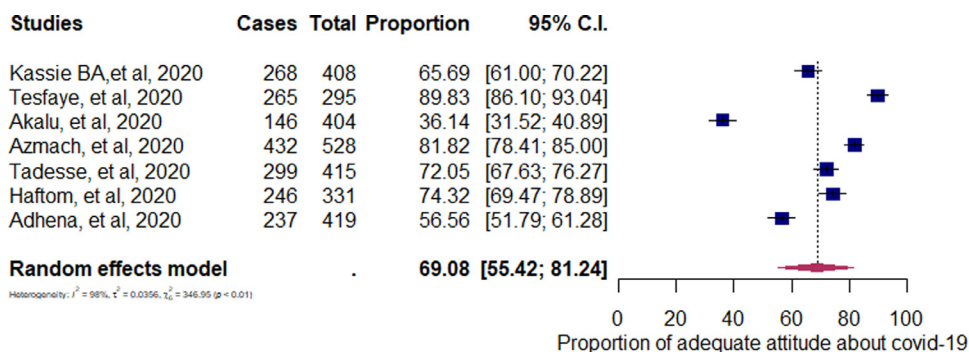†Heterogeneity is presented as % (P value).

Studies	Cases	Total	Proportion	95% C.I.
Kassie BA,et al, 2020	268	408	65.69	[61.00; 70.22]
Tesfaye, et al, 2020	265	295	89.83	[86.10; 93.04]
Akalu, et al, 2020	146	404	36.14	[31.52; 40.89]
Azmach, et al, 2020	432	528	81.82	[78.41; 85.00]
Tadesse, et al, 2020	299	415	72.05	[67.63; 76.27]
Haftom, et al, 2020	246	331	74.32	[69.47; 78.89]
Adhena, et al, 2020	237	419	56.56	[51.79; 61.28]
Random effects model		.		69.08 [55.42; 81.24]

Heterogeneity: $I^2 = 98\%$, $\tau^2 = 0.0356$, $\chi^2_6 = 346.95$ ($p < 0.01$)

Proportion of adequate attitude about covid-19

Figure 3. Forest plot of the proportion of participants with good attitudes regarding coronavirus disease 2019 (COVID-19) in Ethiopia.

Table 3
Subgroup analysis of studies included for proportion of good attitude toward coronavirus disease 2019 in Ethiopia.

Variable	Subgroup	No. of studies	Prevalence*	I^2 (%)	P value	Heterogeneity between groups†
Region	Amhara	2	50.96 (23.06–78.54)	98.63	< 0.001	0.00 (< 0.001)
	Addis Ababa	1	89.80 (86.07–93.01)	0.00	~1	
	SNNP	1	81.84 (78.43–85.02)	0.00	~1	
	Tigray	3	67.83 (56.53–78.16)	93.90	< 0.001	
Study design	CBCS	8	69.99 (43.23–90.95)	98.62	< 0.001	0.00 (0.935)
	IBCS	5	68.73 (50.45–84.41)	98.51	< 0.001	

CBCS = Community based cross-sectional; IBCS = Institutional based cross-sectional; SNNP = South Nation Nationality People.
* Prevalence values are presented as % (range).
† Heterogeneity is presented as % (P value).

mation of the pooled proportion of COVID-19 prevention practices in Ethiopia. The results showed that the pooled proportion did not depend on the outcome of a single study and that it was robust. After stepwise removal of single studies, the pooled proportions ranged from 36.59% (95% CI, 24.68%–49.40%) to 45.03% (95% CI, 30.05%–60.48%) (Table 6).

Discussion

Coronavirus is a contagious pandemic disease and a major public health concern worldwide, including Ethiopia. Controlling the distribution of viruses is a current issue worldwide. Estimating the pooled proportion of adequate knowledge, attitudes, and practices

Table 4

Sensitivity analysis for the proportion of good attitude toward coronavirus disease 2019 in Ethiopia.

Excluded studies	Year of publication	Proportion of good attitude (%)	95% CI	I^2 (%)
Kassie et al[4]	2020	69.65	53.44–83.68	98.55
Tesfaye et al[29]	2020	64.98	51.27–77.53	98.01
Akalu et al[23]	2020	74.13	64.26–82.89	96.46
Azmach et al[27]	2020	66.75	51.51–80.39	98.24
Tadesse et al[28]	2020	68.59	52.30–82.82	98.54
Haftom et al[2]	2020	68.19	52.25–8221	98.53
Adhena et al[22]	2020	71.07	55.67–8433	98.42

Studies	Cases	Total	Proportion	95% C.I.
Tesfaye, et al, 2020	88	295	29.83	[24.74; 35.19]
Akalu, et al, 2020	105	404	25.99	[21.82; 30.38]
Asemahagn, et al, 2020	247	442	55.88	[51.23; 60.49]
Azmach, et al, 2020	135	528	25.57	[21.93; 29.38]
Tadesse, et al, 2020	278	415	66.99	[62.38; 71.44]
Adhena, et al, 2020	199	419	47.49	[42.72; 52.29]
Random effects model			**41.62**	**[27.77; 56.17]**

Heterogeneity: $I^2 = 98\%$, $\tau^2 = 0.0326$, $\tau_0^2 = 275.56$ ($p < 0.01$)
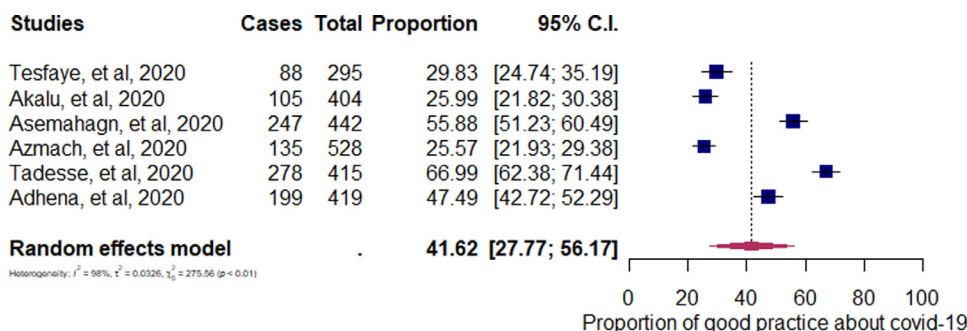
Figure 4. Forest plot of the proportion of participants with good prevention practice regarding coronavirus disease 2019 (COVID-19) in Ethiopia.

Table 5

Subgroup analysis of studies included for proportion of coronavirus disease 2019 prevention practice in Ethiopia.

Variable	Subgroup	No. of studies	Prevalence*	I^2 (%)	P value	Heterogeneity between groups
Region	Amhara	2	40.50 (14.20–70.17)	98.76	< 0.001	0.00 (< 0.007)
	Addis Ababa	1	29.85 (24.76–35.20)	0.00	~1	
	SNNP	1	25.55 (21.92–29.37)	0.00	~1	
	Tigray	2	57.38 (38.08–75.59)	96.94	< 0.001	
Study design	CBCS	2	36.13 (16.55–58.48)	97.97	< 0.001	0.00 (0.585)
	IBCS	4	44.40 (25.29–64.41)	98.47	< 0.001	

CBCS = Community based cross-sectional; IBCS = Institutional based cross-sectional; SNPP = South Nation Nationality People.
* Prevalence values are presented as % (range).†Heterogeneity is presented as % (P value).

Table 6

Sensitivity analysis for the proportion of coronavirus disease 2019 prevention practice in Ethiopia.

Excluded studies	Year of publication	Proportion of good prevention practice (%)	95% CI	I^2 (%)
Tesfaye et al[29]	2020	44.03	28.08–6065	98.43
Akalu et al[23]	2020	44.91	29.48–6085	98.20
Asemahagn et al[1]	2020	38.80	23.58–55.24	98.27
Azmach et al[27]	2020	45.03	30.05–60.48	97.97
Tadesse et al[28]	2020	36.59	24.68–49.40	97.23
Adhena et al[22]	2020	40.45	24.02–58.06	98.5111

toward COVID-19 in Ethiopia may contribute to informing policymakers to implement interventions. The main objective of this study was to estimate the pooled proportion of adequate knowledge, attitude, and prevention practices for COVID-19 in Ethiopia. The findings of this study revealed that the pooled proportion of adequate knowledge of COVID-19 was 70.25% (95% CI, 61.82%–78.02%). This proportion is consistent with that reported by Bekele et al[31] in which 40% to 99.5% of participants had good knowledge of COVD-19 and higher than the 56.6% (95%CI, 45%–67%) reported by Bhagavathula et al.[32] The knowledge of people regarding COVID-19 in the present study was low at the country level. The subgroup analysis indicated a higher knowledge in institution-based studies (73.91%) compared with community-based studies (62.60%). Moreover, knowledge of COVID-19 was highest in the Oromia region (83.07%) and lowest in the Amhara region (61.50%).

In this study, the pooled proportion of participants with a good attitude regarding COVID-19 was 69.08% (95% CI, 55.42%–81.24%), which was low for controlling viral transmission. This result is con-

sistent with the findings reported by Bekele et al,[31] in which 70% to 97.1% had a good attitude, and higher than the 46% (95% CI, 15%–77%) reported by Bhagavathula et al.[32] The pooled proportion of positive attitudes regarding COVID-19 was low compared with that for knowledge in this study. The highest and lowest proportions of positive attitudes were observed in Addis Ababa (89.80%) and the Amhara (61.50%) region, respectively, in the subgroup analysis.

Moreover, the overall proportion of participants engaged in COVID-19 prevention practices was 41.62% (95% CI, 27.77%–56.17%). Prevention practice was low at the national level. Therefore, the distribution of the virus was related to personal hygiene and social distancing. The overall rate of COVID-19 prevention practices at the institution was higher (44.40; 95% CI, 25.29–64.41) than those in community-based studies (36.13; 95% CI, 16.55–58.48). This result indicated that institutional prevention practices were good relative to the communities in Ethiopia.

Limitations

This meta-analysis has several limitations. First, only articles published in English were considered to estimate the pooled proportions in Ethiopia. Moreover, most of the studies included in this analysis used institution-based cross-sectional study designs and most of the participants were health professionals; thus, the results might have been influenced by other confounding variables.

Conclusions

The results of this study revealed low proportions of adequate knowledge, attitudes, and preventive practices regarding COVID-19 in Ethiopia. The lowest pooled proportion was observed in the Amhara region. We recommend that the Ethiopian Institute of Health and Ministries of Health improve the awareness of health professionals toward COVID-19. Furthermore, these results indicate the need to improve planning and policies to increase adequate knowledge, attitudes, and prevention practices toward COVID-19 in Ethiopia, especially in the Amhara region.

Declaration of Competing Interest

The authors have indicated that they have no conflicts of interest regarding the content of this article.

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References

1. Asemahagn MA. Factors determining the knowledge and prevention practice of healthcare workers towards COVID-19 in Amhara region, Ethiopia: a cross-sectional survey. *Trop Med Health*. 2020;48:72.
2. Haftom M, et al. Knowledge, Attitudes, and Practices Towards COVID-19 Pandemic Among Quarantined Adults in Tigrai Region, Ethiopia. *Infection and Drug Resistance*. 2020;13:3727.
3. Kassa AM, et al. Knowledge level and factors influencing prevention of COVID-19 pandemic among residents of Dessie and Kombolcha City administrations, North-East Ethiopia: a population-based cross-sectional study. *BMJ Open*. 2020;10(11).
4. Kassie BA, et al. Knowledge and attitude towards COVID-19 and associated factors among health care providers in Northwest Ethiopia. *PLoS One*. 2020;15(8).
5. Boulos MNK, Geraghty EM. Geographical tracking and mapping of coronavirus disease COVID-19/severe acute respiratory syndrome coronavirus 2 (SARS–CoV-2) epidemic and associated events around the world: how 21st century GIS technologies are supporting the global fight against outbreaks and epidemics. *BioMed Central*. 2020.
6. Organization, W.H., WHO Director-General's opening remarks at the media briefing on COVID-19-11 March 2020. 2020.
7. Chen N, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan. *China: a descriptive study*. 2020;395(10223):507–513.
8. Alhazzani, W., & Du, B. et al., (2020). Surviving Sepsis Campaign: guidelines on the management of critically ill adults with Coronavirus Disease 2019 (COVID-19). p. 1-34.
9. Olum, R., et al., Coronavirus Disease-2019: Knowledge, Attitude, and Practices of Health Care Workers at Makerere University Teaching Hospitals, Uganda. 2020. 8: p. 181.
10. Peters JP, et al. Reporting quality of systematic reviews and meta-analyses of otorhinolaryngologic articles based on the PRISMA statement. *PLoS One*. 2015;10(8).
11. Lessler J, et al. Incubation periods of acute respiratory viral infections: a systematic review. *The Lancet infectious diseases*. 2009;9(5):291–300.
12. Institute JB. The Joanna Briggs Institute Critical Appraisal tools for use in JBI systematic reviews. *Checklist for Randomized Controlled Trials*. 2017.
13. Hoy D, et al. Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. *Journal of clinical epidemiology*. 2012;65(9):934–939.
14. Hedges LV. Meta-analysis. *Journal of Educational Statistics*. 1992;17(4):279–296.
15. Higgins JP, et al. Measuring inconsistency in meta-analyses. *Bmj*. 2003;327(7414):557–560.
16. Cuijpers P. *Meta-analyses in mental health research. A practical guide*. Amsterdam, the Netherlands: Pim Cuijpers Uitgeverij; 2016.
17. Hoge EA, Friedman L, Schulz SC. Meta-analysis of brain size in bipolar disorder. *Schizophrenia Research*. 1999;37(2):177–181.
18. Schwarzer G. meta: An R package for meta-analysis. *R news*. 2007;7(3):40–45.
19. Sterne JA, Egger M. Regression methods to detect publication and other bias in meta-analysis. *Publication bias in meta-analysis: Prevention, assessment and adjustments*. 2005:99–110.
20. Sterne JA, Egger M. Funnel plots for detecting bias in meta-analysis: guidelines on choice of axis. *Journal of clinical epidemiology*. 2001;54(10):1046–1055.
21. Jamie AH. KNOWLEDGE, ATTITUDE AND PRACTICE OF HEALTHCARE WORKERS TOWARDS NOVEL CORONA VIRUS (COVID-19) IN JUGAL HOSPITAL, HARARI REGIONAL STATE, ETHIOPIA. *Public Health of Indonesia*. 2020;6(3):72–77.
22. Adhena G, Hidru HD. Knowledge, Attitude, and Practice of High-Risk Age Groups to Coronavirus Disease-19 Prevention and Control in Korem District, Tigray, Ethiopia: Cross-Sectional Study. *Infection and Drug Resistance*. 2020;13:3801.
23. Akalu Y, Ayelign B, Molla MD. Knowledge, Attitude and Practice Towards COVID-19 Among Chronic Disease Patients at Addis Zemen Hospital, Northwest Ethiopia. *Infect Drug Resist*. 2020;13:1949–1960.
24. Girma S, Alenko A, Agenagnew L. Knowledge and Precautionary Behavioral Practice Toward COVID-19 Among Health Professionals Working in Public University Hospitals in Ethiopia: A Web-Based Survey. *Risk Manag Healthc Policy*. 2020;13:1327–1334.
25. Kebede Y, et al. Knowledge, perceptions and preventive practices towards COVID-19 early in the outbreak among Jimma university medical center visitors, Southwest Ethiopia. *PLoS One*. 2020;15(5).
26. Mechessa DF, et al. Community's Knowledge of COVID-19 and Its Associated Factors in Mizan-Aman Town, Southwest Ethiopia, 2020. *Int J Gen Med*. 2020;13:507–513.
27. Nigussie TF, Azmach NN. KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS COVID-19 AMONG ARBA MINCH TOWN, SOUTHERN ETHIOPIA. *GSJ*. 2020;8(6).
28. Tadesse AW, et al. *Psychological Impacts of COVID-19 among College Students in Dessie Town, Amhara Region, Ethiopia*. Cross-sectional Study; 2020.
29. Tesfaye ZT, et al. COVID-19-Related Knowledge, Attitude and Practice Among Hospital and Community Pharmacists in Addis Ababa. *Ethiopia. Integr Pharm Res Pract*. 2020;9:105–112.
30. Abebe Habtamu Tamire TKL. KNOWLEDGE, ATTITUDES, AND PRACTICES TOWARDS CORONAVIRUS DISEASE -19 AMONG HEALTH PROFESSIONALS IN ADDIS ABABA. *Ethiop Med J*. 2020;58(4).
31. Bekele F, et al. Patterns and associated factors of COVID-19 knowledge, attitude, and practice among general population and health care workers: A systematic review. *SAGE open medicine*. 2020;8.
32. Bhagavathula AS, et al. Knowledge, Attitude, Perceptions and Practice towards COVID-19: A systematic review and Meta-analysis. *medRxiv*. 2020.