COVID-19 preventive practice and associated factors in Ethiopia: A systematic review and meta-analysis

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ARTICLE INFO

Keywords:
COVID-19
Poor practice
Preventive practice
Ethiopia

ABSTRACT

Objective: COVID-19 is a global health concern due to its rapid spread and impact on morbidity and mortality. Implementing preventive measures plays an essential role in curbing the spread of COVID-19 infection. This study aimed to assess COVID-19 preventive practice and associated factors in Ethiopia.

Study design: This study was performed according to the Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines.

Methods: Medline, PubMed, Scopus, Cochrane, EMBASE, African Journal Online (AJOL) and Science Direct search engines were used to identify relevant articles published up to early December 2021. The Joanna Briggs’s Institute (JBI) checklist was used for quality appraisal. A random-effect model was fitted to calculate the pooled estimates. Higgins’s I² statistics and Egger’s test with funnel plots were analysed to check heterogeneity and publication bias, respectively. Due to significant heterogeneity, subgroup analysis by region, study population, study design and publication year, as well as sensitivity analysis, were done to assess the source of heterogeneity.

Results: The pooled level of poor preventive practice for COVID-19 in Ethiopia was 51.60% (95% confidence interval [CI]: 40.30–62.90). Poor COVID-19 preventive practice declined from 61% in studies published in 2020 to 45% in 2021. Lack of knowledge about COVID-19 (adjusted odds ratio [AOR] = 4.61 [95% CI: 2.49–10.73]), a negative attitude towards COVID-19 management (AOR = 2.64 [95% CI: 1.82–3.82]), rural residence (AOR = 2.95 [95% CI: 2.12–4.12]), a low educational level (AOR = 2.93 [95% CI: 2.16–3.98]) and being female (AOR = 1.75 [95% CI: 1.27–2.40]) were significantly associated with a poor level of COVID-19 preventive practice in Ethiopia.

Conclusions: The level of poor COVID-19 preventive practice in Ethiopia was relatively high. Poor COVID-19 prevention practices were significantly correlated with inadequate COVID-19 knowledge, a negative attitude towards COVID-19 management, low educational attainment, living in a rural area and being female. Creating awareness and health education programmes targeting COVID-19 prevention should be strengthened, especially in the target populations identified in this study.

1. Introduction

Coronavirus disease 2019 (COVID-19) is caused by the newly discovered Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) [1]. On the 11 March 2020, COVID-19 was declared a pandemic by the World Health Organisation (WHO) [2]. SARS-CoV-2 was first identified on 30 December 2019 in Wuhan city, Hubei province, China. The virus is highly contagious, with flu-like symptoms, and spread globally within a short period of time [3]. The virus is transmitted by exposure to droplets and aerosols, particularly in overcrowded areas [4]. At the beginning of the pandemic, COVID-19 symptoms started with a high fever and mild respiratory problems, but within a few days, frequently developed to pneumonia [5]. Lockdowns and maintaining self-isolation/social distance are two measures used internationally to
prevent COVID-19 transmission [6]. Other preventive mechanisms recommended by the WHO are frequent hand washing, avoiding touching the eyes, nose and mouth, and frequent disinfection of the surroundings and repeatedly touched surfaces [7,8].

COVID-19 preventive practices were implemented in Ethiopia to mitigate the impact of the pandemic [9,10]. Despite the rapid spread of COVID-19, studies suggest that communities have shown negative responses or carelessness towards the preventive measures of the COVID-19 pandemic [9]. In Ethiopia, adherence to preventive measures for COVID-19 was only 12.3%, regardless of the knowledge and attitude towards the virus. The level of poor COVID-19 preventive practice in Ethiopia was shown to vary from 20.9% [11] to 89.6% [12]. A low level of education, poor attitude towards COVID-19 management, younger age and inadequate knowledge of COVID-19 and its preventive practices were significantly associated with poor preventive practices in many studies [9,13,14].

In Ethiopia, there are barriers that delay control of viral transmission and implementation of preventive measures, such as limited supplies of hand sanitisers, testing kits and personal protective materials, high resistance to implementation of recommended prevention practices and low socio-economic status [15,16]. Although previous studies have measured COVID-19 preventive practices in Ethiopia, their results are inconsistent and inconclusive (12.3–90%) [9,10,17]. In addition, most of these studies were carried out in a single population and none of the studies showed comprehensive data about the poor level of COVID-19 preventive practice in Ethiopia. Therefore, the current study aimed to determine the level of poor COVID-19 preventive practice and its associated factors in Ethiopia.

2. Methods

2.1. Study design

This systematic review and meta-analysis was performed according to the Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA-P 2015) guidelines [18] (Supplementary Table S1).

2.2. Eligibility criteria

All cross-sectional studies published up to early December 2021 in English and reporting poor levels of COVID-19 prevention practice and/or associated factors in Ethiopia were included. Only studies that were published or accepted in peer-reviewed journals were included in this review. Editorial reports, letters, reviews, commentaries and studies that did not report a poor level of COVID-19 preventive practice were excluded.

2.3. Outcome of interest

The primary outcome of interest was to estimate the level of poor COVID-19 prevention practice in Ethiopia, which was expressed as the proportion of participants with a poor level of prevention practice towards COVID-19. Poor levels of preventive practices were defined and assessed against the recommended prevention practices for COVID-19 safety, infection prevention and control guidelines; participants with a total score less than the average, mean or median of the questionnaire in each of the included studies were defined as having a poor level of COVID-19 prevention practice. The cut-off value to define a low level of prevention practice reported in each individual study was used as an operational definition to estimate the pooled level of COVID-19 poor practice because there was variation in the definition of poor level of COVID-19 preventive practice between studies. In addition, this review also aimed to identify variables associated with inadequate COVID-19 preventive practices.

2.4. Search strategy

Articles were identified by searching published studies in the following online databases: Medline, PubMed, Scopus, Cochrane, EMBASE, African Journal Online (AJOL) and Science Direct. All articles published up to early December 2021 were included. Additional studies were identified from the references cited in the relevant articles and through a manual search. Medical Subject Heading (MeSH), keywords and free text search terms were used. Search terms included “practice” OR “poor practice” OR “practice patterns” OR “level of practice” OR “preventive practice” AND “COVID-19” OR ‘SARS CoV-2‘ OR “coronavirus” OR “pandemic” AND “associated factors” OR “determinants” AND “Ethiopia” (Supplementary Table S2).

2.5. Study selection and quality appraisal

Retrieved articles were imported to EndNote X7 (Clarivate, London, UK) to collect and organise search outcomes and for the removal of duplicate articles. Subsequently, three authors (MDT, MM and SG) independently screened the titles and abstracts for potential inclusion in the review. Two authors (MM and SG) independently assessed the quality of studies. Any disagreements were resolved through discussion until mutual consensus was reached, with the involvement of a fourth author (TA) when necessary. The Joanna Briggs Institute (JBI) quality appraisal tool was used to evaluate the quality of the studies [19]. The checklist consists of nine items. The responses were scored ‘0’ for ‘not appropriate’ and ‘not reported’, and ‘1’ for ‘Yes’. Total scores ranged from 0 to 9. Studies scoring >50% on the quality assessment parameters were included for final analysis (Supplementary Table S3).

2.6. Data extraction

Studies that were approved by all authors in the selection processes were included for data extraction. For each included study, the first author’s name, year of publication, the setting where the study was conducted, study design, study period, sample size, study population and poor levels of COVID-19 preventive practices were recorded. In addition, factors associated with poor levels of COVID-19 preventive practices, with their 95% confidence intervals (CIs), were extracted.

2.7. Data processing and analysis

Extracted data were entered into Microsoft Excel and then exported to STATA version 11.0 statistical software for analysis. A random-effect model meta-analysis was used to estimate the pooled effect size and effect of each study with a 95% CI. To summarise the data graphically, forest plots were used by estimating the pooled effect size and weight of each included study with a 95% CI. The degree of heterogeneity between the included studies was evaluated by the index of heterogeneity (I^2 statistics) [20]. Subgroup analysis by region, study design, study population and year of publication, as well as sensitivity analysis, were conducted to determine the potential sources of heterogeneity. Funnel plot analysis and Egger weighted regression tests were used to detect publication bias [21,22]. A P-value <0.05 in Egger’s test was considered as evidence of statistically significant publication bias.

3. Results

3.1. Identified studies

A total of 524 articles were initially retrieved; 184 were excluded due to duplication. A further 273 articles were excluded after reviewing the titles and abstracts, and an additional 49 were excluded as they did not fulfill the inclusion criteria. Finally, 18 articles were used in the analysis (Fig. 1).
3.2. Characteristics of the included studies

A total of 18 studies that assessed the poor levels of COVID-19 preventive practice in Ethiopia were included in the current analysis. In total, 7717 study participants were involved in this review. Of the included articles, eight were from the Amhara region [14,23-29], four from the Oromia region [12,30-32], three from the Tigray region [11,33,34], two from the Addis Ababa city administration [35,36] and one from Southern Nations, Nationalities and Peoples (SNNP) region [37]. Four studies assessed the level of COVID-19 preventive practice at the community level [11,32,33,37]. From the included studies, the smallest sample size was in the study by Shibabaw et al., which involved 112 health workers [29]. The highest level of poor COVID-19 preventive practice (89.6%) was reported by Taye et al. in the Oromia region [12] (Table 1).

3.3. Poor level of COVID-19 preventive practice

The overall pooled level of poor COVID-19 preventive practice in Ethiopia was 51.60% (95% CI: 40.30–62.90). There was a significant level of heterogeneity among included studies ($I^2 = 99.2\%$, $p \leq 0.001$) (Fig. 2).

3.4. Subgroup analysis

The meta-analysis revealed significant levels of heterogeneity; thus, a subgroup analysis was performed to determine the source of heterogeneity. Accordingly, the pooled level of poor preventive practice for

| Study, year, ref. | Region       | Study design       | Study population          | Sample Size | Poor practice (%) | Quality score |
|------------------|--------------|--------------------|----------------------------|-------------|-------------------|---------------|
| Feleke et al., 2021(26) | Amhara       | Institutional-based | Health service visitors   | 404         | 44                | 8             |
| Gebretsadik et al., 2021 [27] | Amhara       | Institutional-based | Health service visitors   | 384         | 41.7              | 9             |
| Iyasu et al., 2021 [37] | Tigray       | Institutional-based | Chronic disease patients  | 422         | 40.5              | 8             |
| Akalu et al., 2020 [28] | Amhara       | Institutional-based | Chronic disease patients  | 404         | 47.3              | 9             |
| Adda et al., 2021 [33] | Oromia       | Institutional-based | Healthcare workers        | 281         | 38.2              | 7             |
| Kassie et al., 2020 [17] | Amhara       | Institutional-based | Healthcare workers        | 630         | 61.27             | 7             |
| Daba et al., 2021 [35] | Oromia       | Community-based    | Community                  | 634         | 73                | 9             |
| Tekeba et al., 2021 [34] | Oromia       | Institutional-based | Health service visitors   | 292         | 20.9              | 7             |
| Adhena et al., 2020 [14] | Tigray       | Community-based    | Community                  | 422         | 52.5              | 9             |
| Tesfaye et al., 2020 [39] | Addis Ababa  | Institutional-based | Healthcare workers        | 295         | 70.2              | 8             |
| Abate et al., 2020 [20] | Amhara       | Institutional-based | Health service visitors   | 392         | 41.6              | 9             |
| Gebretsadik et al., 2021 [30] | Amhara       | Institutional-based | Health service visitors   | 513         | 14.62             | 8             |
| Taye et al., 2020 [15] | Oromia       | Institutional-based | Healthcare workers        | 423         | 89.6              | 7             |
| Gebremeskel et al., 2021 [36] | Tigray       | Community-based    | Community                  | 421         | 32.2              | 7             |
| Desu et al., 2021 [60] | SNNPs        | Community-based    | Community                  | 634         | 82.3              | 8             |
| Ademas et al., 2021 [31] | Amhara       | Institutional-based | Healthcare workers        | 426         | 68.8              | 8             |
| Shibabaw et al., 2021 [32] | Amhara       | Institutional-based | Healthcare workers        | 112         | 40.6              | 8             |
| Tadesse et al., 2020 [36] | Addis Ababa  | Multicentre cross-sectional | Employee              | 628 | 68.8              | 8             |
61.65%. The level of heterogeneity among studies included in each subgroup analysis was high ($p ^2 = 0.05$) (Table 2).

3.5. A leave-out-one analysis

Due to the significant level of heterogeneity, a sensitivity analysis was carried out by removing each study individually to determine how each one affected the combined estimated prevalence. Accordingly, all of the point estimates are within the overall 95% CI, which confirms that the omission of any one of the studies included in this systematic review and meta-analysis does not affect the overall pooled levels of poor COVID-19 preventive practice (Table 3).

3.6. Publication bias

Potential publication bias of the included studies was assessed visually using a funnel plot. As shown in Fig. 3, the funnel plot is symmetrical and indicates the absence of publication bias because all studies are in the triangular region. In addition, the Egger’s regression test result showed no evidence of publication bias ($p = 0.121$) (Table 4).

Fig. 2. Forest plot showing the pooled level of poor COVID-19 preventive practice in Ethiopia. The midpoint and the length of each segment indicates prevalence and a 95% confidence interval (CI), whereas the diamond shape shows the combined prevalence of all studies.

COVID-19 in the Oromia region was 55.48%, while in the Amhara region it was 44.99%. The levels of poor COVID-19 preventive practice were higher in studies conducted at the community level (61.82%) than in studies conducted on patients with chronic diseases and visitors to health services. Surprisingly, the level of poor preventive practice for COVID-19 among studies conducted by health professionals was 61.65%. The level of heterogeneity among studies included in each subgroup analysis was high ($p < 0.05$) (Table 2).

Fig. 3. Funnel plots for publication bias of the studies that were included in the level of poor COVID-19 preventive practice in Ethiopia.

Table 3

| Study omitted, year, ref. | Estimate (95% CI) | Heterogeneity |
|-------------------------|------------------|---------------|
|                         | $I^2$ (%) | $p$-value |
| Fekele et al., 2021 [26] | 52.05 (40.21-63.88) | 99.3 ≤ 0.001 |
| Gebretadik et al., 2021 [27] | 52.18 (40.38-63.98) | 99.3 ≤ 0.001 |
| Iyasu et al., 2021 [37] | 52.25 (40.45-64.05) | 99.3 ≤ 0.001 |
| Akalu et al., 2020 [28] | 51.81 (39.99-63.71) | 99.3 ≤ 0.001 |
| Adola et al., 2021 [33] | 52.38 (40.66-64.11) | 99.3 ≤ 0.001 |
| Kasie et al., 2020 [17] | 51.03 (38.98-63.07) | 99.3 ≤ 0.001 |
| Daba et al., 2021 [55] | 50.33 (38.46-62.21) | 99.3 ≤ 0.001 |
| Tekeba et al., 2021 [34] | 53.41 (42.11-64.71) | 99.2 ≤ 0.001 |
| Adhena et al., 2020 [14] | 51.55 (39.64-63.45) | 99.3 ≤ 0.001 |
| Tesfaye et al., 2020 [39] | 50.51 (38.70-62.29) | 99.3 ≤ 0.001 |
| Abebe et al., 2020 [29] | 52.19 (40.38-63.99) | 99.3 ≤ 0.001 |
| Gebretadik et al., 2021 [30] | 53.81 (43.88-63.74) | 99.9 ≤ 0.001 |
| Taye et al., 2020 [15] | 49.36 (37.80-60.71) | 99.0 ≤ 0.001 |
| Gebremeskel et al.,2021(36) | 52.74 (41.10-64.38) | 99.2 ≤ 0.001 |
| Dessu et al., 2021 [40] | 49.78 (38.42-61.15) | 99.2 ≤ 0.001 |
| Ademas et al., 2021 [31] | 50.59 (38.72-62.45) | 99.3 ≤ 0.001 |
| Shilhabaw et al., 2021 [32] | 52.23 (40.56-63.90) | 99.3 ≤ 0.001 |
| Tadesse et al., 2020 [38] | 50.58 (38.61-62.55) | 99.3 ≤ 0.001 |
| Combined | 51.60 (40.30-62.90) | 99.2 ≤ 0.001 |

Table 2

| Subgroup analysis on poor levels of COVID-19 preventive practice in Ethiopia. |
|-------------------------|------------------|---------------|
| Variables | Subgroup | Number of studies | Sample size | Prevalence (95% CI) | $I^2$ (%) | $p$-value |
| Region | Amhara | 8 | 3265 | 44.99 (30.76-59.22) | 98.7 ≤ 0.001 |
| | Oromia | 4 | 1630 | 55.48 (24.96-86.00) | 99.6 ≤ 0.001 |
| | Tigray | 3 | 1265 | 41.71 (30.15-53.27) | 94.6 ≤ 0.001 |
| | Others* | 3 | 1557 | 73.87 (64.37-83.38) | 94.6 ≤ 0.001 |
| Study design | Institutional based | 13 | 4978 | 47.66 (33.51-61.81) | 99.3 ≤ 0.001 |
| | Community based | 4 | 2111 | 60.05 (38.60-81.50) | 99.2 ≤ 0.001 |
| Study population | Healthcare center visitor | 6 | 1985 | 32.50 (19.29-45.71) | 97.8 ≤ 0.001 |
| | Healthcare workers | 6 | 2167 | 61.65 (46.04-77.27) | 98.6 ≤ 0.001 |
| | Patients with chronic diseases | 2 | 826 | 43.87 (37.20-50.53) | 74.3 0.049 |
| | Community level | 6 | 2739 | 61.82 (45.42-78.22) | 99.2 ≤ 0.001 |
| Publication year | 2020 | 7 | 4523 | 45.19 (29.63-60.76) | 99.3 ≤ 0.001 |
| | 2021 | 11 | 4523 | 45.19 (29.63-60.76) | 99.3 ≤ 0.001 |

CI, confidence interval.
* Others = Addis Ababa and Southern Nations, Nationalities and Peoples (SNNP) Region.
In total, seven studies were used to assess the association between the level of knowledge about COVID-19 and the level of poor COVID-19 preventive practice. Participants with poor COVID-19 knowledge were 5.17 times more likely to have a poor level of COVID-19 preventive practice than participants with good COVID-19 knowledge (adjusted OR [AOR] = 5.17 [95% CI: 2.49–10.73]).

Eight studies were used to evaluate the association between educational level and poor levels of COVID-19 preventive practice. Results showed that participants with a low level of education were 2.93 times more likely to have poor COVID-19 preventive practice than participants with higher levels of education.

Furthermore, participants from rural areas (AOR = 2.95 [95% CI: 2.12–4.12]), participants with a negative attitudes towards COVID-19 management (AOR = 2.64 [95% CI: 1.82–3.82]) and female participants (AOR = 1.75 [95% CI: 1.27–2.40]) were significantly more likely to have a poor level of COVID-19 prevention practice (Table 5).

### Table 5

| Variables                      | OR (95% CI)   | I² | p-value   |
|--------------------------------|---------------|----|-----------|
| Poor COVID-19 knowledge        | 5.17          | 89.0% | 0.000     |
| (2.49–10.73)                   |               |    |           |
| Rural residence                | 2.95          | 0.0%  | 0.505     |
| (2.12–4.12)                    |               |    |           |
| Negative attitude towards COVID-19 management | 2.64         | 37.3% | 0.207     |
| (1.82–3.82)                    |               |    |           |
| Low level of education         | 2.93          | 0.0%  | 0.955     |
| (2.16–3.98)                    |               |    |           |
| Female                         | 1.75          | 0.0%  | 0.608     |
| (1.27–2.40)                    |               |    |           |

OR, Odds ratio; CI, Confidence interval; I², Heterogeneity.

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| Female                         | 1.75          | 0.0%  | 0.608     |
| (1.27–2.40)                    |               |    |           |

OR, Odds ratio; CI, Confidence interval; I², Heterogeneity.
5. Conclusions
More than half of the study participants in Ethiopia showed an inadequate level of COVID-19 preventive practice; however, the poor levels of COVID-19 preventive practice declined from 2020 to 2021. Surprisingly, a subgroup analysis revealed that 61.65% of health professionals had a significant degree of poor COVID-19 preventive practice. Inadequate knowledge and a negative attitude towards COVID-19 management, as well as a low educational level, rural residence and being female, were all associated with poor COVID-19 preventive practice. Creating awareness and health education programmes targeting COVID-19 prevention should be strengthened, especially in the target populations identified in this study.

Ethical approval
Not applicable.

Funding
None declare.

Competing interests
The authors declare that there are no conflicts of interest.

Availability of data and materials
The datasets are available within the manuscript and its supporting materials.

Author contributions
SG and MDT were involved in the design, conducted the review, data analysis, interpretation of the findings and drafted the manuscript. MM and TA were involved in drafting the manuscript, reviewing and editing the manuscript. All the authors critically revised the paper and agreed to be accountable for all aspects of the work.

Appendix A. Supplementary data
Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2022.100329.

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