Depression and insomnia among health care professionals during COVID-19 pandemic in Ethiopia: a systematic review and meta-analysis (#78597)

First revision

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✓ Original primary research within Scope of the journal.

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✓ Methods described with sufficient detail & information to replicate.

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ⓘ Impact and novelty not assessed. *Meaningful* replication encouraged where rationale & benefit to literature is clearly stated.

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Depression and insomnia among health care professionals during COVID-19 pandemic in Ethiopia: a systematic review and meta-analysis

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Introduction. Healthcare professionals plays a great role on struggle against COVID-19. They are highly susceptible to COVID-19 due to their responsibilities. This susceptibility directly affects their mental health status. Comprehensive evidence on prevalence of depression and insomnia during this pandemic is vital. Thus, this study aims to provide the pooled prevalence of depression and insomnia, and their associated factors during the COVID-19 pandemic. Materials and methods. This systematic review and meta-analysis follow the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines. Studies were searched from PubMed, Cochrane Library, CrossRef, African Journals Online and Google Scholar databases from the occurence of the pandemic to June 2022. Study selection, data extraction and methodological quality assessment of study were done by two authors independently. The I^2 statistics was used for testing heterogeneity. A random effect model was used. Stata version 16.0 was used for statistical analysis. Results. Eight studies were incorporated for this systematic review and meta-analysis. From 7 studies the pooled prevalence of depression was 40% (95% CI (0.23-0.57); I^2 = 99.00%; P=0.00). From 3 studies the pooled prevalence of insomnia was 35% (95% CI (0.13-0.58); I^2 = 98.20; P=0.00). Associated factors of depression on healthcare workers (HCWs) were being female pooled AOR: 2.09; 95% CI (1.41-2.76), been married (pooled AOR=2.95; 95% CI (1.83, 4.07)). Due to limited findings on the factors associated insomnia were limited, it is impossible to pooling. Associated factors of insomnia were presented systematically due to limitation of studies. Conclusion. COVID-19 is highly associated with the prevalence of depression and insomnia among healthcare professionals in Ethiopia. The pooled prevalence of depression and insomnia were significantly higher among healthcare professionals. Appropriate psychological counseling package should be realized for health care workers (HCWs) in order to recover the general mental health problems.

Trial registration. This review was registered PROSPERO with registration number; CRD42022314865.

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3 **Ethiopia: a systematic review and meta-analysis**

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ABSTRACT

Introduction. Healthcare professionals plays a great role on struggle against COVID-19. They are highly susceptible to COVID-19 due to their responsibilities. This susceptibility directly affects their mental health status. Comprehensive evidence on prevalence of depression and insomnia during this pandemic is vital. Thus, this study aims to provide the pooled prevalence of depression and insomnia, and their associated factors during the COVID-19 pandemic.

Materials and methods. This systematic review and meta-analysis follow the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines. Studies were searched from PubMed, Cochrane Library, CrossRef, African Journals Online and Google Scholar databases from the occurence of the pandemic to June 2022. Study selection, data extraction and methodological quality assessment of study were done by two authors independently. The I^2 statistics was used for testing heterogeneity. A random effect model was used. Stata version 16.0 was used for statistical analysis**.**

Results. Eight studies were incorporated for this systematic review and meta-analysis. From 7 studies the pooled prevalence of depression was 40% (95% CI (0.23-0.57); I^2 = 99.00%; P=0.00). From 3 studies the pooled prevalence of insomnia was 35% (95% CI (0.13-0.58); I^2 = 98.20; P=0.00). Associated factors of depression on healthcare workers (HCWs) were being female pooled AOR: 2.09; 95% CI (1.41-2.76), been married (pooled AOR=2.95; 95% CI (1.83, 4.07)). Due to limited findings on the factors associated insomnia were limited, it is impossible to pooling. Associated factors of insomnia were presented systematically due to limitation of studies.

Conclusion. COVID-19 is highly associated with the prevalence of depression and insomnia among healthcare professionals in Ethiopia. The pooled prevalence of depression and insomnia were significantly higher among healthcare professionals. Appropriate psychological counseling package should be realized for health care workers (HCWs) in order to recover the general mental health problems.

51   Trial registration. This review was registered PROSPERO with registration number;

52   CRD42022314865.

Keywords?   **Commented [DAW1]:** ?????

53   **INTRODUCTION**

54   The pandemic disease caused by severe acute respiratory syndrome coronavirus 2 (SARS CoV-

55   2), first reported by officials in Wuhan City, China, in December 2019, which has spread to

56   worldwide (World health organization, 2020). Healthcare professionals are forefront in the

57   struggle against COVID-19. They are particularly susceptible to this disease due to their clinical

58   task in the healthcare settings. This affects their mental health status. Studies have started

59   researching the mental health condition of under the COVID-19 pandemic. Study findings on

60   Spanish health care workers (HCWs) imply that COVID-19 has impact on the mental health of

61   HCWs (García-Fernández et al., 2022). In Iran, more than half of the nurses had depression in

62   response to the COVID-19 outbreak (Rn et al., 2021). In Africa, the prevalence of depression is

63   higher compared to those reported elsewhere (Chen, Jiyao Farah, Nusrat Dong, Rebecca Kechen

64   Chen, Richard Z Xu, Wen Yin, Jin Chen, Bryan Z Delios, Andrew Yilong Miller, Saylor Wan,

65   Xue Ye, Wenping Zhang, 2021). Situation report of UNICEF points Ethiopia had 96,169   **Commented [DAW2]:** Please make as the references writing rules

66   confirmed cases of COVID-19 on 31 October, 2020 about 1,876 health care workers had tested

67   positive and 77 had died (UNICEF, 2020).

68   Results of studies in Ethiopia on the prevalence of depression was reported as 66.4% (Yadeta et

69   al., 2021), 21.5% (Wayessa et al., 2021), 25.8% (GebreEyesus et al., 2021) and 58.2% (Asnakew

70   et al., 2021). Being female (Yadeta et al., 2021), age and family size (Wayessa et al., 2021), with

71   medical illness (Wayessa et al., 2021) ; (Asnakew et al., 2021), been married, being pharmacist,

72   and contact with COVID-19 patients (Asnakew et al., 2021) are factors associated with

73   depressive symptom of health care professionals during the pandemic. Also studies showed the

74   prevalence of insomnia was 15.9% (Jemal, Deriba, Geleta, et al., 2021), 50.20% (Yitayih et al.,

75   2021) and 40.8% (Habtamu et al., 2021). Being female, been married and working in emergency

76   unit are factors associated with insomnia of health care workers during the pandemic (Yitayih et

77   al., 2021). Furthermore, a worldwide meta-analysis during the pandemic result showed that the

78   pooled prevalence of depression 34.31%. Mental health problems require early detection and

79   initiation of intervention during the COVID-19 pandemic (Necho et al., 2021).

80 Study findings in Ethiopia on mental health problems (depression and insomnia) during the
81 COVID-19 pandemic were varied [(Jemal, Deriba, & Geleta, 2021); (Wayessa et al., 2021);
82 (Jemal, Deriba, Geleta, et al., 2021); (Yadeta et al., 2021);(GebreEyesus et al., 2021); (Asnakew
83 et al., 2021) ;(Yitayih et al., 2021); (Habtamu et al., 2021)]. A comprehensive evidence on these

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84 findings helps policy makers, practitioners and researchers in numerous ways. This study aims to
85 provide the pooled prevalence of depression and insomnia, and their associated factors among
86 health care professionals during the COVID-19 pandemic in Ethiopia.

87 **MATERIALS AND METHODS**

88 Protocol Registration

89 This systematic review and meta-analysis was conducted in accordance with the Preferred
90 Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement and registered
91 in the International Prospective Register of Systematic Reviews with PROSPERO registration
92 number: CRD42022314865.

93 Search strategy

94 PubMed, Cochrane Library, CrossRef, African Journals Online and Google Scholar databases
95 were searched to get literatures and articles published from the occurence of the pandemic to
96 June 2022. To assess the mental health impact of COVID-19 among health care professionals,
97 observational studies were considered. Systematic searches were conducted by combining every
98 possible combination of Medical Subject Headings (MeSH) terms and keywords. Reference lists
99 of key full text articles included in the review were checked to recognize any potentially eligible
100 studies. The systematic procedure verifies that the literature search comprises all published
101 studies on the impact of COVID-19 among healthcare professionals in Ethiopia. The search
102 results were exported to Mendeley and duplicates were removed (Kwon et al., 2015). Two
103 authors (AAH and AAS) independently screened titles and abstracts of the studies, and any
104 disagreement between the authors was resolved by discussin with third author (AAM). The
105 search strategy of PubMed database is presented (**Table 1**). The search strategy is considered as
106 adequate to reduce the risk of selection and detection bias. For this study only observational
107 studies (cohort, case-control and cross-sectional) focus the impacts of COVID-19 on depression
108 and insomnia among healthcare professionals during the pandemic in Ethiopia were included.

109 **Setting/context***:* Studies conducted in Ethiopia was the main concern of this review.

110 **Population***:* All categories of healthcare professionals in Ethiopia.

111 **Study design***:* Observational studies (cohort, case-control and cross-sectional studies) that

112 reported the prevalence and associated factors of mental disorders among health care

113 professionals during the COVID-19 pandemic.

114 **Language**: English language reported studies were considered.

115 The following types of studies were excluded: Studies on whole populations; Studies with very

116 small sample size (n<30); studies that did not have enough statistical information to be extracted

117 and descriptive reviews, randomized controlled trials, systematic review, meta-analysis,

118 editorials, comments, conference abstracts and expert opinions, not precisely measured the

119 prevalence and the determinants of mental illness of healthcare professionals were excluded.

120 Outcome measures

121 There are two main outcomes in this systematic review and meta-analysis. The first outcome

122 wasthe prevalence of depression and insomnia on healthcare professionals during the COVID-19

123 pandemic. The second outcome of the study was factors related to the prevalence of depression

124 and insomnia among health care professionals during the COVID-19 pandemic in Ethiopia.

125 Selection of studies

126 Two authors (AAH and AAS) assessed the studies based on inclusion and exclusion criteria.

127 Firstly, the authors assessed both the titles and abstracts of the studies identified from the

128 searched databases. Then full-text screening was done to screen the full texts selected in the

129 previous stage. Moreover, we have a rationale for inclusion and exclusion of studies in the

130 PRISMA flow diagram. Lastly, the final list of articles for data extraction for systematic review

131 and meta-analysis was prepared.

132 Data extraction

133 The following data were extracted from each article by two authors independently: author's

134 name, study type, total number of participants, year of publication, region, study design cases,

135 sample size, instrument used, mental disorders, prevalence of mental disorders, and significant

136 associated factors of mental disorders with their effect size. There was pretest the data extraction

137 form to ensure effective, facilitates the collection of all necessary data required for the valuable

138   systematic review and meta-analysis. Disagreements were resolved by deep argument among

139   authors.

140   Methodological quality assessment

141   Two authors (AAH and AAS) separately assessed the quality of included studies using the

142   Newcastle-Ottawa Scale (NOS)(Stang et al., 2018). NOS scale rates observational studies based

143   on 3 parameters: selection, compared between the exposed and unexposed groups, and

144   exposure/outcome assessment. Studies with less than 5 stars were considered low quality, 5-7

145   stars of moderate quality, and more than 7 stars of high quality (Paddy Ssentongo, Anna E.

146   Ssentongo, 2020). Only studies with moderate and above quality score were included in this

147   systematic review and meta-analysis.

148   Data synthesis

149   The extracted data was entered into a Microsoft Excel and then imported in to Stata version 16.0

150   (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC)

151   software for the analyses. We calculated pooled prevalence and pooled adjusted odds ratios

152   (AOR) with 95% confidence interval (CI) by the generic inverse variance method.

153   Heterogeneity among included studies was assessed using the I^2 test. If $I^2 > 0.5$ or $P < 0.1$ it is

154   considered that there is a significant heterogeneity among the included studies,(Feilong Zhu,

155   Ming Zhang, Min Gao, Cheng Zeng, Dan Wang, Qianqin Hong, 2020) and random-effect model

156   with the inverse variance method was used. To determine the source of heterogeneity subgroup

157   analyses was performed by regions and instruments used in individual studies.

158   **RESULTS**

159   A PRISMA flow diagram illustrating the steps of data search and refining process for the study

160   on depression and insomnia among health care professionals during the COVID-19 pandemic

161   period (**Fig.1**). We have got 30 papers from the searched databases. 8 studies duplicated were

162   removed, we examined the titles and abstracts and 3 papers were removed. By examining the full

163   text, we removed 4 that did not meet inclusion criteria. 7 Studies were removed due to not

164   reporting about depression and insomnia. Finally, 8 studies were relevant to the systematic

165   review and meta-analysis.

166   Characteristics of included studies

167   In this systematic review and meta-analysis, we included 8 studies [(Jemal, Deriba, & Geleta,

168   2021); (Wayessa et al., 2021); (Jemal, Deriba, Geleta, et al., 2021); (Yadeta et al., 2021);

169   (GebreEyesus et al., 2021); (Asnakew et al., 2021) ;(Yitayih et al., 2021); (Habtamu et al.,

170   2021)] focusing on the impact of COVID-19 on depression and insomnia among health care

171   professionals in Ethiopia. Regarding the regional distribution 1 study (GebreEyesus et al., 2021)

172   is from SNNP, 3 studies (Jemal, Deriba, & Geleta, 2021); (Wayessa et al., 2021); (Yadeta et al.,

173   2021) are from Oromiya, 1 study (Asnakew et al., 2021) is from Amhara, 1 study (Jemal,

174   Deriba, Geleta, et al., 2021) is from Addis Ababa and Oromiya, 1 study (Habtamu et al., 2021) is

175   from Addis Ababa. Furthermore, the key characteristics of the included papers was summarized

176   and showed in table (**Table 2).**

177   Quality of included studies

178   The methodological quality score of the 8 included studies using the modified Newcastle Ottawa

179   scale for correctional studies quality assessment tool was presented (**Table 2).** Accordingly, 2

180   studies were rated as moderate quality (Asnakew et al., 2021); (Yitayih et al., 2021) and 6

181   studies were rated as high quality (Jemal, Deriba, & Geleta, 2021); (Jemal, Deriba, Geleta, et al.,

182   2021); (Yadeta et al., 2021);(GebreEyesus et al., 2021); (Habtamu et al., 2021); (Wayessa et al.,

183   2021) and were considered for final systematic review and meta analysis.

184184

185   Publication bias

186   Detection of publication and related biases is vital for the validity and interpretation of meta-

187   analytical findings. Test power is usually too low to distinguish chance from real asymmetry

188   when there are less than 10 studies in the meta-analysis. (Furuya-Kanamori et al., 2018).

189   Accordingly, the number of included studies for depression and insomnia are less than ten we do

190   not apply the asymmetry test.

191   Pooled Prevalence of depression

192   A total of 7 studies reported the prevalence of depression, and the pooled prevalence of the

193   depression was 40% (95% CI [0.23-0.57]; $I^2 = 99.00\%$; p=0.00) (**Fig.2**). From the heterogeneity

194   test, there is significant heterogeneity is observed among individual studies on the prevalence of

195   depression among healthcare professionals during the pandemic in Ethiopia.

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Subgroup analysis of depression by region

196

197 To handle this variability in studies the subgroup analysis by region is done. From the forest plot

198 **(Fig.3),** the pooled prevalence of depression in Addis Ababa & Oromiya, Oromiya, SNNP,

199 Addis Ababa and Amhara is 60%, 35%, 26%, 27% and 63% respectively. The heterogeneity test

200 indicates that there is significant variability among regions. The prevalence of depression is

201 higher in Amhara region compared to the others.

Subgroup analysis of depression by instrument

202

203 Based on the instrument used in individual included studies, subgroup analysis is done. From the

204 forest plot **(Fig.4),** the pooled prevalence of depression by DASS-21 and PHQ-9 is 48%, and

205 34% respectively. The heterogeneity test indicates that there is significant variability on a study

206 finding between measurements. The prevalence of depression measured in DASS-21 is higher

207 than that measured by PHQ-9 among health care workers during the pandemic. This might be

208 due to the difference in sensitivity and specificity of the assessment instruments.

Pooled Prevalence of Insomnia

209

210 Three studies reported the prevalence of insomnia, and the pooled prevalence of the insomnia

211 was 35% (95% CI [0.13-0.58]; $I^2 = 98.20\%$; p=0.00) **(Fig.5)**. In the test of heterogeneity, we

212 have seen that there is considerable variation among individual included studies on the

213 prevalence of insomnia among health care professionals during the pandemic in Ethiopia.

Subgroup analysis of Insomnia by region

214

215 Subgroup analysis by region is done. From the forest plot **(Fig.6),** the pooled prevalence of

216 insomnia in Oromiya and Addis Ababa is 24% and 41% respectively. The heterogeneity test

217 indicates that there is significant variation in the prevalence of insomnia between regions. The

218 prevalence of insomnia is higher in Addis Ababa than Oromiya.

Subgroup analysis of insomnia by instrument

219

220 Based on the instrument used in individual included studies, subgroup analysis is done. From the

221 forest plot in **(Fig.7),** the pooled prevalence of depression measured by ISI and PSQI is 24% and

222 41% respectively. The heterogeneity test indicates that there is significant variation on a study

223 finding between measurements. The prevalence of depression measured in PSQI is higher than

224 that measured by ISI among health care workers during the pandemic.

225 Pooled adjusted odds ratio of associated factors of depression and insomnia

226 The pooled adjusted odds ratio of the factors associated with prevalence of depression among
227 health care professionals during COVID-19 in Ethiopia presented (**Table 3**).

228 The pooled adjusted odds ratio on female healthcare workers is 2.09, 95%CI (1.41, 2.76), implies
229 that the odds of female healthcare workers is two times more to develop the depressive symptom
230 than males during the pandemic. Similarly for maritial status (been married) the pooled adjusted
231 odds ratio is 2.95, 95%CI (1.83, 4.07) indicates that the odds of married healthcare workers is
232 nearly 3 times more to develop depression than not married. Whereas, in this study working unit
233 (isolation center) and with medical illness are not statisticaly significant variables on affecting
234 the prevalence of depression during the pandemic. Since the findings on the factors associated
235 with the prevalence of depression and insomnia were heterogeneous and limited, it is impossible
236 to pooling. We explore and present these factors systematically as summarized (**Table 4**).

237 **DISCUSSIONS**

238 This study aims to investigate the pooled prevalence and associated factors of depression and
239 insomnia among health care professionals during the COVID-19 pandemic in Ethiopia. The
240 result shows a high prevalence depression and insomnia among healthcare professionals during
241 the COVID-19 pandemic in Ethiopia. Consequently, there is a major concern for the mental
242 health of health care workers (HCWs) during the COVID-19 pandemic, as well as in potential
243 future public health crises. There are studies at the single level, but to our knowledge, this
244 systematic review and meta-analysis study is the first of its kind that assessed the pooled
245 prevalence of depression and insomnia and their associated factors.

246 The study included 8 studies [(Jemal, Deriba, & Geleta, 2021); (Wayessa et al., 2021); (Jemal,
247 Deriba, Geleta, et al., 2021); (Yadeta et al., 2021);(GebreEyesus et al., 2021); (Asnakew et al.,
248 2021) ;(Yitayih et al., 2021); (Habtamu et al., 2021)] focused on the impact of COVID-19 on
249 depression and insomnia among health care professionals in Ethiopia. This reflects that the
250 impact of COVID-19 on mental health problems especially depression and insomnia were not
251 well investigated. With the available evidence the pooled prevalence of depression and insomnia,
252 and their associated factors were discussed.

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253   In this study the pooled prevalence of depression among HCWs during the COVID-19 pandemic

254   was 40%. This is higher than the previous meta-analysis result of 36% (Sun et al., 2021), 37.12%

255   (Mahmud et al., 2021), 31.8% (Batra et al., 2020), 26.2% (H. Zhang et al., 2021) and 31.1%

256   (Marvaldi et al., 2021). However, the results is lower than the study results in Africa 45% (Chen,

257   Jiyao Farah, Nusrat Dong, Rebecca Kechen Chen, Richard Z Xu, Wen Yin, Jin Chen, Bryan Z

258   Delios, Andrew Yilong Miller, Saylor Wan, Xue Ye, Wenping Zhang, 2021) and Kenya 45.9%

259   (Ali et al., 2021).

260   Among regions, there is heterogeneity on the prevalence of depression. We found the prevalence

261   of depression in Amhara regions is 63%, is higher compared to the others. This might be due to

262   the difference in the availability of prevention equipment's for the COVID-19 and the levels of

263   awareness on the pandemic. Also subgroup analysis by instrument, the pooled prevalence of

264   depression by DASS-21 is 48%, this is higher than study in global 34.83% (Mahmud et al.,

265   2021) and pooled result by PHQ-9 is 34%, lower than study meta analysis result 38.11%

266   (Mahmud et al., 2021).

267   The pooled adjusted odds ratio on female healthcare workers is 2.09, 95%CI (1.41, 2.76), implies

268   that odds of female healthcare workers is two times more to develop the depressive symptom

269   than males during the pandemic. This is inline with the study finding in Kenya females health

270   care workers experiencing more symptoms of all the mental health disorders than males (Ali et

271   al., 2021) and Egypt (Elgohary et al., 2021). Similarly for maritial status (being married) the

272   pooled adjusted odds ratio is 2.95, 95%CI (1.83, 4.07) indicate odds of married healthcare

273   workers are nearly 3 times more to develop depression than non married. Whereas, in this study

274   working unit (isolation center) and with medical illness are not statisticaly significant variables

275   on affecting the prevalence of depression during COVID-19 pandemic.

276   The pooled prevalence of insomnia among HCWs during the COVID-19 pandemic was 35%.

277   This is inline with the pooled prevalence of insomnia among healthcare workers in China

278   34.5% (H. Zhang et al., 2021) and a study result in Kenya 37.0% (Ali et al., 2021). The result is

279   higher than meta analysis results 28% (Chen et al., 2021), and 27.8 % (Batra et al., 2020) but

280   lower than the global meta analysis result 43.76% (Mahmud et al., 2021). Up on subgroup

281   analysis by region, the heterogeneity test indicates that there is significant variation in the

282   prevalence of insomnia between regions. The prevalence of insomnia in Addis Ababa is 41%

283   higher than Oromiya. The pooled prevalence of depression measured by ISI is 24% , this is lower

284   than study in China 36.1% (C. Zhang et al., 2020) similarly using PSQI 41%, this is higher than

285   study in Kenya 24.2% (Kwobah et al., 2021). The heterogeneity test indicates that there is

286   significant variation on a study finding between measurements. This might be due to the

287   sensitivity and specificity on the measurement tools. For insomnia, pooling the adjusted odds

288   ratio for associated factors was not performed due to the limited data available.

289   This study is with strengths and some limitations. Study selection, data extraction and quality

290   assessment were performed by two authors independently. Newcastle-Ottawa Scale used to

291   assess the quality of the included studies were the strengths. Whereas, the absence of sufficient

292   studies on the impact of COVID-19 on the mental health of health care professionals in Ethiopia

293   and heterogeneity among studies were the limitations of this systematic review and meta-

294   analysis.

295   **CONCLUSION**

296   COVID-19 pandemic caused a variety of mental health impacts among health care professionals

297   in Ethiopia. Due to this pandemic, the prevalence of depression and insomnia among health care

298   professionals became high in Ethiopia. The prevalence varied among regions as well as

299   instruments used. The suitable programs that offer awareness on the COVID-19 virus,

300   psychological counseling and intervention should be implemented for healthcare workers

301   (HCWs) to improve the general mental health problems including depression and insomnia.

302302

303   Abbreviations

304   **AOR**   Adjusted Odds Ratio

305   **CI**   Confidence Interval

306   **HCWs**   Health Care Workers

307   **MeSH**   Medical Subject Headings

308   **NOS**   Newcastle Ottawa Quality Assessment Scale

309   **PRISMA**   Preferred Reporting Items for Systematic Review and Meta-Analysis

310   **SNNP**   Southern Nations, Nationalities and People

311   **WHO** World Health Organization

319   **REFERENCES**

320   Ali, S. K., Shah, J., & Talib, Z. (2021). COVID-19 and mental well-being of nurses in a tertiary
321   facility in Kenya. *PLoS ONE*, *16*(7 July), 1–10.
322   https://doi.org/10.1371/journal.pone.0254074

323   Asnakew, S., Amha, H., & Kassew, T. (2021). Mental health adverse effects of covid-19
324   pandemic on health care workers in north west Ethiopia: A multicenter cross-sectional
325   study. *Neuropsychiatric Disease and Treatment*, *17*, 1375–1384.
326   https://doi.org/10.2147/NDT.S306300

327   Batra, K., Singh, T. P., Sharma, M., Batra, R., & Schvaneveldt, N. (2020). Investigating the
328   psychological impact of COVID-19 among healthcare workers: A meta-analysis.
329   *International Journal of Environmental Research and Public Health*, *17*(23), 1–33.
330   https://doi.org/10.3390/ijerph17239096

331   Chen, Jiyao Farah, Nusrat Dong, Rebecca Kechen Chen, Richard Z Xu, Wen Yin, Jin Chen,
332   Bryan Z Delios, Andrew Yilong Miller, Saylor Wan, Xue Ye, Wenping Zhang, S. X.
333   (2021). Mental Health during the COVID-19 Crisis in Africa: A Systematic Review and
334   Meta-Analysis. *International Journal of Environmental Research and Public Health*,
335   *18*(20). https://doi.org/10.3390/ijerph182010604

336   Chen, J., Farah, N., Dong, R. K., Chen, R. Z., Xu, W., Yin, J., Chen, B. Z., Delios, A. Y., Miller,
337   S., Wan, X., Ye, W., & Zhang, S. X. (2021). Mental Health during the COVID-19 Crisis in
338   Africa/: A Systematic Review and Meta-Analysis. *International Journal of Environmental*

339   *Research and Public Health*, *18*(20), 1060. https://doi.org/https://

340   doi.org/10.3390/ijerph182010604

341   Elgohary, H. M., Sehlo, M. G., Bassiony, M. M., Youssef, U. M., Elrafey, D. S., & Amin, S. I.

342   (2021). Depression among health workers caring for patients with COVID-19 in Egypt.

343   *Egyptian Journal of Neurology, Psychiatry and Neurosurgery*, *57*(1), 1–10.

344   https://doi.org/10.1186/s41983-021-00394-1

345   Feilong Zhu, Ming Zhang, Min Gao, Cheng Zeng, Dan Wang, Qianqin Hong, W. C. (2020).

346   Effects of respiratory rehabilitation on patients with novel coronavirus (COVID-19)

347   pneumonia in the rehabilitation phase: protocol for a systematic review and meta-analysis.

348   *BMJ Open*, *10*(e039771.). https://doi.org/10.1136/ bmjopen-2020-039771

349   Furuya-Kanamori, L., Barendregt, J. J., & Doi, S. A. R. (2018). A new improved graphical and

350   quantitative method for detecting bias in meta-analysis. *JBI Evidence Implementation*,

351   *16*(4).

352   García-Fernández, L., Romero-Ferreiro, V., López-Roldán, P. D., Padilla, S., Calero-Sierra, I.,

353   Monzó-García, M., Pérez-Martín, J., & Rodriguez-Jimenez, R. (2022). Mental health

354   impact of COVID-19 pandemic on Spanish healthcare workers. *Psychological Medicine*,

355   *52*(1), 195–197. https://doi.org/10.1017/S0033291720002019

356   GebreEyesus, F. A., Tarekegn, T. T., Amlak, B. T., Shiferaw, B. Z., Emeria, M. S., Geleta, O. T.,

357   Terefe, T. F., Mammo Tadereregew, M., Jimma, M. S., Degu, F. S., Abdisa, E. N., Eshetu,

358   M. A., Misganaw, N. M., & Chanie, E. S. (2021). Levels and predictors of anxiety,

359   depression, and stress during COVID-19 pandemic among frontline healthcare providers in

360   Gurage zonal public hospitals, Southwest Ethiopia, 2020: A multicenter cross-sectional

361   study. *PloS One*, *16*(11), e0259906. https://doi.org/10.1371/journal.pone.0259906

362   Habtamu, Y., Admasu, K., Tullu, M., Damene, W., Birhanu, A., Beyero, T., & Birhanu Tekeda,

363   A. (2021). Mental Health Outcomes among Frontline Health-Care Workers at Eka Kotebe

364   National COVID-19 Treatment Center, Addis Ababa, Ethiopia, 2020: A Cross-Sectional

365   Study. *Neuropsychiatric Disease and Treatment*, *Volume 17*(August), 2831–2840.

366   https://doi.org/10.2147/ndt.s311949

367   Jemal, K., Deriba, B. S., & Geleta, T. A. (2021). Psychological Distress, Early Behavioral
368   Response, and Perception Toward the COVID-19 Pandemic Among Health Care Workers
369   in North Shoa Zone, Oromiya Region. *Frontiers in Psychiatry*, *12*(May), 1–12.
370   https://doi.org/10.3389/fpsyt.2021.628898

371   Jemal, K., Deriba, B. S., Geleta, T. A., Tesema, M., Awol, M., Mengistu, E., & Annous, Y.
372   (2021). Self-reported symptoms of depression, anxiety, and stress among healthcare
373   workers in ethiopia during the covid-19 pandemic: A cross-sectional study.
374   *Neuropsychiatric Disease and Treatment*, *17*, 1363–1373.
375   https://doi.org/10.2147/NDT.S306240

376   Kwobah, E. K., Mwangi, A., Patel, K., Mwogi, T., & Kiptoo, R. (2021). *Mental Disorders*
377   *Among Health Care Workers at the Early Phase of COVID-19 Pandemic in Kenya/;*
378   *Findings of an Online Descriptive Survey*. *12*(July), 1–11.
379   https://doi.org/10.3389/fpsyt.2021.665611

380   Kwon, Y., Lemieux, M., McTavish, J., & Wathen, N. (2015). Identifying and removing duplicate
381   records from systematic review searches. *Journal of the Medical Library Association*,
382   *103*(4), 184–188. https://doi.org/10.3163/1536-5050.103.4.004

383   Lin, L., & Chu, H. (2018). Quantifying publication bias in meta-analysis. *Biometrics*, *74*(3),
384   785–794. https://doi.org/10.1111/biom.12817

385   Mahmud, S., Hossain, S., Muyeed, A., Islam, M. M., & Mohsin, M. (2021). The global
386   prevalence of depression, anxiety, stress, and, insomnia and its changes among health
387   professionals during COVID-19 pandemic: A rapid systematic review and meta-analysis.
388   *Heliyon*, *7*(7), e07393. https://doi.org/10.1016/j.heliyon.2021.e07393

389   Marvaldi, M., Mallet, J., Dubertret, C., Moro, M. R., & Guessoum, S. B. (2021). Anxiety,
390   depression, trauma-related, and sleep disorders among healthcare workers during the
391   COVID-19 pandemic: A systematic review and meta-analysis. *Neuroscience and*
392   *Biobehavioral Reviews*, *126*(March), 252–264.
393   https://doi.org/10.1016/j.neubiorev.2021.03.024

394   Necho, M., Tsehay, M., Birkie, M., Biset, G., & Tadesse, E. (2021). Prevalence of anxiety,
395   depression, and psychological distress among the general population during the COVID-19
396   pandemic: A systematic review and meta-analysis. *International Journal of Social*
397   *Psychiatry*, *67*(7), 892–906. https://doi.org/10.1177/00207640211003121

398   Paddy Ssentongo, Anna E. Ssentongo, E. S. H. and et al. (2020). Association of cardiovascular
399   disease and 10 other pre-existing comorbidities with COVID-19 mortality: A systematic
400   review and meta-analysis. *Plos One*, *15*(8), e0238215. https://doi.org/10.1371/journal.
401   pone.0238215

402   Rn, S. P., Rn, S. Y., & Rn, H. B. (2021). *The relationship between mental workload and job*
403   *performance among Iranian nurses providing care to COVID- - patients/: A cross- -*
404   *sectional study*. *December 2020*, 1–10. https://doi.org/10.1111/jonm.13305

405   Stang, A., Jonas, S., & Poole, C. (2018). Case study in major quotation errors: a critical
406   commentary on the Newcastle–Ottawa scale. *European Journal of Epidemiology*, *33*(11),
407   1025–1031. https://doi.org/10.1007/s10654-018-0443-3

408   Sun, P., Wang, M., Song, T., Wu, Y., Luo, J., Chen, L., & Yan, L. (2021). *The Psychological*
409   *Impact of COVID-19 Pandemic on Health Care Workers/: A Systematic Review and Meta-*
410   *Analysis*. *12*, 626547. https://doi.org/10.3389/fpsyg.2021.626547

411   UNICEF. (2020). *Situation in Numbers cases 344 in critical condition*.

412   Vignesh Chidambaram, Nyan Lynn Tun, W. Z. H. and et al. (2020). Factors associated with
413   disease severity and mortality among patients with COVID-19: A systematic review and
414   meta-analysis. *PLoS ONE*, *15*(11), e0241541. https://doi.org/10.1371/journal. pone.0241541

415   Wayessa, Z. J., Melesse, G. T., Amaje Hadona, E., & Wako, W. G. (2021). Prevalence of
416   depressive symptoms due to COVID-19 and associated factors among healthcare workers in
417   Southern Ethiopia. *SAGE Open Medicine*, *9*, 205031212110328.
418   https://doi.org/10.1177/20503121211032810

419   World health organization. (2020). *COVID-19 Situation Report*. *31*(2), 61–66.

420   Yadeta, T. A., Dessie, Y., & Balis, B. (2021). Magnitude and Predictors of Health Care Workers

421   Depression During the COVID-19 Pandemic: Health Facility-Based Study in Eastern

422   Ethiopia. *Frontiers in Psychiatry*, *12*(July), 1–8. https://doi.org/10.3389/fpsyt.2021.654430

423   Yitayih, Y., Mekonen, S., Zeynudin, A., Mengistie, E., & Ambelu, A. (2021). Mental health of

424   healthcare professionals during the early stage of the COVID-19 pandemic in Ethiopia.

425   *BJPsych Open*, *7*(1), 1–6. https://doi.org/10.1192/bjo.2020.130

426   Zhang, C., Yang, L., Liu, S., Ma, S., Wang, Y., Cai, Z., Du, H., Li, R., Kang, L., Su, M., Zhang,

427   J., Liu, Z., & Zhang, B. (2020). Survey of Insomnia and Related Social Psychological

428   Factors Among Medical Staff Involved in the 2019 Novel Coronavirus Disease Outbreak.

429   *Frontiers in Psychiatry*, *11*, 306. https://doi.org/10.3389/fpsyt.2020.00306

430   Zhang, H., Li, W., Li, H., Zhang, C., Luo, J., Zhu, Y., Wu, H., Zhu, Z., Xu, Y., Wang, J., & Li,

431   C. (2021). Prevalence and dynamic features of psychological issues among Chinese

432   healthcare workers during the COVID-19 pandemic: A systematic review and cumulative

433   meta-analysis. *General Psychiatry*, *34*(3). https://doi.org/10.1136/gpsych-2020-100344

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Table 1(on next page)

PubMed search strategy.
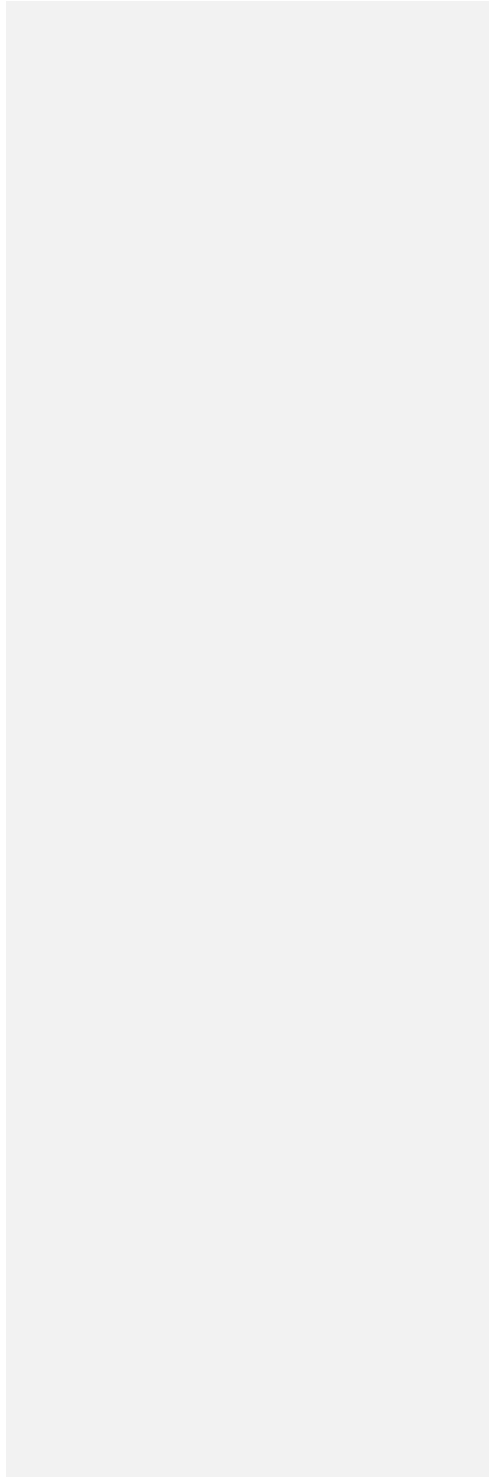
1

Search number	Search detail
	"COVID-19"[MeSH Terms]
#2	"depression"[Mesh Terms]
#3	"insomnia"[Mesh Terms]
#4	"COVID-19"[Title/Abstract] OR "2019 novel coronavirus disease"[Title/Abstract] OR "2019 novel coronavirus infection"[Title/Abstract] OR "2019 ncov disease"[Title/Abstract] OR "2019 ncov infection"[Title/Abstract] OR "covid 19 pandemic"[Title/Abstract] OR "covid 19 pandemics"[Title/Abstract] OR "covid 19 virus disease"[Title/Abstract] OR "covid 19 virus infection"[Title/Abstract] OR "COVID19"[Title/Abstract] OR "coronavirus disease 2019"[Title/Abstract] OR "coronavirus disease 19"[Title/Abstract] OR "sars coronavirus 2 infection"[Title/Abstract] OR "sars cov 2 infection"[Title/Abstract] OR "severe acute respiratory syndrome coronavirus 2 infection""[Title/Abstract] OR "SARS-CoV-2"[Title/Abstract] OR "2019 novel coronavirus"[Title/Abstract] OR "2019 novel coronavirus"[Title/Abstract] OR "2019- nCoV"[Title/Abstract] OR "covid 19 virus"[Title/Abstract] OR "covid19 virus"[Title/Abstract] OR "Coronavirus disease 2019 virus"[Title/Abstract] OR "SARS coronavirus 2"[Title/Abstract] OR "SARS cov 2 virus"[Title/Abstract] OR "severe acute respiratory syndrome coronavirus 2"[Title/Abstract] OR "Wuhan coronavirus"[Title/Abstract] OR "Wuhan seafood market pneumonia virus"[Title/Abstract]
#5	"Mental illness" [Title/Abstract] OR "Psychiatric problem" [Title/Abstract] AND "insomnia" [Title/Abstract] OR "depression" [Title/Abstract] OR "psychology problem" [Title/Abstract] OR "mental health effect" [Title/Abstract] OR "psychological disturbance" [Title/Abstract] "Mental Disorder" [Title/Abstract] OR "Psychiatric Illness" [Title/Abstract] OR "Psychiatric Diseases" [Title/Abstract] OR "Psychiatric Disorders" [Title/Abstract] OR Behavior Disorders" [Title/Abstract] OR "Severe Mental Disorder" [Title/Abstract]
#6	"health care professionals"[Title/Abstract] OR "health care workers"[Title/Abstract] AND "Ethiopia"[Title/Abstract] OR "Addis Ababa"[Title/Abstract] OR "Amhara"[Title/Abstract] OR "Afar"[Title/Abstract] OR "Oromia"[Title/Abstract] OR "SNNP"[Title/Abstract] OR "Somali" [Title/Abstract] OR "Gambella" [Title/Abstract] OR " Benishangul-Gumuz" [Title/Abstract] OR "Tigrai" [Title/Abstract] OR " Harari " [Title/Abstract] OR "Dire Dawa" [Title/Abstract]
#7	#1 OR #4
#8	#2 OR #3 OR #5
#9	#6 AND #7 AND #8
#10	Limit to "observational studies" OR "cohort" OR "case-control" OR "cross-sectional"

Table 2(on next page)

Key characteristics of the included studies for depression and insomnia of HCWs during the COVID-19 pandemic in Ethiopia.
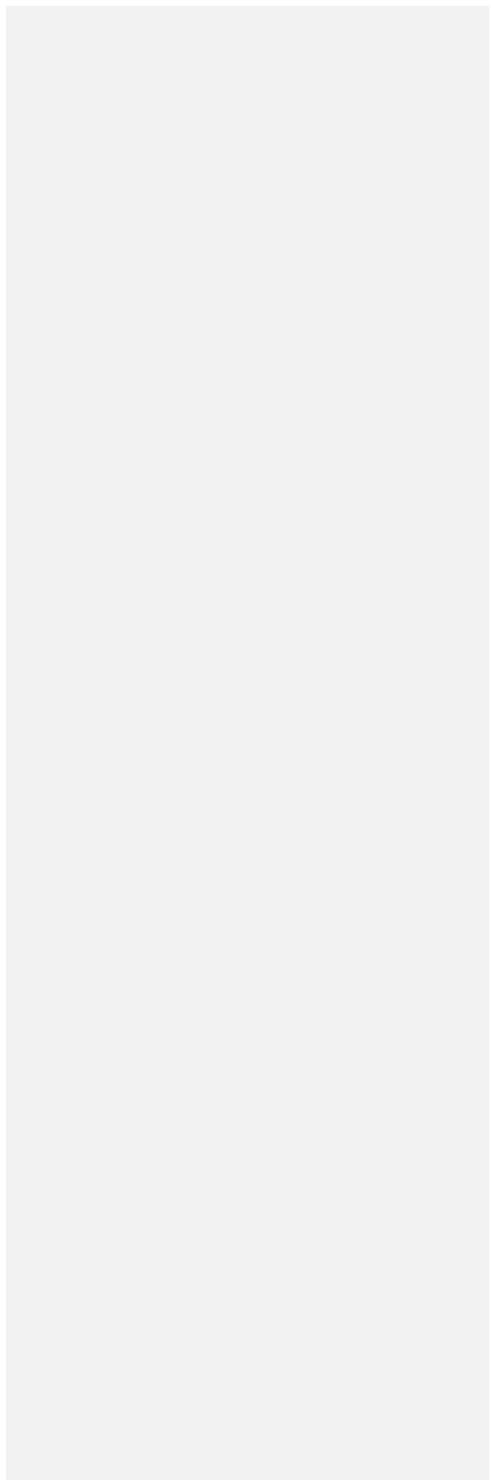
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No	Authors (year)	Region	Study design	Gender (male %)	Cases	n	Mental disorders	Instrument	P (%)	Quality
1	Jemal et al.(2021) A	AA and Oromiya	CS	540(66.17)	492	816	Depression	DASS-21	60.3	8
2	Jemal et al. (2021) B	Oromiya	CS	279(66.90)	66	417	Insomnia	ISI	15.9	8
					68	417	Depression	PHQ-9	16.3	
3	Yitayih et al.(2021)	Oromiya	CS	118(47.38)	125	249	Insomnia	ISI	50.2	7
4	GebreEyesus et al.(2021)	SNNP	CS	167(51.86)	83	322	Depression	PHQ-9	25.8	9
5	Habtamu et al. (2021)	AA	CS	101(42.43)	65	238	Depression	PHQ-9	27.3	9
					97	238	Insomnia	PSQI	40.8	
6	Wayessa et al. (2021)	Oromiya	CS	173(62.90)	59	275	Depression	DASS-21	21.5	8
7	Yadeta et al.(2021)	Oromiya	CS	133(50.18)	176	265	Depression	PHQ-9	66.4	8
8	Asnakew et al.(2021)	Amhara	CS	292(69.7)	244	419	Depression	DASS-21	58.2	7

4 **Note**: P= prevalence, n= sample size, CS=cross-sectional, DASS-21=21-item Depression Anxiety Stress
5 Scale, PHQ-9= 9-item Patient Health Questionnaire, ISI= Insomnia Severity Index, PSQI= Pittsburgh Sleep
6 Quality Index, AA=Addis Ababa, SNNP= Southern nations nationalities and people.
7

Table 3(on next page)

Pooled adjusted odds ratio of associated factors of depression.
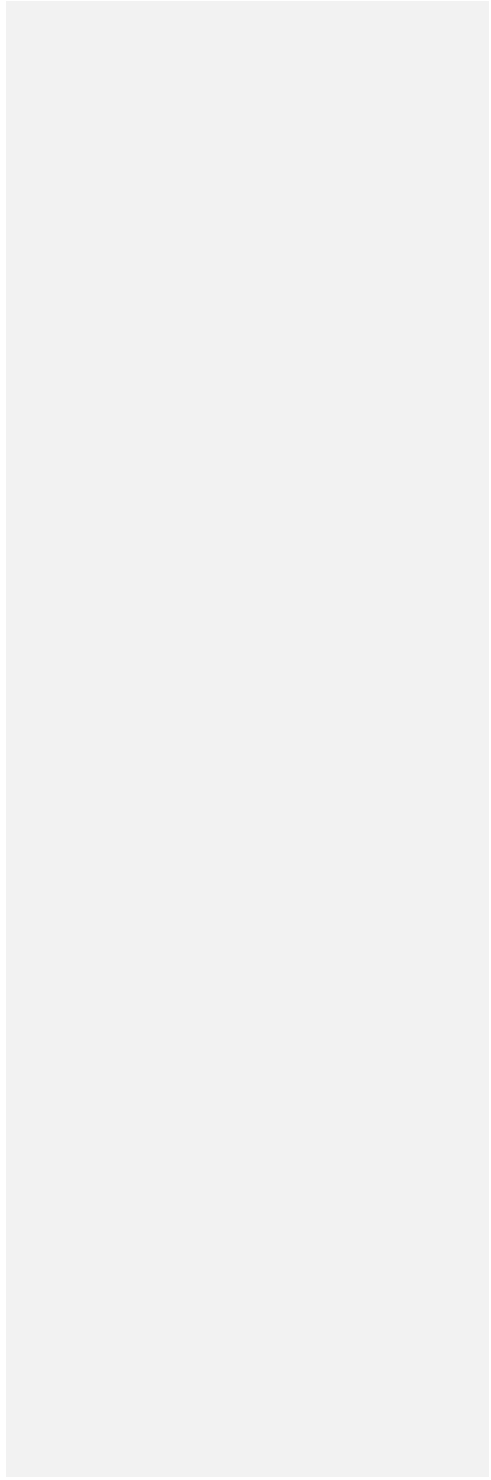
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Mental illness	Numbers of studies	Variables	Reference category	Pooled AOR (95% CI)	Heterogeneity	
					I² (%)	p-value
Depression	4	Sex(female)	Male	2.09 (1.41, 2.76)	0.00	0.837
Depression	2	Working unit (COVID-19 isolation center)	Pharmacy	2.13 (0.94, 3.31)	0.00	0.980
Depression	3	Marital status (married)	Single	2.95(1.83, 4.07)	0.00	0.743
Depression	2	With medical illness	Not	4.11(-1.66, 9.87)	40.4	0.195

3

4

Table 4(on next page)

A summarized review of study findings on factors of depression and insomnia with their magnitude among healthcare professionals during the COVID-19 pandemic in Ethiopia.
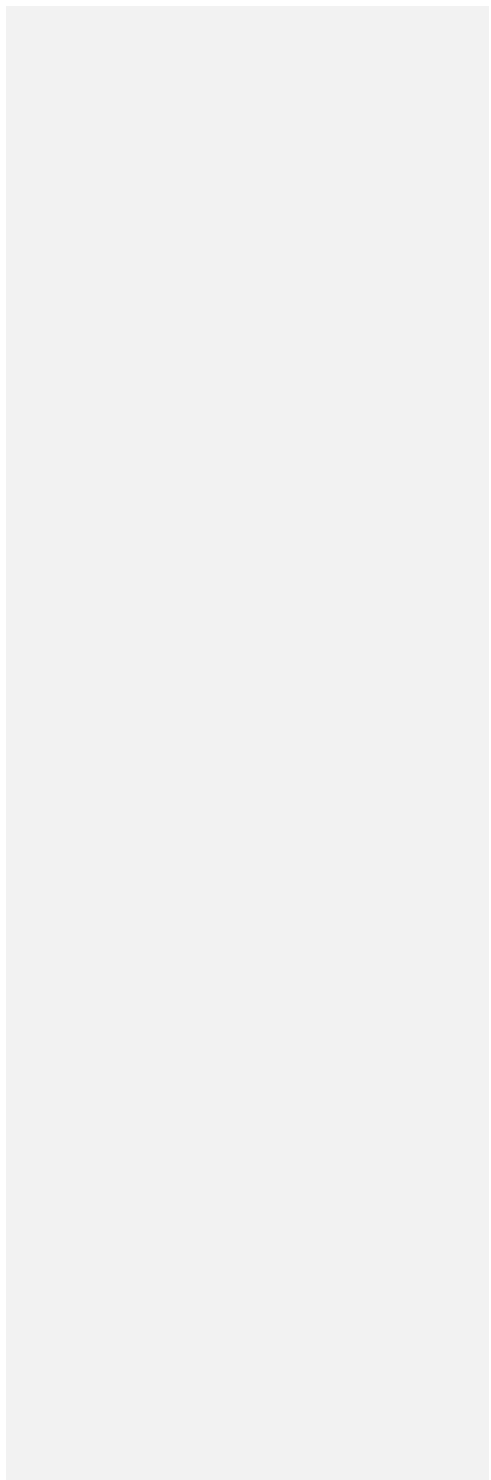
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Authors (	Mental Disorder	Variables	Category	AOR(95% CI)
et al.(2021) A	Depression	Hcws in the Oromiya zone Medical laboratory professionals	Centeral Oromiya Pharmacy	3.94 (1.94, 8.09) 4.69 (2.81, 9.17)

et al. (2021)	Depression	Married participants
		        unit
		     of years
		Poor behavioral responses
		Poor perception to COVID-19
			Single
			Outpatient
			>=10 years
			Good response
			Good
				2.87 (2.03, 4.30)
				2.11 (1.27, 4.61)
				2.07 (1.89, 4.84)
				2.13 (1.18, 3.57)
				1.47 (1.88, 2.64)

GebreEyesus et al.(2021)	Depression	Masters and above Whose educational status, degrees Live with their husband/wife Live with their families	Deploma Deploma Alone Alone	10.844 (1.131,4.551) 2.269 (3.314,35.482) 5.824 (1.896,17.88) 3.938 (1.380,11.242)
Wayessa et al. (2021)	Depression	Age 25-29 Family size>=4 members Alcohol use Having training on COVID-19 Poor knowledge on COVID-19	Age >=35 1 person Not Not Good	2.35 (1.126,3.95) 3.56 (1.09,11.62) 4.31 (1.76, 10.55) 0.37 (0.17–0.81) 15.34 (6.32–37.21)
Yadeta et al.(2021)	Depression	Perceived susceptibility to COVID-19	Not	4.05 (1.12-14.53)
Asnakew et al.(2021)	Depression	With Mental illness Contact confirmed COVID-19 patients Poor social support	Not Not contct Good	2.72(1.05,7.01) 2.59 (1.37,4.89) 1.87(1.08,3.22)
Jemal et al. (2021) B	Insomnia	Female HCWs Married participants Working in the emergency units Working experience of <5 years Poor behavioral responses to COVID-19 Have poor perception COVID-19	Male Single Outpatient >=10 years Good Good	2.16 (1.58, 4.38) 3.31 (1.56, 6.68) 2.74 (1.85, 6.45) 2.45 (1.28, 4.90) 1.69 (1.02, 3.17) 1.98 (1.56, 3.95)

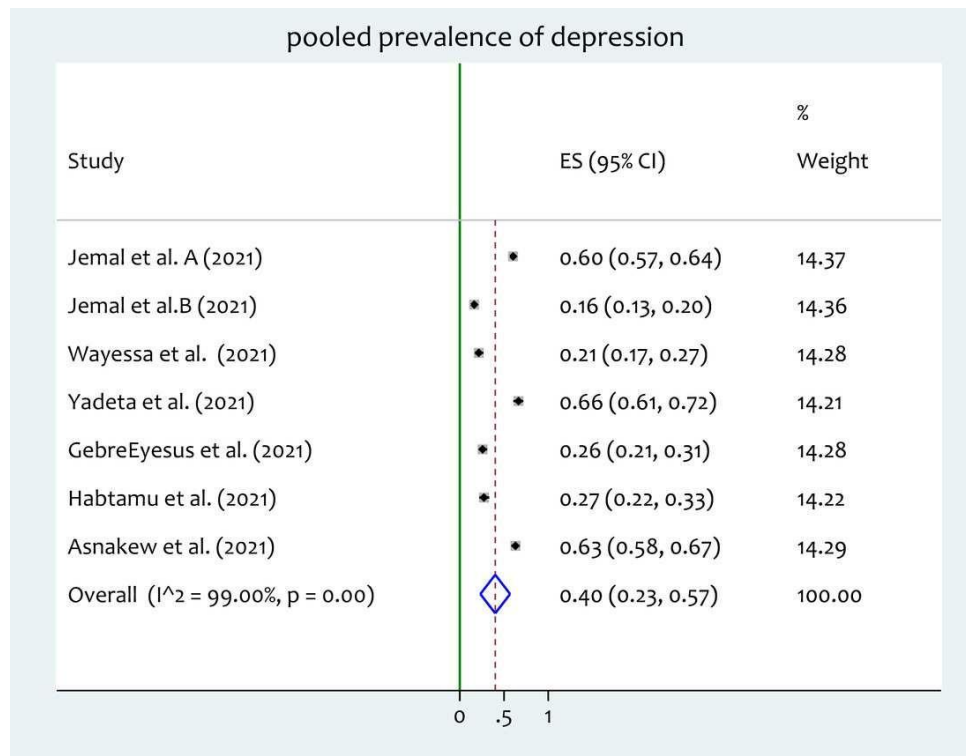2   AOR=Adjusted Odds Ratio, CI=Confidence Interval, HCWs= Health Care Workers

Figure 1

Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow chart.
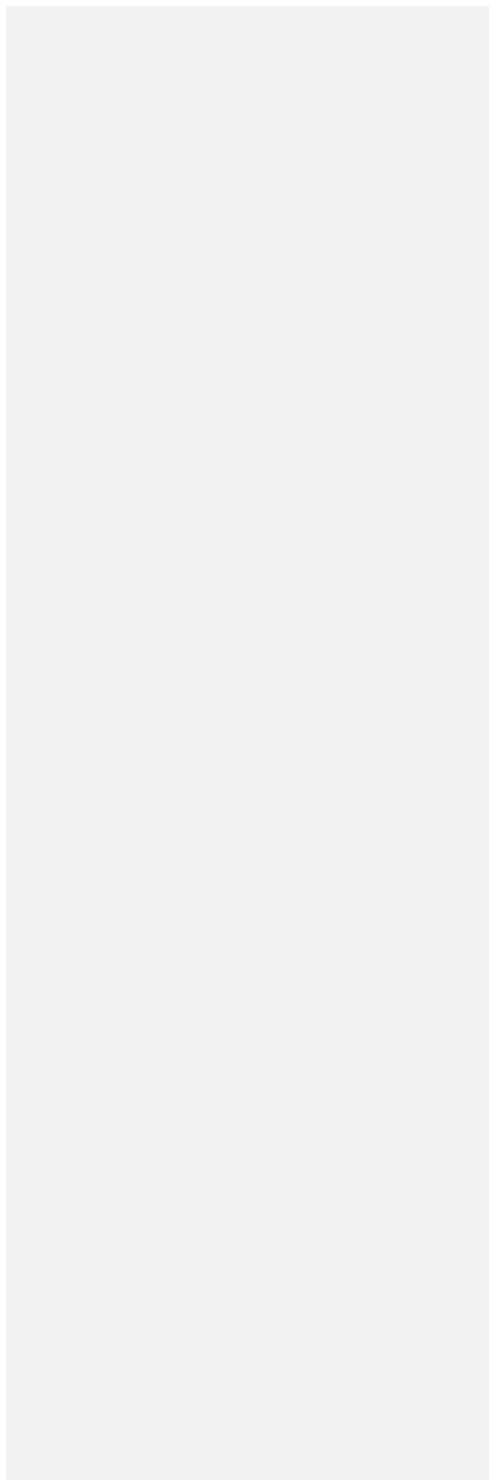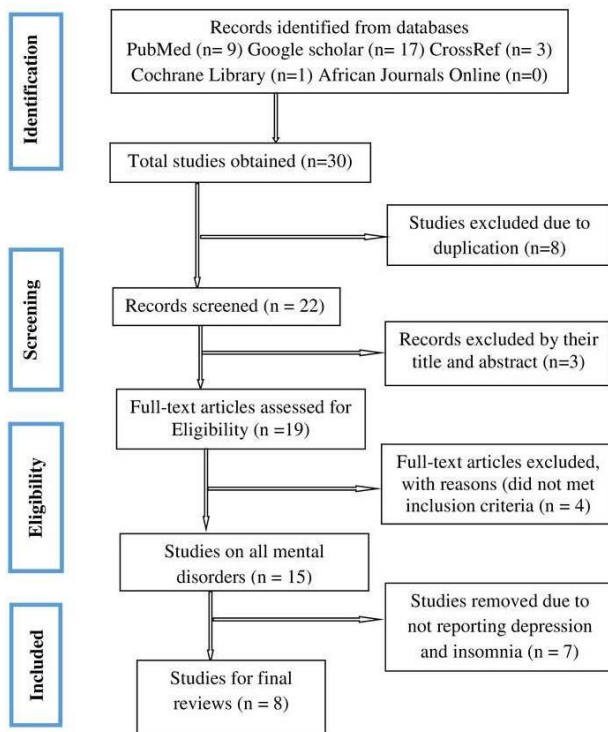
Figure 2

Forest plot for the prevalence of depression among the health care professionals during COVID-19 pandemic. ES, effect size; CI, confidence interval; Weight, weight of each included study.

pooled prevalence of depression

Study	ES (95% CI)	% Weight
Jemal et al. A (2021)	0.60 (0.57, 0.64)	14.37
Jemal et al.B (2021)	0.16 (0.13, 0.20)	14.36
Wayessa et al. (2021)	0.21 (0.17, 0.27)	14.28
Yadeta et al. (2021)	0.66 (0.61, 0.72)	14.21
GebreEyesus et al. (2021)	0.26 (0.21, 0.31)	14.28
Habtamu et al. (2021)	0.27 (0.22, 0.33)	14.22
Asnakew et al. (2021)	0.63 (0.58, 0.67)	14.29
Overall ($I^2 = 99.00\%$, p = 0.00)	0.40 (0.23, 0.57)	100.00

0   .5   1

Figure 3

Subgroup analysis of prevalence of depression among health care workers during the COVID-19 pandemic by region. SNNP, Southern nation9s nationalities and people; ES, effect size; CI, confidence interval; Weight, weight of each included study
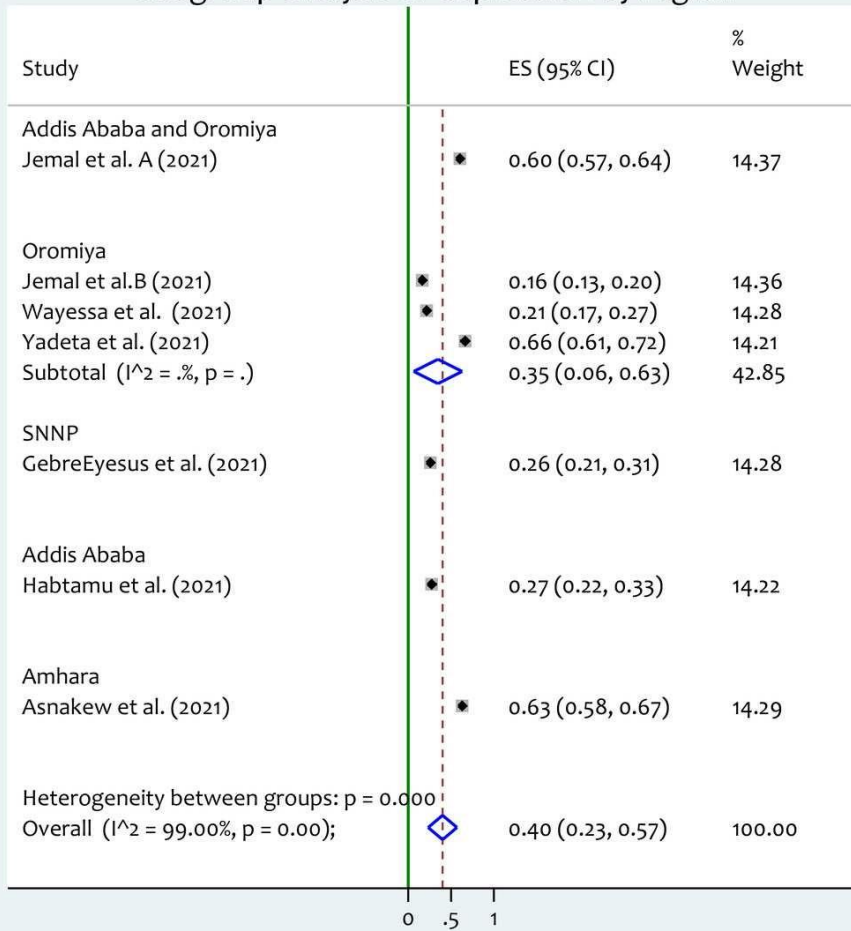
subgroup analysis of depression by region

| Study		ES (95% CI)	% Weight
Addis Ababa and Oromiya			
Jemal et al. A (2021)		0.60 (0.57, 0.64)	14.37
Oromiya			
Jemal et al.B (2021)		0.16 (0.13, 0.20)	14.36
Wayessa et al. (2021)		0.21 (0.17, 0.27)	14.28
Yadeta et al. (2021)		0.66 (0.61, 0.72)	14.21
Subtotal (I^2 = .%, p = .)		0.35 (0.06, 0.63)	42.85
SNNP			
GebreEyesus et al. (2021)		0.26 (0.21, 0.31)	14.28
Addis Ababa			
Habtamu et al. (2021)		0.27 (0.22, 0.33)	14.22
Amhara			
Asnakew et al. (2021)		0.63 (0.58, 0.67)	14.29
Heterogeneity between groups: p = 0.000			
Overall (I^2 = 99.00%, p = 0.00);		0.40 (0.23, 0.57)	100.00

0   .5   1
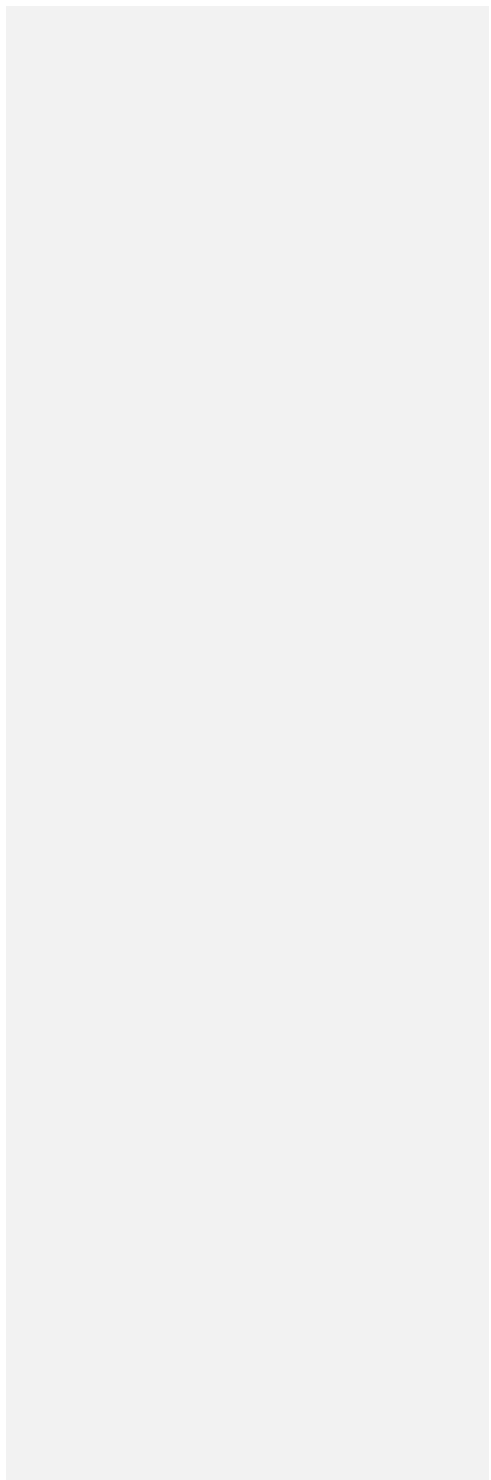
Figure 4

Subgroup analysis for prevalence of depression among health care professionals during the COVID-19 pandemic in Ethiopia by instrument. DASS-21, Depression, Anxiety, Stress Scale -21; PHQ-9, the 9-item Patient Health Questionnaire.
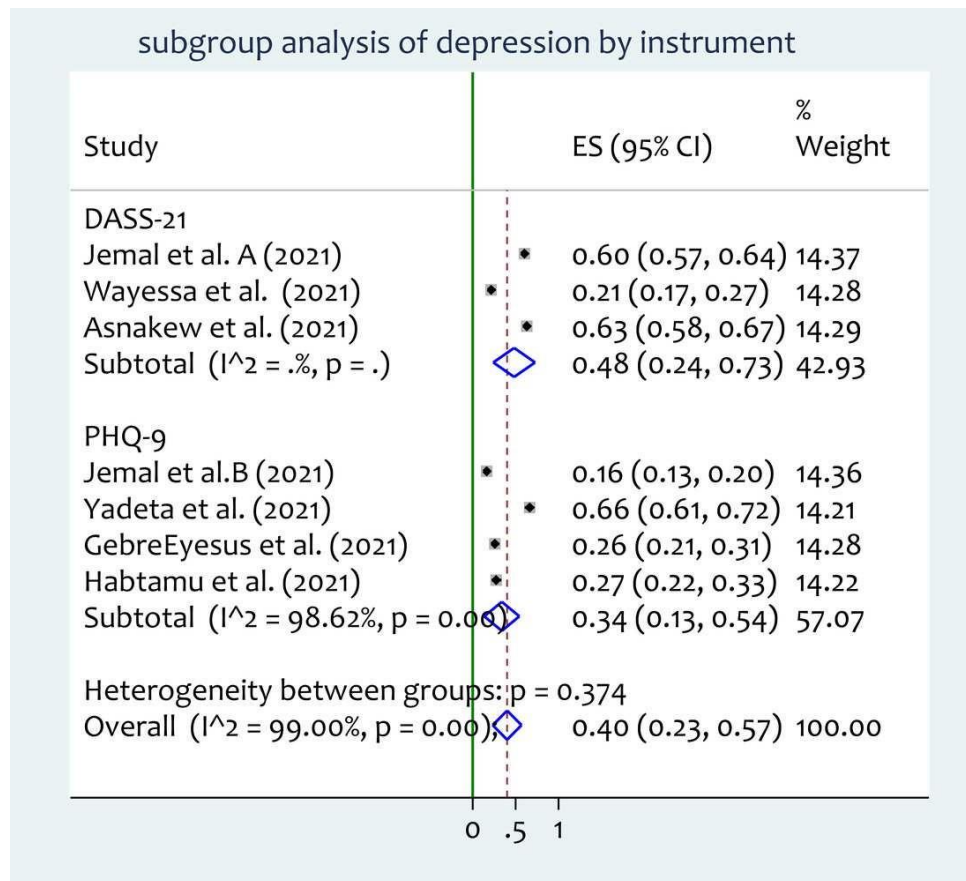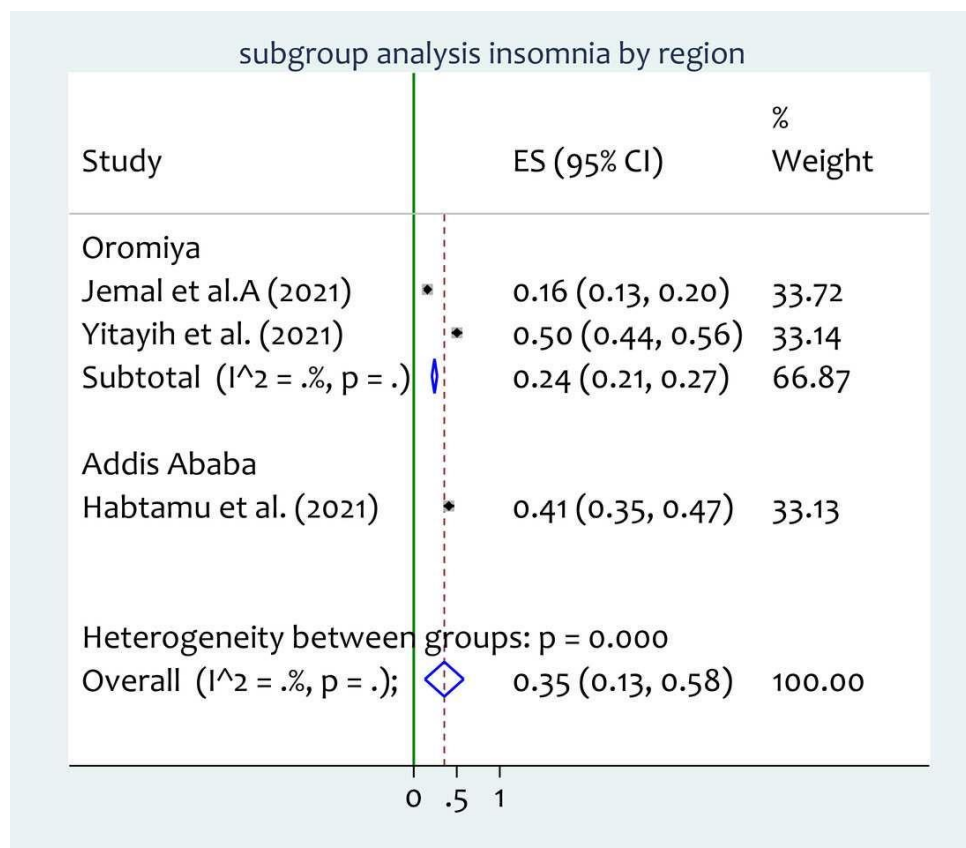
Figure 5

Forest plot for the prevalence of insomnia among the health care professionals during the COVID-19 pandemic. ES, effect size; CI, confidence interval; Weight, weight of each included study.
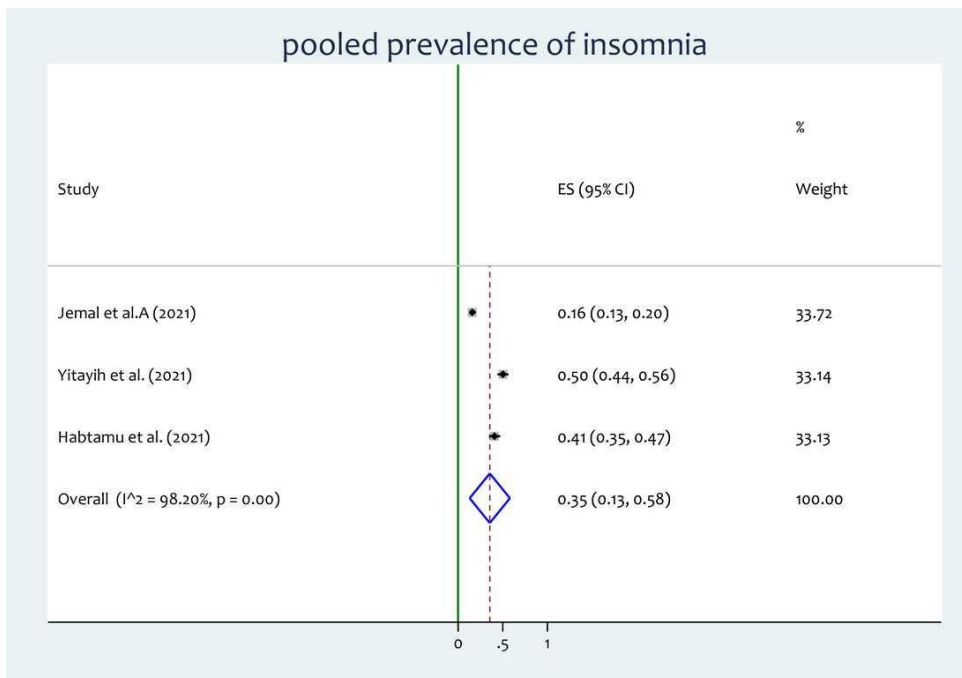
Figure 6

Subgroup analysis of prevalence of insomnia among health care professionals during COVID-19 pandemic by region.

Figure 7

Subgroup analysis of prevalence of insomnia among health care professionals during the COVID-19 pandemic in Ethiopia by instrument. ISI, Insomnia Severity Index; PSQI, Pittsburgh Sleep Quality Index.

subgroup analysis of insomnia by instrument

Study		ES (95% CI)	% Weight
ISI			
Jemal et al.A (2021)		0.16 (0.13, 0.20)	33.72
Yitayih et al. (2021)		0.50 (0.44, 0.56)	33.14
Subtotal (I^2 = .%, p = .)		0.24 (0.21, 0.27)	66.87
PSQI			
Habtamu et al. (2021)		0.41 (0.35, 0.47)	33.13
Heterogeneity between groups: p = 0.000			
Overall (I^2 = .%, p = .);		0.35 (0.13, 0.58)	100.00

0   .5   1