

1 **Effectiveness of psychological crisis interventions during infectious**
2 **disease outbreaks in low and middle-income countries: a systematic**
3 **review of Randomized Control Trials**

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18

19 **Abstract**

20 The huge mental health treatment gap in low and middle-income countries (LMICs) is further
21 exacerbated when infectious disease outbreaks occur. To address the increasing mental
22 health needs during outbreaks, availability of flexible and efficient mental health interventions
23 is paramount, especially in low-resourced settings where outbreaks are more common.
24 Psychological interventions may help to address these mental health needs with efficient
25 implementation costs. However, there is a huge paucity of quality evidence to inform

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26 psychosocial interventions during outbreaks. This systematic review sought to update the
27 existing evidence to inform effectiveness of psychological interventions that addresses mental
28 health issues during outbreaks in LMICs.

29 Six electronic databases were searched – Scopus, PubMed, PsycINFO, Embase, Cochrane
30 library, and CINAHL. We included randomised controlled trials of psychological interventions
31 aimed to address common mental health conditions among adults affected by infectious
32 disease outbreaks in LMICs. Studies were excluded if they were done among all age groups,
33 used mixed interventions with pharmacotherapies, addressed severe mental health
34 conditions, and published other than in English. The quality of evidence in the included trials
35 was assessed using the Cochrane Collaboration risk of bias tool.

36 We included 17 trials that examined the effectiveness of psychological interventions among
37 outbreak affected adults in LMICs. Quality of studies was generally average, but tended to
38 provide evidence that brief psychoeducational interventions based on cognitive restructuring,
39 mindfulness, relaxation, and stress management techniques were effective in reducing
40 perceived stress and anxiety symptoms, and in improving resilience and self-efficacy.
41 Similarly, mindfulness-based interventions and mindfulness stress reduction treatments were
42 effective in addressing depression, anxiety and generalised anxiety disorder.

43 Brief psychological interventions that can be delivered by non-specialist could have value in
44 addressing the huge mental health needs in outbreak contexts.

45

46 **Impact statement**

47 Given the increasing mental health needs during infectious disease outbreaks,
48 psychological interventions that are culturally acceptable and effective should be given
49 a priority for under resourced countries. This systematic review provides important
50 insights on the benefits of psychological interventions in addressing common mental
51 health issues of outbreak affected population in Low and middle-income countries
52 (LMICs). Brief psychoeducational interventions with stress management principles were
53 helpful in addressing common mental health issues, including depression, anxiety,
54 post-traumatic stress symptoms, and sleep problems associated with emergencies of
55 infectious disease outbreaks in LMICs. Overall, non-specialist delivered, brief
56 sessions are more likely to be valuable in addressing mental health issues that arise
57 in outbreaks. Filling the existing knowledge gap with quality evidence will contribute to
58 the development of standardised, evidence-based, and contextually relevant
59 intervention guidelines that are applicable to LMICs. Therefore, future efforts should
60 focus on improving access to quality data that can inform evidence-based decisions.
61

62 Introduction

63 Infectious disease outbreaks have had a devastating impact on lives and livelihoods
64 around the globe (Baker et al., 2021), and are a threat to planetary health and
65 development (Huremović, 2019). The profound impacts of intermittent disease
66 outbreaks include increased mortality, reduced effectiveness of health systems, social
67 inequity and economic crisis (Sampath et al., 2021). Disease outbreaks pose a
68 significant increased risk to mental health of affected individuals and communities,
69 particularly in low and middle-income countries (LMICs) where health system
70 resilience is low and the treatment gap is high (Jacob, 2017).

71 Although the impact of infectious disease outbreaks is on a wider population, specific
72 groups of people are particularly vulnerable, including people directly affected by the
73 disease, people with pre-existing health conditions and disabilities, and frontline
74 healthcare workers (Singu et al., 2020). Evidence shows that the prevalence of several
75 mental health problems such as post-traumatic stress disorder (PTSD), depression,
76 and anxiety symptoms doubled during infectious disease outbreaks and pandemics
77 (Schindell et al., 2024; Hossain et al., 2020; Yuan et al., 2022). For instance, a 76%
78 prevalence of PTSD symptoms and 48% prevalence of anxiety-depression symptoms
79 were recorded during the Ebola epidemic in Siera Leone in 2015 (Jalloh et al., 2018).
80 Similarly, a 64% prevalence of psychological distress and 40.7% prevalence of PTSD
81 was reported among Severe Acute Respiratory Syndrome (SARS) survivors in Hong
82 Kong in 2004 (Lee et al., 2007). The COVID-19 pandemic had a huge impact on
83 population mental health and contributed to a more than 25% increase in cases of
84 depression and anxiety globally (World Health Organization, 2022).

85 People with pre-existing mental health conditions were impacted to a greater extent
86 than others (Boden et al., 2021). This may be for two reasons: in addition to being
87 susceptible to the experience of stress common to everyone, mental health services
88 are often disrupted, as occurred worldwide during the COVID-19 pandemic. Access to
89 basic counselling services, medication adherence programmes, social support
90 mechanisms, and emergency mental health services also collapsed. The impact was
91 more severe when countries closed schools and workspaces and imposed restriction
92 of movement and quarantine measures. In addition, mental health services were often
93 de-prioritised, community services were suspended, and facilities were changed to

94 quarantine facilities (Yirdaw et al., 2024). With all the added risks to people with mental
95 conditions, maintenance of mental health services was important, as a part of wider
96 response measures. However, the capacity of health systems in LMICs to quickly
97 develop plans and to respond to mental health needs was very limited and the process
98 often slow (Kola et al., 2021). While in some countries, online options using
99 telemedicine or digital technology enabled mental health services to bridge some
100 gaps, LMICs struggled to adapt and maintain mental health service delivery (Arenliu
101 et al., 2020). For instance, during the COVID-19 pandemic in China, several key
102 challenges were noted (Duan and Zhu, 2020): i) little attention was given to the
103 practical implementation of psychological interventions, ii) little effort was made to
104 align interventions into community healthcare services, iii) there was a shortage of
105 professionals and resources, iv) and there were restrictions to entry to isolation centres
106 to receive appropriate care. During the COVID-19 pandemic in Africa, mental health
107 interventions were not often included in planning, due to lack of political commitment,
108 low prioritisation of mental health during emergencies compared to other response
109 activities and the scarcity of financial and human resources allocated to mental health
110 activities (Yirdaw et al., 2024; Walker et al., 2022).

111 Implementing the established good practice of enabling frontline workers to deliver
112 basic psychological interventions as part of other response activities was also
113 challenging due to complicated work procedures, heavy workloads, and lack of
114 standardised training resources (Duan and Zhu, 2020). Given the significant mental
115 health impact of outbreaks and associated public health counter-measures,
116 application of evidence-based interventions with alternative treatment and support
117 solutions should be part of outbreak response plans.

118 While acknowledging the contribution of previous studies (Pollock et al., 2020; Zace
119 et al., 2021; Yang et al., 2021), there is a huge paucity of quality evidence to inform
120 effective psychosocial interventions to address mental health issues during infectious
121 disease outbreaks. The most recent systematic review (in 2021) of all of intervention
122 types with different study designs found a huge evidence gap where no Randomised
123 Controlled Trials (RCT) were carried out in LMICs (Zace et al., 2021). The lack of
124 evidence is partially due to difficulties in implementing research in outbreak contexts,
125 challenges in measurement of treatment outcomes and lack of quality data on longer

126 impact of trials. Our systematic review explores the literature to update the existing
127 evidence gap with a body of evidence to inform effective psychological interventions
128 to address mental health issues during infectious disease outbreaks in LMICs.

129 **Methods**

130 We searched for RCTs evaluating the effectiveness of psychosocial interventions in
131 infectious disease outbreaks in LMICs. This systematic review is reported using the
132 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)
133 guidelines.

134 **Inclusion and exclusion criteria**

135 Psychosocial interventions are defined as strategies, activities, techniques, and
136 toolkits that address psychological and social problems, and promote mental
137 wellbeing. We used a broad definition of therapeutic practices, including but not limited
138 to cognitive behavioural therapy, supportive therapy, interpersonal psychotherapy,
139 counselling, and mindfulness. Psychological interventions could be delivered through
140 various means such as face-to-face modalities (whether group or one-to-one), or
141 through the use of technology like telemedicine/teletherapy, or software-based
142 interventions such as mobile applications.

143 The general inclusion criteria for this systematic review were: i) trials with any type of
144 psychological interventions, ii) conducted in LMICs, iii) studies must be RCTs iv)
145 conducted among adults with age ≥ 18 years, iv) carried out to address mental health
146 conditions in infectious disease outbreaks.

147 Studies were excluded if they were: i) included all age groups and not reporting on
148 adults separately, ii) focused on non-outbreak settings, iii) used mixed interventions
149 including pharmacological therapies concurrently, with no separate analysis of
150 psychological interventions only, iv) addressed only severe mental health conditions
151 including psychosis, and v) published in other languages than English.

152 **Literature search strategies**

153 We searched six databases (Scopus, PubMed, PsycINFO, Embase, Cochrane library,
154 and CINAHL) and other sources including manual search of google scholar. There

155 were no restrictions on publication date, study type and design in the initial search.
156 Databases were searched in 15-25 October 2023 without language restrictions. The
157 keywords used for searching were psychological interventions, mental conditions,
158 infectious disease outbreaks, and list of LMICS. Similar concepts, synonyms and
159 medical subject headings (MeSH) were used for each key word. Appropriate syntax
160 was developed and used for each database. The search strategies used for the search
161 are available in Appendix 1.

162 **Study selection**

163 Studies identified from the search were screened by topic and exported to EndNote
164 20 software. Duplicates were removed from the EndNote and the remaining articles
165 were then moved to Rayyan software for further duplicate identification and abstract
166 screening. Studies which fulfilled most of the inclusion criteria were identified from the
167 abstract screening. Full text articles were searched by BAY and JAS. BAY and JAS
168 double-checked the screened articles, resolved disagreements, and assessed the full
169 text articles against the inclusion criteria independently.

170 **Data extraction and management**

171 Data extraction was done by BAY and JAS using the Cochrane Collaboration data
172 collection form for RCTs. The extracted data includes publication year, study setting,
173 population, country, sample size, type of intervention, number of sessions, session
174 duration, method of delivery, outcomes, outcome measures, key findings and
175 limitations.

176 **Risk of bias assessment**

177 Two of the authors (BAY and JAS) evaluated each study using the Cochrane
178 Collaboration risk of bias tool (Higgins et al., 2011). The tool formalises the judgment
179 of specific features of a randomized control trial to assist review authors in identifying
180 possible limitations and considerations for the assessing strength of results of an
181 article. This tool has five key domains for assessment: selection bias, reporting bias,
182 performance bias, detection bias, and attrition bias. Each study in the risk of bias
183 assessment was judged under each category of bias as either low risk for bias, high-

184 risk for bias, or unclear. Unclear suggests a lack of sufficient information or persistent
185 uncertainty over the potential for bias under this category.

186 **Data synthesis**

187 The extracted and collated data were summarised in tables, with data captured
188 including study design, participants, settings, sample size, intervention type, duration
189 of each intervention, and outcome measures. A narrative synthesis was done to
190 analyse the differences, patterns, and similarities of interventions. No meta-analysis
191 was conducted due to the high heterogeneity of the trials in several aspects such as
192 differences in the quality of the data, outcome measure, intervention type, session
193 duration and delivering agents.

194 **RESULTS**

195 **Characteristics of the included studies**

196 Of 10,890 screened articles, 2,809 duplicates were removed. After removal of
197 duplicates, 5,955 articles were excluded because they did not fulfil at least one of the
198 inclusion criteria – not outcome of interest, population of interest, intervention of
199 interest or not a systematic review. Full text of 166 articles was reviewed to check
200 whether they fulfilled all the inclusion criteria. In the first round of full text review, we
201 excluded 104 articles because they were not mental health related (76 articles), not
202 the right population (16 articles), not an intervention (two articles), and not in English
203 (eight articles). Finally, we selected 17 articles that fulfilled all the inclusion criteria
204 (Figure 1).

205 All the included trials were conducted in five countries during the COVID-19 pandemic
206 from 2020-2023: these were seven from China (Fan et al., 2021; Li et al., 2023; Li et
207 al., 2020; Liu et al., 2021; Sun et al., 2022), six from Iran (Ghazanfarpour et al., 2022;
208 Khosravi et al., 2022; Mirhosseini et al., 2022; Shabahang et al., 2021; Shaygan et al.,
209 2021; Shaygan et al., 2023), two from Turkey (Dincer and Inangil, 2021;
210 Hosseinzadeh, 2022), one from India (Gupta et al., 2021), and one from Jordan
211 (Alkhalwaldeh, 2023). As shown in Table 1, half of these trials (n=8) were conducted
212 among COVID-19 patients and six trials (n=6) were among frontline healthcare
213 workers involved COVID-19 response. The remaining studies focused on college

214 students (n=2) and pregnant women (n=1). In terms of setting, 13 trials were
215 conducted in hospital-based settings, four (n=4) were in community-based health
216 centres and one (n=1) quarantine facility. The total number of study participants
217 included in all trials was 1,687 and the sample size in each study ranged from 35-118.
218 Table 1 provides an overview of the characteristics of the included studies.

219 Table 1. Characteristics of the included studies in this systematic review (N=17).

Author, year – country	Study population	Settings	N (intervention vs control)	Mean age (yrs)	Interventions	Controls
Alkhalwaldeh JM, 2023 – Jordan	Nurses responding to COVID-19	Community based health centres	84 (42:42)	29.9	Psychoeducational intervention that involves cognitive restructuring, relaxation and stress management techniques	Waitlist
Dincer B, and Inangil D, 2021 – Turkey	Nurses caring for COVID-19 patients	University hospital	80 (35:45)	33.45	Emotional Freedom Techniques	Waitlist
Fan Y, et al., 2021 – China	COVID-19 patients	Three COVID-19 designated hospitals	111 (56:55)	46.4	Narrative exposure therapy (NET) and personalized psychological intervention	Personalized psychological treatment
Ghazanfarpour M, et al., 2022 – Iran	Healthcare providers caring for COVID-19 patients	Community based COVID-19 clinics	111 (55:56)	Not reported.	Cognitive-behavioral and mindfulness-based techniques	Waitlist
Gupta S, et al., 2021 – India	Healthcare workers caring for COVID-19 patients	Hospital based	35 (18:17)	Not reported but all participants were under 30 years old.	Brief eclectic psychotherapy	Treatment as usual with information on Covid prevention and control
Hosseinzadeh Asl NR., 2022 – Turkey	Social workers involved in COVID-19 response	Community based clinics	59 (30:29)	33.1	Mindfulness-based cognitive therapy (MBCT)	Waitlist
Khosravi HM, et al., 2022 – Iran	Pregnant women affected by COVID-19	In two community-based health centers	66 (33:33)	26.1 & 28.4 intervention & control group	Individual counselling	Treatment as usual
Li H, et al., 2023 – China	COVID-10 patients	Hospital based	58 (29:29)	37.9% middle-aged and 43.1% young age.	Online Mindfulness-Based Stress Reduction (MBSR)	Conventional psychological counseling
Li J, et al., 2020 – China	COVID-19 Patients	Hospital based	94 (47:47)	48	Cognitive-behavioral therapy with cognitive intervention, relaxation techniques, problem-solving, and social support strategy	Treatment as usual – received routine treatment and nursing care

Liu Y, et al., 2021 – China	COVID-19 patients	Hospital based	140 (70:70)	43.8	Group psychological intervention and pulmonary rehabilitation exercises	Treatment as usual – received routine care as per Covid-19 protocols
Liu Z, et al., 2021 – China	COVID-19 patients	Hospital based	273 (137:136)	Not reported	Computerized CBT (cCBT) included Relaxation mental imagery training, and mindfulness	Treatment as usual – received usual care per COVID-19 protocols
Mirhosseini S, et al., 2022 – Iran	COVID-19 survivors	Hospital based	70 (35:35)	3/4 th were above 40 years old	Psychoeducational support training program	Treatment as usual – received routine care
Shabahang R, et al., 2021 – Iran	College student affected by COVID-19	University based	152 (76:76)	24.7	A video-based cognitive-behavioural therapy	Waitlist
Shaygan M, et al., 2021 – Iran	COVID-19 patients	Hospital based	50 (27:23)	36.8	Online multimedia psychoeducational intervention	Telephone-based multimedia psychoeducational interventions
Shaygan M, et al., 2023 – Iran	COVID-19 patients	University hospital	72 (36:36)	Most participants were in the range of 30-50 years old	Psychoeducational intervention that involved coping techniques, positive thinking, and relaxation	Treatment as usual – received routine care
Sun F, et al., 2021 – China	College students in COVID-19 quarantine	In quarantine facilities	114 (57:57)	22.2	Mindfulness-based intervention	Social Support-based mHealth
Zhou K, et al., 2022 – China	Nurses involved in COVID-19 response	Hospital based	118 (60:58)	29.6	E-aid cognitive behavioural therapy	Waitlist

221 Outcome measures

222 Of the 17 included trials, 14 of them targeted anxiety symptoms only and 10 of them
223 assessed both anxiety and depression as a primary outcome (Table 2). Stress, post-
224 traumatic stress symptoms, psychological distress, resilience, burnout, sleep quality
225 and self-efficacy were primary outcomes in one or more trials. The tools used to
226 measure these outcomes vary significantly in type, item, validation and cut-off point.
227 Four trials used combined tools to assess depression, anxiety, and stress altogether;
228 these were: the Depression, Anxiety and Stress Scale (DASS-21) (Gupta et al., 2021;
229 Hosseinzadeh, 2022; Li et al., 2020), and the Hospital Anxiety and Depression Scale
230 (HADS) (Ghazanfarpour et al., 2022). Another five trials evaluated depression
231 independently using the Patient Health Questionnaire (PHQ-9), (Zhou et al., 2022;
232 Sun et al., 2022) the Hamilton Depression Rating Scale (HAMD), (Liu et al., 2021),
233 and the Self-rating Depression Scale (SDS) (Li et al., 2023; Fan et al., 2021). Several
234 tools were used to assess anxiety independently including the State Anxiety Scale
235 (Dincer and Inangil, 2021) Self-rating Anxiety Scale (Fan et al., 2021; Li et al., 2023),
236 Hamilton Anxiety Rating Scale (Liu et al., 2021), COVID-19 Anxiety Questionnaire
237 (Shabahang et al., 2021), Short Anxiety Inventory (Shabahang et al., 2021), State Trait
238 Anxiety Inventory (Shaygan et al., 2023), and the Generalised Anxiety Disorder
239 Questionnaire (Sun et al., 2022; Zhou et al., 2022). Lack of consistency in the use of
240 outcome measures and a lack of clarity on the degree of cultural validation of the tools
241 across studies was observed.

242 Intervention characteristics and effectiveness

243 Of 17 included trials, seven (n=7) of them used CBT principles (Sun et al., 2022;
244 Hosseinzadeh, 2022; Li et al., 2023; Ghazanfarpour et al., 2022; Shabahang et al.,
245 2021; Liu et al., 2021), of which two (n=2) of them combined mindfulness with CBT
246 (Ghazanfarpour et al., 2022; Hosseinzadeh, 2022). Five (n=5) of the included trials
247 used psychoeducational interventions based on training, cognitive restructuring,
248 stress management, positive therapy and relaxation techniques (Shaygan et al., 2021;
249 Shaygan et al., 2023; Mirhosseini et al., 2022; Liu et al., 2022; Alkhawaldeh, 2023).
250 Two more trials used mindfulness techniques alone involving practical stress reduction
251 exercises (Sun et al., 2022; Li et al., 2023). The remaining trials used Narrative
252 Exposure Therapy (NET) (Fan et al., 2021), Emotional Freedom Techniques (Dincer

253 and Inangil, 2021), Brief Eclectic Psychotherapy (Gupta et al., 2021), and individual
254 counselling (Khosravi et al., 2022).

255 Of the 17 included trials, 13 of them delivered interventions remotely, two were
256 delivered face-to-face (Alkhalil, 2023; Li et al., 2020) and other two used a hybrid
257 approach (remotely and face-to-face) (Fan et al., 2021; Khosravi et al., 2022). Different
258 digital tools were used to deliver interventions remotely such as mobile apps, websites,
259 telephone calls and messaging platforms like WeChat, zoom and WhatsApp. Most of
260 these used live video calls as a means of delivering established intervention models.
261 The interventions varied by number and duration of sessions. Overall, the number of
262 sessions ranged from a single to 14 sessions, lasting for 15 minutes up to 2 hours per
263 session. The delivering agents were trained healthcare workers including
264 psychiatrists, nurses, psychologists and mental health experts.

265 The most structured and intensive intervention was NET that involved up to two
266 sessions per week with session duration of 90-120 minutes and lasted for eight weeks.
267 Sessions were delivered using a hybrid approach remotely (via internet online, mobile
268 phones, WeChat) and face-to-face in a one-to-one model in clinics (Fan et al., 2021).
269 Study participants were followed up for six months after the intervention. The NET
270 intervention was used to treat post-traumatic stress, depression and anxiety symptoms
271 of COVID-19 patients admitted to hospitals. The intervention included three phases: i)
272 diagnostic interviews and psychoeducation, ii) constructing lifeline with a life events
273 timeline, and iii) narrative of the exposure.

274 The effectiveness of these trials varied from non-significant change to high effect sizes
275 in reducing depression, anxiety, stress, sleep problems and post traumatic symptoms.
276 The majority of the trials showed a significant reduction in depression, anxiety, stress,
277 and insomnia scores between baseline and post-treatment assessments. Brief
278 psychoeducational interventions based on cognitive restructuring, mindfulness,
279 relaxation, and stress management techniques were effective in reducing perceived
280 stress and anxiety symptoms, and to improve resilience and self-efficacy (Shaygan et
281 al., 2023; Shaygan et al., 2021; Mirhosseini et al., 2022; Alkhalil, 2023). Also,
282 brief mindfulness-based interventions (Sun et al., 2022) and mindfulness-based stress
283 reduction (Li et al., 2023) treatments were effective in addressing depression, anxiety,
284 and generalised anxiety disorder. Remotely delivered CBT and mindfulness-based

285 CBT interventions showed promising but non-significant changes in reducing
286 depression, anxiety, sleep, and stress (Hossain et al., 2020; Ghazanfarpour et al.,
287 2022; Li et al., 2020; Liu et al., 2021; Gupta et al., 2021). Although NET had a
288 statistically significant change in reducing post-traumatic stress symptoms, there was
289 non-significant change in sleep quality, depression, and anxiety scores (Fan et al.,
290 2021). Similarly, brief Eclectic Psychotherapy (Gupta et al., 2021) and Individual
291 Counselling (Khosravi et al., 2022) were non-effective in bringing significant changes
292 on anxiety depression, and perceived stress (Table 2).

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299 **Table 2: Interventions, key findings and important limitations (N=17).**

Author, year – country	Outcomes	Outcome measures	Intervention, therapists, sessions	Assessment point, attrition rate	Key results and important limitations
Alkhaldeh JM, 2023 – Jordan	Occupational stress Coping strategy	Nursing stress scale Brief COPE questionnaire	Psychoeducational intervention. Six sessions of psychoeducational intervention delivered over 2 weeks for 2 hours by a trained psychiatrist face-to-face in interactive learning approach.	Assessments were done at baseline, immediately after the last session, and one month after the last session. Retention: 80/84 (95.3%); 40/42 in intervention and 40/42 in the control groups completed.	The degrees of occupational stress and coping strategies significantly differed between study groups over the three points of assessment. The psychoeducational interventional programme was a valuable noninvasive method that can improve individual coping strategies to manage stress in practice during the COVID-19 pandemic. Limitation: small sample size and no longer follow up involved.
Dincer B, and Inangil D, 2021 – Turkey	Psychological Distress Anxiety Burnout	SUD SAS BMSF	Emotional Freedom Techniques (EFT) intervention. A single session of emotional freedom training delivered 20 minutes with practical sessions – online in groups. Treatment was delivered by trained personnel in EFT.	Before-after assessment: pre-test and post-test assessment was done before and at the end of the session through SurveyMonkey among frontline nurses. Retention: 100%	Statistically significant reductions in stress, anxiety, and burnout observed. A single online group EFT session reduced stress, anxiety, and burnout levels in nurses treating COVID-19. Pre-test and post-test assessments were done within a short time interval, after a single session intervention. Limitation: No follow up assessment was done to inform sustained response.
Fan Y, et al., 2021 – China	PTS symptoms Depression Anxiety Sleep quality	PCL-C SDS SRAS PSQI	Narrative exposure therapy (NET). The NET therapy had a duration of eight weeks, with one or two sessions a week, lasting for 90~120 minutes each time involved 6-months follow up. Sessions were delivered in a one-to-one model by certified Doctors and Nurses via internet , mobile phones, WeChat, and later in person.	Before-after assessment: COVID-19 patients were assessed before and after the last session of the intervention. Retention: 100% in both groups.	Statistically significant change in PTSS was found. There were non-significant improvements in sleep quality, anxiety and depression score. Limitations: Relatively small sample size, selection bias (only those with internet connection were included in the study), assessors were not blind, and the PCL-C tool not widely used in China.

Ghazanfarpour M, et al., 2022 – Iran	Anxiety Depression	HADS ^A HADS ^D	Cognitive-behavioral and mindfulness-based Techniques. Seven sessions counselling was implemented through voice or video calls, text chats, and video clips shared on WhatsApp, in seven sessions on seven consecutive days – delivered by trained MSc students in midwifery counselling . Each session lasts 45-90 minutes – tele-counselling .	Before-after assessment: pre-test and post-test assessment done among healthcare workers . Retention: 103/109 (94.5%); 50/53 in the intervention group and 53/56 control group lost follow up due to workload and infection.	A promising result was observed in reducing anxiety and depression related to the Corona virus. Pre-post assessment in the intervention group showed a significant reduction anxiety and depression . However, change between the intervention and control group at the end of the intervention was non-significant. Limitation: Generalizability of the results is weak due to recruitment bias.
Gupta S, et al., 2021 – India	Depression Anxiety Stress	DASS-21	Brief Eclectic Psychotherapy using tele-counselling. The intervention involved three sessions included expressing empathy, emphasizing on strengthening, psychoeducation on relaxation and motivational interviewing sessions delivered through telephonic audio conversation combined with WhatsApp and email messaging. Each session lasts for 30-minute over 7-10 days – online telecounseling . No information on the delivering agents.	Point of assessment was not clearly defined. Frontline health workers were assessed overtime until the completion of the intervention. Retention: 24/29 (82.8%); 11/14 intervention and 13/15 control arm.	A significant over-time-effect was observed depression, anxiety and stress. However, there was no significant between the two groups overtime. Limitation: there was a high refusal rate in the recruitment of participants into the study and high attrition rate, so selection bias could not be ruled out. Sample size was not powered, assessor was not blind, and the tool was not validated.
Hosseinzadeh Asl NR., 2022 – Turkey	Depression Anxiety Stress Self-compassion	DASS-21 & self-compassion scale	Mindfulness-based cognitive therapy (MBCT) and meditation. Four weekly 70-min mindfulness training sessions plus 10 to 20 min of daily meditation as homework. Sessions were delivered online via zoom app .	Pre-test, post-test and follow up assessment after 1 month were done among frontline social workers . Retention: 49/59 (83.1%); (28/30 in the experimental group and 21/29 in the control group)	Brief MBCT for 4 weeks improves psychological flexibility, self-compassion and depression in social workers, but not effective in reducing anxiety and stress . The effectiveness of the brief online MBCT sustained at least for one month after the interventions completed. Limitation: low generalizability of the results due to recruitment bias due to the use of convenience sampling. And mechanism of change was not examined.

<p>Khosravi HM, et al., 2022 – Iran</p>	<p>Stress of self and the fetus</p>	<p>PREPS-15</p>	<p>BELIFE individual counseling that shapes the current expectations of women and their feelings about pregnancy tensions. Individual counseling sessions provided as part of antenatal care in three 60-minute sessions, each with one-week interval – phone calls were included between sessions – hybrid (face-to-face and phone call).</p>	<p>Post-test assessment was done 2 weeks after the last counseling session among COVID-19 affected pregnant women. Retention: 100% attendance rate.</p>	<p>Although the individual counselling was able to reduce the mean scores of stress of Covid-19 in the experimental group, this difference was not statistically significant. Limitation: recruitment bias</p>
<p>Li H, et al., 2023 – China</p>	<p>Anxiety Depression</p>	<p>SRAS SDS</p>	<p>Mindfulness-Based Stress Reduction (MBSR). The mindfulness practice was performed in 30 minutes per session, 2 sessions daily (before nap and nightfall) for 5 days – online using audio-video mindfulness designs.</p>	<p>Pre-test and post-test evaluation was done. Post-test was assessed at the end of the intervention among COVID-19 patients. Retention: not reported.</p>	<p>Online-based MBSR intervention alleviated anxiety and depression symptoms among COVID-19 patients in quarantine. Online MBSR found to be a cost-effective and time-efficient interventions. Limitation: long-term effects of online-based MBSR, allocation bias and matching of study subjects at baseline was not ensured, and sample size was not powered to detect effectiveness.</p>
<p>Li J, et al., 2020 – China</p>	<p>Depression Anxiety Stress</p>	<p>DASS-21</p>	<p>Cognitive-behavioral therapy (CBT) with cognitive intervention, relaxation techniques, problem-solving, and social support strategy. CBT was delivered once a day for 30 minutes. Depending on the length of hospital stay (Average 14.4 days). CBT trained Nurses facilitated sessions – face to face.</p>	<p>Baseline and post-intervention assessment was done among COVID-19 patients. Retention: 47/47 in the intervention group (100% attendance) and 46/47 in the control group.</p>	<p>All participants in the intervention group had a significant reduction in depression, anxiety and stress status, but there were no significant differences between the intervention and control groups. CBT was effective in improving psychological health including depression, anxiety and stress among patients with COVID-19. Limitation: 1) relatively short period of intervention with no long-term follow up after the completion of the intervention therefore lead to misinterpretation of the effectiveness of the intervention; 2) small sample size due to shortage of therapists and rapid transmission of the infection.</p>

Liu Y, et al., 2021 – China	Anxiety Sleep quality	SAS PSQI	Group psychoeducational intervention and pulmonary rehabilitation exercises . Psychological interventions delivered using WeChat Groups and instructional videos – online	Assessments were carried out at baseline and post-intervention. Retention: not reported.	Both anxiety and poor sleep quality scores of the intervention group were significantly lower than those of the control group. This intervention was useful to mitigate anxiety and sleep disorders for the patients with mild COVID-19 infections
Liu Z, et al., 2021 – China	Anxiety Depression	HAMA HAMD	Computerized CBT (cCBT) included Relaxation mental imagery training, and Mindfulness meditation. Intervention was delivered through more than 10 minutes of self-directed individual therapy per day for 1 week – a self-help remote intervention model using iPad.	Pre- and postintervention assessments. Follow up assessments were done again within 1 month after the post-intervention assessment. Retention: 252/273 (92.3%); 126/136 in the intervention and 126/137 in the control group completed.	Computerised CBT program had a significant effect in relieving symptoms of anxiety, depression, and insomnia at post-intervention and follow up assessment among patients with COVID-19. However, the insomnia symptoms in females and those with middle school education were not improved. Limitation: participants were non-blind for the intervention, the sample sizes were relatively small, and the time before the follow-up was relatively short.
Mirhosseini S, et al., 2022 – Iran	Perceived stress	PSS-14	Psychoeducational support training program. Six online psychoeducational group sessions were delivered on stress management. Each session last for 35–45 minutes once in a week – online group video calls via WhatsApp.	Pre- and post - intervention assessments were done. Retention: 100% attendance rate in both groups.	A statistically significant reduction in perceived stress score observed in the intervention group at post-intervention assessment. Using an online psychoeducational support group is suggested as a useful and low-cost solution to relieving the psychological stress of caregivers of COVID-19 survivors. Limitation: generalizability of the results to other contexts is limited.
Shabahang R, et al., 2021 – Iran	Anxiety	CVAQ SHAI ASI-3	Video-based CBT . Intervention group received a CBT based self-help package of 9 video clips and 25-page online booklet. They were instructed to first watch a video clip for 15-20 minutes each and then read the corresponding 2-3 pages booklet for 3 days of each week over	Pre- and post-treatment evaluation among college students. Retention: 150/152 (98.7%); 75/76 in the intervention and similarly	There was a significant difference between the intervention and control groups in COVID-19 anxiety, health anxiety, anxiety sensitivity, and somatosensory amplification with small (0.2), medium (0.5), and large effect sizes (0.8) effect sizes respectively. Overall, the video based CBT was slightly to moderately effective in lowering COVID-19 anxiety, health anxiety, anxiety

			the course of 3 consecutive weeks – online multimedia.	75/76 in the control group	sensitivity, and somatosensory amplification of individuals with high levels of COVID-19 anxiety. Limitation: selection bias introduced due to convenient sampling, assessments were not masked, adherence to the intervention was not assessed, and longer effect of the intervention was not assessed in follow up.
Shaygan M, et al., 2021 – Iran	Resilience & Perceived stress	CD-RISC, Perceived Stress Scale	Online multimedia psychoeducational intervention. An online multimedia psychoeducational intervention delivered for 2 weeks. The interventions consisted of 14 daily modules and patients were asked to complete 1 module per day, which was designed to be 60 min in total. Each module consists of videos, audios and text files – online multimedia.	Pre- and post-treatment assessed before and 2 weeks after the interventions was done among COVID-19 patients. Retention: 48/50 (96%) 26/27 in the treatment and 22/23 in the control groups completed the post-treatment assessment.	Compared with the control groups, patients in the online multimedia psychoeducational intervention had a greater score of resilience and reduced level of stress after 2 weeks. The online multimedia psychoeducational intervention based on CBT techniques, mindfulness-based stress reduction and positive psychotherapy has shown significant benefits and can be regarded as a cost-effective and convenient tool to protect the patients from the stress. Limitation: small sample size, lack of long-term follow-ups, and was no objective measure of adherence.
Shaygan M, et al., 2023 – Iran	Self-efficacy Anxiety	SUPPH-29 STAI	Psychoeducational intervention delivered via WhatsApp groups daily for 14 days until the quarantine period is over. Video, audio and text files were shared on WhatsApp. Psychologists, mental health nurses and psychiatrists involved in the delivery of the sessions – online multimedia.	Pre- and post-treatment assessed before and 2 weeks after the intervention among COVID-19 patients. Retention: 100% attendance in both groups.	The intervention was effective in reducing self-efficacy and anxiety. Interactive psychoeducational interventions via social networks are cost-effective treatments that can improve self-efficacy and reduced anxiety among patients infected with COVID-19 who lived in home quarantine. Limitation: limited generalisability of the results.
Sun F, et al., 2021 – China	GAD Depression	GAD-7 PHQ-9	Mindfulness-based intervention. 60 minutes sessions per week for 4 weeks. App-based delivery using	Baseline, immediate post-intervention (1 month), and at follow-up	Compared to social support mental health intervention, mindfulness-based intervention had superior effect on anxiety and both conditions improved depression. Mindfulness

			instructional Video – mobile app based.	(2-month post-baseline) assessments were done. Retention: >80% attendance in both groups.	intervention demonstrated to be cost-effective, more feasible and acceptable in program engagement, evaluation, skills improvement, and perceived benefit, and to address anxiety and depression. Limitation: the results may not guarantee effectiveness in the real world.
Zhou K, et al., 2022 – China	Sleep quality GAD Depression	PSQI GAD-7 PHQ-9	E-aid CBT. CBT courses involving relaxation training communicated with healthcare providers online via mobile phone or tablets for 6 weeks – online.	Pre- and post-treatment evaluation was done among frontline nurses, after 6 weeks of intervention. Retention: 100% in both groups	Compared to the scores of the control group, sleep quality improved significantly among the participants in the treatment group. The GAD-7 and PHQ-9 scores in the eCBT-I group were significantly lower after treatment than before treatment. Compared with subjects in the control group subjects in the eCBT-I group had lower scores on the GAD-7 and PHQ-9 scales after treatment. E-CBT improved the sleep quality of frontline nurses during the COVID-19 prevention and control period and relieved anxiety and depression. Limitation: most study participants were women, so the results are not fully generalised.

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Key: N*, number of participants completed the study
 Anxiety Sensitivity Index (ASI); BMSF (burnout measure short-form); CD-RISC (Connor-Davidson Resilience Scale); CVAQ (COVID-19 Anxiety Questionnaire); DASS (Depression, Anxiety, Stress Scale); DASS^D (DASS-depression); DASS^A (DASS-anxiety); DASS^S (DASS-stress); HADS (Hospital Anxiety and Depression Scale); GAD (Generalized Anxiety Disorder); HADS^A (HADS-anxiety); HADS^D (HADS-depression); HAMA (Hamilton Anxiety Rating Scale); HAMD (Hamilton Depression Rating Scale); PREPS (Pandemic-Related Pregnancy Stress Scale); PCL-C (PTSD Checklist Civilian version); PHQ (Patient Health Questionnaire); PSS (Perceived Stress Scale); PSQI (Pittsburgh Sleep Quality Index); PTSS (Post Traumatic Stress Symptoms); SAS (State Anxiety Scale); SDS (Self-rating Depression Scale); SHAI (Short Health Anxiety Inventory); STAI (State-Trait Anxiety Inventory); SRAS (Self Rating Anxiety Scale); SMD (Standard Mean Difference); SUD (Subjective Unit of Distress); SUPPH (Strategy Used by People to Promote Health).

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309 Quality of the included studies

310 Of 17 included trials, 14 (82.3%) had at least one unclear domain with respect to the
311 Cochrane Collaboration risk of bias checklist, and ten (n=10, 58.8%) had at least one
312 domain with high risk of bias (Figure 2). Only one trial had low risk of bias in all
313 Cochrane risk of bias assessment items (Sun et al., 2022). In most trials, blinding of
314 study participants and outcome assessors was not carried out. Similarly, several trials
315 had a recruitment bias due to not employing proper randomisation (Figure 2).

316 Discussion

317 This systematic review explored several electronic databases to identify and
318 summarise RCTs that were conducted in LMICs, and to synthesise evidence on the
319 effectiveness of psychological interventions in addressing mental health issues during
320 infectious disease outbreaks. After a robust systematic search and careful screening,
321 we found 17 RCTs eligible for this systematic review. These trials were all conducted
322 during the COVID-19 pandemic from 2020–2023, showing the huge research gap
323 before the COVID-19 pandemic in LMICs, despite many examples of devastating
324 outbreaks. This systematic review found no included trials conducted in Africa or Latin
325 America, again despite there being many examples here. Notably, most of the included
326 trials were delivered remotely, despite there being very little robust evidence of this
327 means of delivering treatments at the time. The trials were of interventions to address
328 depression, anxiety, stress, sleep, and post-traumatic stress symptoms among
329 COVID-19 patients, frontline healthcare professionals involved in COVID-19
330 response, and college students in quarantine. A range of interventions were used
331 including CBT, psychoeducational interventions, mindfulness techniques, NET and
332 individual counselling with varying number of sessions and duration.

333 The systematic review found that brief psychoeducational interventions based on
334 cognitive, relaxation, and stress management techniques were effective for
335 management of perceived stress and anxiety symptoms as well as in improving
336 resilience, coping strategies, and self-efficacy (Shaygan et al., 2023; Shaygan et al.,
337 2021; Mirhosseini et al., 2022). These findings align with a report from a single blind
338 RCT in a high-income country (Morina et al., 2023) in which a brief psychoeducational
339 intervention was successful in reducing psychological distress, generalised worry, and

340 burnout among healthcare workers during the COVID-19 pandemic in Zurich,
341 Switzerland. This trial recommended booster sessions to maintain the initial gains
342 beyond six months. Brief psychoeducational interventions are non-intensive, flexible
343 and can be delivered by non-specialists in any context including in
344 outbreaks/pandemics.

345 Moreover, brief mindfulness-based intervention (Sun et al., 2022) and mindfulness-
346 based stress reduction interventions (Li et al., 2023) were effective in addressing
347 depression, anxiety, and generalised anxiety disorder. Similar findings have been
348 reported from a systematic review and meta-analysis of 26 RCTs that mindfulness-
349 based interventions reduced depressive symptoms significantly among adults affected
350 by COVID-19 pandemic (Fu et al., 2024).

351 Remotely delivered CBT and mindfulness-based CBT interventions showed promising
352 but non-significant changes in reducing depression, anxiety, sleep and stress (Hossain
353 et al., 2020; Ghazanfarpour et al., 2022; Li et al., 2020; Liu et al., 2021; Gupta et al.,
354 2021). Although CBT has superior benefits and is a first line treatment for variety of
355 mental health conditions (Surmai M and Duff E., 2022), it may be more effective when
356 it is provided intensively for longer sessions (over 12 sessions) over longer period of
357 time (Levy et al., 2020). Evidence shows that people who are taking CBT have shown
358 a more gradual course of change (Driessen and Hollon, 2010), and the minimum
359 number of sessions needed to address common mental health problems is between
360 7-14 sessions (Robinson et al., 2020). Additionally, the use of active treatments (e.g.
361 in standard interventions) for controls could also result in non-significant changes for
362 CBT (Cuijpers, 2024).

363 Although, NET was superior in reducing post-traumatic stress symptoms to the control
364 group, there was non-significant change in improving sleep quality, reducing
365 depressive and anxiety symptoms (Fan et al., 2021). NET is one of the recommended
366 therapies for prevention and treatment of post-traumatic stress disorder (Megnin-
367 Viggars et al., 2019), and the results of our systematic review showed that NET is
368 effective in reducing post-traumatic stress symptoms among COVID-19 patients. Even
369 so, the therapeutic components of NET are designed to resolve traumatic symptoms,
370 its broader efficacy beyond PTSD requires further investigation.

371 Due to their simplicity and adaptability, these interventions have been recommended
372 as appropriate to be delivered in global normative guidelines for some time, but their
373 adaptation for delivery using different approaches including hybrid face-to-face and
374 online, or via phone or video calls was novel and often brought about by necessity
375 rather than being well established in evidence. The use of digital platforms in most
376 included trials to deliver interventions remotely was deemed appropriate in
377 outbreak/pandemic contexts, given contact limitations and scale of demand. This
378 seemed to have proven to be acceptable, as evidenced by the high recruitment and
379 completion rate, where more than 90% of participants completed all sessions in 80%
380 (n=12) of the included trials. Despite lack of access to digital technologies and low
381 digital literacy in low-income settings, delivering interventions remotely using flexible
382 approaches and multimedia platforms could strengthen the uptake of interventions as
383 well as promote infection prevention and control in outbreaks/pandemics.

384 The current systematic review has several implications in filling the evidence gap in
385 understanding how to effectively address mental health needs during infectious
386 disease outbreaks. The lack of inclusion of issues related to culture in these studies
387 on evidence-based practice is concerning. This is a topic that is often identified as
388 important, and in fact efforts at adaptation, or even locally-developed practice
389 embedded in local cultures, are common, so there is need for high quality research for
390 informed decisions to equip health systems with more treatment options that properly
391 incorporate sensitivity to culture during disease outbreaks. Importantly, it found some
392 evidence for the value of established psychological interventions in what was a unique
393 set of circumstances, requiring innovative approaches to delivery in LMICs. It found
394 that these were often feasible and acceptable, with high adherence, though there may
395 be bias associated with being part of a study. However, there are several limitations
396 that need to be considered when interpreting the results of this systematic review.
397 These are, but not limited to: i) as the result of lack of consistency, for example in
398 standard case definition and outcome measures, and lack of clarity on the cultural
399 validation of the tools, it may be difficult to generalise effectiveness of results to other
400 populations and contexts; ii) most of the included trials did not examine sustained
401 effectiveness and therefore longer-term effectiveness of the interventions is unknown;
402 iii) trials that were written and published in languages other than English were not
403 included in this review; iv) the overall quality of evidence from these trials is moderately

404 high, although the quality of evidence from each trial varies significantly. Weaknesses
405 of included trials included a lack of proper randomisation, blinding and small sample
406 sizes.

407 **Conclusion**

408 Non-specialist delivered brief psychological interventions are likely to be valuable for
409 addressing the huge mental health needs that arise in outbreaks. Overall, this review
410 demonstrated that brief and remotely delivered psychoeducational interventions seem
411 effective, feasible, cost-effective, and time-efficient in the context of the COVID-19
412 pandemic, which provides valuable insights into their use in future outbreaks. The
413 huge evidence gap in LMICs was marked - none of the included trials were from Africa
414 and Latin America) despite Africa being where outbreaks are most common. Hence,
415 addressing the huge research gap should be a priority to inform evidence-based and
416 resource efficient psychological interventions for outbreak/pandemic contexts in
417 LMICs. While it was appropriate to innovate rapidly during the exceptional
418 circumstances of the COVID-19 pandemic, future research should examine the use,
419 applicability and scalability of digital interventions in LMICs, to better inform future
420 outbreak preparedness and response. A particular consideration should also be given
421 to cultural adaptation of psychological interventions and mental health tools, in the
422 context of still centralised production of normative guidance, which draws largely on
423 evidence from high income countries.

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432 **Author Contribution**

433 BAY, JE, and JAS conceptualised the study. BAY and JAS conducted literature search,
434 article screening, and selection. BAY and JAS did quality appraisal of included studies.
435 JE and MA assisted the data collection and synthesis. BAY drafted the original writing,
436 and JE, JAS, and MA reviewed and edited it subsequently.

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438 None

439 **Conflict of interest**

440 The authors declare that they have no conflict of interest.

441 **Ethics**

442 Not applicable

443 **Data availability**

444 All data relevant to the study are included in the article or uploaded as supplementary
445 information.

446 **References**

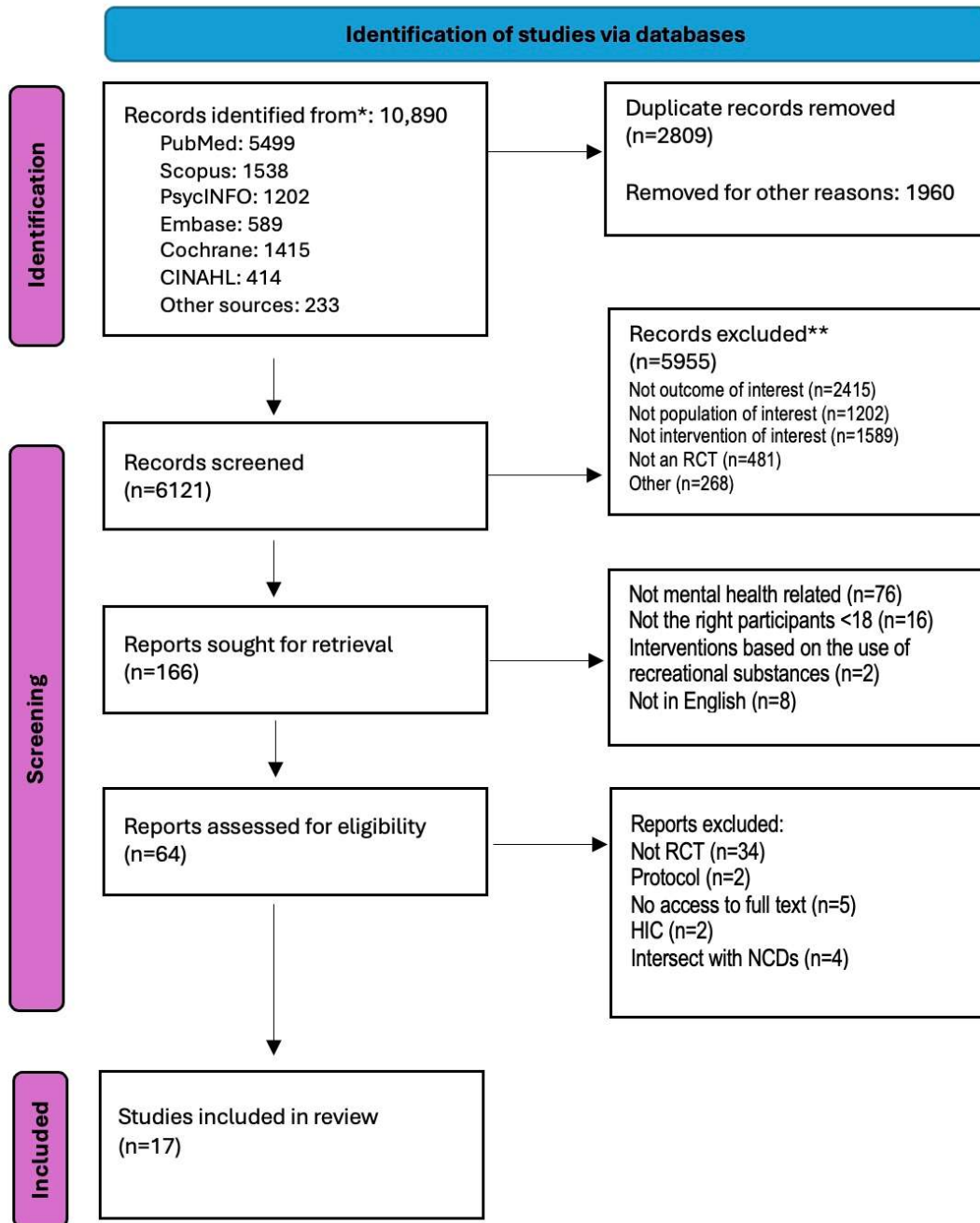
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595 *Figure 1. PRISMA flow diagram of search results.*

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Author (year)	Selection Bias		Reporting Bias	Performance Bias	Detection Bias	Attrition Bias
	Random Sequence Generation	Allocation Concealment	Selective Reporting	Blinding (participant and personnel)	Blinding (outcome)	Incomplete Outcome Data
Alkhalaf JM, 2023 – Jordan	Low	Low	Low	High	High	Low
Dincer B, and Inancil D, 2021 – Turkey	Low	High	Unclear	High	Low	Low
Fan Y, et al., 2021 – China	Unclear	High	Low	Unclear	High	Low
Ghazanfarpour M, et al., 2022 – Iran	Low	Unclear	Low	Unclear	Unclear	Low
Gupta S, et al., 2021 – India	Low	High	Unclear	Low	High	High
Hosseinzadeh Asl NR., 2022 – Turkey	Unclear	Unclear	Low	High	High	Low
Khosravi HM, et al., 2022 – Iran	Unclear	Unclear	Low	Unclear	Unclear	Low
Li H, et al., 2023 – China	Low	Low	Low	Low	Unclear	Unclear
Li J, et al., 2020 – China	Low	High	Low	High	Low	Low
Liu Y, et al., 2021 – China	Low	High	Unclear	Low	High	Low
Liu Z, et al., 2021 – China	Low	Low	Low	High	High	Unclear
Mirhosseini S, et al., 2022 – Iran	High	High	Low	Unclear	Low	Low
Shabahang R, et al., 2021 – Iran	Low	Unclear	Low	Low	Low	Low
Shaygan M, et al., 2021 – Iran	Low	Low	Unclear	Low	Unclear	Low
Shaygan M, et al., 2023 – Iran	High	Unclear	Low	Unclear	Low	Unclear
Sun F, et al., 2021 – China	Low	Low	Low	Low	Low	Low

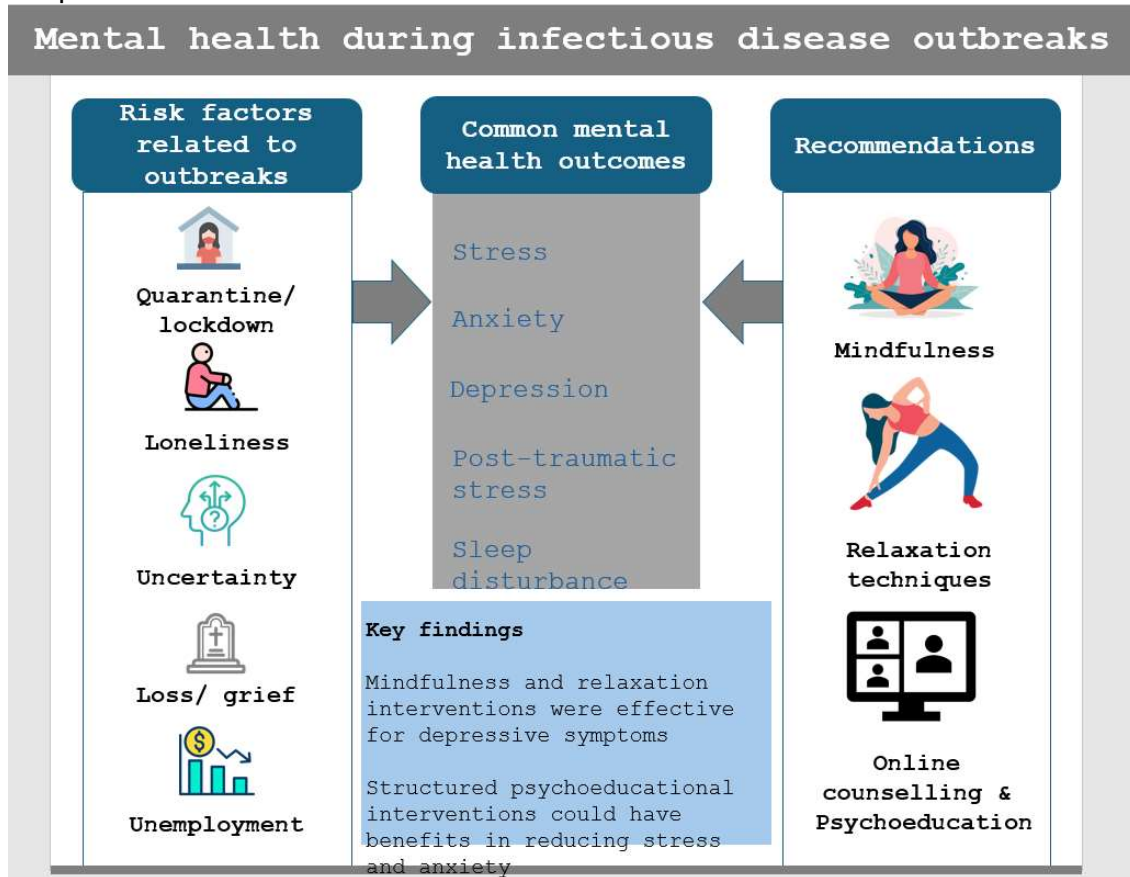
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600 *Figure 2. Risk of bias assessment for included trials using the Cochrane Collaboration's Risk of Bias tool (N=17).*

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603 Graphic abstract



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