Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Research paper

Impact of viral epidemic outbreaks on mental health of healthcare workers: a rapid systematic review and meta-analysis

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ABSTRACT

Background: This study aimed at examining the impact of providing healthcare during health emergencies caused by viral epidemic outbreaks on healthcare workers' (HCWs) mental health; to identify factors associated with worse impact, and; to assess the available evidence base regarding interventions to reduce such impact.

Method: Rapid systematic review. We searched MEDLINE, Embase, and PsycINFO (inception to August 2020). We pooled data using random-effects meta-analyses to estimate the prevalence of specific mental health problems, and used GRADE to ascertain the certainty of evidence.

Results: We included 117 studies. The pooled prevalence was higher for acute stress disorder (40% (95%CI 39 to 41%)), followed by anxiety (30%, (30 to 31%)), burnout (28% (26 to 31%)), depression (24% (24 to 25%)), and post-traumatic stress disorder (13% (13 to 14%)). We identified factors associated with the likelihood of developing those problems, including sociodemographic (younger age and female gender), social (lack of social support, stigmatization), and occupational (working in a high-risk environment, specific occupational roles, and lower levels of specialised training and job experience) factors. Four studies reported interventions for frontline HCW: two educational interventions increased confidence in pandemic self-efficacy and in interpersonal problems solving (very low certainty), whereas one multifaceted intervention improved anxiety, depression, and sleep quality (very low certainty).

Limitations: We only searched three databases, and the initial screening was undertaken by a single reviewer.

Conclusion: Given the very limited evidence regarding the impact of interventions to tackle mental health problems in HCWs, the risk factors identified represent important targets for future interventions.

1. Introduction

Infectious disease outbreaks are relatively common, (World Health Organization, 2020a) often prompting an international response involving thousands of healthcare workers (HCWs) (Brooks et al., 2018). Providing frontline healthcare during infectious outbreaks increases the

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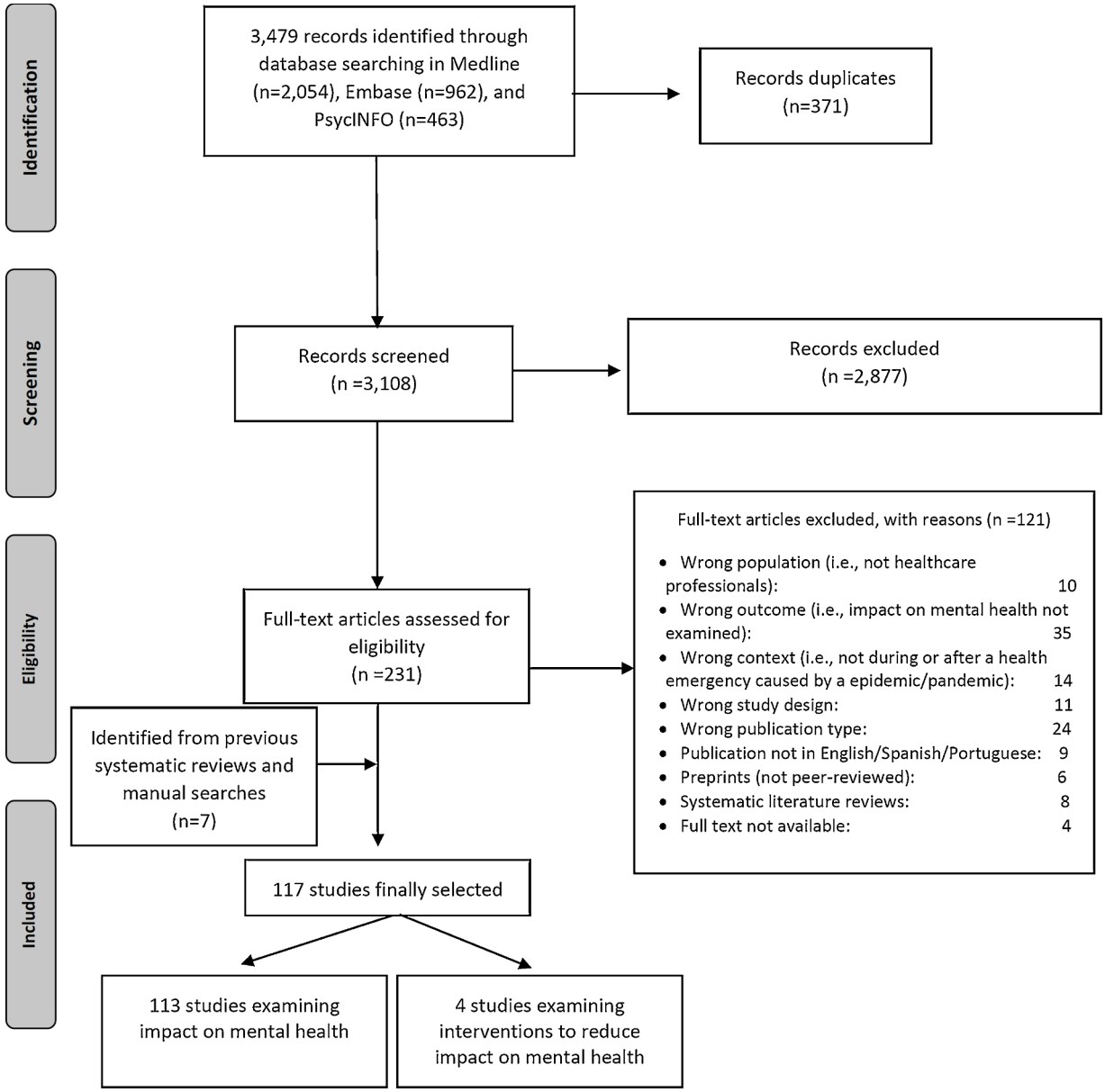

Fig. 1. PRISMA Flowchart.

risk of HCWs developing mental health problems, both short and long-term (Maunder et al., 2006). It has been suggested that specific occupational factors are associated with psychological outcomes of HCWs during an infectious disease outbreak. Working in a high-risk environment, adhering to quarantine, job-related stress, and belonging to a specific cadre were all considered to aggravate psychological outcomes. Perceived safety, namely through access to protective equipment, and specialised training, mitigated those outcomes (Brooks et al., 2017).

During December 2019 a new infectious disease outbreak was reported in Wuhan, Hubei province, China (Wang et al., 2020a), which was named COVID-19 (World Health Organization, 2020b). The World Health Organization (WHO) declared COVID-19 a pandemic by March 11th 2020, and by August 2020 it had spread to most countries and territories, with almost 20 million known cases and a death toll of over 730,000 people (World Health Organization, 2020c; Smith et al., 2018; Koh et al., 2011). Early anecdotal evidence from Wuhan showed how this unprecedented situation impacted the mental health of frontline HCWs, who reported mental problems such as anxiety, depressive symptoms, anger, and fear (Kang et al., 2020a). These problems cannot only have a long-lasting effect on the mental health of HCWs, (Maunder et al., 2006) but also hinder the urgent response to COVID-19, by jeopardising attention and decision-making (Kang et al., 2020a). Tackling the mental health of HCWs during this pandemic is essential, and will strengthen healthcare systems' capacity (Bao et al., 2020).

Previous systematic reviews have explored social and occupational factors associated with psychological outcomes in HCW during an infectious disease outbreak (Brooks et al., 2018), and their perceptions of risk and use of coping strategies towards emerging respiratory infectious diseases (Koh et al., 2011). A number of recent systematic reviews have examined the psychological and mental impact of COVID-19 on medical staff and other HCWs (Garcia-Iglesias et al., 2020; Kisely et al., 2020; Luo et al., 2020; Pan et al., 2020; Pappa et al., 2020; Shaukat et al., 2020), some of them focussing on specific mental health problems such as post-traumatic stress disorder (PTSD) (Carmassi et al., 2020) or anxiety (Pan et al., 2020). However, given the exponential proliferation of studies on this area during the last months, there is a need to synthesise the current body of knowledge. Moreover, the evidence base concerning the effectiveness of the interventions to ameliorate such impact has not been systematically assessed and reported.

The aim of this rapid systematic literature review is threefold: i) to

Table 1
Features of the studies selected (N = 117)

	N	%
Year of the study publication		
2001-2005	22	19
2006-2010	19	16
2011-2015	5	4
2016-2020	71	61
Epidemiologic design		
Cross-sectional	106	91
Cohort study	8	6
Quasi-experimental	2	2
Case-control	1	1
Use of validated measures of mental health		
Yes	98	84
No	19	16
Number of participants[a]	1,036	(26 - 21,199)
Mental health problems[b]		
Anxiety	62	53
Depression	54	46
Acute stress disorder	33	28
Post-traumatic stress disorder	31	26
Mental health status (overall assessment)	28	24
Insomnia	19	16
Burnout	12	10
Others	33	28
Area[b]		
Asia (excluding Middle East countries)	78	65
Northern America	15	13
Middle East	14	12
Europe	10	9
West Africa	2	2
Worlwide	1	1
Study timing		
During outbreak	86	74
After outbreak	27	23
Both during and after outbreak	2	2
Prior, during and after outbreak	1	1
Prior outbreak onset	1	1
Type of health emergency		
COVID-19	61	52
SARS	41	35
MERS-COV	7	6
H1N1 influenza virus	4	3
Ebola	3	3
H7N9 influenza virus	1	1
Population		
Health care workers in general	85	73
Nurses	18	15
Doctors	14	12
Setting		
Hospital	80	68
Healthcare facilities in general	16	14
Primary Care centre	3	5
Non specified	18	15

[a] Mean and range.
[b] Percentages exceeding 100% as categories are not mutually exclusive.

examine the impact of health emergencies caused by a viral pandemic or epidemic outbreak on HCWs mental health; ii) to identify factors associated with worse impact, and iii) to assess the effectiveness of interventions to reduce such impact.

2. Methods

We conducted a rapid systematic review following WHO guidelines (Tricco et al., 2017) and Cochrane's recommendations for Rapid Reviews in response to COVID-19 (Cochrane, 2020). We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for planning, conducting and reporting this study (Moher et al., 2009).

2.1. Data sources and searches

We designed specific search strategies for biomedical databases (MEDLINE/Ovid, EMBASE/Elsevier, and PsycInfo/EBSCO), combining MeSH terms and free-text keywords (Online Appendix 1). We searched databases from inception to 3rd August 2020, and checked the list of included studies of relevant systematic reviews (Shaukat et al., 2020; Pappa et al., 2020; Pan et al., 2020; Luo et al., 2020; Kisely et al., 2020; Garcia-Iglesias et al., 2020; Carmassi et al., 2020; Brooks et al., 2018) to identify potential additional studies. We used EndNote X8™ to create a bibliographical database, and Rayyan to screen relevant records (Ouzzani et al., 2016).

2.2. Selection criteria

We included empirical studies examining the impact on mental health of viral epidemic outbreaks on HCWs, and studies about interventions to reduce such impact. We included observational (cross-sectional, case-control, and cohort studies), and experimental studies (non-controlled before-after studies, controlled before-after studies, non-randomised controlled trials, and randomised controlled trials). We included studies on any type of health emergency caused by a viral epidemic outbreak or pandemic, and examining its impact on HCWs mental health during or after the crisis. For intervention studies, we included also those that examined interventions to protect mental health of HCWs prior, during or after the outbreak onset. All types of settings and healthcare professionals were accepted for inclusion. We included studies measuring any type of mental health problem or psychiatric morbidity. We excluded systematic reviews, narrative reviews, thesis, editorials, protocols, letters to the editor, and studies published in preprint servers but not in peer reviewed journals. We also excluded studies published in languages other than English, Spanish or Portuguese.

2.3. Study selection

One reviewer (of IRC, MJSR, MAFR, RZC, DGB) screened the retrieved references at title and abstract against the selection criteria. Two reviewers (of those aforementioned) independently and blinded against the others' judgements assessed full-text eligibility. We solved disagreements by consensus or by involving a third reviewer if needed.

2.4. Data extraction and quality assessment

We used structured forms to extract relevant data, such as country, health emergency, setting, population, epidemiological design, number of participants, mental health conditions, clinical outcomes and their measurement tools, and main study results. For observational studies addressing the impact of health emergencies on HCWs mental health, we extracted the prevalence rate of the mental conditions examined in terms of the number of professionals suffering the condition (numerator) out of the total number of study participants (denominator). If available, we extracted information about the risk factors. For intervention studies (i.e., randomised and non-randomised trials), we extracted data about the characteristics of the intervention as well as that reported also for observational studies.

We assessed the risk of bias of observational studies (i.e., cross-sectional, case-control, and cohort studies) by using the set of tools developed by Evidence Partners (McMaster University) (Partners, 2020); whereas ROBINS I (Sterne et al., 2016) was applied to uncontrolled trials.

For all studies one reviewer (of MJSR, MAFR, AC, DF, JM, GP, RZC) extracted all the data and assessed the risk of bias, while a second reviewer cross-checked the information for accuracy and completeness.

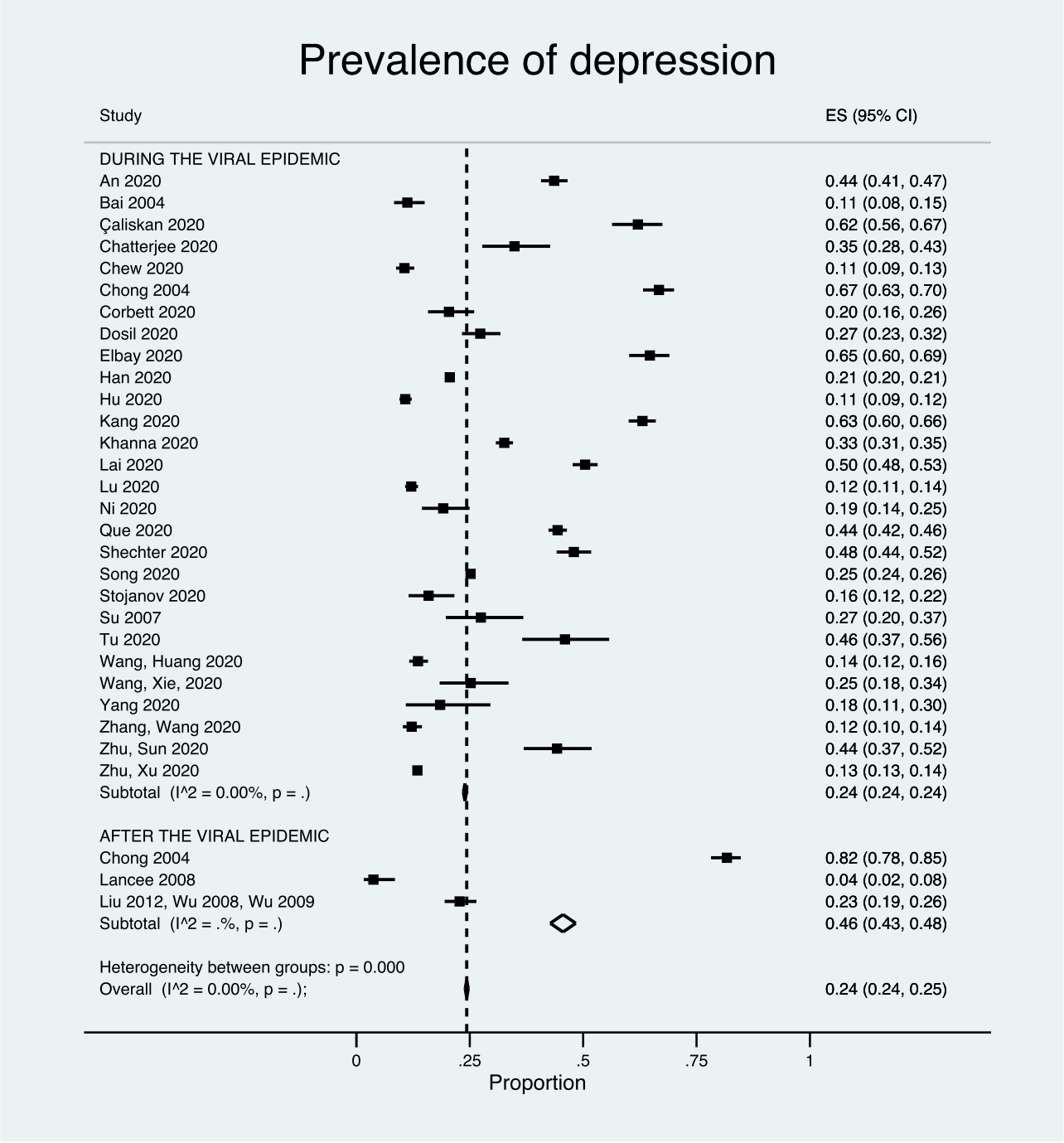

Fig. 2. Forest plot - prevalence of depression.
Legend: ES, effect size; CI, confidence interval; I2, heterogeneity level.

2.5. Data synthesis and analysis

We conducted a narrative and tabulated synthesis of the results, classifying the studies according to the type of study (i.e., impact of infectious disease outbreaks on HCWs mental health, or interventions to reduce such impact), and timing of data collection (i.e., before, during, or after the outbreak – based on the studies´ own definition). We adapted a taxonomy proposed in a previous study (Brooks et al., 2018) to classify risk factors as social, occupational and sociodemographic.

For studies about the impact of outbreaks on mental health, we used the STATA command "metaprop" (Nyaga et al., 2014) to pool estimates of proportions with corresponding 95% confidence intervals. Proportions were computed on the base of the Freeman-Tukey double arcsine transformation (Freeman and Tukey, 1950; Miller, 1978) within a random effect model framework. We conducted subgroup analyses to explore potential differences in the prevalence of mental health disorders during vs. after the outbreak. Where possible, subgroup analyses exploring gender differences were also undertaken. Heterogeneity was quantified by the I^2 statistic, where $I^2 > 50\%$ was deemed as substantial heterogeneity (Deeks et al., 2019). Publication bias was examined with funnel plots and presence of asymmetry tested with Begg (Begg and Mazumdar, 1994) and Egger tests (Egger et al., 1997). We used Stata, version 12.0 to conduct meta-analyses. Although we initially planned to pool the results from interventions to reduce mental health problems,

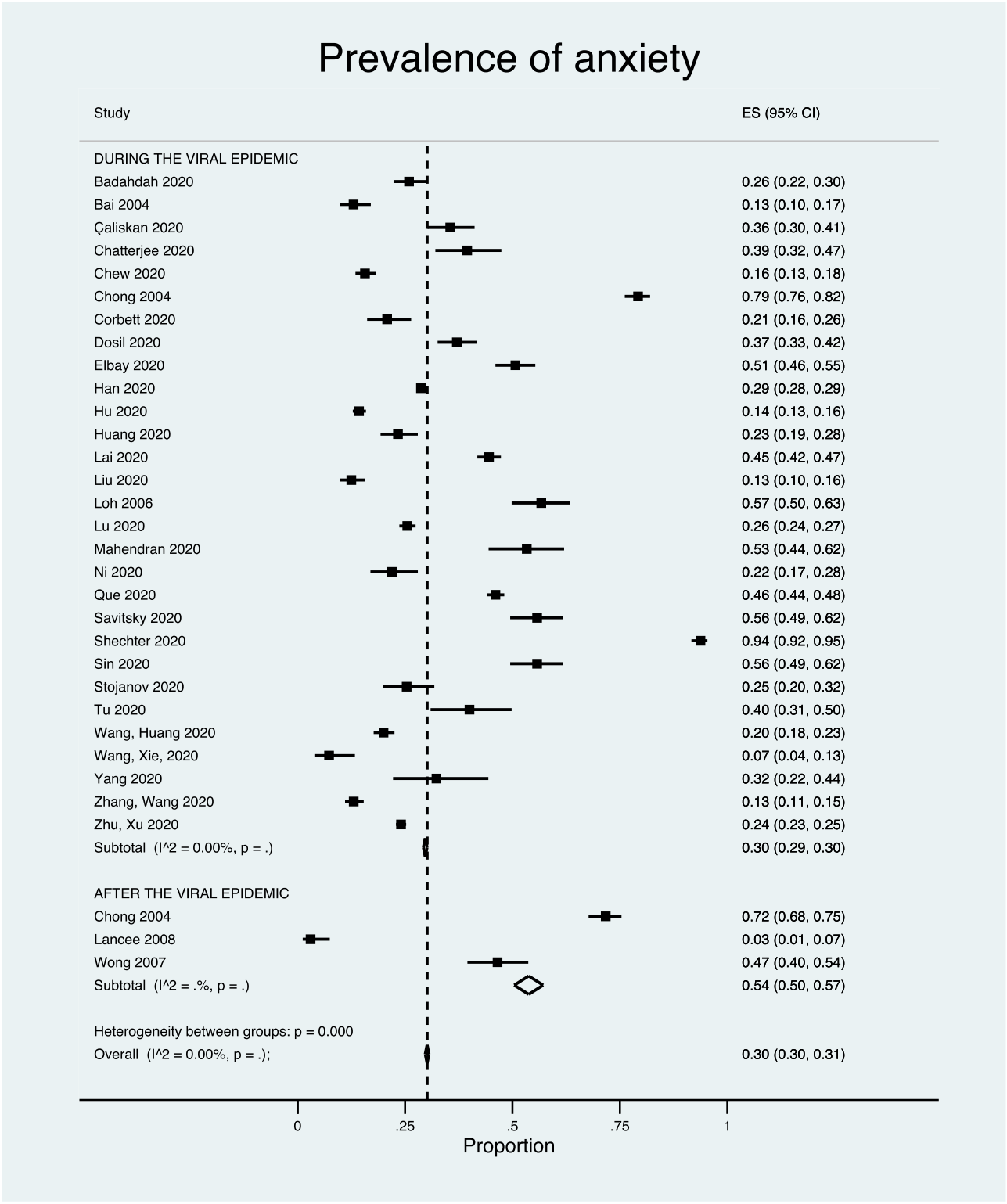

Fig. 3. Forest plot - prevalence of anxiety.
Legend: ES, effect size; CI, confidence interval; I2, heterogeneity level

this was finally not possible due to the scarcity of available data. Instead, we conducted a narrative and tabulated synthesis of the interventions and main results.

2.6. GRADE and 'summary of findings' tables

We used the GRADE approach (Schünemann et al., 2019) to assess the quality of evidence related to the outcomes included in this rapid review. We used GRADEpro 2011 software to create 'Summary of findings' tables. For assessments of the overall quality of evidence for each outcome, we downgraded the evidence from 'high quality' by one level for serious, or by two levels for very serious, study limitations (risk of bias), indirectness of evidence, inconsistency, imprecision of effect estimates, or potential publication bias (Schünemann et al., 2019).

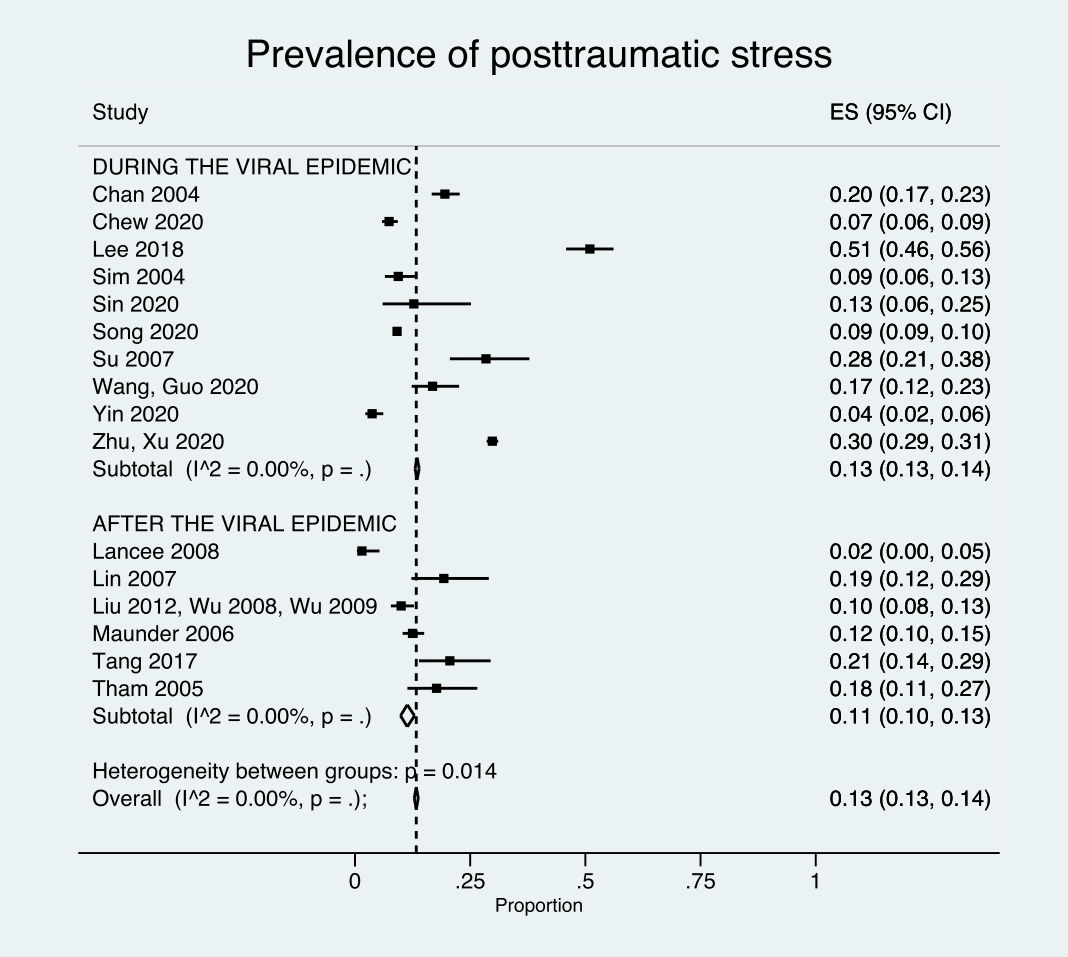

Fig. 4. Forest plot - prevalence of posttraumatic stress.
Legend: ES, effect size; CI, confidence interval; I2, heterogeneity level.

3. Results

3.1. Search results

The search resulted in a total of 3,479 records. After 371 duplicates were removed, 3,108 records remained to be screened. We excluded 2,877 records based on title and abstract screening. We assessed 231 articles in full-text, of which we excluded 121. After including seven additional studies identified from manual searches, 117 published studies met the inclusion criteria for this systematic rapid review. Fig. 1 illustrates the selection process of the included studies. Online Appendix 2 presents the excluded studies.

3.2. Characteristics of the studies

This systematic review included 119,189 participants (total). Most of the studies (65%) were conducted in Asian countries (excluding Middle East countries), including China (43%), Taiwan (8%), and Singapore (7%), among others. 13% of the studies were conducted in Northern American countries, and 12% in Middle East Countries. The mean number of participants was 1,036 (range 26 to 21,199). Around half of the studies (52%) examined the impact of COVID-19, followed by Severe Acute Respiratory Syndrome (SARS epidemic) (35%). Most studies were conducted during the viral epidemic outbreaks (74%). Almost seven out of ten took place in the hospital setting. General HCWs was the most common studied group (73%), whereas a minority of studies focused in specific types of HCWs (nurses (15%) and physicians (12%)). Anxiety (62%) and depression (54%) were the mental health conditions most frequently examined, followed by acute stress disorder (33%) and PTSD (31%). The majority followed a cross-sectional design (91%). 84% did use validated instruments to evaluate mental health. The characteristics of the included studies are summarised in Table 1.

3.3. Risk of bias assessment

The results of the risk of bias assessment are provided in Online Appendix 3. In general, main risks of bias in the 106 cross-sectional studies were low response rate (high risk of bias in 10% of the studies) and selection bias (10%). The main sources of bias across the eight cohort studies were related to low confidence that the outcome of interest was not present at start of the study (38%) and to potential selection bias (25%). Main sources of bias of the two uncontrolled before-after studies were bias in selection of participants, and bias in outcome measurement. The case-control study did not present serious risks of bias.

3.4. Prevalence of mental health problems in HCWs during and after viral epidemic outbreaks

113 studies examined the mental health problems among frontline HCWs during and/or after an viral epidemic outbreak. The individual study characteristics and results are detailed in Online Appendix 4. The great majority of them reported clinically significant mental health

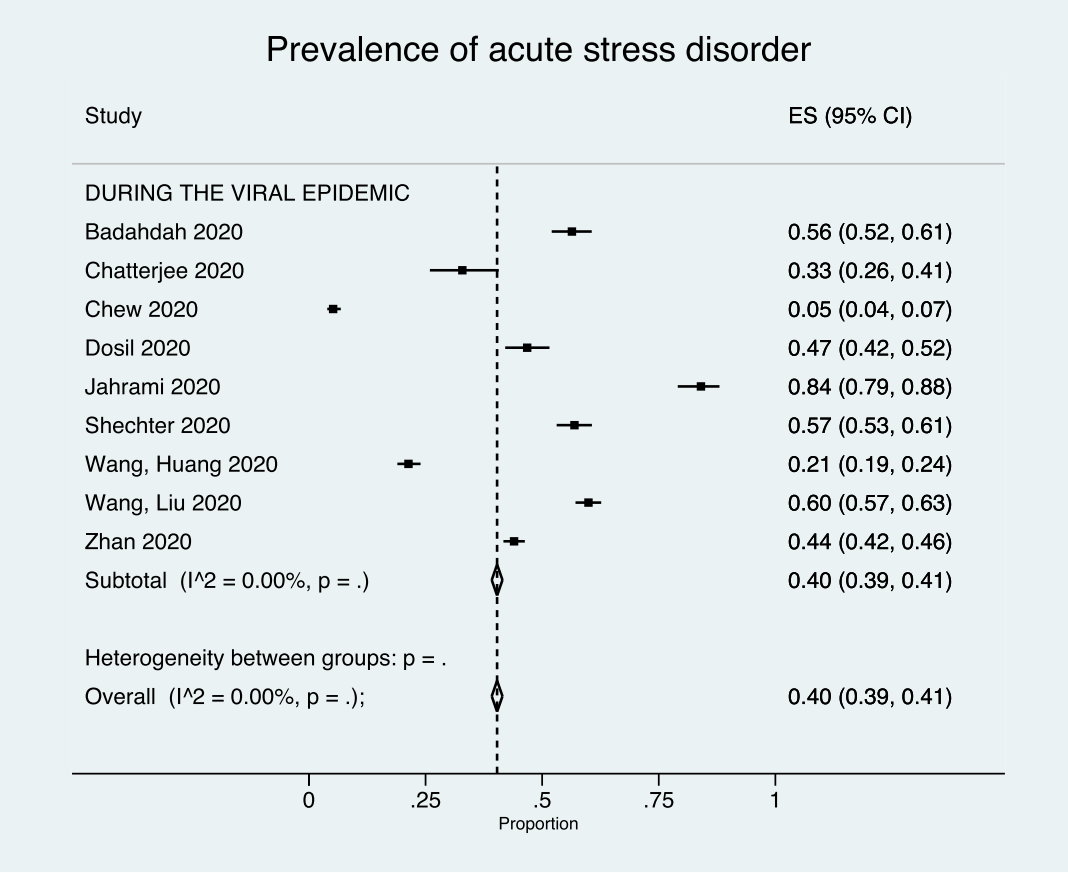

Fig. 5. Forest plot - prevalence of acute disorders.
Legend: ES, effect size; CI, confidence interval; I2, heterogeneity level.

symptoms, most frequently PTSD, anxiety, depression, acute stress and burnout. Prevalence forest plots are shown in Figs. 2–6. For clinically significant symptoms of mental health disorders, the pooled prevalence was higher for acute stress (40%, 95%CI 39 to 41%, I2 0%; 9 studies, 6,949 participants), followed by anxiety (30%, 95%CI 30 to 31%, I2 0%; 32 studies, 43,751 participants), burnout (28%, 95%CI 26 to 31%, 3 studies, 1,168 participants)), depression (24%, 95%CI 24 to 25%, I2 0%; 31 studies, 61,463 participants)), and post-traumatic stress disorder (13%, 95%CI 13 to 14%, I2 0%; 16 studies, 24,540 participants)). Subgroup analyses showed higher prevalence of depression (46%, 95%CI 43 to 48%) and of anxiety (30%, 95% 29 to 30%) after the outbreaks than during the outbreaks (24%, 95%CI 24 to 24%, and 30%, 95%CI 29 to 30%, respectively). No relevant differences were observed for the rest of mental health symptoms. According to exploratory subgroup analyses by gender (Online Appendix 5), female HCWs experienced higher prevalence of PTSD (30%, 95%CI 28 to 31%) and anxiety (26%, 95%CI 25 to 27%) than their male counterparts (16%, 95%CI 13 to 14%, and; 21%, 95%CI 19 to 23%, respectively). The prevalence of depression was very similar in male and female HCWs (23% in both cases). No data was available to examine potential gender differences in the prevalence of the rest of burnout and acute stress disorders. Similarly, we could not conduct subgroups analyses to explore differences according to HCWs' age due to the lack of available data reported in a homogeneous format (e.g. age quartiles). Begg's and Egger's tests suggested the absence of publication bias for all the meta-analyses conducted.

3.5. Risk factors for mental health problems in HCWs during and after viral epidemic outbreaks

Seventy studies examined occupational, sociodemographic and social factors associated with the likelihood of developing mental health problems while providing frontline healthcare during an infectious disease outbreak (Online Appendix 4).

The main occupational factors were working in a high-risk environment, higher perception of threat and risk, specialised training received, and specific occupational role. Working in a high risk environment was associated with different mental health problems, namely depression (Lai et al., 2020; An et al., 2020; Chatterjee et al., 2020; Elbay et al., 2020; Lu et al., 2020; Ni et al., 2020, Wang et al., 2020b, Wu et al., 2008), anxiety (Lai et al., 2020; Li et al., 2015; Matsuishi et al., 2012; Verma et al., 2004; Dosil Santamaria et al., 2020; Elbay et al., 2020; Liu et al., 2020; Lu et al., 2020; Ni et al., 2020; Que et al., 2020, Wang et al., 2020b, Zhang et al., 2020), PTSD (Bukhari et al., 2016; Styra et al., 2008; Tang et al., 2017; Wu et al., 2009; Wu et al., 2008; Arpacioglu et al., 2020), and burnout (Tolomiczenko et al., 2005). The definition of *high risk environment* varied across studies, but usually included being in direct contact with infected patients, either providing care (Bukhari et al., 2016; Verma et al., 2004) or being responsible for cleaning and disinfection (Li et al., 2015).

Likewise, higher perception of threat and risk was also associated with a higher prevalence of a number of different mental health problems, including depression (Liu et al., 2012), anxiety (Alsubaie et al., 2019; Liu et al., 2020) and PTSD (Maunder et al., 2004; Styra et al., 2008; Wu et al., 2009). Lack of specialised training was a risk factor for anxiety (Matsuishi et al., 2012; Wong et al., 2007; Çalişkan and Dost, 2020), PTSD (Tang et al., 2017), and burnout (Maunder et al., 2004). Some of the studies that recruited more than one cadre reported that specific HCWs were at higher risk of developing mental health problems. A number of studies found that nurses were more likely to develop PTSD (Tang et al., 2017; Barello et al., 2020; Song et al., 2020),

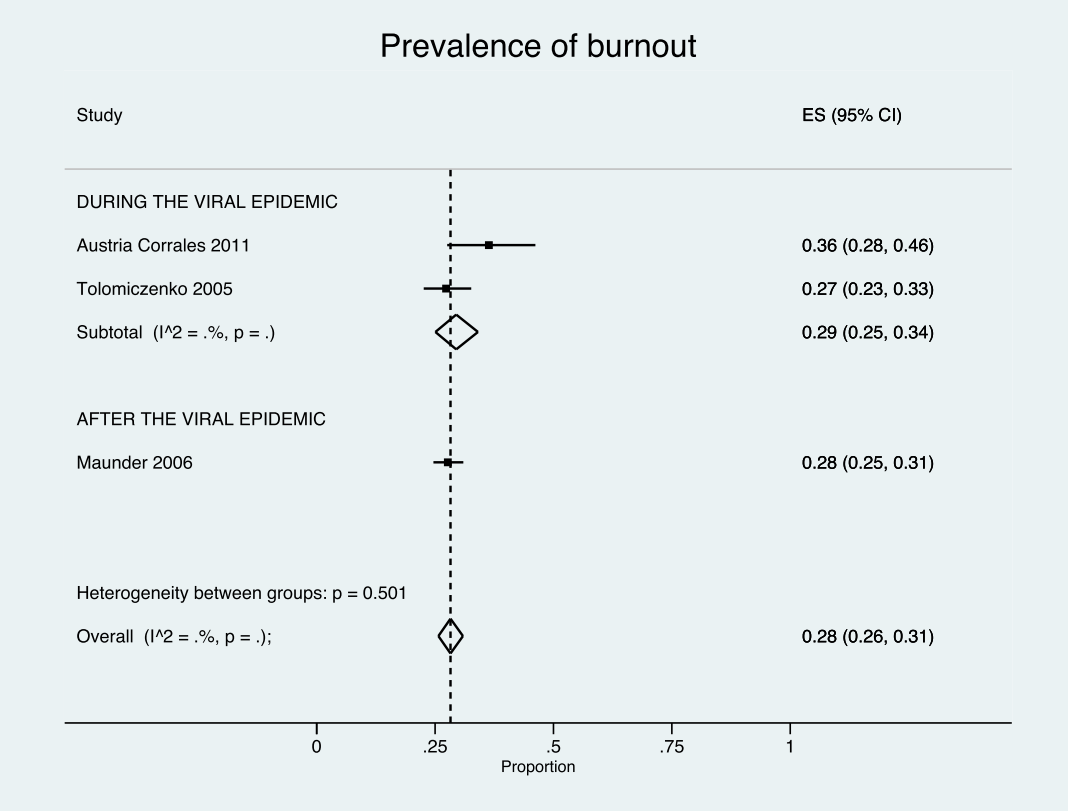

Fig. 6. Forest plot - prevalence of burnout.
Legend: ES, effect size; CI, confidence interval; I2, heterogeneity level.

anxiety (Han et al., 2020; Huang et al., 2020), stress (Wang et al., 2020c), and burnout (Tolomiczenko et al., 2005), whereas one study (Austria-Corrales et al., 2011) reported that resident pulmonologists were at higher risk of burnout.

Other occupational risk factors for PTSD were job stress (Maunder et al., 2004), and less job experience (Tang et al., 2017), whereas lower levels of organisational support increased the risk of burnout (Marjanovic et al., 2007).

In terms of sociodemographic factors, younger age was a risk factor for depression (Khanna et al., 2020), anxiety (Yildirim et al., 2020), PTSD (Tang et al., 2017; Sim et al., 2004) and burnout (Austria-Corrales et al., 2011). Female gender was consistently associated with higher levels of depression (Dosil Santamaria et al., 2020; Kurt et al., 2020; Lai et al., 2020; Elbay et al., 2020; Yildirim et al., 2020, Zhu et al., 2020), stress (Zhu et al., 2020; Badahdah et al., 2020; Elbay et al., 2020), anxiety (Dosil Santamaria et al., 2020, Kang et al., 2020b, Kurt et al., 2020; Lai et al., 2020; Badahdah et al., 2020; Corbett et al., 2020; Elbay et al., 2020; Yildirim et al., 2020) and burnout (Tolomiczenko et al., 2005), whereas no consistent associations were found for PTSD.

Feelings of social rejection or isolation and higher impact of the outbreak on daily life (Styra et al., 2008) increased the likelihood of developing PTSD, depression (Chatterjee et al., 2020), stress (Zhu et al., 2020), and anxiety (Que et al., 2020). Lack of family and friends support were associated with burnout (Kim and Choi, 2016). In addition, stigmatisation (Koh et al., 2005), social rejection (Park et al., 2018), and lower levels of social support were identified as risk factors for stress (Xiao et al., 2020).

3.6. Interventions to reduce the mental health impact of viral epidemic outbreaks in HCWs

Four studies (Aiello et al., 2011; Maunder et al., 2010; Chen et al., 2006; Wu and Wei, 2020) described four different interventions to reduce the mental health impact of viral epidemic outbreaks in HCWs (Online Appendix 6). None of them used an experimental design. Two studies in Canada evaluated two educational interventions for improving HCWs mental health by increasing resilience (Aiello et al., 2011; Maunder et al., 2010). Aiello and colleagues (Aiello et al., 2011) conducted a cross-sectional study to evaluate an educational intervention targeted to HCWs during the SARS epidemic, which consisted of a face-to-face group training session based on Folkman and Greer's model of coping (Folkman and Greer, 2000). The session focused on stressors associated with pandemic influenza and on organisational and individual approaches to building resilience and reducing stress. While most participants did not feel prepared to deal confidently with the pandemic before the session (35%), there was a higher proportion of participants who felt better able to cope after the session (76%). Maunder and colleagues conducted an uncontrolled before-after study to explore the impact of a computer-assisted resilience training to prepare HCWs for a potential pandemic influenza (Maunder et al., 2010). The course consisted of modules incorporating different modalities of learning (knowledge-based modules, relaxation skills, and self-assessment modules using questionnaires to characterize interpersonal problems and coping style). The intervention improved confidence in support and training, pandemic self-efficacy and interpersonal problems ($p < 0.05$). One cross-sectional study examined the impact of exercise interventions to relieve psychological stress and improve sleep status for frontline medical staff in the fight against COVID-19 in China (Wu and Wei, 2020). In comparison with the control group, participants in the intervention group experienced higher levels of anxiety (45.89 ± 1.12 vs 41.02 ± 1.15; $p = 0.056$), depression (50.13 ± 1.81 vs 36.11 ± 2.06; $p = 0.04$), and PTSD (50.13 ± 1.813 vs 29.89 ± 1.97; $p = 0.03$). We have very low confidence on the evidence of educational interventions for preventing the psychological impact of viral epidemic outbreaks in HCWs due to the study design (uncontrolled before-after

studies) and very serious risk of bias regarding confounding and measurement of outcomes (Online Appendix 7).

One uncontrolled before-after study in Taiwan (Chen et al., 2006) evaluated the effects of a multifaceted intervention to prevent depression and anxiety in hospital nurses during the SARS epidemic. The intervention included in-service training, manpower allocation, gathering sufficient protective equipment, and establishment of a mental health team. The authors observed statistically significant improvements in nurses' anxiety and depression along with sleep quality at two weeks follow-up. Our confidence on the evidence for multifaceted interventions for preventing the psychological impact during viral epidemic outbreaks in HCWs was very low (Online Appendix 7) due to limitations in the study design (uncontrolled before after studies) and very serious risk of bias (high risk of selection bias and high risk of bias in measurement of outcomes).

4. Discussion

4.1. Summary of findings

In this timely systematic rapid review, we synthesized evidence from 117 studies examining the impact on mental health of providing frontline healthcare during viral epidemic outbreaks. Results showed that HCWs commonly present high levels of anxiety, depression, and PTSD, both during and after the outbreaks. We identified a broad number of risk factors for these conditions, including sociodemographic factors such as younger age and female gender, and social factors such as lack of social support, social rejection or isolation and stigmatization. Occupational factors entailed working in a high-risk environment (frontline staff), specific occupational roles (e.g., nurse), and having lower levels of specialized training, preparedness and job experience. In contrast with the high number of studies examining impact on mental health, there is limited evidence regarding the impact of interventions to reduce mental health problems in this particularly vulnerable population, and overall its certainty is very low, mainly due to study design and serious risk of bias.

4.2. Discussion of the main findings

Some of the risk factors associated with mental health problems while providing frontline care during viral epidemic outbreaks cannot be modified. In this way, working in a high risk environment increases the risk of developing clinically significant symptoms, namely depression (Lai et al., 2020; An et al., 2020; Chatterjee et al., 2020; Elbay et al., 2020; Lu et al., 2020; Ni et al. 2020), anxiety (Lai et al., 2020; Li et al., 2015; Matsuishi et al., 2012; Verma et al., 2004; Dosil Santamaria et al., 2020; Elbay et al., 2020; Liu et al., 2020; Lu et al., 2020; Ni et al., 2020; Que et al., 2020, Wang et al., 2020b, Zhang et al., 2020), PTSD (Bukhari et al., 2016; Tang et al., 2017; Wu et al., 2009; Arpacioglu et al., 2020; Styra et al., 2008; Wu et al., 2008), and burnout (Tolomiczenko et al., 2005). Likewise, it seems like specific cadres are more likely to report mental health problems, namely PTSD (Tang et al., 2017), and burnout (Austria-Corrales et al., 2011; Tolomiczenko et al., 2005).

However, this review also identified specific modifiable factors that can be addressed in advance and mitigate the risk brought by the aforementioned factors. Lack of specialized training was associated with anxiety, PTSD (Tang et al., 2017), and burnout (Maunder et al., 2004), and higher perception of threat and risk was associated with depression (Liu et al., 2012), anxiety (Alsubaie et al., 2019), and PTSD (Ho et al., 2005; Maunder et al., 2004; Styra et al., 2008; Wu et al., 2009). Long-term institutional preparedness is possible for both factors, through the development and implementation of specialized training that includes infection prevention, diagnostics, patient care, staff, and communication (de Rooij et al., 2020).

Continuous communication between HCWs and managers, including the provision of up-to-date facts about the progression of the outbreak, can convey institutional support (Marjanovic et al., 2007), and promote the acquisition of knowledge and confidence for those HCWs who have less job experience (Tang et al., 2017). Likewise, managers are essential to mitigate feelings of social isolation (Lee et al., 2018; Maunder et al., 2004) and stigmatization (Koh et al., 2005), especially among those HCWs who have to be quarantined. The proliferation of online mobile-based technologies could play an essential role in promoting connectedness and decrease the feelings of isolation and stigmatization (Gonçalves-Bradley et al., 2018), and can also be used for informal contacts between HCWs who are quarantined.

Although very limited, evidence from intervention studies indicates that educational interventions have the potential to increase knowledge and resilience (Aiello et al., 2011; Maunder et al., 2010), even when implemented during an outbreak (Chen et al., 2006).

4.3. Strengths and limitations of the review

This is a timely and comprehensive rapid review of the current literature on the impact of viral epidemic outbreaks on the mental health of HCWs. We examined three relevant areas, namely the prevalence of mental health problems, factors associated with an increased likelihood of developing those problems, and the effects of interventions to improve mental health of HCWs. We followed the highest methodological standards when undertaking the current rapid review (Tricco et al., 2017), and we used the GRADE approach to evaluate the certainty of the evidence, in order to facilitate evidence-informed decision making processes. There were also some limitations underlying this work. Despite searching three major databases and manually searching references of previously published systematic reviews, we did not examine grey literature. Moreover, the initial screening was undertaken by a single reviewer. Therefore, we cannot discard that relevant references may have been missed out.

4.4. Limitations of available evidence and future research needs

Despite the large number of studies identified in this systematic review, only four studies assessed the efficacy of interventions to ameliorate the impact of health emergencies on mental health of HCWs. None of them was a randomized controlled trial. During the last six months (since the onset of the COVID-19 pandemic) we have witnessed a proliferation of a large volume of studies examining the impact of COVID-19 on HCWs´ mental health. To make progress in this area, future studies should address these limitations of the available literature. The use of validated measurement tools and more representative sample sizes are warranted in order to strengthen the quality of future cross-sectional studies. Robust trials are however much more needed to identify effective interventions to reduce mental health problems in HCWs. Intervention studies should adhere to international reporting standards such as CONSORT (de Rooij et al., 2020) and TIDieR (Hoffmann et al., 2014).

4.5. Conclusions

As observed in our review, the mental health burden for HCWs during pandemics is especially high both during and after the outbreak. We urge governments, policy-makers and relevant stakeholders to monitor and follow these outcomes and conduct scientifically sound interventional research, in order to mitigate mental health impact on HCWs.

The physical health of HCWs is already at stake from the virus, and once we tackle the current pandemic, we will need to heal the healers, not only for the sake of having a prepared and resilient work-force, but to honour their tremendous sacrifices. If we want to address these concerns and be able to mitigate its impact, we need to act soon.

Contributors

IRC, IRP and MJSR had the idea for the study. IRC designed the search strategy. IRC, MJSR, MAFR, RZC, DGB screened abstracts and full texts. MJSR, MAFR, AC, DFN, JM, GP, RZ, DGB acquired data, and assessed risk of bias in studies. IRC did the data analysis. All authors interpreted the data analysis. IRC and DGB wrote the manuscript, with revisions from all authors. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. IRC is the guarantor.

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Declaration of Competing Interest

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Supplementary materials

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