

Factors associated with work performance and mental health of healthcare workers during pandemics: a systematic review and meta-analysis

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ABSTRACT

Introduction Healthcare workers' work performance and mental health are associated with positive mental health outcomes and directly related to increased productivity and decreased disability costs.

Methods We conducted a systematic review to identify factors associated with work performance of healthcare workers during a pandemic and conducted a meta-analysis of the prevalence of mental health outcomes in this context. Primary papers were collected and analysed using the Population/Intervention/Comparison/Outcome framework and using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. To critically appraise the studies included in the review, we used the AXIS appraisal tool to assess each cross-sectional study's quality.

Results The study identified nine factors associated with the work performance and mental health of healthcare workers, including experiencing feelings of depression, anxiety, having inadequate support, experiencing occupational stress, decreased productivity, lack of workplace preparedness, financial concerns associated with changes in income and daily living, fear of transmission and burnout/fatigue.

Conclusion There is a rapidly rising need to address the work performance and mental health of healthcare workers providing timely care to patients. Regular and sustained interventions, including the use of information and communication technologies such as telehealth, are warranted.

Keywords COVID-19, healthcare workers, pandemic, work performance, workplace mental health

Introduction

The coronavirus disease 2019 (COVID-19) was declared a global pandemic on 11 March 2020 by the World Health Organization.¹ The pandemic's short-term and long-term impact on healthcare workers' mental health and well-being remains largely unknown. Mental health is interconnected with many aspects of everyday life, including employment. The importance of initiatives fostering mental health has been accentuated globally during the current COVID-19 pandemic.² Preliminary evidence suggests that healthcare workers are at risk of developing mental health symptoms^{3–6} during the COVID-19 pandemic. Early evidence during the pandemic from China indicated that nearly 37% of medical and nursing staff experienced mental health disturbances during the

COVID-19 pandemic.⁶ Another Chinese study of Wuhan healthcare workers found that 50.4% experienced symptoms of depression, 44.6% of anxiety and 71.5% of distress.³ Individuals employed in the healthcare system are more likely to have high levels of stress at their workplace and experience long-term mental health problems than those of different occupations,⁷ and diminished work performance.⁸

Healthcare workers' work performance is a critical issue in occupational health and of greater interest during the

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COVID-19 pandemic.^{9,10} A widely accepted definition of work performance includes those behaviours or actions relevant to the organization's goals and related to job responsibilities.¹¹ Work performance is comprised of three dimensions, including task performance, contextual performance and counterproductive work behaviour. Healthcare workers' work performance includes their job duties such as their job skills, clinical competencies and work quality (task performance), and those that fall outside of the job descriptions (contextual performance).^{11,12} Finally, behaviours against an organization's goals include being late for work, engaging in off-task activities and not attending work (counterproductive work behaviour).^{9,13}

The COVID-19 pandemic places significant pressures on healthcare workers' work performance and increases their risk for mental health problems.¹⁴ Previous systematic reviews have examined social factors associated with mental health outcomes in healthcare workers during a pandemic¹⁵ or the mental impact of COVID-19 on healthcare workers.^{16–18} Other studies have examined healthcare workers' well-being during the COVID-19 pandemic in China, finding workers experienced anxiety, depression and distress when treating patients.³ Similarly, in a meta-analysis that examined healthcare workers' mental health, the researchers determined that at least 20% of health professionals reported anxiety and depression symptoms, and 40% reported sleeping concerns.¹⁸

During crises such as a pandemic, healthcare workers' relationships with family members may be affected and predispose them to mental illness.^{5,19} Specifically, many healthcare workers face the dilemma of providing for family, while also putting their family at risk for disease spread secondary to consistent contact with ill individuals. A functional activity that may be affected is the extent to which healthcare workers participate in and prioritize their physical well-being due to lack of motivation or physical disability resulting from their mental illness.²⁰ Studies have found that anxiety and depression were increased among healthcare workers, including nurses and doctors who worked during severe acute respiratory syndrome (SARS)^{21–24} and the Middle East respiratory syndrome^{25,26} epidemics.

The objective of our study was to conduct a systematic review to identify factors associated with work performance of healthcare workers during a pandemic and a meta-analysis of the prevalence of mental health outcomes in this context.

Highlight

Working during a pandemic has deleterious effects on healthcare workers' work performance and mental health.

This study has identified nine factors associated with lower work performance and mental health. The impact of the coronavirus disease 2019 pandemic demonstrates the urgent need to evaluate the work performance and mental health of healthcare workers and to provide supports to improve their health and well-being.

Study Design

Systematic review and meta-analysis.

Methods

This systematic review is registered with the PROSPERO (ID CRD42020196615). We searched the following databases: Ovid Medline, Embase, PsychINFO, CINAHL, Web of Science, Scopus and ProQuest. We used the Population/Intervention/Comparison/Outcome framework to refine, improve and finalize our search strategy (Appendix B). The databases were searched from January 2000 to September 2020.

Search strategy and study selection

The search criteria were confirmed with assistance from a health systems research librarian, and all articles chosen were published in English. Our approach complied with the requirements of each database used (Fig. 1), and our search strategy and keywords are included in Appendix A. Articles were retrieved on 28 September 2020.

Inclusion and exclusion criteria

The studies chosen for this review contained information regarding factors of work performance and mental health among healthcare providers working during a pandemic (e.g. SARS pandemic). For instance, they include factors associated with work performance and mental health of healthcare workers employed during pandemics and study characteristics (e.g. sample size, study design). The study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses²⁷ guidelines for the mapping and identifying records. Two reviewers accurately examined, collected and reported the data of each article. All of the studies included in the systematic review were stored in Covidence. Covidence is a web-based systematic review instrument designed to support the data collection, screening and evaluation of articles.^{28,29} Collectively, disputes and disagreements were examined by the team and consensus was achieved.

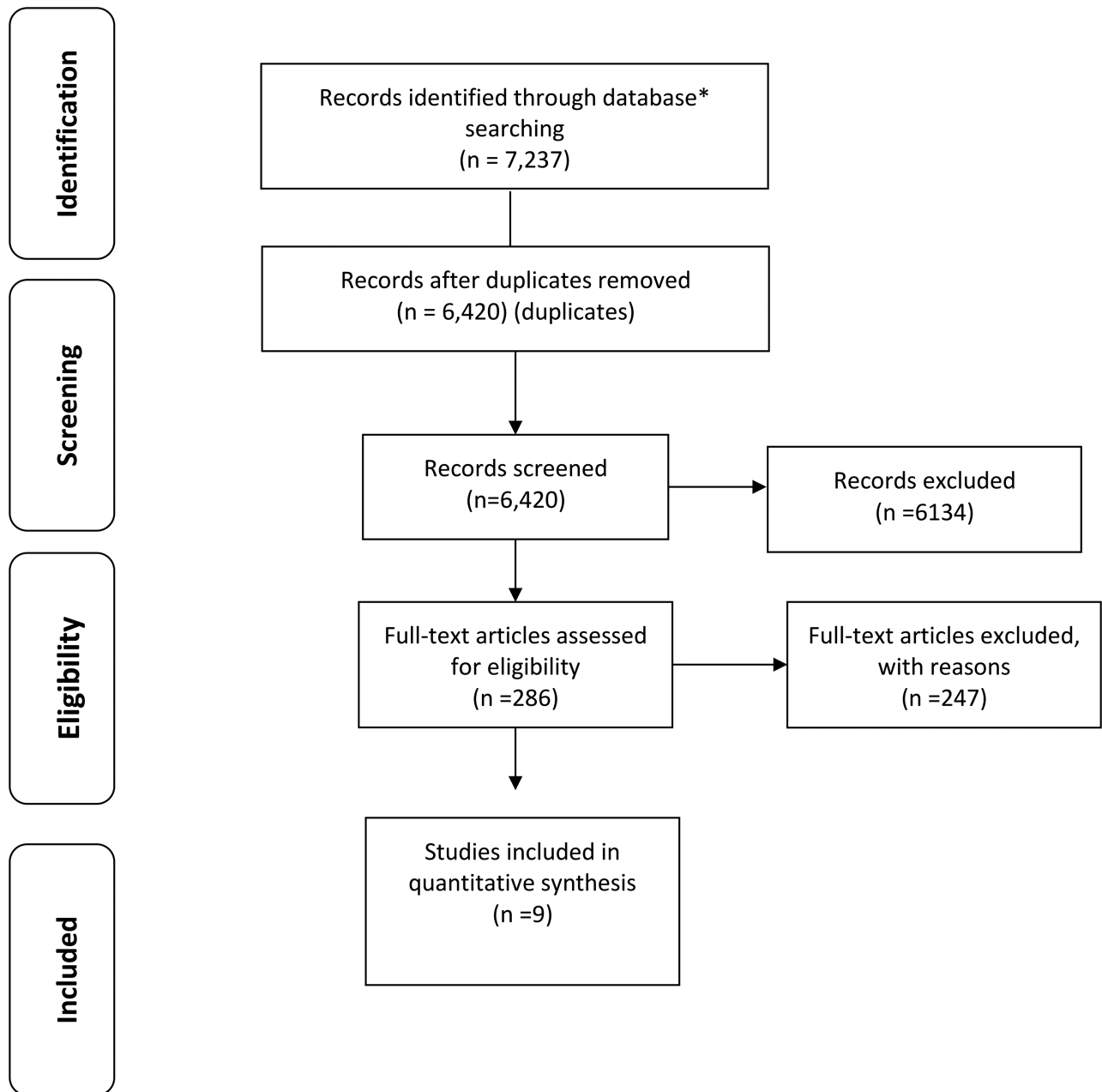


Fig. 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of the inclusion process. Asterisk indicates references included per database before removing duplicates: OVID (3956), Medline (637), EMBASE (501), PSYCINFO (903), CINAHL (163), Web of Science (891), Scopus (132) and ProQuest (54).

Critical appraisal of included studies

The Appraisal tool for Cross-Sectional Studies (AXIS tool) was used to assess the quality of cross-sectional studies.³⁰ The AXIS tool was developed through a robust process involving a Delphi panel.³⁰ The tool includes 20 questions across five domains. The first domain (e.g. introduction) includes one question; the second domain (e.g. methods) consists of 10 questions; the third domain (e.g. results) includes five questions; the fourth domain (e.g. discussion) includes two ques-

tions; and the final domain (e.g. other) includes two questions. Higher scores on the AXIS tool are reflective of higher quality studies.

Statistical analyses

A meta-analysis of proportions was tabulated using the data from the nine articles. The use of the arc-sine transformation was used to evaluate the variance of proportions using the Freeman–Tukey variant of the arc-sine square root

of transformed proportions procedure. The combined proportion of respondents who endorsed the specific mental health or functional outcome was tabulated as the back-transformation of the weighted average of the computed proportions, using inverse arc-sine variance weights for the random-effects model.³¹ This approach employed the DerSimonian–Laird weights for the random-effects model³¹ and assumed the studies’ heterogeneity was estimating different, yet associated intervention effects.³¹ The model uses an estimator that assumes the form $x_i = \mu = b_i + e_i$, where b_i is drawn from $N(0, \tau^2)$ and e_i is drawn from $N(0, \sigma_i^2)$.

The I^2 statistic was also tabulated as a measurement of the proportion of the overall variation in the proportion that was attributable to between-study heterogeneity. All analyses were conducted in R 4.02 (Windows), and ‘metafor’ (Version 2.4-0) package was used for the meta-analysis of proportions.^{32–34} The underlying assumption of the meta-analytic procedures assumed the findings were independent. We also conducted sensitivity analyses using the trim and fill non-parametric method.^{35–37}

Theoretical framework and definitions

This study used the International Classification of Functioning, Disability and Health (ICF) framework³⁸ to conceptualize the systematic review and meta-analysis results. The ICF permits the scientific basis for understanding health and disability by exploring the interconnectedness amongst body structure, activity, participation, and environmental and personal factors of an individual.³⁸ Specifically, it provides a standard nomenclature in describing health and work performance and comparing data across countries, healthcare disciplines and services.³⁸ Based on the ICF framework, included studies defined work performance based on productivity, workplace preparedness, employment income, fear of transmission and burnout/fatigue associated with working as a healthcare provider during pandemics. Studies that defined psychological well-being based on depression, anxiety, stress and inadequate support associated with working as a healthcare provider during pandemics were reviewed.

Results

Overall, nine studies were included.^{39–47} Following the critical appraisal and assignment of AXIS scores to all nine studies, each was assessed to develop a systematic review and meta-analysis of the impact of pandemics on healthcare providers’ work performance and mental health. The studies’ characteristics included sample size, study design, a summary of mental health and functional impact, and AXIS scores, which are

outlined in Table 1. AXIS scores for the nine studies ranged from 11 to 19, with a combined mean score of 16.7 (standard deviation [SD] = 2.40). The studies covered the geographic regions of Africa (South Africa), Asia (India, China and Pakistan), Europe (Scotland and Slovak Republic) and North America (Canada and USA).

The systematic review identified nine factors of pandemics that impact healthcare workers’ work performance and mental health. The nine factors were based on the results of both the qualitative and quantitative findings and include (a) depression,^{41,45,47} (b) anxiety,^{41,45,47} (c) inadequate support,^{39,41,43,44,46} (d) occupational stress,^{39,41,46,47} (e) productivity at work,^{39,40,44,46} (f) workplace preparedness,^{39,42,43} (g) financial concerns associated with income/daily living,^{39,42} (h) fear of transmission^{39,43,46} and (i) burnout/fatigue.⁴⁶ Five studies were associated with work performance and mental health outcomes,^{39,40,42,44,46} and four studies examined factors associated with mental health.^{41,43,45,47} Six factors (depression, anxiety, inadequate support, occupational stress, fear of transmission and burnout/fatigue) were associated with mental health outcomes. Three factors (inadequate support, workplace preparedness and financial concerns associated with income/daily living) examined work performance.

Meta-analyses regarding the impact of pandemics on mental health (Fig. 2), work performance (Fig. 3), and prevalence of mental health (e.g. depression, anxiety, stress) and impact on productivity after pandemics (Fig. 4) of healthcare providers were conducted. The prevalence of deleterious mental health outcomes for healthcare providers working during a pandemic was 46.1% (95% confidence interval [CI], 0.306–0.620; $I^2 = 0.97$). The prevalence of affected work performance among healthcare providers working during a pandemic was 41.6% (95% CI, 0.270–0.571; $I^2 = 0.97$). The prevalence of depression, anxiety, stress and affected productivity among healthcare providers occurring after a pandemic was 39.3% (95% CI, 0.185–0.623; $I^2 = 0.99$).

Discussion

Main findings

Guided by the ICF, we conducted a systematic review to identify factors associated with work performance of healthcare workers during a pandemic and conducted a meta-analysis of the prevalence of mental health outcomes in this context. Our results revealed nine factors related to healthcare workers’ work performance (inadequate support, workplace preparedness and financial concerns associated with income/daily living) and mental health: depression, anxiety, inadequacy, occupational stress, productivity at work, workplace

Table 1 Characteristics and factors associated on the mental health and work performance of healthcare workers during a pandemic

Authors	Sample size; period of years examined; study design	Factors associated on the mental health and work performance of healthcare workers	AXIS grade
Allen and Cug ³⁹ , Scotland	N = 740; 04, 2020; cross-sectional study	Functional and mental health: adequate protection, access to support, workplace preparedness, stress, workload/hours and public attitude	11
Amin ⁴⁰ , Pakistan	N = 250; 02–04, 2020; cross-sectional study	Functional and mental health: stress, physical and psychological tension, corona phobia	15
Chatterjee <i>et al.</i> ⁴¹ , India	N = 152; 03–04, 2020; cross-sectional study	Functional and mental health: depression, stress, anxiety, knowledge, attitude and other practice characteristics	18
Ekberg <i>et al.</i> ⁴² , USA	N = 87; 2009; cross-sectional study	Functional and mental health: uncertainty, affected working situations and preparedness	15
Maunder <i>et al.</i> ⁴³ , Canada	N = 19; 03–04, 2003; cross-sectional study	Functional and mental health: uncertainty, probability of personal danger, social support and connectivity, physical well-being, infection	18
McMahon <i>et al.</i> ⁴⁴ , USA	N = 35; 12, 2014–01, 2015; cross-sectional study	Functional and mental health: restrictions to accessing many services, i.e. travel, restaurants, medical services, fear, changes to facility routines and practices, stigmatized by family and community	18
Ni <i>et al.</i> ⁴⁵ , China	N = 214; 02, 2020; cross-sectional study	Functional and mental health: close contact with COVID-19, time spent on COVID-19 news via social media and perceived social support	18
Ramaci <i>et al.</i> ⁴⁶ , Italy	N = 273; 03, 2020; cross-sectional study	Functional and mental health: uncertainty, stigma discrimination, stigma fear, satisfaction, psychological job demand, self-efficacy, fatigue, burnout and potentially exposing their families to infection	18
Taylor ⁴⁷ , USA	N = 10; 2014–2015; cross-sectional study	Functional and mental health: depression, anxiety, personal thought, insomnia and suicidal ideation	19

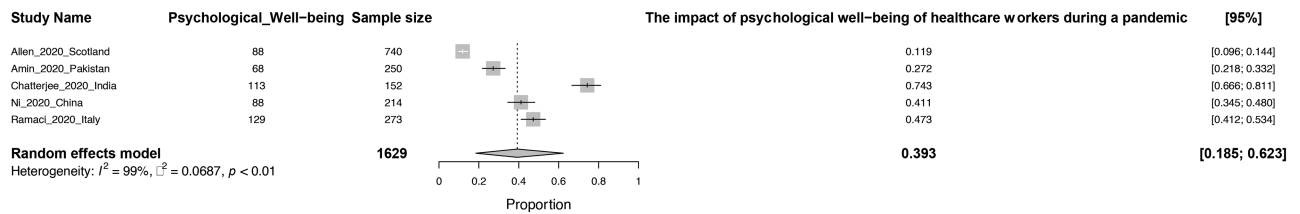


Fig. 2 The impact on psychological well-being on healthcare workers during a pandemic.

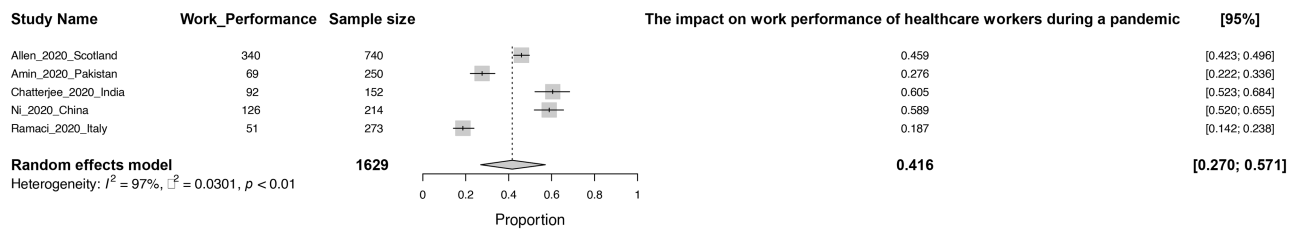


Fig. 3 The impact on work performance of healthcare workers during a pandemic.

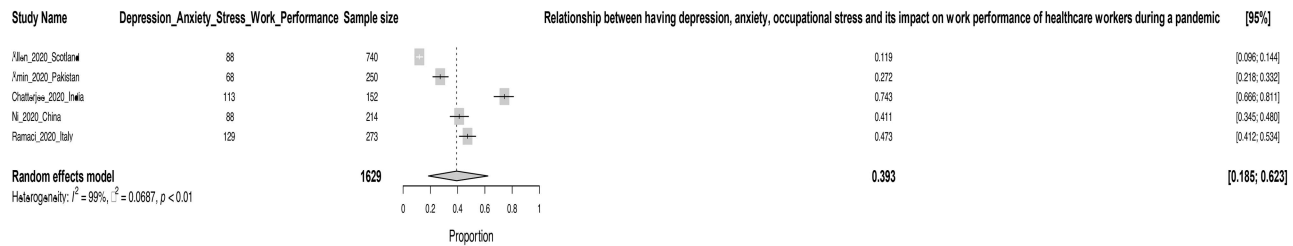


Fig. 4 The prevalence of depression, anxiety and stress and its impact on the work performance of healthcare workers during a pandemic.

preparedness, financial concerns with income/daily living, fear of transmission and burnout/fatigue.

What is already known on this topic?

The COVID-19 pandemic has raised significant concerns about its impact on healthcare workers' mental health.^{18,48} This is particularly important, given that healthcare workers are at risk of infection, fear of contagion, spread to loved ones and increased job-related stressors, including workload and work pace.⁴⁹ An international cross-sectional study of 41 countries found factors such as geographic location (working in USA or UK), caring for a COVID-19 positive who subsequently died and a lack of appropriate personal protective equipment were associated with depressive symptoms.⁵⁰

What this study adds?

Despite the alarming results with the COVID-19 pandemic, many of the concerns highlighted in our study and current literature might not necessarily be a direct outcome of the pandemic. Instead, negative mental health outcomes may be exacerbated during difficult times.⁵¹ A recent meta-analysis revealed that mental health concerns, poor work support, emotional exhaustion and increased work demands are among the leading causes of sickness, absenteeism and workplace disabilities in the nursing field.⁵² Sick leaves translate to job shortages, which leads to higher working demands and more sick leaves. Although these findings were based on a 'pre-COVID-19' work environment, they closely resemble the pandemic concerns.

Working in life-threatening conditions with increased job demands would likely increase occupational stress, fear of contamination and limit work support.⁵¹ Although it might be challenging to manage workload during unprecedented times, a focus on organizational/workplace factors is recommended. This could include establishing supportive leadership teams and positive workplace environments in addressing work performance issues.⁵³ Effective management of work performance needs of healthcare workers require that organizations develop policies, programmes, services and practices that advance the organization's goals and are aligned with the

unique job responsibilities of healthcare workers during public health crises.

Promoting healthcare workers' mental health is a priority for organizations (e.g. employers) and governments.⁵⁴ Furthermore, the long-term impacts of the COVID-19 pandemic on healthcare workers may lead to long-lasting and harmful mental health outcomes. Therefore, our study has identified work performance and mental health outcomes that employers and governments should prioritize to protect healthcare workers' mental health and well-being. Healthcare workers should be afforded access to mental health services and work within a work environment that fosters a culture of psychological health and safety.⁵⁵ Work performance should be promoted through a strategy that emphasizes prevention and identifies risk factors to work performance and mental health. Organizations must implement structures and practices in the work environment that are aligned with work performance.

Limitations

There were some limitations to this study that are important to consider when interpreting findings. Methodologically, publication bias is often an inherent threat.⁵⁶ To mitigate this concern, we reviewed unpublished documents and dissertations. Furthermore, the results pooled into the meta-analysis were cross-sectional and only used publications in English. Given the study design limitation, we cannot confirm that the identified factors are directly related to the pandemic.

Conclusion

COVID-19 has increased the need for governments and employers to develop strategies to support healthcare workers' mental health, well-being and work productivity. The growth of information and communication technologies, including telehealth, can meet this growing demand. Regular, innovative and timely interventions that address mental health issues experienced by healthcare workers during times of crisis can support, sustain and foster a healthy and robust workforce.

Authors' Contributions

BNK participated in the study design. GS, MO and NN collected data for this study. BNK participated in the analysis and wrote this paper with contributions from GS, MO, NN and BG. All authors reviewed the final version of the paper and supported this publication.

Funding

None declared.

Conflict of Interest

None declared.

Ethics

This is a systematic review and meta-analysis and does not require an ethics review at our institution.

Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Availability of Data and Material

The data used for analyses is presented in the paper.

Code Availability

Not applicable.

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Appendix A

PubMed

(mental health and mental wellbeing) AND (health*care pro* or healthcare pro* or clinician*) AND (COVID* or corona* or pandemic or H1N1 or Ebola or MERS or SARS)

OVID

[Embase, APA PsycInfo, Healthstar, AMED (Allied and Complementary Medicine), Joanna Briggs Institute EBP Database, International Pharmaceutical Abstracts, Health and Psychosocial Instruments, Mental Measurements Yearbook, Journals@Ovid Full Text, Books@Ovid, CAB Abstracts, NASW Clinical Register, Social Work Abstracts, International Index to Film Periodicals, International Index to TV Periodicals, List of Periodicals Indexed, Treasures from the Film Archives, Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily and Versions(R)]

[(mental adj1 wellbein*).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] OR [(mental adj2 wellbeing*).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]] AND [(mental adj1 health*).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] OR (mental adj2 health).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]] AND [exp Adult/or exp Health Knowledge, Attitudes, Practice/or exp

Adolescent/or exp Male/or exp Health Personnel/or exp Female/or exp Humans/or exp Middle Aged/] AND exp Coronavirus Infections/or exp Pandemics/or COVID*.mp]

EBSCOhost

(physical health or physical wellbeing) OR (mental health or mental wellbeing) AND (health* care pro* or healthcare pro* or clinician*) AND (COVID* or corona* or pandemic or H1N1 or Ebola or MERS or SARS)

ProQuest

(mental health OR mental wellbeing) AND (health* care pro* OR healthcare pro* OR clinician*) AND (COVID* OR corona* OR pandemic OR H1N1 OR Ebola OR MERS OR SARS)

Scopus

(ALL (mental AND health OR mental AND wellbeing) AND ALL (health* AND care AND pro * OR healthcare AND pro* OR clinician*) AND ALL (covid* OR corona* OR pandemic OR h1n1 OR ebola OR mers OR sars))

Web of Science

TOPIC: (mental health or mental wellbeing) AND TOPIC (health* care pro* or healthcare pro* or clinician*) AND TOPIC: (COVID* or corona* or pandemic or H1N1 or Ebola or MERS or SARS)

Appendix B—Population, Intervention, Comparison and Outcome (PICO)

The PICO tool was used to support and improve our search strategy for our question: what factors are associated with mental health and work performance of healthcare workers during pandemics?

Patients—workers (18+ years) who were employed as a healthcare worker during a pandemic.

Intervention—not applicable.

Comparison—not applicable.

Outcome—work performance and mental health outcomes related to working during a pandemic for healthcare workers.