

Psychological impact of COVID-19 on healthcare workers: prevalence systematic review

Impacto psicológico da COVID-19 nos profissionais de saúde: revisão sistemática de prevalência
Impacto psicológico de la COVID-19 en los profesionales de la salud: revisión sistemática de prevalencia

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Keywords

Coronavirus infections; COVID-19; Mental health; Depression; Anxiety; Psychological distress; Health personnel

Descritores

Infeções por coronavírus; COVID-19; Saúde mental; Depressão; Ansiedade; Angústia psicológica; Pessoal de saúde

Descriptorios

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Abstract

Objective: To synthesize the prevalence of psychological and mental health outcomes among healthcare professionals who are responsible for treating patients with COVID-19.

Methods: Systematic literature review. The literature search was carried out in the PubMed, CINAHL and Scopus databases. Studies written in English, Portuguese and Spanish and that were published between December 1st 2019 and July 31st 2020 were included. The systematic review was performed using fixed-effect meta-analysis of binary data with STATA®15.0 and inverse-variance method using Freeman-Tukey double arcsine transformation.

Results: The search strategy identified 38,657 records. Only five of those studies were selected and were included in the final review corpus. The meta-analysis conducted showed that the prevalence of depression reached 27.5% (95%CI=25.9-29.3; $p<0.001$), the prevalence of anxiety was 26.8% (95%CI=25.1-28.5; $p<0.001$), that of insomnia 35.8% (95%CI=33.8-37.9; $p=0.03$) and the prevalence of stress amounted to 51.9% (95%CI=49.6-54.3; $p<0.001$). Three of the studies included in the review show that healthcare professionals have also reported significant levels of vicarious traumatization, posttraumatic stress, somatization, and obsessive-compulsive symptoms.

Conclusion: The COVID-19 pandemic is found to have a very significant psychological impact on healthcare workers and is quite likely to lead to an important prevalence of depression, anxiety, insomnia, and stress. Frontline healthcare professionals are a particularly vulnerable group and deserve special attention/intervention.

Resumo

Objetivo: Sintetizar a prevalência de resultados psicológicos e de saúde mental dos profissionais de saúde que tratam doentes com COVID-19.

Métodos: Revisão sistemática da literatura. A busca dos estudos foi realizada nas plataformas PubMed, CINAHL e Scopus. Foram incluídos estudos em língua inglesa, portuguesa e espanhola, com data de publicação de 1 de dezembro de 2019 até 31 de julho de 2020. A revisão sistemática foi realizada com meta-análises binárias de efeito fixo de prevalência utilizando-se o STATA®15.0 e método do inverso da variância com transformação Freeman-Tukey double arcsine.

Resultados: A estratégia de pesquisa identificou 38.657 registos, dos quais apenas cinco estudos foram selecionados e integraram o corpus final da revisão. A meta-análise de prevalências para a depressão foi de 27,5% (IC95%=25,9-29,3; $p<0,001$), ansiedade 26,8% (IC95%=25,1-28,5; $p<0,001$), insônia 35,8%

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(IC95%=33,8-37,9; $p=0,03$) e estresse 51,9% (IC95%=49,6-54,3; $p<0,001$). Em três dos estudos incluídos os profissionais de saúde relataram níveis de trauma vicário adicionalmente importante, estresse pós-traumático, somatização e sintomas obsessivo-compulsivos.

Conclusão: A pandemia da COVID-19 apresenta um impacto psicológico muito significativo nos profissionais de saúde, assumindo importantes prevalências de depressão, ansiedade, insônia e estresse. Os profissionais de saúde da “linha de frente” são uma população particularmente vulnerável e merecem especial atenção/ intervenção.

Resumen

Objetivo: Sintetizar la prevalencia de resultados psicológicos y de salud mental de los profesionales de la salud que tratan enfermos de COVID-19.

Métodos: Revisión sistemática de la literatura. La búsqueda de los estudios fue realizada en las plataformas PubMed, CINAHL y Scopus. Se incluyeron estudios en idioma inglés, portugués y español, con fecha de publicación entre 1 de diciembre de 2019 y 31 de julio de 2020. La revisión sistemática fue realizada con metaanálisis binarios de efecto fijo de prevalencia mediante la utilización del STATA®15.0 y el método del inverso de la varianza con transformación Freeman-Tukey double arcsine.

Resultados: A través de la estrategia de investigación se identificaron 38.657 registros, de los cuales solo cinco estudios fueron seleccionados e integraron el corpus final de la revisión. El metaanálisis de prevalencias de la depresión fue del 27,5 % (IC95 % = 25,9-29,3; $p<0,001$), ansiedad 26,8 % (IC95 % = 25,1-28,5; $p<0,001$), insomnio 35,8 % (IC95 % = 33,8-37,9; $p=0,03$) y estrés 51,9 % (IC95 % = 49,6-54,3; $p<0,001$). En tres de los estudios incluidos, los profesionales de la salud relataron niveles importantes de trauma vicario, estrés postraumático, somatización y síntomas obsesivo-compulsivos.

Conclusión: La pandemia de COVID-19 presenta un impacto psicológico muy significativo en los profesionales de la salud, con importantes prevalencias de depresión, ansiedad, insomnio y estrés. Los profesionales de la salud de la “línea de frente” son una población particularmente vulnerable y merecen especial atención/intervención.

Introduction

Since December 2019, the 2019 Coronavirus outbreak (COVID-19), that was identified in the city of Wuhan in China, has brought healthcare systems across the world to the brink of collapse,⁽¹⁻³⁾ has increased drastically healthcare professionals' workload and has put extraordinary stress on these workers.⁽⁴⁻⁶⁾

On January 30th, 2020, the World Health Organization declared that the outbreak constitutes a public health emergency of international concern. Later on, on March 11th, 2020, the outbreak was characterized as a pandemic, primarily because of the virus' highly infectious nature and because of its exponential growth rate.⁽⁷⁾

COVID-19 first seemed to be less virulent compared to other viruses, yet its long incubation period can give rise to a significant number of asymptomatic and pre-symptomatic carriers.⁽⁸⁻¹⁰⁾ The number of confirmed cases has been steadily growing worldwide, and eight months after the outbreak, more than 126 million cases and more than 2.7 million deaths have been reported.⁽¹¹⁾

Healthcare workers have been working effectively against COVID-19, facing a substantial risk of contracting the disease (called SARS-CoV-2), with enormous personal and professional sacrifices.^(4,5,12,13) Due to asymptomatic transmissions that

increase the risk of hospital-acquired infection and exposure, healthcare workers are a particularly high-risk population.⁽¹⁴⁾

On the other hand, these professionals who have been directly engaged in the diagnosis, treatment, and care for patients with COVID-19, (commonly referred to as “frontline” professionals), have to face extremely demanding situations that threaten their professional resilience.

The stress and emotional conflict experienced throughout this period can be caused by factors such as increased workload, the lack of personal protection and of other kinds of equipment, the long periods that these workers have to spend away from their family, the relentlessly increasing number of infection cases and deaths, the pressure from the different news networks and social media and the fact that healthcare workers are at high risk of infection, among many others.^(4,5,12,13) This has had a profound impact on a wide range of psychological and mental health outcomes.

Since the evidence related to this particular area was highly dispersed, our aim was to synthesize the information on the prevalence of psychological and mental health outcomes among healthcare professionals who are responsible for treating patients with COVID-19. To achieve such a goal, the following research question was designed: What kind of psychological impacts did direct involvement

with COVID-19 patients have on healthcare workers? For this purpose, we defined “psychological and mental health outcomes” as any acquired psychiatric disorder such as anxiety, depression, stress, or insomnia, among others.^(4,5,12,13)

A preliminary search conducted on July 1st, 2020, through JBI Database of Systematic Reviews and Implementation Reports, Cochrane Database of Systematic Reviews, PROSPERO and PubMed revealed that there was no evidence of any other published or ongoing systematic review on this matter.

Methods

The systematic review and meta-analysis of the prevalence and incidence followed the Joanna Briggs Institute method⁽¹⁵⁾ and was carried out in strict accordance with the Preferred reporting items for systematic reviews and meta-analyses (PRISMA).⁽¹⁶⁾

The review protocol was carried out and followed by the authors but was not published and/or registered. However, it may be sent upon request.

The search was conducted on July 31st, 2020, through the PubMed, CINAHL and Scopus platforms. Studies written in English, Portuguese and Spanish published between December 1st 2019 and July 31st 2020 were included. The choice of this time interval had to do with the COVID-19 pandemic's onset, since the first studies focusing on such issue only became available after the virus was identified.

Those were the inclusion criteria considered:

- **PARTICIPANTS:** All studies with references to healthcare professionals who had been in contact with/had been treating patients with COVID-19 were considered.
- **CONDITION:** Psychological and/or mental health disorders acquired during the COVID-19 pandemic: particularly issues involving anxiety, depression, stress and insomnia.
- **SETTING:** No restrictions were established, and studies may focus on inpatient or outpatient care services, among others.
- **TYPE OF STUDIES:** Quantitative studies, namely non-randomised primary studies, and

mixed studies that will allow quantitative data to be extracted separately.

The search strategy carried out in Pubmed was: “((((((COVID-19[Title/Abstract]) OR (coronavirus*[Title/Abstract]) OR (SARS-CoV-2[Title/Abstract])) AND (“depression”[MeSH Terms]) AND (“anxiety”[MeSH Terms]) OR (Insomnia[Title/Abstract]) OR (distress[Title/Abstract]) OR (stress*[Title/Abstract]) OR (“mental health”[MeSH Terms])) AND (((healthprofessional*[Title/Abstract]))) OR (nurs*[Title/Abstract])) OR (physician*[Title/Abstract]))”. This strategy was adapted to the specific glossaries used by the other databases.

Once the search was completed, all identified citations were transferred to Endnote V7.7.1 (Clarivate Analytics, PA, USA) and duplicates were removed. Titles and abstracts were reviewed by two independent reviewers (LS and JA) in order to assess their eligibility. Reviewers failed to reach full agreement, so a third reviewer (ES) was included and served as a tie-breaker. Endnote V7.7.1 was also used as a tool to record single-blind reviews. Once duplicates were removed, the articles were distributed to the reviewers for independent selection and after this procedure the libraries were reconciled so that the concordance of the selection could be analysed.

Quality assessment of the studies was carried out by two independent reviewers (LS and JA) using the “Checklist for Prevalence studies”.⁽¹⁷⁾ This instrument includes the following questions(Q): Q1. Was the sample appropriate to address the target population? Q2. Were study participants recruited in an appropriate way? Q3. Was the sample size adequate? Q4. Were the study subjects and setting described in detail? Q5. Was data analysis conducted with sufficient coverage of the identified sample? Q6. Were valid methods used for the identification of the condition? Q7. Was the condition measured in a standard and reliable way for all participants? Q8. Was there appropriate statistical analysis? Q9. Was the response rate adequate, and if not, was the low response rate managed appropriately? Possible answers include yes, no, or not applicable/unclear. Percentages are calculated for each question by us-

ing the following formula: %Yes = number of “yes” responses / number of studies. A 100% rate indicates complete and absolute fulfilment of the quality criterion assessed by the question. The higher the percentage, the higher the quality.⁽¹⁷⁾ Failing consensus, a third reviewer (ES) was included as a tie-breaker. Once the critical appraisal was conducted, all studies were included regardless of the results. However, the results of the critical appraisal were considered in the evidence synthesis and reported in narrative and table form.

Data were extracted by two independent reviewers (LS and JA) and a data collection instrument specially designed for this purpose was used by the authors to minimise the risk of bias. The lack of agreement between the reviewers was solved with the presence of a third reviewer (ES). The results were grouped in a table and included in the narrative synthesis.

Finally, prevalence fixed-effect meta-analyses of binary data were performed using STATA®15.0 and inverse variance method with Freeman-Tukey double arcsine transformation. Heterogeneity was assessed with the help of chi-square and *I*² tests. Statistical analyses included random effect models when heterogeneity was found to be moderate to high (*I*²>50%) and fixed effect models when there was no heterogeneity.⁽¹⁸⁾

Results

The search strategy identified a total of 38,657 records. 963 of them were duplicates. After reading all titles and abstracts, 37,602 were excluded as they did not specifically refer to the topic under study. The remaining articles (n=92) were read in full and assessed according to the inclusion criteria previously set. This procedure led to the exclusion of 87 of those articles, mostly due to aspects related to the participants’ characteristics and to the conditions previously defined. The 5 articles selected in this process were submitted to critical appraisal and formed the final corpus of the review. Only 3 articles were included in the meta-analysis due to statistical heterogeneity. Figure 1 shows the flowchart that summarises the process of study selection and inclusion.

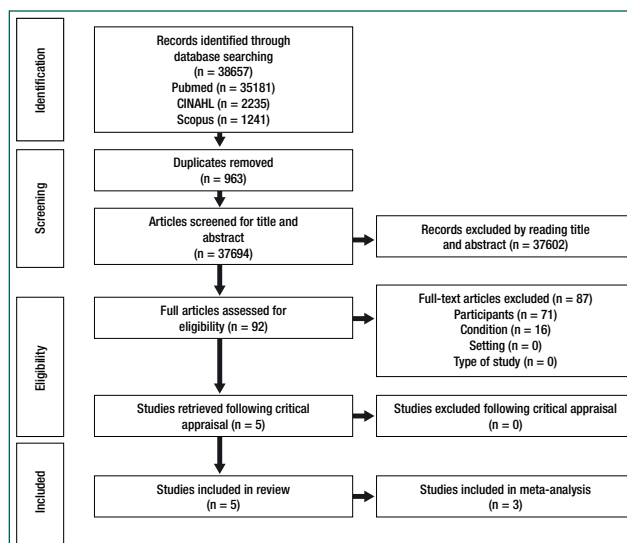


Figure 1. Flowchart of study selection and inclusion process

The results of the critical appraisal are summarised in chart 1. The reviewers agreed to include the five assessed studies, since they were all considered of high quality.

Chart 1. Results of the critical appraisal of the retrieved studies

Studies	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Lai et al., 2020 ⁽⁴⁾	Y	Y	Y	Y	Y	Y	Y	Y	Y
Li et al., 2020 ⁽⁵⁾	Y	Y	Y	Y	Y	Y	Y	Y	Y
Xiao et al., 2020 ⁽⁶⁾	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tan et al., 2020 ⁽¹²⁾	Y	Y	Y	NA	Y	Y	Y	Y	Y
Zhang et al., 2020 ⁽¹³⁾	Y	Y	Y	Y	Y	Y	Y	Y	Y
% Yes	100	100	100	80	100	100	100	100	100

Y - Yes; N - No; NA - Not/Applicable or unclear

All the studies included are observational and cross-sectional studies whose main features were summarised in chart 2. There were no external funding sources for any of the studies included.

Meta-analysis

A prevalence fixed-effect meta-analysis of binary data was performed for three studies^(4, 12, 13) and a sample of 2,654 healthcare professionals was used. The pooled prevalence for depression was 27.5% (95% CI=25.9-29.3; p<0.001), for anxiety 26.8% (95% CI=25.1-28.5; p<0.001), for insomnia 35.8% (95% CI=33.8-37.9; p=0.03) and for stress 51.9% (95% CI=49.6-54.3; p<0.001). The results of meta-analysis per outcome (depression, anxiety, insomnia, and stress) are presented in figure 1.

Since the studies included in the meta-analysis are of high quality, there is no impact on the choice

Chart 2. Characteristics of the studies included in the review.

Study/ Country	Type of study	Population/ Setting	Condition	Results	Conclusions
Lai et al., 2020 ⁽⁴⁾ (China)	Cross-sectional study	1257 healthcare workers (39,2% physicians e 60,8% nurses) / hospital	Depression, anxiety, insomnia, and distress	- Prevalent symptoms were: depression (50,4%), anxiety (44,6%), insomnia (34,0%), and distress (71,5%). - Frontline healthcare workers were associated with higher risk of symptoms of depression (OR=1,52; 95% CI,1,11-2,09; $p=0.01$), anxiety (OR=1,57; 95% CI,1,22-2,02; $p<0.001$), insomnia (OR=2,97; 95% CI,1,92-4,60; $p<0.001$), and distress (OR=1,60; 95% CI,1,25-2,04; $p<0.001$).	- Participants reported experiencing psychological burden, especially nurses, women, those who were in Wuhan, and frontline healthcare workers who were directly engaged in the diagnosis, treatment and care for patients with COVID-19. - Special interventions meant to promote mental well-being have to be implemented at once.
Li et al., 2020 ⁽⁵⁾ (China)	Cross-sectional study	526 nurses e 214 general public/ hospital	Vicarious traumatization	- Vicarious traumatization scores (including scores for physiological and psychological responses) for frontline nurses were significantly lower than those of non-frontline nurses ($p<0,001$). - Vicarious traumatization scores for the general public were found to be significantly higher than those of frontline nurses ($p<0,001$); however, no statistical difference was observed compared with those of non-frontline nurses ($p>0,05$).	- Increased attention should be paid to the psychological problems of healthcare workers, especially to non-frontline nurses and to general public affected by the COVID-19 pandemic. - Early strategies meant to prevent and treat vicarious traumatization in healthcare workers and general public are highly necessary.
Xiao et al., 2020 ⁽⁶⁾ (China)	Cross-sectional study	180 medical staff/ hospital	Anxiety, insomnia, stress, social support, and self-efficiency.	- The level of social support for medical staff was significantly associated with self-efficiency and sleep quality and negatively associated with levels of stress and anxiety. - Levels of anxiety were significantly associated with the levels of stress and had a negative impact on self-efficiency and sleep quality. - Anxiety, stress, and self-efficiency were mediating variables related to social support and sleep quality.	- Medical staff had levels of anxiety, stress and self-efficiency that were dependent on sleep quality and social support.
Tan et al., 2020 ⁽¹²⁾ (Singapore)	Cross-sectional study	470 healthcare workers (296 medical healthcare staff and 174 nonmedical healthcare personnel) / hospital	Depression, anxiety, and stress	- 14.5% of the participants showed anxiety, 8.9% showed signs of depression, 6.6% of stress and 7.7% symptoms of posttraumatic stress disorder. - The prevalence of anxiety was higher among nonmedical healthcare personnel (20.7% vs 10.8%; adjusted prevalence ratio= 1,85; 95% CI,1,15 a 2,99; $p=0,01$). - Higher mean anxiety scores for anxiety and impact of events were observed in nonmedical healthcare workers.	- Nonmedical healthcare workers were at highest risk for psychological distress during the COVID-19 outbreak. - The implementation of early psychological interventions aimed at this vulnerable group may be beneficial.
Zhang et al., 2020 ⁽¹³⁾ (China)	Cross-sectional study	2182 healthcare workers (927 medical healthcare professionals and 1255 nonmedical healthcare workers) / hospital	Insomnia, anxiety, depression, somatization, and obsessive-compulsive symptoms.	- Compared with nonmedical healthcare workers, medical healthcare professionals had a higher prevalence of insomnia (38.4 vs 30.5%, $p<0.01$), anxiety (13.0 vs 8.5%, $p<0.01$), depression (12.2 vs 9.5%, $p<0.04$), somatization (1.6 vs 0.4%; $p<0.01$), and obsessive-compulsive symptoms (5.3 vs 2.2%; $p<0.01$). - Living in rural areas, being female, and being at risk of contact with COVID-19 patients were the most common factors for insomnia, anxiety, obsessive-compulsive symptoms, and depression ($p<0.01$ or 0.05).	- During the COVID-19 outbreak, medical healthcare workers had psychosocial problems and risk factors that would help develop those problems.

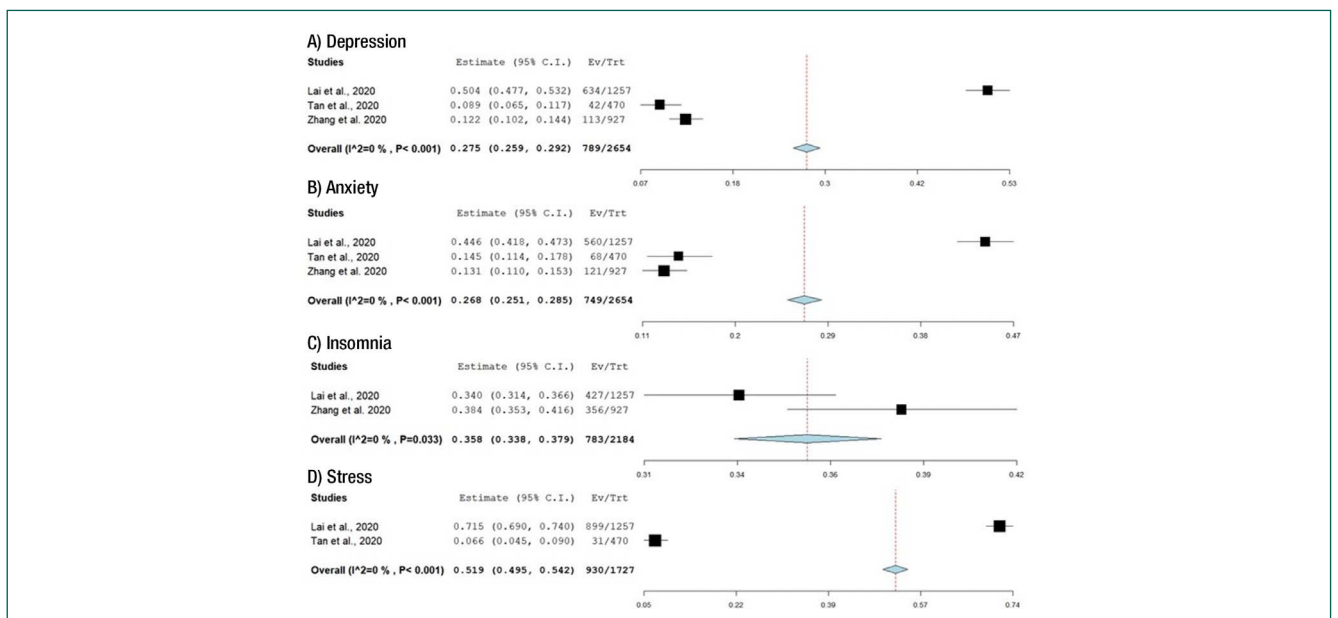


Figure 1. Meta-analysis per outcome

of meta-analysis models and/or assumptions. We found no heterogeneity between the retrieved studies ($I^2=0\%$), which confirms the use of fixed-effect models for all analyses. The analysis of publication bias was not carried out since we could not find at least 10 studies to carry out the funnel plot.⁽¹⁹⁾

Discussion

The potential psychological and mental health impact that direct contact with COVID-19 patients has on healthcare professionals is widely recognized today,^(4,5,12,13) however there is no concordance among studies. This finding led to this systematic literature review that, for the first time, was able to synthesise the prevalence of the main outcomes and provide relevant recommendations to be used in clinical practice.

The meta-analysis of prevalence for depression was 27.5%, for anxiety 26.8%, for insomnia 35.8% and for stress 51.9%. Additionally, three of the retrieved studies showed that healthcare professionals have reported significant levels of vicarious traumatization,⁽⁵⁾ posttraumatic stress symptoms,⁽¹²⁾ somatization and obsessive-compulsive symptoms.⁽¹³⁾

These results clearly demonstrate that healthcare professionals are a group that is particularly susceptible to experiencing psychological problems. But it remains to be seen whether or not this reality is more prevalent in the so-called frontline services, since studies tend to provide discrepant results and conclusions.^(4,5) On the other hand, being a nurse, being female and the presence of comorbidities are apparently major risk factors for psychopathology.^(4,5,12) However, this finding also requires further confirmation.

Considering the prevalence of the aforementioned psychological problems, the fact that a safe, effective and lasting treatment for the COVID-19 virus is yet to be found,⁽²⁰⁾ and that the effects of widespread vaccination are yet to be felt, it can be expected that healthcare workers will continue to be affected by psychological problems that are likely to get worse due to continued exposure. The development of early psychological interventions meant

to promote healthcare workers' mental health and resilience, and psychological treatment where necessary, should therefore be a priority.^(4-6,12,13)

The strengths of this systematic review included strict inclusion criteria, the selection of high-quality studies and a set of thorough procedures used for data extraction and synthesis. However, this review has some limitations as well: the studies included focus on a single country (China), the publication language or the fact that the search strategy used only 3 databases. Still, these limitations are understandable because most of the studies focusing on the COVID-19 pandemic have been conducted in China, since this is the country where the pandemic was first identified. As for the number of databases used and for the fact that the study did not include grey literature, for instance, it should be noted that the studies conducted on COVID-19 were open access and/or published in open access repositories in PubMed to provide rapid access to science information. Finally, even though there are some studies focusing on the psychological impact of COVID-19 on the general public, these have not yet been synthesised and the results they provide are still vague. This fact makes it impossible to establish a "real risk condition" to be applied to healthcare professional, for the prevalence of impact obtained for these professionals cannot be compared with that of the general public.

Further research studies should include a systematic review that will allow us to synthesize the prevalence of psychological and mental health outcomes for the general public so that risk inferences can finally be established.

Conclusion

The COVID-19 pandemic has had a highly significant psychological impact on healthcare professionals' health and has become a leading cause of depression, anxiety, insomnia, and distress. Frontline healthcare workers are a particularly vulnerable group who deserves special attention/intervention. This work has clear implications for practice since we suggest the implementation of psychological in-

terventions, which should be made widely available and proactively promoted, and that will be crucial to protect this vital workforce and thereby ensure that they can continue to respond to the stressful and exhausting demands they are expected to fulfil for the sake of public health. As for research implications, conclusions demonstrate the need for further studies focusing on this topic in order to keep this systematic review fully updated.

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