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Risk factors for healthcare professionals' mental health during the COVID-19 pandemic: a systematic review

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Abstract *The aim of the present study was to map the available evidence on the mental health risk factors of frontline health professionals during the COVID-19 pandemic. This is a systematic review that followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria. The search was independently carried out by four researchers, following the selection criteria in the electronic databases: PubMed Central, Ovid Technologies, GALE Academic Onefile, Science Citation Index Expanded. The data processing used Zotero software, responsible for creating and importing items according to the criteria established by the research. A total of 18,733 articles were found, of which 2,722 were excluded by the Zotero software because they were in duplicate, and another 366 were manually excluded. After applying the selection criteria, 43 articles entered the final analysis of this review. It is recommended that new scientific research be carried out, especially focusing on the analysis of health workers' mental health, aiming at providing the basis to create and implement public mental health programs and policies for workers.*

Key words *Health professional, COVID-19, SARS-CoV-2, Mental health, Workers*

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Introduction

The outbreak of COVID-19 (acronym for coronavirus disease), originated in December 2019 in Wuhan, a city located in the Hubei province, in China. Due to the high transmissibility capacity of the coronavirus, it has spread all over the world, causing a major public health problem worldwide. Thus, on March 11, 2020, a global pandemic was declared by the World Health Organization (WHO)[1,2]. With the increase in the number of cases of people infected by the coronavirus, the health system experienced several problems due to the lack of scientific knowledge about the new disease, which had a high mortality rate[1].

With the arrival of the virus and its different mutations, health systems collapsed and faced great difficulties due to the lack of effective protocols to fight the virus and of scientific evidence-based treatments[2]. Also, the lack or the inadequacy of appropriate training in COVID-19 care teams regarding the prevention and control of infections resulted in a high number of contamination cases among health professionals. Moreover, the lack of personal protective equipment supply at the beginning of the pandemic made the situation of health workers who were on the frontlines of the fight against COVID-19 even more precarious.

Faced with the existing circumstances, which demanded great responsibility from health professionals and constituted a life-threatening situation, it is clear that it is necessary to be concerned about the possible impacts on the mental health of these professionals, especially those who were directly linked to coping with the pandemic, in the so-called frontlines. Therefore, it is important to carry out scientific research of the systematic review type, aiming to gather evidence from studies whose objective was to map the available evidence on risk factors for the mental health of health professionals working on the frontline during the COVID-19 pandemic.

Regarding the unprecedented character of this study, it was shown that at the time it was carried out, there were no reviews registered in the PROSPERO database addressing this subject. Emphasis is added on how the articles were categorized and on how the quality of the studies was assessed. PROSPERO is a free registration database for systematic review protocols. It should be noted that the scientific relevance of this database is internationally recognized and allows the identification of unpublished reviews, such as the present one, and also of outcome biases.

Method

This systematic review was performed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, according to the guidelines of the PRISMA committee[3]. The research was registered in the International Prospective Register of Systematic Reviews (PROSPERO) on April 26, 2021 under registration number CRD42021241088.

Eligibility criteria – study selection

The studies were selected using predefined criteria established by two lead researchers. For key question 1, the study sample/population consisted of health professionals who worked in the assistance and care of patients infected and diagnosed with COVID-19 and frontline workers in hospitals, clinics and/or rehabilitation and screening centers for COVID-19. For key question 2, the potential risk factors were demographic characteristics – assessed country and/or city, history of exposure, administrative factors – such as workload. Two researchers (BILB and MAXS) reviewed each selection stage of the studies included in this research and a judge's opinion (MMAS) was requested when there was no consensus among the researchers.

According to the PICOS model, the following eligibility criteria were adopted: Participants (P): health professionals who care for or assist patients with COVID-19 infection and workers who work on the frontlines of hospitals, clinics and rehabilitation and screening centers for COVID-19; Outcome (O): Prevalence of common mental disorders reported in studies; Study(S): cross-sectional, or longitudinal, or cohort (baseline data). Because it is a systematic review, not all questions were able to receive a satisfactory answer.

The following were considered as inclusion criteria: the article indexed in the selected databases, with complete availability – as free and full form – of the text; peer-reviewed journal articles; research published in English, Spanish and/or Portuguese; with date filter related to the years 2019 to June 1, 2021. No restrictions were assigned to the place where the manuscript was produced.

Information sources and search strategy

A search was carried out independently by four researchers, following the selection criteria

established by the PRISMA-2020 guideline. The following electronic databases were consulted: PubMed Central (PMC), OVID Technologies, OneFile (GALE) and Science Citation Index Expanded. Zotero software was used for data processing, responsible for creating and importing items according to the criteria established by the research team.

The terms used in the search were established by the Medical Subject Headings descriptors (MeSH Terms). A search was carried out in the literature based on the following descriptors: "Health professional" AND "COVID-19" OR "SARS-CoV-2" AND "Mental Health" AND "Workers". The variations in the descriptors were used to find a greater range of significant results for this research.

Data collection process

Data management, import, synchronization, and storage were performed using Zotero software. Data extraction was initially carried out by two authors and then analyzed and revised by a third researcher, independently and without intervention at the time of the extraction and, after the data analysis, in case of disagreement; consensus was reached through a discussion among the researchers, and a final arbiter was not necessary. The selection process for the research hierarchically included a three-stage data collection procedure, identifying relevant studies: (1) analysis and selection by title screening; (2) analysis and selection by reading the abstracts, and (3) analysis and selection by reading the full text of eligible studies.

Data list

All articles reached the maximum level of relevance to the outcome measures chosen for this research. To map the characteristics of the articles, the following variables were collected: title and year; analyzed group and professional category; type of study and sample; research objective; outcome measures; and, the main outcomes and limitations of the studies, as shown in Chart 1 (available from: https://drive.google.com/file/d/1L_9UvMQ5R329MYnfLFMErJIO_WNqMkjt/view?usp=sharing).

Synthesis methods

To assess the quality of the selected studies, two researchers participated in this process, by extracting data from the selected studies and organizing them into Chart 2 (available from: https://drive.google.com/file/d/1Jwi0Zfot8K9ldwhTN-Ptf8G3yzUvHlDl/view?usp=sharing) results that contain the quality assessment that was carried out based on the criteria determined by the National Heart, Lung, and Blood Institute (NHLBI).

Considering the importance of measuring the quality of studies in systematic reviews, the National Heart, Lung, and Blood Institute (NHLBI) developed a set of customized tools that guide this measurement, such as the Guidance for Assessing the Quality of Observational Cohort and Cross- Sectional Studies[4]. This tool consists of 14 items, and each one of them corresponds to a question, which can be answered with "yes", "no" or "not reported". In the tool, a score of 1 is attributed to each "yes" answer and zero to all other responses. Overall, the total study score would be the number of "yes" answers. Scores greater than 12 are considered "good," meaning the study has a low risk of bias. Scores that are lower than 9 are considered "average", which means that the study is considered as having acceptable quality. On the other hand, scores lower than 9 mean that the study is "reasonable"[5], that is, it has strengths and weaknesses, but has a significant risk of bias. For this study, only observational cohort articles were assessed for quality.

Results

Study selection

The initial search using the keyword database returned 18,733 potentially eligible articles, in the following search databases: Pubmed Central: 9,987, Ovid Technologies: 6,864, GALE Academic Onefile: 1,354, Science Citation Index Expanded: 528.

The search results are shown in Figure 1 – PRISMA 2020 flow diagram for new systematic reviews, which included searches in databases and registers only. After selecting the 18,733 articles, the records were imported using the Zotero program, where 2,722 duplicate articles were excluded and 366 were manually excluded, leaving a total of 15,645 records, of which a total of 5,679 were eligible for abstract screening. After abstract screening, 4,632 studies were excluded, leaving 1,047 articles for full-text screening, of which 1,004 articles were excluded after the screening of full articles, leaving 43 articles for

data extraction - selected and displayed in Charts 1 (available from: https:/ /drive.google.com/file/d/1L_9UvMQ5R329MYnfLFMErJIO_WNqMkjt/view?usp=sharing) and 2 (available from: https://drive.google.com/file/d/1Jwi0Zfot8K9ldwhTN-Ptf8G3yzUvHlDl/view?usp=sharing) and in Figure 1.

Overall characteristics of included studies and quality assessment

The eligible articles had an average NHLBI quality assessment score, namely: seven studies scored above 9, being considered average 9/5[27,38-40,44]; 10/1[26]; 11/1[33]. The studies considered reasonable were the vast majority 6/2[29,47]; 7/5[28,30,34-36]; 8/9[25,31,32,37,42-44,46,47]; all studies eligible for the NHLBI quality assessment are shown in Chart 2 (available from: https://drive.google.com/file/d/1Jwi0Zfot8K9ldwhTN-Ptf8G3yzUvHlDl/view?usp=sharing)

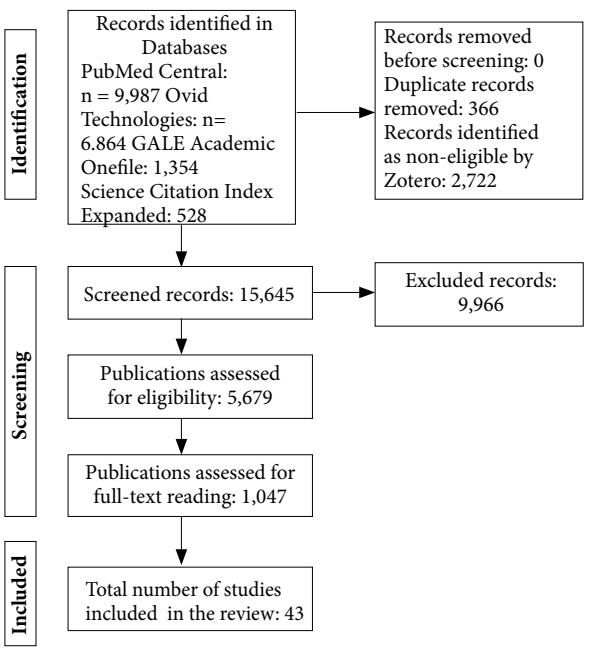

Figure 1. Identification of studies from databases and records.

Source: Page MJ et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021; 372:n71.

The research characteristics (analyzed group/professional categories; country of origin; objective) as well as the results of the study are shown in Chart 1 (available from: https://drive.google.com/file/d/1L_9UvMQ5R329MYnfLFMErJIO_WNqMkjt/view?usp=sharing). Regarding the methodological characteristics of the eligible studies, of these, 34 were cross-sectional studies[6-10,12-14,16-23,25-27,32-39,41-48], two were longitudinal studies[11,24], one was a comparative study[15], one was an observational cohort[28], one was an observational and descriptive cross-sectional study[30], one was an observational cross-sectional[31], and one was a prospective cohort study[40]. Of the 43 studies included, 42 were performed and published in 2020[6-8,10-48], and only one study was published in 2021[9].

Regarding the samples, the total number of the assessed population in the studies was 49,117. All studies had a detailed profile and studied population and most cross-sectional studies used non-probabilistic sampling methods. As for the demographic characteristics related to the origin of the studies, most of the them were Chinese (15), where the outbreak of COVID-19 started. However, studies were also carried out in Spain (4), the United States (3), Italy (3), Turkey (2), Germany (2), India (2), Japan (2), Saudi Arabia (2), Sri Lanka (1), Ghana (1), Ireland (1), France (1), United Kingdom (1), Russia (1), Oman (1) and Ethiopia (1).

The professional category most frequently reported in the studies was the nursing professional, followed by physicians, technical professionals, dentists, administration, cleaning and security workers.

Profile of the study population

The most frequently researched professional categories in the selected studies were Nurses and Physicians, and most of the studies pointed out these professionals experienced work overload, as reported in 37 studies[6-17,20-25, 27-32,34,36-48]. The assessed nursing professionals were mostly women[7,8,16,30,31,34,37,41,48]. The predictors for the emergence of mental disorders and/or mental suffering most often described in these 37 studies were: constant exposure to infected patients or carriers of the virus; lack of personal protective equipment; high possibility of contagion in the work environment; discomfort caused by continuous use of personal protective equipment; chronic shortage of health professionals; high workload day; lack of a more efficient global pol-

icy regarding infection control. These were the most impactful factors in the daily lives of these professionals.

Final selection: description of the risks to which health workers involved in the care of patients diagnosed with COVID-19 are exposed during the pandemic

During the final selection, 43 articles were included for full-text reading and data extraction. Four main risks to which health workers involved in the care of patients diagnosed with COVID-19 are exposed during the pandemic were highlighted, which were grouped into three categories, two that deal with the risks and a third that aims to describe the incidence of symptoms/mental disorders in the studied population, namely: i) description of the risks associated with the occupation and environment, ii) description of the risks associated with the lack of educational and training programs, and iii) description of the impact on the mental health of professionals: incidence of symptoms/disorders related to mental health described in the studies.

Description of the risks associated with the occupation and the work environment

With regard to issues involving work organization and lack of personal protective equipment, all 43 studies reported some type of PPE deficit, something that was considered a factor that increased the level of stress among health professionals.

Exposure to infected patients, mainly through work in high-risk departments/environments, such as the Intensive Care Unit (ICU) and other places with large circulation of contaminated fluids/aerosols, have been reported as an important risk factor for COVID-19 contamination among health professionals[8,19,21,28].

Fatigue, sleep and insomnia, which are related to working hours and work overload, were the main predictors for the onset of stress and anxiety at work[3,4,6,11,18,24,29,33,34]. Four studies showed data on this association, which resulted in lack of rest, sleep deprivation, insomnia and prolonged exposure to infected patients[4,6,18,34] as factors that led workers to stress.

The combined effects of stressors, viral load and environments that were unprepared to meet the needs to fight the virus were some of the items identified in the screening of the systematic review[8,23].

The findings by Chang et al.[8] showed that emergency department workers (31.64%) were more likely to contract COVID-19, when compared to healthcare professionals in the ICU (23.17%) and hospital admission environments (25.53%); these findings are related to the work environment and the organizational structure and education of each environment.

Description of the risks associated with the shortage of training and educational programs

Inadequate training of health professionals was a factor reported as a predictor of the emergence of mental disorders and/or mental suffering and, consequently, of COVID-19 contamination. The lack of adherence to infection control protocols, associated with the lack of a psychosocial support system, which would accompany workers outside work shifts, as well as training and updating of access and use of personal protective equipment, were also issues related to educational risks [29,39,43], increasing the possibility of mental disorders among the workers.

Description of the impact on the professionals' mental health: incidence of symptoms/disorders related to mental health described in the studies

The studies described a wide variety of findings on mental health effects. These effects, considered to be a result of the COVID-19 pandemic on the health workers' mental health, were grouped into two categories, namely: i) issues related to mental disorders, and ii) issues related to the work process.

Regarding the aforementioned symptoms/disorders, anxiety, depressed mood, insomnia, distress, emotional exhaustion, fatigue and/or obsessive-compulsive disorder (OCD) were the most frequently reported ones in the 43 analyzed studies[6-17,20-34,36-48].

In general terms, the proportion of severe to extremely severe symptoms of depression and anxiety was reported by 40% of the population assessed in this review, in 27 studies, allowing the understanding there is a significant association between the workers' contact and interventions with patients infected by COVID-19 and symptoms of anxiety and stress at work, respectively[6-10,12-17,23,24,26-30,32,33,37,41,44-48]. Psychological symptoms were evaluated across studies using different validated measures. To measure levels of

professional burnout, for example, the Maslach Burnout Inventory (MBI) was used[12-14,41]. These findings suggest marked differences in the prevalence of depressive symptoms among the studies assessed in this review.

Three cross-sectional studies, all from China, reported resilience, good preparedness of the professional team, good management of the health system, as well as good psychological coping capacity of professionals and management when facing public health emergencies as positive factors, which could prevent or alleviate the health professionals' mental illness[18,19,35].

Discussion

The SARS-CoV-2 pandemic was declared in March 2020 by the World Health Organization (WHO), putting more than 200 countries on alert. While the world was concerned about it and committed to saving lives, counting on the quality and speed of the health professionals' work who cared for the individuals diagnosed with the virus, the mental health of these workers was neglected[1,11-13,21,46,48-52].

A study carried out by the Oswaldo Cruz Foundation, which considered the Working Conditions of Health Professionals in the Context of COVID-19 in Brazil, had 25,000 participants and portrayed the reality of professionals who worked on the frontline, who described being marked by physical and mental pain, suffering and sadness, with strong signs of physical and mental exhaustion. In most cases, the work was carried out in strenuous environments, where the work and activity overload was a constant, as a way to compensate for the high degree of absenteeism that occurred. Moreover, the fear of contamination and imminent death were experienced on a daily basis, in actions marked by the risk of sequestration of the worker's rights (loss of labor rights, outsourcing, unemployment, loss of income, low wages, extra expenses with PPE purchases, alternative transport and food)[51].

Although most countries managed to control the COVID-19 pandemic over the last few years through vaccination, incipient research has addressed the mental/psychiatric health issues of health professionals who worked on the frontlines during the pandemic, and there are few studies with descriptions of the most frequently reported mental disorders/illnesses during the pandemic period. It is understood that the mental health dimension is an essential aspect that should be more valued in the universe of research performance in pandemic situations, understanding that these scientific studies are important documents for the creation and implementation of professional practices, organization, management and creation of public health and work policies.

The World Health Organization presented relevant data, warning that the first year of the COVID-19 pandemic caused an increase in the global prevalence of anxiety and depression, an increase of 25% of reported and diagnosed cases. These concerns with presumed increases in these conditions led 90% of the assessed countries to include mental health and psychosocial support in their plans to respond to COVID-19 in the workplace. However, there are still significant gaps and concerns related to the workers' health[50].

The Pan American Health Organization (PAHO) in 2022 highlighted the impact of COVID-19 on the mental health of the world's population as being only the tip of the iceberg. Therefore, the aforementioned organization pointed out that all countries (especially developing countries, which suffer more from economic issues and inequality in mental health care) need to consider mental health as an important element, because only then would it be possible to offer decent work, in terms of better support to the mental health of populations in pandemic periods[52].

The director of the WHO Department of Mental Health and Substance Use, in turn, underlined that even though the pandemic has generated interest and concern for mental health, a framework was revealed, related to the historical underinvestment in services that offered care focused on this issue[49,51,52]. Thus, countries need to act urgently, aiming to guaranteeing mental health support that is available to all, especially in the pandemic and post-pandemic periods[51].

Description of the risks associated with occupation and the work environment

Frontline workers, when facing the COVID-19 pandemic, were directly involved in the reception, care, embracement, diagnosis and treatment of individuals with COVID-19. The increasing numbers of confirmed cases in 2020 in Europe, Asia and America, and in the beginning of 2021, mainly in Latin America and Africa[49-52], increased the rates of contamination by different variants among health professionals. The wors-

ening of contamination associated with the high workload, insufficient beds and hospitals, lack of PPE, increased risk of infection for family members and the immediate community, in addition to the lack of adequate planning and support and inability to adhere to prevention strategies, contributed to the health professionals' mental overload[7,9,13,28-49]. Exposure to infected patients in areas of high flow and turnover of people, such as the intensive care unit (ICU) and places with high contamination due to contaminated fluids/aerosols, operating rooms and dental offices were shown as environmental risk factors for health professionals[13,24,26,33].

In 2021, the WHO released interim guidelines on health professionals' risk assessment and management in the context of COVID-19[49,52]. Guidance was offered to healthcare professionals and their workplace. The scarcity of personal protective equipment, an important issue always pointed out by the WHO, was widely reported in all 43 studies that were included in this review, in addition to the lack of trained and qualified professionals to act on the frontline in pandemics with still unknown viruses[8,19,21,28]. This review highlighted the importance of more effective and preventive measures to protect frontline health professionals, preventing psychological damage from the insecurity and fear of contracting a virus that had high lethality rates[3,4,6,11,18,24,29,33,34].

Description of the risks associated with the scarcity of training and educational programs

Regarding issues related to the number of working hours, the proximity between health professionals and infected patients, and training programs, the study by Rodríguez-Rey et al.[48] demonstrated that many frontline health workers in Spain suffered from depression and anxiety. Some of the reasons given in the study were prolonged exposure to the virus, with the lack of personal protective equipment, the fear of infecting family members and the lack of training of the medical team in relation to the spread of the disease, since frontline healthcare workers who treat patients with COVID-19 are likely to be at the highest risk of infection due to close and frequent contact with patients.

The study carried out by Croghan et al.[37] disclosed several forms of support and training programs for professionals in the work environment, as short and long-term processes of systematic interventions to mitigate stress for the health team. Moreover, the lack of training can lead to an increase in the rates of contamination among workers[3,4,6,11,18,24,29,33,34,51].

Reports of acute psychological impact and psychosocial risks were evidenced in study by Tan et al.[23] In addition, several other studies have reported high levels of distress, depression, anxiety, fear and frustration, as well as the need to establish follow-up programs for frontline workers[15-17,20,24,26,40,44].

Description of the effects on the professionals' mental health: incidence of symptoms/disorders related to mental health described in the studies

A study carried out in Brazil by Fiocruz[51] showed, among other aspects, severe and harmful consequences for the mental health of those who worked in the care of infected patients in critical moments of the pandemic. The most common alterations in their daily lives, mentioned by the professionals, were sleep disorders (15.8%), irritability/frequent crying/disorders in general (13.6%), inability to relax/stress (11.7%), difficulty concentrating or slow thinking (9.2%), loss of career or life satisfaction/sadness/apathy (9.1%), negative feelings about the future/negative thinking, suicidal thoughts (8.3%) and changes in appetite/weight alterations (8.1%).

The study by Trumello et al. [13] highlights that workers who worked directly with patients with COVID-19 had an increased risk rate for the development of stress, burnout, secondary trauma, depression and anxiety, and health professionals who worked in the geographical areas most affected by the virus, had a higher risk of developing burnout and stress, in addition to having low job satisfaction. The mental health of health professionals who worked on the frontline demanded greater attention than other professionals in the same health service, requiring the implementation and use of targeted prevention and intervention programs[13,15-20].

The prevalence of anxiety and depression among frontline health professionals showed higher indicators than health professionals who did not work on the frontline. Furthermore, nurses had higher rates of anxiety, insomnia and depression than physicians, dentists and other frontline professionals[7,8,16,30,31,34,38,41,48]. In a systematic review with meta-analysis, carried out by Sun et al.[50], significant levels of anxiety were identified among frontline workers, 37% (95%CI: 0.31-0.42, $I^2 = 99.9\%$) , further corrob-

orating other authors, in which the prevalence of depression and insomnia showed significant levels[8,9,11,16,23,29,34,38,39].

The study by Sun et al.[50] further triggered the structural crisis that the COVID-19 pandemic brought to the world of work, especially to work performed by women. In a subgroup analysis carried out in the aforementioned study, high rates of depression were displayed by female professionals, compared to male ones, who worked on the frontline, corroborating the findings in this review[7,8,16,30,31,34,38,41,48].

The results found in this review suggest that the intervention process in the work environment needs to be carried out early, aiming to reduce the high levels of adverse mental health problems in health professionals, especially regarding the incidence of anxiety. and depression[8-13,15-17,30,31,34,38,41,48].

There are numerous strengths and some limitations in the present review study, among which are the issues involving the division of professional categories that worked with patients with Covid-19, something that made the analysis a complex one. To minimize these limitations, the review also included studies that assessed technical professionals, who, despite not being from the health area, worked daily in health services and dealt with interventions related to the frontline. Another factor related to limitations is related to the inherent heterogeneity of studies. While numerous studies showed levels of prevalence of anxiety, depression, burnout, and insomnia, others used the same tests, but different assessment scales, thus establishing different thresholds.

Although in the year 2023 the World Health Organization declared the long-awaited end of the Public Health Emergency of International Concern (PHEIC) for COVID-19[53], all the studies that were analyzed in this systematic review included discussions about the fear of being infected and the distress caused by the fear of spreading it to family members, stigmatization by the population at the critical moment of the pandemic, low self-confidence, low occupational safety and long working hours/high workloads, as crucial risk factors, which need to be considered in the design and implementation of future psychological support services for health professionals who have experienced this pandemic and those who may experience future ones.

Conclusion

This systematic review sought to identify articles related to the effects of the COVID-19 pandemic on the mental health of health workers who worked to fight the virus and the prevalence of impacts for these professionals. The review of the articles showed the description of the characteristics of the included studies, measured their quality, identified the target audience of these studies (most frequently involved professionals), identified different types of risk factors related to the performance of this work (occupational/environmental, training/ education, and focused on mental health), and carried out reflections based on the need for investment by companies and governments in care programs aimed at mental health worldwide.

Finally, the study disclosed the need to develop new scientific research, with different methodologies, but which deal with the description and analysis of the work experience of professionals who were involved in interventions with patients diagnosed with COVID-19, especially having as an object for the analysis the mental health of these workers. This study has as a limitation, the time period of the bibliographic search.

Collaborations

CRC Galvão, MMMA Barros and ACO Silva are senior co-authors. MAX Silva, MMA Santos, AB Araújo, MBCA Souza and BIL Barroso conceived this article, organized the literature review, conducted the analysis to inform the content of this research. BIL Barroso conducted the literature review, guided the research and analyzed the data, and prepared the materials for the project development meeting. MBCA Souza and BIL Barroso worked on the design of the results, critical review, data analysis, manuscript writing and final approval of the version to be published. All researchers worked on the critical review of the article. All authors approved the final version of the study. BIL Barroso is the head of research and ensured the quality of this study. MBCA Souza, the corresponding author, certifies that all listed researchers meet the criteria for authorship and participation in this project, and that no researcher was omitted.

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