

Integrative review



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Repercussions of COVID-19 on health professionals in the mobile pre-hospital care service: integrative review

Repercussões da COVID-19 nos profissionais da saúde do serviço de atendimento pré-hospitalar móvel: revisão integrativa

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ABSTRACT | INTRODUCTION: To summarize scientific knowledge about the repercussions of COVID-19 on health professionals in the mobile pre-hospital care service. **METHOD:** This is an integrative review carried out in the Latin American and Caribbean Literature in Health Sciences (LILACS), PubMed Central, SCOPUS, ScienceDirect and Web of Science databases. The search took place in May and June 2022. The search resulted in a total of 263 articles and, after applying the selection criteria, nine articles made up the final sample. **RESULTS:** The main repercussions of COVID-19 on health professionals in the mobile pre-hospital care service corresponded to mental repercussions (33.33%; n=3); occupational (33.33%; n=3); as well as mental, occupational and physical repercussions (33.33%; n=3). Some studies have pointed to strategies to reduce the exposure of professionals to the Coronavirus during the COVID-19 pandemic. None of the included studies pointed out strategies to support the professionals' mental symptoms. **FINAL CONSIDERATIONS:** The results allowed us to conclude that COVID-19 had an impact on the mental, physical and occupational health of mobile pre-hospital care professionals, as well as causing changes in the work process and occupational overload.

KEYWORDS: COVID-19. Occupational health. Emergency Medical Services. Prehospital Assistance.

RESUMO | INTRODUÇÃO: Sumarizar o conhecimento científico sobre as repercussões da COVID-19 nos profissionais de saúde do serviço de atendimento pré-hospitalar móvel. **MÉTODO:** Trata-se de uma revisão integrativa realizada nas bases de dados Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), PubMed Central, SCOPUS, ScienceDirect e Web of Science. A busca ocorreu nos meses de maio e junho de 2022. A busca resultou em um total de 263 artigos e, após aplicação dos critérios de seleção, nove artigos compuseram a amostra final. **RESULTADOS:** As principais repercussões da COVID-19 nos profissionais da saúde do serviço de atendimento pré-hospitalar móvel corresponderam a repercussões mentais (33,3%; n=3); ocupacionais (33,3%; n=3); bem como repercussões mentais, ocupacionais e físicas (33,3%; n=3). Alguns estudos apontaram estratégias para diminuir a exposição dos profissionais ao Coronavírus, durante a pandemia da COVID-19. Nenhum estudo incluído apontou estratégias de suporte e apoio aos sintomas mentais dos profissionais. **CONSIDERAÇÕES FINAIS:** Os resultados permitiram concluir que a COVID-19 repercutiu na saúde mental, física e ocupacional dos profissionais do atendimento pré-hospitalar móvel, bem como ocasionou mudanças no processo de trabalho e sobrecarga ocupacional.

PALAVRAS-CHAVE: COVID-19. Saúde do Trabalhador. Serviços Médicos de Emergência. Assistência Pré-Hospitalar.



Introduction

The new coronavirus was named SARS-CoV-2, which triggers the disease called COVID-19. The virus is transmitted by respiratory droplets expelled by coughing or sneezing, by aerosols and by direct contact with the infected person.¹

Covid-19 spread rapidly, producing large numbers of people affected and deaths. On May 5, 2023, when the World Health Organization declared the end of the Public Health Emergency of International Concern related to COVID-19, the world registered 760,599,719 accumulated cases.² In Brazil, the same day bulletin announced that the country had registered 37,449,418 accumulated cases and a total of 701,494 deaths from COVID-19.²

Healthcare professionals were vulnerable to biopsychosocial illness because they were exposed to risk factors, such as, for example, the inefficient supply of PPE (Personal Protective Equipment), stigma due to their profession, fear of infecting family and friends, poor control of infections, pre-existing medical conditions, among others.^{3,4}

Results of reviews on the health of health professionals during the COVID-19 pandemic point to outcomes such as anxiety, depression, stress, anguish, fear, sleep disorders, burnout, fatigue, among others.^{5,6}

The pre-hospital care services, in particular, constituted one of the gateways for the care of respiratory symptoms, in which many workers were contaminated and died. Prolonged stress, increased workload and increased pressure at work led these professionals to mental, emotional and physiological exhaustion.⁷

Through a preliminary search on scientific research platforms, no literature review studies were identified that analyzed the repercussions of COVID-19 on mobile pre-hospital care professionals. However, isolated studies carried out in Brazil, Zimbabwe, Africa, and another in China, for example, described the presence of symptoms such as emotional fatigue, stress, Burnout Syndrome, sleep disturbances, irritability, difficulty concentrating, sadness, negative thoughts, changes in weight and loss of career satisfaction.^{4,7}

In this way, the description of the different repercussions of COVID-19 on these health professionals in different parts of the world can be observed. The question then arises: how does the literature describe the repercussions of COVID-19 on mobile pre-hospital care professionals? Thus, this study is justified by the need to gather information about the illness and the implications of this disease in these professionals, to elucidate this problem and, consequently, contribute to the search for its resolution, since workers need to be biopsychosocially well, to provide a assistance properly.

The objective of this study is to summarize the scientific knowledge about the repercussions of COVID-19 on health professionals in the mobile pre-hospital care service.

Methods

This is an integrative review, a type of research that enables the synthesis and analysis of other academic productions, as well as the incorporation of the applicability of results from significant studies in practice.

In this review, five stages were adopted: (1) problem identification, (2) literature search, (3) data assessment, (4) data analysis and interpretation, and (5) presentation of results.⁸

The PCC (Population, Concept and Context) strategy was used to conduct the research question. "Health Professionals" was adopted as the population, "Repercussions of COVID-19" as the concept, and "Mobile Pre-Hospital Care" as the context. Thus, the study had the following guiding question: what are the repercussions of COVID-19 on health professionals in mobile pre-hospital care?

The literature search took place in May and June 2022, in the following databases: Latin American and Caribbean Literature in Health Sciences (LILACS), PubMed Central, SCOPUS, Science Direct and WEB OF SCIENCE. Access to the articles was through the Journal Portal of CAPES (Coordination for the Improvement of Higher Education Personnel), with login from the Universidade Federal do Rio Grande do Norte.

The descriptors were selected from the Descriptors in Health Sciences (DeCS), in Portuguese and English, and crossed by the Boolean operator “AND”, namely: Emergency Medical Services, COVID-19, Occupational Health, Emergency Medical Services and Occupational Health. Table 1 presents the description of the crossings in the selected Databases and the search strategy.

It should be noted that the text filters available in full were used to search for data. It is stated that the research did not apply restrictions regarding the languages of publication and temporal delimitation. It is noteworthy that due to the study phenomenon, the COVID-19 infections, having started in December 2019, the selected studies tend to follow a temporal pattern after that year.

Table 1. Description of crossings in selected databases and search strategy. Natal/RN, 2022

DATABASE	CROSSING DESCRIPTORS
LILACS	#1 Serviços Médicos de Emergência AND Saúde do Trabalhador AND COVID-19. Search: Words
Science Direct	#1 Emergency Medical Services AND COVID-19 AND Occupational Health. Search: <i>ABSTRACT</i>
PUBMED Central	#1 Emergency Medical Services AND COVID-19 AND Occupational Health. Search: SUMMARY
Scopus	#1 Emergency Medical Services AND COVID-19 AND Occupational Health. Search: <i>ABSTRACT</i>
web of science	#1 Emergency Medical Services AND COVID-19 AND Occupational Health. Search: TOPIC

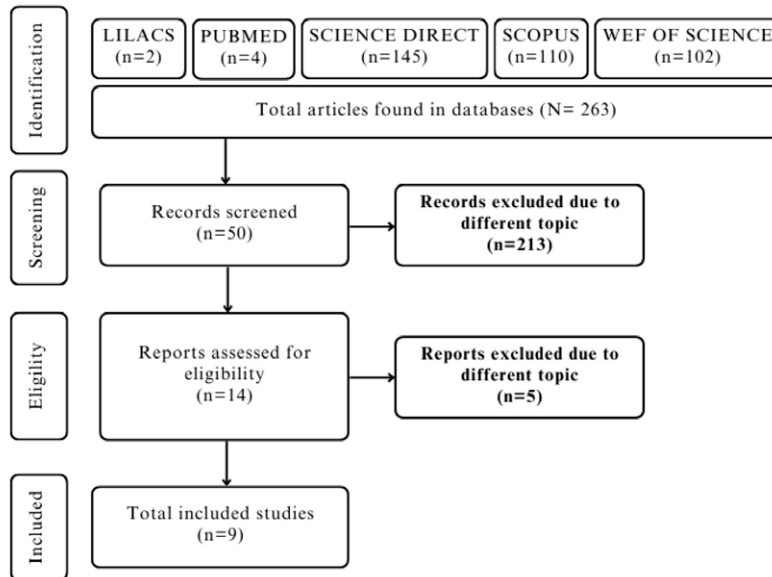
Source: the authors (2023).

The RAYYAN® program was used to organize the reading and selection of articles by the authors involved. The selection of articles was carried out by two reviewers independently, to ensure the rigor of the method and the reliability of the results. In cases of divergence in the choice and selection of studies, a third reviewer was contacted to decide on the inclusion or exclusion from studies.

Original articles were included, in all publication languages, with text available online and for free. Duplicate articles and articles that did not deal with the theme were excluded. The articles found were initially analyzed from the reading of the titles and abstracts and, if they met the selection criteria, they were subsequently read floatingly, and finally they were read in full.

Thus, the search in the literature resulted in a total of 263 articles and, after applying the selection criteria, 50 studies went on to read the titles and abstracts. 213 articles were excluded due to not being in accordance with the topic addressed. After this phase, 14 studies were selected for floating reading, of which nine scientific productions made up the final sample after reading in full, as they met the inclusion and exclusion criteria of the study. Figure 1 shows the identification, eligibility and inclusion steps, according to the recommendations of the PRISMA 2020 flowchart.⁹

Figure 1. PRISMA flowchart for identification, eligibility and inclusion of studies. Natal/RN, 2022



Source: the authors (2023).

In the data assessment stage, an instrument developed by the authors was used with variables corresponding to the identification of the articles, objective, method and main results. The articles were analyzed individually, by a single researcher. Doubts about the pertinence of the findings were discussed with a second researcher. Then, the collected data were tabulated in the Microsoft Excel software.

The analysis and interpretation of data regarding the identification variables of the articles was carried out using descriptive statistics, with frequency and percentages. The descriptive data of the other variables were synthesized in thematic categories that will be presented in the topic of results.

For the analysis of scientific evidence, the Melnyk and Fineout-Overholt classification was used, in which level I consists of evidence from systematic reviews or meta-analyses of all randomized clinical trials; level II comprises evidence derived from at least one well-defined randomized controlled clinical trial; level III covers evidence obtained from well-defined clinical trials, without randomization; level IV integrates evidence from well-defined cohort and case-control studies; level V consists of evidence derived from systematic reviews of descriptive and qualitative studies; level VI contains evidence from a single descriptive or qualitative study; and level VII encompasses evidence originating from the opinions of authorities and/or reports by expert committees.¹⁰

Results

This review included nine primary studies, of which 88.8% (n=8) were published in English, 11.2% (n=1) in Portuguese, and published in the years 2021 (44.4%/n=4) and 2022 (55.6%/n=5). A total of 50 authors were identified in the publications, of which 28% were nurses (n=14); 44% were physicians (n=22); 10% were paramedics (n=5); and 18% were other health professionals (n=9).

The studies were carried out in mobile pre-hospital services in Ardabil, Canada, Taiwan, Turkey, Poland (2 studies), southern Iran, the Netherlands and Brazil, where 44.4% were land transport (n = 4), 22, 2% were air transport (n = 2) and 33.4% did not specify the transport carried out (n = 3). Referring to land transport, 15% took place by ambulances and motorcycles (n = 1) and 75% only by ambulances. As for air transport, there was 50% only by plane (n=1) and 50% by helicopter (n=1). Other characteristics of the studies are detailed in Table 2.

Table 2. Characterization of the studies included in the review. Natal/RN, 2022 (to be continued)

Author/ Reference	Study population	Prehospital care service	Objective of the study	Type of Study/ Level of Evidence/ Year/ Country
Spoelder EJ, Tacke MCT, van Geffen GJ, Slagt C ¹¹	HEMS (Helicopter Emergency Medical Service) Team	Air mobile (helicopter)	To describe our new operation and evaluate and discuss our choices regarding our way of working and safeguarding procedures.	Cohort Study/ Level IV/ 2021/ Netherlands
Mausz J, Jackson NA, Lapalme C, Piquette D, Wakely D, Cheskes S ¹²	Paramedics	Land Mobile (ambulance and motorcycle)	To provide a rich description of the program and share lessons learned in its development and implementation.	Descriptive Study / Level VI / 2022/ Canada
Rzońca P, Tomaka P, Rzońca E, Gałazkowski R ¹³	Poland medical air rescue team	Air mobile (plane and helicopter)	To present the experience of the Polish Medical Air Rescue Service during the first year of the COVID-19 pandemic and the measures taken to protect patients, medical staff and aircrew from SARS-CoV-2 infection.	Cohort Study/ Level IV/ 2022/ Poland
Unal M, Yilmaz A, Yilmaz H, Tasdemir GY, Uluturk M, Kemanci A, <i>et al.</i> ¹⁴	Multidisciplinary pre-hospital care team	fixed and mobile	To explore the impact of the COVID-19 outbreak on pre-hospital care providers' perception of social support and acute stress disorder in Denizli Province.	Descriptive Study/ Level VI/ 2022/ Türkiye
Ilczak T, Rak M, Ćwiertnia M, Mikulska M, Waksmańska W, Krakowiak A, <i>et al.</i> ¹⁵	Members of Polish emergency medical services (doctors, nurses and paramedics)	Fixed (Emergency Room) and land mobile pre-hospital (ambulance)	To use research developed for the study to assess predictors of stress that paramedics, nurses, and physicians experience in the face of the COVID-19 Pandemic.	Descriptive Study/ Level VI/ 2021/ Poland

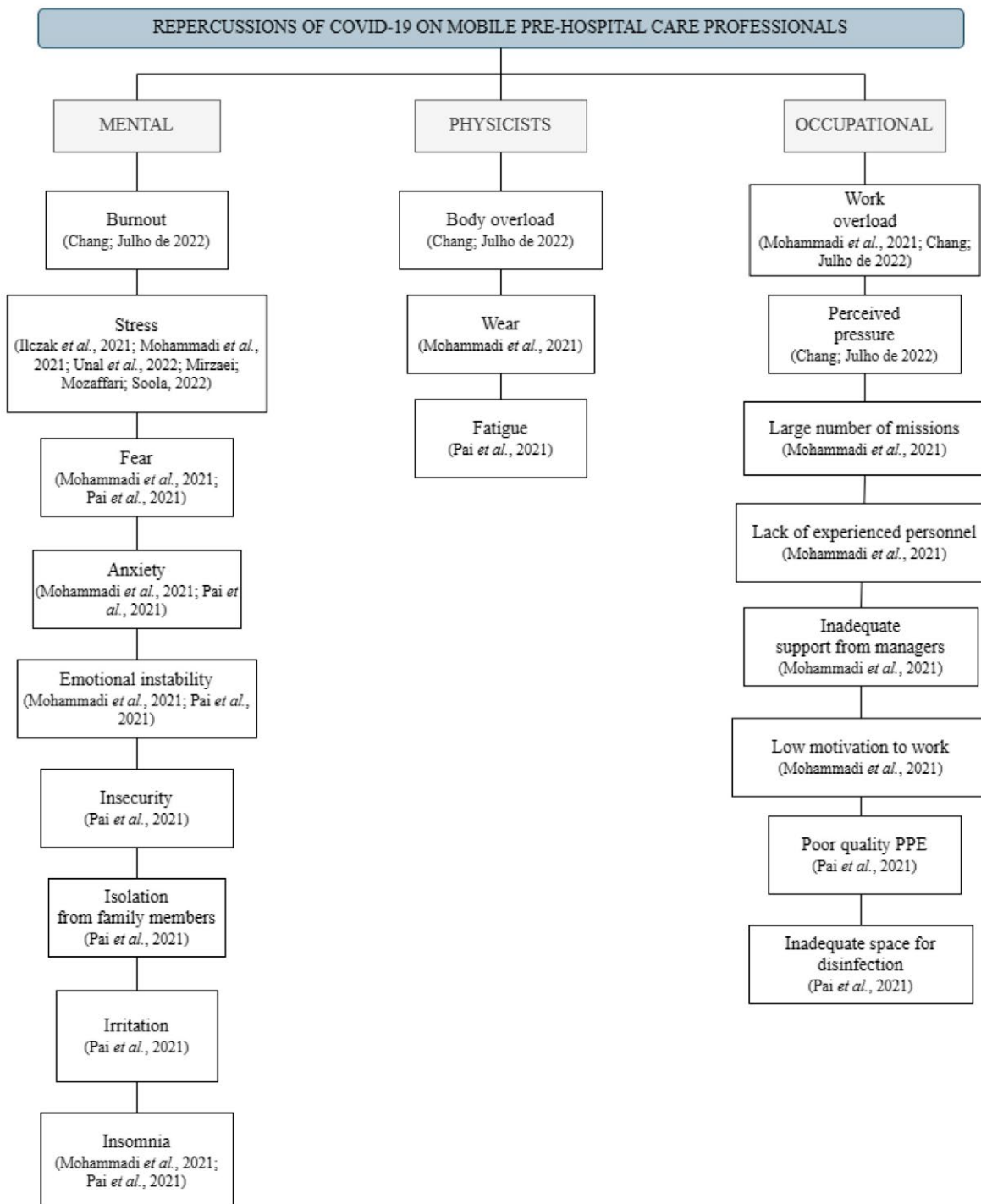
Table 2. Characterization of the studies included in the review. Natal/RN, 2022 (conclusion)

Author/Reference	Study population	Prehospital care service	Objective of the study	Type of Study/ Level of Evidence/ Year/ Country
Mirzaei A, Mozaffari N, Habibi Soola A ¹⁶	Emergency Room Nurses and Emergency Medical Services staff	Fixed (First Aid) and mobile	To investigate occupational stress and its relationship with spiritual coping among ER nurses and MPHC workers.	Correlational Descriptive Study/ Level VI/ 2022/ Will
Chang YT, Hu YJ ¹⁷	Pre-hospital fire team	Mobile	To measure factors related to physical and mental health among EMTs and paramedics in Taiwanese fire departments, and to investigate the association between these factors during the peak in the number of COVID-19 cases in Taiwanese communities.	Cross-sectional Descriptive Study/ Level VI/ 2022/ Taiwan
Dal Pai D, Gemelli MP, Boufleuer E, Finckler PVPR, Miorin JD, Tavares JP, <i>et al.</i> ¹⁸	Nursing Technicians, Nurses, Doctors and Drivers	Land mobile pre-hospital (ambulance)	To learn about the repercussions of the COVID-19 pandemic on the work and health of professionals from the Mobile Emergency Care Service (SAMU) in a capital in the southern region of Brazil.	Qualitative Study/ Level VI/ 2021/ Brazil
Mohammadi F, Tehranine shat B, Bijani M, Khaleghi AA ¹⁹	Prehospital emergency professionals	Land mobile (ambulance)	To identify some strategies to manage COVID-19 related challenges faced by pre-hospital emergency care personnel in southern Iran.	Qualitative Study/ Level VI/ 2021/ Will

Source: the authors (2023).

As for the main repercussions of COVID-19 on MPHIC (Mobile Pre-Hospital Care) professionals, 33.3% (n=3) of the studies pointed only to mental repercussions; 33.3% (n=3) described occupational repercussions; and 33.3% (n=3) indicated mental, physical and occupational repercussions. Some studies have pointed to strategies to reduce the exposure of professionals working in the MPHIC to the Coronavirus during the COVID-19 pandemic. None of the included studies pointed out strategies to support and support the professionals' mental symptoms. The synthesis of the results of this review is presented in a visual map of the literature (Figure 2).

Figure 2. Visual map of the repercussions of COVID-19 on pre-hospital care professionals. Natal/RN, 2022



Source: the authors (2023).

In the selected studies, MPHC teams involved Nurses (23.8%), Nursing technicians (1.0%), physicians (6.4%), paramedics (40%), emergency medical technicians (11.5%), rescue drivers (0.7%), firefighters (8.5%), intermediary employees and cleaning staff (8.1%).

Some studies have indicated measures to reduce exposure and the risk of contamination by SARS-Cov-2.¹¹⁻¹³ Among them, we highlight the provision of training in donning and undressing, as well as the removal of these PPE being done under the supervision of pairs¹¹, provision of training to perform certain procedures, such as mechanical CPR (Cardiopulmonary Resuscitation)¹², and use of units NP-320 insulation and barrier tents, in air transport.¹³ However, no study pointed out strategies adopted to reduce other repercussions, such as, for example, work overload and the mental impacts of these professionals.

Discussion

This literature review selected studies developed with MPHC professionals from eight countries, which made it possible to bring together diverse experiences regarding the repercussions of COVID-19 on frontline workers of the SARS-Cov-2 pandemic.

Despite the divergent functioning of MPHC in the most diverse pre-hospital services around the world, it was found in this study that the repercussions of COVID-19 on pre-hospital care professionals were mainly related to mental issues. This data corroborates the findings of other studies developed with professionals working in other care segments during the pandemic period.²⁰⁻²⁴

Among the mental aspects, stress was revealed to be the most frequent repercussion in the selected studies.^{14-16,19} In this regard, the highest levels of this emotional state were found in the female population¹⁴⁻¹⁶, in nurses¹⁵⁻¹⁶ and paramedics.¹⁴

The main predictors pointed out in research for increased stress levels during the COVID-19 pandemic were fear of contracting the disease, decreased level of safety while performing procedures¹⁵, increased workload and reduced capacity of adaptation.¹⁶ High levels of this reaction caused feelings of emotional fatigue and insecurity in the workplace¹⁵ and could

lead to a decrease in the quality of care provided by health services.¹⁴

Studies developed with health professionals who worked in other care settings during the COVID-19 pandemic also showed a high prevalence of mental symptoms, such as depression, anxiety and stress.^{20,21} This corroborates the results of this review on the negative psychological impact of the pandemic on the mental health of health professionals, regardless of the place of work.

In contrast, studies included in this review demonstrated that positive spiritual behaviors were the main strategies for coping with stress¹⁶ and that lower levels of this reaction may be the result of high levels of perceived family/social support.¹⁴

In addition to stress, the included studies identified descriptions of the repercussions of COVID-19 in different degrees of burnout, fatigue and a moderate level of exhaustion, mainly in paramedics and in participants who were on the poverty line.¹⁷

Burnout Syndrome is characterized as an emotional illness that brings together characteristics such as physical exhaustion and emotional exhaustion, resulting from prolonged and stressful work. Its effects interfere both in the professional life of individuals, as well as in the institutions in which they work, since they interfere in the quality, effectiveness and productivity of work.²⁵

Burnout levels were shown to be inversely proportional to professional experience, that is, the greater the experience, the lower the levels of burnout. While these levels were directly proportional to perceived pressure, workload and body load¹⁷. Ratifying this finding, a review published in 2022 points to the relationship between burnout syndrome and extreme workloads, stress, anxiety, depression and uncertainties caused by the direct and daily battle against COVID-19.²²

In the context of changes in the work process due to COVID-19, other occupational factors had repercussions on MPHC professionals. PPE, for example, hindered mobility, visibility and agility.¹⁸ At times, these PPE seemed insufficient for 28.2% of health professionals in a study carried out in Portugal, during the pandemic period.²³

Another review, which investigated changes in the routines of MPHC professionals, observed that professionals had to adapt to the new realities in care, due to the incidence of new care protocols and the stages of gowning and undressing, in order to prevent the spread of the virus. However, it was difficult to execute all these new changes due to recurrent alterations derived from new scientific findings, the lack of equipment and physical and human resources, among other difficulties faced.²⁴

However, studies point out that the correct use of PPE, as well as the correct performance of undressing, can reduce the chance of health workers to be contaminated by infectious diseases during the exercise of their profession.²⁶ In the context of COVID-19, studies have shown the presence of high concentrations of viral RNA in protective clothing changing rooms, which confirms the high risk of contamination during the undressing process.^{26,27}

The decontamination of ambulances at each appointment, as well as the dressing and undressing of professionals, increased the response time between appointments.¹⁹ However, it was observed in the results of the study a search for practices related to the use of PPE and for skills and training to improve the quality of care provided.¹⁸

In addition, the Federal Council of Nursing (COFEN) prepared a manual with guidelines for the correct use of PPE²⁸, however, it is extremely important that training be offered to professionals on the subject, for better safety at work.

The large number of missions, the lack of experienced personnel, inadequate support from managers and low motivation for work were observed repercussions that put workers' occupational health at risk and negatively affect the quality of the service provided.¹⁹

Despite this, another study found that adequate preparation for each mission, with full PPE, a disciplinary routine and cleaning procedures after each transport, was the key to the success of the operation performed by the HEMS (Helicopter Emergency Medical Service) team, in which no symptoms suggestive of COVID-19 were reported by crew members.¹¹

Also, in relation to air mobile pre-hospital care, it was noticed that the use of protective suits, disposable gloves and goggles or face shields, in addition to the use of isolation units, were of substantial importance to limit the risk to limbs of the crew as well as the isolation allowed the crews to quickly restore mission readiness.¹³

Still related to the use of PPE, it was verified that the use of a higher level of attire, as well as training for professionals to carry out procedures more safely, resulted in better indicators of quality of care and none of the service's paramedics developed COVID-19.¹²

Therefore, it is of substantial importance to prevent health problems due to occupational diseases, through the support of managers, the development of comprehensive care protocols for better patient care and interventions for the protection and prevention of workers' health, in order to improve their quality of life.^{19,29}

With the studies in this review, it was found that stressors are related to increased workload, lack of preparation for handling infected patients, fear and increased physical load. With the team exposed to a certain degree of pressure, fatigue and other physical and mental health conditions, these were associated with professional exhaustion and, therefore, with burnout. Adding to this, the fear of contracting the infection in patients with chronic illnesses and the social isolation applied during outbreaks increase the stress level of those with existing mental problems.

Studies carried out in hospitals in different countries, such as Iran, Saudi Arabia and the USA, with health professionals and other professional categories, identified similar results regarding the repercussions of COVID-19 on their professionals, as well as the associated predictors.³⁰⁻³² However, other studies have identified a high incidence of occupational dermatoses, such as contact dermatitis and xerosis, in health professionals, due to excessive hand washing and prolonged use of PPE.³³⁻³⁵

The aforementioned repercussions of COVID-19 are still present today. Workers' health has gained relevance and has been the focus of governmental and institutional policies and strategies.³⁶ It is up to managers to adopt legitimate measures aimed at

healthy work environments, aiming to mitigate the repercussions of the pandemic on workers' health.³⁶

Vaccines against COVID-19 are currently available. In Brazil, it was made available in early 2021, initially for health professionals who were working on the front lines, and the elderly. It should be noted that no study included in this review analyzed the vaccination variable on the impact of COVID-19 on MPHC professionals.

This fact constitutes a limitation of this study, which may have occurred due to a selection bias, due to not having included in the research protocol, search strategies in the gray literature, such as in theses and dissertations and works published in congresses. As well as another limitation is the lack of studies that point to support strategies and support for the mental symptoms of health professionals. Thus, further studies need to be developed in order to elucidate this problem.

The relevance of research and scientific production is highlighted, in which it was extremely important for a better understanding of the disease, its dynamics, in the search for solutions, and in the identification of the effects of the disease.³⁷

Final considerations

The summary of the studies carried out in eight countries led to the conclusion that COVID-19 had repercussions on the mental, physical and occupational health of MPHC professionals, as well as causing changes in the work process and occupational overload.

Conducting training and developing protocols were strategies described for the prevention and mitigation of the repercussions of this disease on the health and safety of these health professionals. However, other studies need to be developed to monitor the behavior of these mental, physical and occupational repercussions on MPHC professionals in the post-pandemic period, to help create new coping strategies and policies aimed at improving workers' health.

In this perspective, this study allowed to gather information about the implications of COVID-19 on MPHC professionals and to elucidate some interventions developed by pre-hospital services to adapt to the challenges faced by the prolonged conditions of the COVID-19 crisis.

Authors' contributions

Rocha MBM participated in the design of the research question, methodological design, search and analysis of research data, interpretation of results and writing of the scientific article. Dantas DNA participated in the design of the research question, data search and analysis and writing of the scientific article. Lino CRM and Araujo RO participated in the methodological design and writing of the scientific article. Silva WN participated in the methodological design, search and interpretation of data. Neves Júnior TT participated in the data search. All authors reviewed and approved the final version and are in agreement with its publication.

Conflicts of interest

No financial, legal or political conflicts involving third parties (government, companies and private foundations, etc.) have been declared for any aspect of submitted work (including, but not limited to, grants and funding, advisory board participation, study design, preparation manuscript, statistical analysis, etc.).

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References

1. Ministério da Saúde (Brasil). Coronavírus [Internet]. Brasília: Ministério da Saúde; 2021. Available from: <https://www.gov.br/saude/pt-br/coronavirus>
2. WHO. WHO Coronavirus (COVID-19) Dashboard [Internet]. Geneva: World Health Organization; 2021. Available from: <https://covid19.who.int/table>
3. Mhango M, Dzobo M, Chitungo I, Dzinamarira T. COVID-19 Risk Factors Among Health Workers: A Rapid Review. *Saf Health Work.* 2020;11(3):262-65. <http://dx.doi.org/10.1016/j.shaw.2020.06.001>

4. Chingono RMS, Nzvere FP, Marambire ET, Makwembere M, Mhembere N, Herbert T, et al. Psychological distress among healthcare workers accessing occupational health services during the COVID-19 pandemic in Zimbabwe. *Compr Psychiatry*. 2022;116:152321. <http://dx.doi.org/10.1016/j.comppsy.2022.152321>
5. Vizheh M, Qorbani M, Arzaghi SM, Muhidin S, Javanmard Z, Esmaeili M. The Mental Health of Healthcare Workers in the COVID-19 Pandemic: A Systematic Review. *J Diabetes Metab Disord*. 2020;19(2):1967-78. <http://dx.doi.org/10.1007/s40200-020-00643-9>
6. Franklin P, Gkiouleka A. A Scoping Review of Psychosocial Risks to Health Workers during the Covid-19 Pandemic. *Int J Environ Res Public Health*. 2021;18(5):2453. <http://dx.doi.org/10.3390/ijerph18052453>
7. Teixeira CFS, Soares CM, Souza EA, Lisboa ES, Pinto ICM, Andrade LR, et al. The health of healthcare professionals coping with the Covid-19 pandemic. *Ciênc Saúde Coletiva*. 2020;25(9):3465-74. <http://dx.doi.org/10.1590/1413-81232020259.19562020>
8. Whittemore R, Knafk K. The integrative review: updated methodology. *J Adv Nurs*. 2005;52(5):546-53. <https://doi.org/10.1111/j.1365-2648.2005.03621.x>
9. Joana Briggs Institute (JBI). JBSIRIR endorses PRISMA Statement [Internet]. Adelaide: The University of Adelaide; [n.d]. Available from: <https://jbi.global/news/article/jbsirir-endorses-prisma-statement>
10. Melnyk BM, Fineout-Overholt E. Evidence-Based Practice in Nursing & Healthcare: A Guide to Best Practice. Philadelphia: Lippincott Williams & Wilkins; 2005.
11. Spoelder EJ, Tacke MCT, van Geffen G-J, Slagt C. Helicopter transport of critical care COVID-19 patients in the Netherlands: protection against COVID-19 exposure-a challenge to critical care retrieval personnel in a novel operation. *Scand J Trauma Resusc Emerg Med*. 2021;29(1):41. <http://dx.doi.org/10.1186/s13049-021-00845-x>
12. Mausz J, Jackson NA, Lapalme C, Piquette D, Wakely D, Cheskes S. Protected 911: Development, Implementation, and Evaluation of a Prehospital COVID-19 High-Risk Response Team. *Int J Environ Res Public Health*. 2022;19(5):3004. <http://dx.doi.org/10.3390/ijerph19053004>
13. Rzońca P, Tomaka P, Rzońca E, Gałązkowski R. Experience of the Polish Medical Air Rescue Service During the First Year of the COVID-19 Pandemic and Measures Taken to Protect Patients, Medical Staff, and Air Crew from SARS-CoV-2 Infection. *Med Sci Monit*. 2022;28:e935474. <http://dx.doi.org/10.12659/msm.935474>
14. Unal M, Yilmaz A, Yilmaz H, Tasdemir GY, Uluturk M, Kemanci A, et al. The impact of COVID-19 on social support perception and stress of prehospital care providers. *Australas Emerg Care*. 2022;25(4):334-40. <http://dx.doi.org/10.1016/j.auec.2022.04.003>
15. Ilczak T, Rak M, Ćwiertnia M, Mikulska M, Waksmańska W, Krakowiak A, et al. Predictors of stress among emergency medical personnel during the COVID-19 pandemic. *Int J Occup Med Environ Health*. 2021;34(2):139-49. <https://doi.org/10.13075/ijomh.1896.01688>
16. Mirzaei A, Mozaffari N, Soola AH. Occupational stress and its relationship with spiritual coping among emergency department nurses and emergency medical services staff. *Int Emerg Nurs*. 2022;62:101170. <http://dx.doi.org/10.1016/j.ienj.2022.101170>
17. Chang Y-T, Hu Y-J. Burnout and Health Issues among Prehospital Personnel in Taiwan Fire Departments during a Sudden Spike in Community COVID-19 Cases: A Cross-Sectional Study. *Int J Environ Res Public Health*. 2022;19(4):2257. <http://dx.doi.org/10.3390/ijerph19042257>
18. Dal Pai D, Gemelli MP, Boufleuer E, Finckler PVPR, Miorin JD, Tavares JP, et al. Repercussions of the COVID-19 pandemic on the emergency pre-hospital care service and worker's health. *Esc Anna Nery*. 2021;25(spe):e20210014. <https://doi.org/10.1590/2177-9465-EAN-2021-0014>
19. Mohammadi F, Tehranineshat B, Bijani M, Khaleghi AA. Management of COVID-19-related challenges faced by EMS personnel: a qualitative study. *BMC Emerg Med*. 2021;21(1):95. <https://doi.org/10.1186/s12873-021-00489-1>
20. Garcia GPA, Fracarolli IFL, Santos HEC, Oliveira SA, Martins BG, Santin Junior LJ, et al. Depression, anxiety and stress in health professionals in the COVID-19 context. *Int J Environ Res Public Health*. 2022;19(7):4402. <https://doi.org/10.3390/ijerph19074402>
21. Ruiz-Fernández MD, Ramos-Pichardo JD, Ibáñez-Masero O, Cabrera-Troya J, Carmona-Rega MI, Ortega-Galán AM. Compassion fatigue, burnout, compassion satisfaction and perceived stress in healthcare professionals during the COVID-19 health crisis in Spain. *J Clin Nurs*. 2020;29(21-22):4321-30. <https://doi.org/10.1111/jocn.15469>
22. Pêgo FPL, Pêgo DR. Burnout Syndrome. *Rev Bras Med Trab*. 2016;14(2):171-6. <https://doi.org/10.5327/Z1679-443520162215>
23. Andrade TGVS, Feitosa ABS, Silva LS, Silva NMR. COVID-19 and its negative impact on the mental health of health professionals: an integrative literature review. *Rev Bras Med Trab*. 2022;20(1):132-9. <http://dx.doi.org/10.47626/1679-4435-2022-894>

24. Sousa-Uva M, Sousa-Uva A, Serranheira F. Prevalence of COVID-19 in health professionals and occupational psychosocial risks. *Rev Bras Med Trab.* 2021;19(1):73-81. <http://dx.doi.org/10.47626/1679-4435-2021-625>
25. Santos VS, Cordeiro TLR, Chevonik I, Castro JG. Changes in the routines of professionals working in pre-hospital care in the context of the pandemic: integrative review. *REAS.* 2022;15(3):e9992. <https://doi.org/10.25248/reas.e9992.2022>
26. Bernardes GCS, Godoi APN, Almeida NA, Nogueira LS, Pinheiro MB. Doffing personal protective equipment in times of COVID-19. *Rev Bras Med Trab.* 2021;19(1):88-93. <http://dx.doi.org/10.47626/1679-4435-2021-605>
27. Liu Y, Ning Z, Chen Y, Guo M, Liu Y, Gali NK, et al. Aerodynamic analysis of SARS-CoV-2 in two Wuhan hospitals. *Nature.* 2020;582(7813):557-60. <https://doi.org/10.1038/s41586-020-2271-3>
28. Conselho Federal de Enfermagem (COFEN). Orientações sobre a colocação e retirada de equipamentos de proteção individual (EPI) [Internet]. Brasília; 2020. Available from: http://www.cofen.gov.br/wp-content/uploads/2020/03/cartilha_epi.pdf
29. Ribeiro BMSS, Scorsolini-Comin F, Souza SR. Burnout syndrome in intensive care unit nurses during the COVID-19 pandemic. *Rev Bras Med Trab.* 2021;19(3):363-71. <http://dx.doi.org/10.47626/1679-4435-2021-662>
30. Zare S, Mohammadi Dameneh M, Esmaeili R, Kazemi R, Naseri S, Panahi D. Occupational stress assessment of health care workers (HCWs) facing COVID-19 patients in Kerman province hospitals in Iran. *Heliyon.* 2021;7(5):e07035. <https://doi.org/10.1016/j.heliyon.2021.e07035>
31. Hendrickson RC, McCall CA, Rosser AF, Pagulayan KF, Chang BP, Sano ED, et al. The relative contribution of COVID-19 infection versus COVID-19 related occupational stressors to insomnia in healthcare workers. *Sleep Medicine: X.* 2023;5:100067. <https://doi.org/10.1016/j.sleepx.2023.100067>
32. Shubayr N, Faraj H, Hurbush M, Khormi M, Alyami A, Majrashi N, et al. Assessment of job satisfaction, lifestyle behaviors, and occupational burnout symptoms during the COVID-19 pandemic among radiologic technologists in Saudi Arabia. *Radiography.* 2022;28(4):1087-92. <https://doi.org/10.1016/j.radi.2022.07.015>
33. Abdali S, Yu J. Occupational Dermatoses Related to Personal Protective Equipment Used During the COVID-19 Pandemic. *Dermatol Clin.* 2021;39(4):555-68. <https://doi.org/10.1016/j.det.2021.05.009>
34. Zhang M. Skin diseases of frontline health workers in China: from perspectives of occupational protection against COVID-19. *Saf Health Work.* 2022;13:S33. <https://doi.org/10.1016/j.shaw.2021.12.818>
35. Keng BMH, Gan WH, Tam YC, Oh CC. Personal protective equipment-related occupational dermatoses during COVID-19 among healthcare workers – a worldwide systematic review. *JAAD Int.* 2021;5:85-95. <https://doi.org/10.1016/j.jdin.2021.08.004>
36. Luz EMF, Munhoz OL, Morais BX, Greco PBT, Camponogara S, Magnago TSBS. Repercussions of Covid-19 in the mental health of nursing workers. *Rev Enferm Cent O Min.* 2020;10:e3824. <https://doi.org/10.19175/recom.v10i0.3824>
37. Negri F, Zucoloto G, Miranda P, Koeller P. Ciência e Tecnologia frente à pandemia [Internet]. Centro de Pesquisa em Ciência, Tecnologia e Sociedade; 2020 [updated 202 mar 27]. Available from: <https://www.ipea.gov.br/cts/pt/central-de-conteudo/artigos/artigos/182-corona>