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# Resilience and post-traumatic stress disorder among healthcare workers during the COVID-19 outbreak

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**ABSTRACT**

During the health emergency caused by the COVID-19 pandemic, one of the most affected sectors was the healthcare workers (HCWs), since it is a population group with a high risk of developing post-traumatic stress disorder (PTSD), anxiety, or depression. Resilience is one of the abilities that can favor a greater adaptation to adverse circumstances. Therefore, the aim of the present research was to know the association between resilience and PTSD in HCWs during the COVID-19 outbreak, which contributes to the development of preventive strategies and therapeutic interventions for this debilitating mental disorder. The study was prospective ex post facto, cross-sectional; it had a non-probabilistic sample of 613 Mexican HCWs. Data was collected through the platform www.personalcovid.com. The results obtained showed that resilience is negatively related to PTSD, with nurses being the most at-risk group among HCWs.

**Keywords:** resilience, PTSD, healthcare workers, COVID-19

## INTRODUCTION

In 2019, the SARS-CoV-2 virus (severe acute respiratory syndrome coronavirus) appeared in China, causing the disease COVID-19 (coronavirus disease from SARS-CoV-2), which spread rapidly throughout the world and by March 11, 2020. World Health Organization (WHO) characterized it as a pandemic. Worldwide, until April 23, 2023, the presence of 763,740,140 confirmed cases of COVID-19, including 6,908,554 deaths; 7,563,576 confirmed cases of COVID-19 and 333,669 deaths of which correspond to Mexico [1]. Therefore, the world health system has had to make great efforts to deal with this crisis, with first responders (i.e., people who are in direct contact with COVID-19 patients, such as physicians, their assistants, and nursing staff) presenting a higher risk of contagion.

According to [2], the increase in the number of confirmed and suspected cases, as well as the workload, the shortage of personal protective equipment, the lack of specific medicines, the vast media information, and the feeling of not having enough support have contributed to the psychological burden of these healthcare workers (HCWs). On the other hand, it was found that HCW present various risk factors that can have a negative psychological impact such as chronic disease (e.g., hypertension, diabetes), direct contact with infected patients, fear of becoming infected and contagious, death of patients attended and the lack of self-care [3]. As mentioned by [4], it is known that the negative effects on mental health take place not only among those who suffered the losses directly, but also affect other people, including HCW.

HCW constitute a population group at high risk of developing post-traumatic stress disorder (PTSD) or anxiety-depressive disorder [5]; witnessing cases of illness or death can have the same traumatic effect, both for the general population, as for health workers who suffer day after day the rigors of patient conditions [6-8]. PTSD is not the only condition that health physicians can present, prolonged stress also causes anxiety and depression that require treatment [9-12]. One of the first investigations carried out after the pandemic was declared, included 1,257 Chinese physicians and nurses from 34 hospitals; 71.5% had an acute stress reaction [2], a well-known risk factor to develop PTSD. In this line, it was observed sub-symptoms of PTSD such as re-experiencing, negative alterations in cognition or mood, and hyperarousal, which were more frequent in women than in men [13].

In México, it was identified mental health problems among HCW involved with the COVID-19 outbreak [14]; PTSD was present in 37.5% of frontline HCW, mostly in women. Personal COVID-19 status was leading risk factor for mental disorder.

Even though research continues to find that a range between 3.6%-37% of people exposed to a community disaster trauma generate PTSD symptoms [15-17], most people achieve recovery [18]. Furthermore, there is a group of people who not only, not present PTSD symptoms, but instead, they have shown posttraumatic growth and resilience. A change of the paradigm, which focused on pathology has been substituted by the one that suggests stressful events may help a group of people flourish in adversity. Trajectories after a traumatic event vary depending on various variables: gender, social support, level of exposure, among others. Research carried out on mental health workers has confirmed similar findings regarding these factors after having experienced a stressful event susceptible to being traumatic [3, 19-21].

Accordingly, the determining aspects to consider for the development of trauma are the individual differences of the victims exposed to a traumatic event. These differences are associated with psychological (e.g., a precarious emotional balance) and biological (e.g., an innately lower threshold for psychophysiological arousal) vulnerabilities. In this sense, low self-esteem, social isolation, growing up in adverse environments, genetic background [22, 23] and the perception of fatalism weaken resistance to trauma and generate a feeling of helplessness and despair. These factors aggravate the psychological impact and act as modulators between the traumatic event and the psychological damage [24]. Therefore, the probability of generating a trauma resulted from the greater or lesser weight of vulnerability factors and protective factors, which may contribute to worsen or process the traumatic event suffered.

In this regard, resilience has been defined as the ability of people to adapt positively after a stressful situation [25, 26]. According to [27], resilience implies the ability to emerge unscathed from a negative experience, learn from it, and improve as part of personal development. It is also considered a continuous process that implies the ability to maintain a stable equilibrium over time. This process is the result of the individual's interaction with her environment. Within this concept, three key elements can be observed: the process, adversity, and positive adaptation [28, 29].

In the context of COVID-19 outbreak, the study [30] has suggested a collective trauma approach to rebuild resilience in HCWs' mental health. Particularly, the study [31] has proposed strategies for HCW as well as for the hospital leadership in order to aid in the mitigation of the risk of PTSD after COVID-19. These strategies also help to build resilience considering a potential second surge of the pandemic. Some of the strategies include: ensuring a collaborative and standardized process regarding end-of-life decision-making processes, frequent monitoring of PTSD and mental health screening among the staff (including depression, burnout, and overall health), receiving resilience and health care training on a regular basis, environments, which not only allow, but require that the staff take regular breaks in order to reset physically and emotionally, and increasing daily huddles for case supervision and peer consultation [32].

In [33], it was identified that during the COVID-19 outbreak, HCWs reported physical and psychological symptoms. However, some denied having experienced distress and none accessed psychological assistance as a form of self-care. Participants described their social network as remarkably helpful, as despite coping with the demands of intensive work, their strong sense of responsibility for patients and trust in the medical system were sources of strength, which supports the evidence that even in the face of high levels of stress, it is possible that HCWs do not seek care for their physical and psychological symptoms, and deploy functional coping strategies that lessen the emotional impact or harmful consequences on their mental health.

The study [34] outlines vulnerability and resilience factors for HCW during the COVID-19 pandemic. Female gender, low socio-economic status, traumatic events during the lifespan, and premorbid psychopathology were among the vulnerability factors. In contrast, context-specific vulnerability factors included stressful working shifts, interpersonal distrust, and difficult communications with colleagues. On the other hand, resilience factors involve social support, self-efficacy, internal locus of control, sense of coherence, mindful attention, and emotional intelligence.

Along the same lines, it was found that nursing assistants and residents were the health professionals with the most frequent emotional symptoms, and the most affected were those on the front line [3]. Likewise, the psychological variables that were negatively associated with the frequency of all symptomatic manifestations were: self-care, self-esteem, resilience, and the use of active coping strategies, together with self-efficacy and social support for stress and depression. The study [35] found that compared to men, women who reported pre-existing anxiety were more prone to acute stress; and younger age was related to both pre-existing common psychological symptoms and lower resilience in HCW. Some studies agree [36, 37] that gender, educational level, department category, position, experience of violence in the workplace, enthusiasm for work, and professional identity were the factors that most influenced the manifestation of symptoms of anxiety and depression among physicians, so personalized psychological intervention could consider predisposing factors to promote healthy coping behaviors in HCW.

Also, it was reported that frontline HCWs were more likely to experience COVID-19-related discrimination than second line workers. Such discrimination could lead to an increase in PTSD symptoms and psychological distress. Hence, campaigns against discrimination in the general population were highly recommended [38-40]. In this context, it is of interest to know the emotional impact of the pandemic on our health environment. This study explored the association between resilience and PTSD in HCW during the COVID-19 outbreak. In this regard, understanding behavioral vulnerability and resilience to traumatic stress will contribute to developing preventive strategies and therapeutic interventions for PTSD.

## MATERIALS AND METHODS

### Study Design

The design was a prospective ex post-facto study [41] to explore the association of resilience and PTSD in HCW during COVID-19. The present cross-sectional study was part of a larger research/intervention study exploring multiple clinical factors of HCWs who accessed a free online platform devised to

provide emotional support from the 17th of July 2021 to the 22nd of February 2022.

### Participants

A non-probabilistic convenience sampling was carried out, consisting of 613 Mexican participants. The eligibility criteria were accepting to participate in the collection of their data to carry out research and answer all the questionnaires, were HCWs, and were aged >17 years.

### Instruments

Sociodemographic information included open questions such as age and employment status. In the event of an affirmative answer, participants were asked which area they worked in and how long they had done so for.

To evaluate PTSD, post-traumatic diagnostic scale (PTDS) was used. It consists of 17 Likert-type items with four response options (0=never to 3=very much) that classify the severity of post-traumatic stress symptoms in the last two weeks [42]. The severity of the symptoms is calculated with the total of the items and can range from 0 (total absence of symptoms) to 51 (severely affected). For this study, the validated version in Spanish [43] was used, with a Cronbach's alpha value of α=.96 for PTSD symptom severity, and values of α=.90 or above for the scales; arousal (α=.93), avoidance (α=.90), and re-experiencing (α=.92).

To evaluate the resilience, resilience measurement scale for Mexicans (RESI-M) was used. It consists of 43 Likert items with four response options (1=totally disagree to 4=totally agree); a higher score, higher resilience. The items are grouped into five factors:

1. strength and self-confidence,
2. social competence,
3. family support,
4. social support, and
5. structure.

The scale presents a total Cronbach's α consistency of .93, obtaining values between α=.79 and α=.92 for its component factors [44].

### Procedure

The data was collected through the web platform www.personalcovid.com, a multicomponent intervention that is aimed at HCWs to reduce anxiety and depression symptoms, burnout, stress, compassion fatigue, increase quality of life, sleep, self-care, and training in skills to communicate bad news to patients and their family [45].

To register for the online intervention, the participants created an account with an email address. No sensible or identifiable data was requested, such as name, address, phone number, and neither in which hospital nor clinic they were working. This procedure guaranteed the anonymity of participants. For including only valid accounts for participants who were interested in accessing the treatment, data of all participants were re-confirmed through their email addresses.

### Data Analysis

Once the database was created, SPSS version 20 was used to analyze whether PTSD and resilience met the assumption of normality using the Kolmogorov-Smirnov test. A correlational analysis was performed to examine the bilateral association between the variables after fulfilling the assumption of normality. Likewise, an ANOVA was carried out to identify if there were differences in PTSD and resilience according to the profession. It has been reported that the ANOVA is a robust enough analysis to deal with groups with different subject numbers [46]. Tuckey's post hoc test was used to determine between which groups there were significant differences. Finally, an input method regression analysis was performed to examine the effect of resilience on PTSD. To determine the effect size (f) and the statistical power (1-β) of the ANOVA and regression, the G*power version 3.9.1.2 program was used.

**Table 1.** Correlations of age & work experience with PTSD & resilience

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Age | | | | | | | | |
| Experience | .731** | | | | | | | |
| PTSD | -.081* | -.048 | | | | | | |
| Resilience | .135** | .134** | -.463** | | | | | |
| RES1 | .138** | .131** | -.431** | .930** | | | | |
| RES2 | .105** | .100* | -.384** | .786** | .635** | | | |
| RES3 | .071 | .094* | -.324** | .706** | .525** | .439** | | |
| RES4 | .067 | .061 | -.316** | .721** | .565** | .470** | .590** | |
| RES5 | .121** | .122** | -.298** | .685** | .614** | .440** | .366** | .434** |

Note. **p<.01; *p<.05; RES1: Strength & self-confidence; RES2: Social competence; RES3: Family support; RES4: Social support; & RES5: Structure

## RESULTS

### Demographic Characteristics

Among the 613 participants, 83% were women and 17% were men, with ages ranging between 17 and 64 years (mean [M=]35.09, standard deviation [SD]=8.88). Regarding the labor category, 198 (32.3%) were physicians, 176 (28.7%) were nurses, 139 (22.7%) were psychologists, 41 (6.7%) were in administrative areas, 27 (4.4%) were doing social work, 18 (2.9%) were paramedics, and 14 (2.3%) performed management and coordination functions.

### Mean, Standard Deviations, and Bivariate Correlation of PTSD, Resilience, and Socio-Demographic Variables

Resilience (r=-.663, p<.01) and all its factors were negatively associated with PTSD. Besides, resilience was positively associated with age (r=.135, p<.01) and experience (r=.134, p<.01). However, the social support dimension was not related to age or experience. **Table 1** shows bilateral association between PTSD and resilience and dimensions that comprise it.

After finding internal associations between resilience and PTSD scores, the potential role of resilience in developing PTSD was evaluated. Differences were found in resilience and PTSD scores among HCW. Regarding PTSD, through a post hoc test, it was found that nurses showed a higher mean than physicians (p=.007) 95% CI [.75, 7.88] and psychologists (p<.001) 95% CI [5.25, 13.06]. Administrative staff showed a higher mean than psychologists (p=.011) 95% CI [.98, 13.21], and physicians reported a higher mean compared to psychologists (p=.004) 95% CI [1.03, 8.64]. In contrast, regarding mean resilience scores, only psychologists reported higher means compared with nurses (p=.005) 95% CI [.86, 7.84]. In **Table 2**, scores that each group obtained in both variables can be distinguished.

**Table 2.** Comparison of PTSD & resilience in health sector workers during the COVID-19 pandemic

| | M (SD) | | | | | | | F | p | f | 1-β |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Physicians | Nurses | Psychologists | AA | Social work | Paramedics | PM/CF | | | | |
| PTSD | 21.13 (11.39) | 25.45 (11.85) | 16.29 (11.02) | 23.39 (13.16) | 21.67 (10.77) | 18.94 (11.83) | 19.79 (14.40) | 8.42 | >.001 | .28 | .99 |
| RESI | 128.56 (21.43) | 125.31 (22.12) | 135.88 (17.75) | 128.83 (19.49) | 137.37 (18.55) | 141.11 (16.5) | 134.71 (21.65) | 3.74 | .001 | .19 | .87 |

Note. AA: Administrative area; PM/CF: Performed management/coordination functions; & RESI: Resilience

**Table 3.** Regression model for the effect of resilience on PTSD

| | F | $R^2$ | $\Delta R^2$ | B | SE | β | p | $f^2$ | 1-β |
|---|---|---|---|---|---|---|---|---|---|
| RESI-PTSD | 166.76 (1,612) | 0.214 | 0.213 | -0.267 | 0.021 | -0.463 | <.001 | 0.272 | 0.99 |

Note. RESI: Resilience & SE: Standard error

Finally, as shown in **Table 3**, using regression equations, statistically significant differences were found. It is possible to notice that resilience appeared to have a negative effect on PTSD, which could be explained in 21%.

## DISCUSSION

This study aimed to explore the association of resilience and PTSD in HCWs during the COVID-19 outbreak, and to learn the potential role of positive coping style, particularly resilience, with the development of PTSD symptoms among HCW.

From the extraordinary experience of the COVID-19 pandemic, the problems faced by HCWs became evident, such as high mortality of patients under their care, high demands on health care, rationing of health care supplies, physical stress and extraordinary emotional [14, 47]. PTSD has been shown to be present in HCW in previous emergent virus crises. The study [48] is an example of evidence-informed methods to provide specific skills as a security plan that health personnel could use when responding to disasters. Our findings support the need to join efforts in mental health services to promote the well-being of the population, especially those who may be at higher risk.

Not all individuals react in the same way to situations of vulnerability, establishing a new paradigm in which trauma does not always lead to serious damage and is not the consequence of an adverse event. In such a way that the impact that these events have on a person's life is related to the perception made of it, as well as the individual characteristics that determine the degree of vulnerability and the coping strategies of everyone. In this sense, the presence of both protective factors and risk factors is necessary for the development of resilience, because as suggested, resilience arises from exposure to risk and is based on the strengths of individuals, where protective factors serve as support by reducing or avoiding the negative effects of risk, that is, it represents a dynamic interaction between risk and protection processes, as well as internal and external processes to the individual. The study [49] comments that in situations of greater vulnerability ideas, skills, intuitions, and knowledge arise that drive the growth and development of individuals, even in difficult situations.

Understanding the coping responses during COVID-19 outbreak among HCW is important for developing tailored prevention and intervention actions to protect the populations at risk from the deleterious impacts of uncontrollable and life-threatening diseases and promote ability to cope, particularly resilience, to improve quality of life and well-being. Particularly, our findings suggest resilience as a protective factor against PTSD that should be included in prevention programs.

Particularly, nurses appear to be a high-risk group among HCW. Our findings underline the need of bringing special attention to this sub sample. Similar findings have emphasized that being a nurse within the COVID 19 pandemic could be associated with a higher risk of having at least one of the mental health problems [13]. This might be caused by more intensive and sustained daily contact with critically ill patients and therefore a greater number of traumatic experiences related to their care compared to other professionals [47]. Efforts towards implementing evidence-based interventions for this population must be prioritized (e.g., Mealer's multimodal resilience training program for ICU nurses [50].

Our data support the idea of promoting the development of prevention and health promotion strategies in HCW, not only because of the health crisis but also for the future. In this sense, the need for strategies that allow HCW to access mental health support, especially in emergency situations, becomes relevant. Institutions must implement actions to promote coping skills, social support, and resilience as elements for promoting well-being and preventing emotional distress [51]. As well as the importance of accompanying these initiatives with the encouragement of having social support networks [19].

Developing resilience is relevant since it can be an important factor in the difference in individual vulnerability to presenting PTSS and those who do not. Protective factors such as self-care, physical activation, and sleep hygiene have shown promising effects in decreasing rates of burnout, improving quality of life, and promoting resilience in HCW [52, 53].

Similarly, strategies aimed at achieving meaning and value at work are associated with less burnout [54], as well as providing adequate training and thereby improving skills in work tasks, is essential to provide safe patient care and thus strengthen the professional self-confidence of HCWs. Likewise, psychoeducational, and psychological interventions focused on cognitive modification, anxiety management, coping strategies have shown an incidence in reducing the symptoms of anxiety, depression, and stress in HCW [55].

Finally, the study provides evidence about the impact on mental health in HCW during COVID-19 in Mexico, thus contributing to existing incipient studies compared to developed countries. Likewise, information is offered that can be transferred to policy makers and take actions for the mental health care of HCWs.

### Limitations

The main limitation of the study is that the data were obtained from participants who sought self-applied treatment to cope with the emotional distress during the COVID-19

pandemic, which could bias their responses aimed at obtaining the intervention; this was not a probabilistic sample, they constitute a group of special interest due to their particular characteristics. Another limitation to consider is the limited representativeness of the evaluated sample, which prevents the generalization of the results to the entire population.

Future studies could include variables such as socioeconomic status, mental health status prior to the COVID-19 pandemic, subjective happiness, and hope to prevent fear of the consequences of COVID-19. It would be important to explore in depth the variables under study, to identify aspects that could constitute tailored interventions for this population.

**Author contributions: ARG:** conceptualization & data collection, writing original draft preparation, writing, review, & editing; **AD-R, RJMA, PEH-A, & RRG:** conceptualization & data collection, writing, review, & editing; **AMRH:** data curation & statistical analyzes; **LAF-P & CSTT:** writing original draft preparation, writing, review, & editing; & **AEG & EBV:** writing, review, & editin. All authors have sufficiently contributed to the study and agreed with the results and conclusions.

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**Declaration of interest:** No conflict of interest is declared by authors.

**Data sharing statement:** Data supporting the findings and conclusions are available upon request from the corresponding author.

## REFERENCES

1. WHO. WHO COVID-19 dashboard. World Health Organization; 2023. Available at: https://covid19.who.int/ (Accessed: 5 January 2023).
2. Lai J, Ma S, Wang Y, et al. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA Netw Open. 2020;3(3):e203976. https://doi.org/10.1001/jamanetworkopen.2020.3976 PMid:32202646 PMCid:PMC7090843
3. Cabedo E, Prieto J, Quiles L, et al. Factors associated to emotional impact of COVID-19 pandemic on health professional. Behav Psychol. 2022;30(1):69-91. https://doi.org/10.51668/bp.8322104s
4. Ventura R. Atención psicosocial en desastres [Psychosocial care in disasters]. Editorial Ciencias Médicas [Editorial Medical Sciences]; 2011.
5. Johns G, Samuel V, Freemantle L, Lewis J, Waddington L. The global prevalence of depression and anxiety among doctors during the COVID-19 pandemic: Systematic review and meta-analysis. J Affect Disord. 2021;298:431-41. https://doi.org/10.1016/j.jad.2021.11.026 PMid:34785264 PMCid:PMC8596335
6. Brooks S, Amlôt R, Rubin GJ, Greenberg N. Psychological resilience and post-traumatic growth in disaster-exposed organisations: Overview of the literature. BMJ Mil Health. 2020;166(1):52-6. https://doi.org/10.1136/jramc-2017-000876 PMid:29420257
7. Kisely S, Warren N, McMahon L, Dalais C, Henry I, Siskind D. Occurrence, prevention, and management of the psychological effects of emerging virus outbreaks on healthcare workers: Rapid review and meta-analysis. BMJ. 2020;369:m1642. https://doi.org/10.1136/bmj.m1642 PMid:32371466 PMCid:PMC7199468
8. Mosheva M, Gross R, Hertz-Palmor N, et al. The association between witnessing patient death and mental health outcomes in frontline COVID-19 healthcare workers. Depress Anxiety. 2021;38:468-79. https://doi.org/10.1002/da.23140 PMid:33544405 PMCid:PMC8014064
9. Luceño-Moreno L, Talavera-Velasco B, García-Albuerne Y, Martín-García J. Symptoms of posttraumatic stress, anxiety, depression, levels of resilience and burnout in Spanish health personnel during the COVID-19 pandemic. Int J Environ Res Public Health. 2020;17(15):5514. https://doi.org/10.3390/ijerph17155514 PMid:32751624 PMCid:PMC7432016
10. Marvaldi M, Mallet J, Dubertret C, Moro MR, Guessoum SB. Anxiety, depression, trauma-related, and sleep disorders among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. Neurosci Biobehav Rev. 2021;126:252-64. https://doi.org/10.1016/j.neubiorev.2021.03.024 PMid:33774085 PMCid:PMC9754720
11. Naushad VA, Bierens JJ, Nishan KP, et al. A systematic review of the impact of disaster on the mental health of medical responders. Prehosp Disaster Med. 2019;34(6):632-43. https://doi.org/10.1017/S1049023X19004874 PMid:31625487
12. Rodríguez C. Cinco retos psicológicos de la crisis del COVID-19 [Five psychological challenges of the COVID-19 crisis]. JONNPR. 2020;5(6):583-88. https://doi.org/10.19230/jonnpr.3662
13. Liu N, Zhang F, Wei C, et al. Prevalence, and predictors of PTSS during COVID-19 outbreak in China hardest-hit areas: Gender differences matter. Psychiatry Res. 2020;287:112921. https://doi.org/10.1016/j.psychres.2020.112921 PMid:32240896 PMCid:PMC7102622
14. Robles R, Rodríguez E, Vega-Ramírez H, et al. Mental health problems among healthcare workers involved with the COVID-19 outbreak. Braz J Psychiatry. 2021;43(5):494-503. https://doi.org/10.1590/1516-4446-2020-1346 PMid:33331498 PMCid:PMC8555639
15. Benjet C, Bromet E, Karam EG, et al. The epidemiology of traumatic event exposure worldwide: Results from the world mental health survey consortium. Psychol Med. 2016;46(2):327-43. https://doi.org/10.1017/S0033291715001981 PMid:26511595 PMCid:PMC4869975
16. Dalvie S, Daskalakis NP. The biological effects of trauma. Complex Psychiatry. 2021;7(1-2):16-8. https://doi.org/10.1159/000517236 PMid:35592091 PMCid:PMC8443929
17. Lee JY, Kim SW, Kim JM. The impact of community disaster trauma: A focus on emerging research of PTSD and other mental health outcomes. Chonnam Med J. 2020;56(2):99-107. https://doi.org/10.4068/cmj.2020.56.2.99 PMid:32509556 PMCid:PMC7250671
18. Daskalakis NP, Rijal CM, King C, Huckins LM, Ressler KJ. Recent genetics and epigenetics approaches to PTSD. Curr Psychiatry Rep. 2018;20(5):30. https://doi.org/10.1007/s11920-018-0898-7 PMid:29623448 PMCid:PMC6486832

19. Labrague LJ. Psychological resilience, coping behaviours and social support among health care workers during the COVID-19 pandemic: A systematic review of quantitative studies. J Nurs Manag. 2021;29(7):1893-905. https://doi.org/10.1111/jonm.13336 PMid:33843087 PMCid:PMC8250179
20. Lenzo V, Quattropani MC, Sardella A, Martino G, Bonanno GA. Depression, anxiety, and stress among healthcare workers during the COVID-19 outbreak and relationships with expressive flexibility and context sensitivity. Front Psychol. 2021;12:623033. https://doi.org/10.3389/fpsyg.2021.623033 PMid:33692724 PMCid:PMC7937736
21. Oakley LD, Kuo WC, Kowalkowski JA, Park W. Meta-analysis of cultural influences in trauma exposure and PTSD prevalence rates. J Transcult Nurs. 2021;32(4):412-24. https://doi.org/10.1177/1043659621993909 PMid:33593236
22. Brewin CR. Coherence, disorganization, and fragmentation in traumatic memory reconsidered: A response to Rubin et al. (2016). J Abnorm Psychol. 2016;125(7):1011-7. https://doi.org/10.1037/abn0000154 PMid:27732029
23. Broekman BF, Olff M, Boer F. The genetic background to PTSD. Neurosci Biobehav Rev. 2007;31(3):348-62. https://doi.org/10.1016/j.neubiorev.2006.10.001 PMid:17126903
24. Sherin JE, Nemeroff CB. Post-traumatic stress disorder: The neurobiological impact of psychological trauma. Dialogues Clin Neurosci. 2011;13(3):263-78. https://doi.org/10.31887/DCNS.2011.13.2/jsherin PMid:22034143 PMCid:PMC3182008
25. APA. APA dictionary of psychology. American Psychological Association; 2022. Avaiilable at: https://dictionary.apa.org (Accessed: 5 January 2023).
26. Bonanno GA, Mancini AD. Beyond resilience and PTSD: Mapping the heterogeneity of responses to potential trauma. Psychol Trauma: Theory Res Pract Policy. 2012;4(1):74-83. https://doi.org/10.1037/a0017829
27. Vecina M. Emociones positivas [Positive emotions]. Psychol Papers. 2006;27(1):9-17.
28. García del Castillo J A, García del Castillo-López A, López-Sánchez C, DiasPaulo C. Conceptualización teórica de la resiliencia psicosocial y su relación con la salud [Theoretical conceptualization of psychosocial resilience and its relationship with health]. Health Drug. 2016;16(1):59-68. https://doi.org/10.21134/haaj.v16i1.263
29. Poseck B, Baquero B, Jiménez ML. La experiencia traumática desde la psicología positiva: Resiliencia y crecimiento postraumático [The traumatic experience from positive psychology: Resilience and post-traumatic growth]. Role Psychol. 2006;27(1):40-9.
30. Resnick KS, Fins JJ. Professionalism and resilience after COVID-19. Acad Psychiatry. 2021;45(5):552-6. https://doi.org/10.1007/s40596-021-01416-z PMid:33649940 PMCid:PMC7920636
31. Benham TL, Hart A, Bortolin M, et al. Preparing for the second surge: Preventing posttraumatic stress disorder and building resilience for health care workers in the face of COVID-19. Disaster Med Public Health Prep. 2022;16(2):714-7. https://doi.org/10.1017/dmp.2020.371 PMid:33046178 PMCid:PMC7684017
32. Ruiz-Fernández MD, Ramos-Pichardo JD, Ibáñez-Masero O, Cabrera-Troya J, Carmona-Rega MI, Ortega-Galán M. Compassion fatigue, burnout, compassion satisfaction and perceived stress in healthcare professionals during the COVID-19 health crisis in Spain. J Clin Nurs. 2020;29:4321-30. https://doi.org/10.1111/jocn.15469 PMid:32860287
33. Ma R, Oakman JM, Zhang M, Zhang X, Chen W, Buchanan NT. Lessons for mental health systems from the COVID-19 front line: Chinese healthcare workers' challenges, resources, resilience, and cultural considerations. Traumatology. 2021;27(4):432-43. https://doi.org/10.1037/trm0000343
34. Conversano C, Marchi L, Miniati M. Psychological distress among healthcare professionals involved in the COVID-19 emergency: Vulnerability and resilience factors. Clin Neuropsychiatry. 2020;17(2):94-6. https://doi.org/10.36131/CN20200212 PMid:34908976 PMCid:PMC8629057
35. Miguel-Puga JA, Cooper-Bribiesca D, Avelar-Garnica FJ, et al. Burnout, depersonalization and anxiety contribute to posttraumatic stress in frontline health workers at COVID-19 patient care, a follow-up study. Brain Behav. 2021;11:e02007. https://doi.org/10.1002/brb3.2007 PMid:33319496 PMCid:PMC7883101
36. Dobson H, Malpas CB, Burrell AJ, et al. Burnout and psychological distress amongst Australian healthcare workers during the COVID-19 pandemic. Australas Psychiatry. 2020;29(1):26-30. https://doi.org/10.1177/1039856220965045 PMid:33043677 PMCid:PMC7554409
37. Jiang M, Shao X, Rao S, et al. Emotional state of Chinese healthcare workers during COVID-19 pandemic. Front Psychol. 2022;13:854815. https://doi:10.3389/fpsyg.2022.854815 PMid:35401318 PMCid:PMC8984149
38. Campo-Arias A, Jiménez-Villamizar MP, Caballero-Domínguez CC. Healthcare workers' distress and perceived discrimination related to COVID-19 in Colombia. Nurs Health Sci. 2021;23(3):763-7. https://doi.org/10.1111/nhs.12854 PMid:33999491 PMCid:PMC8242481
39. McKay D, Heisler M, Mishori R, Catton H, Kloiber O. Attacks against health-care personnel must stop, especially as the world fights COVID-19. Lancet. 2020;395:1743-5. https://doi.org/10.1016/S0140-6736(20)31191-0 PMCid:PMC723962
40. Narita Z, Okubo R, Sasaki Y, et al. COVID-19-related discrimination, PTSD symptoms, and psychological distress in healthcare workers. Int J Ment Health Nurs. 2023;32:139-46. https://doi.org/10.1111/inm.13069 PMid:36176263 PMCid:PMC9538840
41. Montero I, León G. Sistema de clasificación del método en los informes de investigación en psicología [Method classification system in research reports in psychology]. Int J Clin Health Psychol. 2005;5(1):115-27.
42. Foa EB, Cashman L, Jaycox L. Perry K. The validation of a self-report measure of posttraumatic stress disorder: The posttraumatic diagnostic scale. Psychol Assess. 1997;9(4):445-51. https://doi.org/10.1037/1040-3590.9.4.445
43. Novy DM, Stanley MA, Averill P, Daza P. Psychometric comparability of English- and Spanish-language measures of anxiety and related affective symptoms. Psychol Assess. 2001;13(3):347-55. https://doi.org/10.1037//1040-3590.13.3.347 PMid:11556271
44. Palomar J, Gómez NE. Desarrollo de una escala de medición de resiliencia con Mexicanos (RESI-M) [Development of a resilience measurement scale with Mexicans (RESI-M)]. Interdisciplinaria. 2010;27(1):7-22.

45. Dominguez-Rodriguez A, Martínez-Arriaga RJ, Herdoiza-Arroyo PE, et al. E-health psychological intervention for COVID-19 healthcare workers: Protocol for its implementation and evaluation. Int J Environ Res Public Health. 2022;19(19):12749. https://doi.org/10.3390/ijerph191912749 PMid:36232049 PMCid:PMC9566813
46. Blanca MJ, Alarcón R, Arnau J, Bono R, Bendayan R. Non-normal data: Is ANOVA still a valid option? Psicothema. 2017;29(4):552-7. https://doi.org/10.7334/psicothema2016.383 PMid:29048317
47. Lorente L, Vera M, Peiró T. Nurses' stressors and psychological distress during the COVID-19 pandemic: The mediating role of coping and resilience. J Adv Nurs. 2021;77(3):1335-44. https://doi.org/10.1111/jan.14695 PMid:33210768 PMCid:PMC7753515
48. Schreiber M, Cates DS, Formanski S, King M. Maximizing the resilience of healthcare workers in multi-hazard events: Lessons from the 2014-2015 ebola response in Africa. Mil Med. 2019;184(Suppl1):114-20. https://doi.org/10.1093/milmed/usy400 PMid:30901435
49. Acero J. Emoción como exploración [Emotion as exploration]. Philos Rev. 2009;26(52):133-62.
50. Mealer M, Conrad, D, Evans, J, et al. Feasibility, and acceptability of a resilience training program for intensive care unit nurses. Am J Crit Care. 2014;23(6):e97-105. https://doi.org/10.4037/ajcc2014747 PMid:25362680
51. Cantor-Cruz F, McDouall-Lombana J, Parra A, et al. Mental health care of health workers during COVID-19: Recommendations based on evidence and expert consensus. Rev Colomb Psiquiatr. 2021;50(3):225-31. https://doi.org/10.1016/j.rcpeng.2021.02.004 PMid:34629561 PMCid:PMC7955936
52. Heath C, Sommerfield A, von Ungern-Sternberg BS. Resilience strategies to manage psychological distress among healthcare workers during the COVID-19 pandemic: A narrative review. Anaesthesia. 2020;75:1364-71. https://doi.org/10.1111/anae.15180 PMid:32534465 PMCid:PMC7323405
53. Weight CJ, Sellon JL, Lessard-Anderson CR, Shanafelt TD, Olsen KD, Laskowski ER. Physical activity, quality of life, and burnout among physician trainees: The effect of a team-based, incentivized exercise program. Mayo Clin Proc. 2013;88(12):1435-42. https://doi.org/10.1016/j.mayocp.2013.09.010 PMid:24290117
54. Fox S, Lydon S, Byrne D, Madden C, Connolly F, O'Connor P. A systematic review of interventions to foster physician resilience. Postgrad Med J. 2018;94(1109):162-70. https://doi.org/10.1136/postgradmedj-2017-135212 PMid:29018095
55. Robles R, Ascencio L, Díaz D, et al. Implementation science of telepsychotherapy for anxiety, depression, and somatization in health care workers dealing with COVID-19. Telemed J E Health. 2022. https://doi.org/10.1089/tmj.2022.0155 PMid:36126309