Stress and quality of life of intensive care nurses during the COVID-19 pandemic: Self-efficacy and resilience as resources

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Abstract
Background: Health care workers employed in the COVID-19 emergency are at a high risk of stress.
Aims and objectives: To explore the mediating roles of self-efficacy and resilience between stress and both physical and mental quality-of-life components in intensive care nurses during the COVID-19 pandemic.
Design: Cross-sectional survey design.
Methods: The stress subscale (depression, anxiety, and stress scale in Spanish Scale, DASS-21), the summary components (physical and mental) of health-related quality of life (SF-36), the general self-efficacy scale (GSES), and the resilience scale (RS-14) were administered in 308 intensive care nurses. Serial multiple mediator models were used.
Results: There was a significant indirect effect of levels of perceived stress on both physical and mental health components through self-efficacy and resilience. Specifically, greater perception of self-efficacy was associated with a lower perception of stress and greater resilience, while higher resilience was associated with greater physical and mental health ($B = -0.03; SE = 0.02; 95\% CI = [-0.07, -0.01]$; $B = -0.03, SE = 0.01, 95\% CI = [-0.07, -0.01]$, respectively). It was observed that self-efficacy alone also mediates the relationship of the perception of stress on the components of physical and mental health ($B = -0.07; SE = 0.05; 95\% CI = [-0.18, -0.03]$; $B = -0.09; SE = 0.04; 95\% CI = [-0.17, -0.24]$, respectively). However, resilience alone was not a significant mediator of these associations.
Conclusions: It can be concluded that stress is linked to the physical and mental health components related to quality of life through self-efficacy and resilience.
Relevance to clinical practice: These psychological resources would allow the nursing staff to maintain a good quality of life despite high levels of stress. These findings...
INTRODUCTION

The health crisis caused by the 2019 coronavirus pandemic (COVID-19) has highlighted the relevance of intensive care unit (ICU) health care personnel. At the same time, this situation has caused a decrease in the quality of life related to both the physical and mental health of these particular workers. Lack of resources, lack of sleep, longer work shifts, or risks associated with exposure to the virus are some of the factors that have contributed to the appearance of stress. Understanding as feelings of physical or emotional tension that appear in adverse situations when we are overwhelmed by believing that we do not have the time or personal resources to solve it. A current review of the stress perceived by health care professionals during the COVID-19 pandemic notes that nurses experience extremely high stress. As a consequence, this group has indicated that their physical and mental quality of life has worsened, having a detrimental impact on the quality of patient care.

The transactional theory of stress proposed by Lazarus and Folkman provides an adequate framework to understand the health consequences in ICU personnel during this pandemic. This model proposes that individuals are agents and not victims of the stress process, suggesting the need to study the personal psychological resources of workers to maintain health, despite exposure to adverse conditions. Being in continuous contact with the suffering of others, subjected to high care pressures without the necessary support to carry out the activity safely, or long work days in which they are caring for people who are invaded by fear, evidence the psychological resources that individuals develop while working in this environment.

Two of the main personal resources that play an important role in how the individual addresses challenges are self-efficacy and resilience. From the perspective of Bandura's theory, self-efficacy is considered a central construct in carrying out a behaviour, since the relationship between knowledge and action is significantly mediated by thoughts of self-efficacy. The latter has been defined as the belief in one's abilities to achieve their proposed objectives. Resilience theory attempts to answer why some people respond better to stress and adversity. Thus, resilience is defined as the ability to flexibly assume and overcome limited situations.

Within the studies carried out regarding the impact on health care staff working during the COVID-19 pandemic, and according to the literature in other populations, it has been found that both resilience and self-efficacy have been negatively associated with stress, anxiety, physical fatigue, or work performance, among others, and positively associated with well-being, quality of life, or physical functionality. Furthermore, different studies have mentioned the possible mediating role of both variables in the face of highly stressful events. Therefore, it could be considered that possessing positive psychological resources could reduce the impact associated with the stressful situations created by coping with the COVID-19 pandemic on ICU personnel. In this context, the most current literature has shown that nurses have high and moderate levels of resilience and moderate levels of self-efficacy despite presenting symptoms of anxiety and depression. Thus, the aim of this study was to analyse the moderating effect of personal resources, namely, self-efficacy and resilience, between stress and the components of physical and mental quality of life in ICU nurses during the COVID-19 pandemic. It is
hypothesized that both variables mediate the relationship between stress and physical and mental health components.

2 | METHODS

2.1 | Procedure

Data collection was performed using an online electronic form designed for this purpose by the research team. The aim of the study was presented on the first sheet of the questionnaire, and the consent to use their data in the study was requested. A previous pilot study was carried out with health professionals (n = 20) from a public hospital in Madrid (Spain). The selection of the sample was carried out by means of non-probability convenience sampling, sending the link to ICU nurses in the Spanish health system who had been in contact with patients affected by COVID-19, circulating it through social networks (Facebook, Twitter, LinkedIn) and corporate emails from hospitals nationwide when available, so the exact number of participants who were invited to participate could not be known. A minimum sample size of 200 participants was established, following the minimum number criteria for modelling analysis. A total of 308 nurses who provided their services in surgical and general critical care units between the months of March 2020 to June 2020 participated in the present study. At this time, Spain was facing the first wave of the pandemic.

2.2 | Ethical consideration

The study was approved by the Hospital Ethics and Research Committee. In addition, the present study has received the scientific endorsement of the Spanish Society of Intensive and Coronary Care Nursing (SEEIUC).

2.3 | Measurements

2.3.1 | Stress

The stress subscale of the depression, anxiety, and stress scale (DASS-21) was used in its Spanish version. This subscale consists of 7 items on a Likert-type response format of four alternatives from 0 (it has not happened to me) to 3 (it has happened to me a lot or most of the time). The Cronbach’s alpha value in the present study was .88, which is considered excellent. Furthermore, in the original validation of the Spanish version, a Cronbach’s alpha for stress of .82 was obtained.

2.3.2 | Self-efficacy

The general self-efficacy scale (GSES) was used. It is composed of 10 items that measure the stable feeling of competence to handle life situations. It is scored on a Likert-type response scale with four alternatives, ranging from 1 (strongly disagree) to 4 (strongly agree), with a range of total scores from 10 to 40. In this study, the GSES showed excellent internal consistency (Cronbach’s alpha = .87) similar to what was obtained in the original Spanish validation (Cronbach’s alpha = .90).

2.3.3 | Resilience

The resilience scale (RS-14) was used for this study. This scale measures, through 14 items, the degree of individual resilience, considered as a positive personality characteristic that allows the individual to adapt to adverse situations. It is assessed using a Likert-type response scale with seven alternatives, ranging from 1 (totally disagree) to 7 (totally agree). The alpha value was .89 in the present study, which implies an excellent internal consistency, being slightly higher than that obtained in the original Spanish validation (Cronbach’s alpha = .79).

2.3.4 | Quality-of-life components related to physical and mental health

The two summary components, physical health component (PCS) and mental health component (MCS), of the health-related quality-of-life scale (SF-36) were used as the main result in this study. The SF-36 is made up of 36 items that cover the following scales: physical function, physical role, bodily pain, general health, vitality, social function, emotional role, and mental health. The combination of the scores for each dimension gives rise to two summary scores corresponding to the PCS and the MCS. This allows the obtained values to be compared with the population values. For the Spanish population, these two components have a mean of 50 (Min = 0, Max = 100) and an SD of 10. Scores above or below 50 are considered to be better or worse, respectively, than those of the general population. The Spanish versions of the SF-36 health questionnaire and the population norms have been validated by Alonso et al.

The Cronbach’s alpha of the scale for the PCS was .90 and for the MCS it was .89. Both values, involving excellent reliability, were higher than those obtained in the original Spanish validation of the scale, both being above .70.

2.4 | Statistical analysis

The analyses were performed with the SPSS 22 statistical package. First, descriptive analysis, internal consistency analysis (Cronbach’s alpha coefficients), and Pearson correlations were performed. For continuous variables, means, SDs, and range medians were used, while categorical data were presented as numbers and percentages. The level of statistical significance for all tests was established at a P value of <.05.
For the serial multiple mediation analysis (SMM; mediation of several mediators going one after another), SPSS macro PROCESS (model 6) was used, applying two significant mediators. As recommended by Hayes, the regression/trajectory coefficients are all in non-standardized form since the standardized coefficients generally do not have a useful substantive interpretation. The tested model included stress as a predictor (X), self-efficacy (M1), and resilience (M2) as mediators and PSC and MSC as dependent variables (Y and Y’, respectively). The model fit was also examined using the following criteria: a chi-square/df of ≤2, a P value of >.05, a comparative fit index of ≥0.95, and an approximation of the mean squared error of <0.06.

3 | RESULTS

3.1 | Sample characteristics, descriptive statistics, and zero-order correlations

Among the 308 participants, 268 (87%) were women and 40 (13%) were men. The average age was 38.86 (SD = 10.29). A total of 53.9% were working on a temporary basis, 19.8% were permanent staff, and 26.3% were hired specifically for the COVID-19 pandemic. All participants cared for COVID patients during the sampling period. Of which, <2% (1.9%) cared for <5 COVID patients, 9.7% cared for 5-10 COVID patients, 30.2% cared for 11-20 COVID patients, and 58.1% cared for >20 COVID patients. Regarding the workload during the pandemic, 0.6% reported a lower than usual load, 3.9% a workload equal to the usual, and 95.5% a higher than usual load. The average number of hours during the week was 45.12 (SD = 10.88) with a range of 20-100.

Table 1 shows the mean values, SDs, and ranges for the sociodemographic and psychosocial variables. There was a significant correlation between the scores of all the variables under study. Stress was negatively correlated with resilience (r = −0.31, P = .021), self-efficacy (r = −0.21, P < .001), as well as with PCS (r = −0.29, P < .001) and MCS (r = −0.67, P < .001). The PCS positively correlated with resilience (r = 0.16, P = .004) and self-efficacy (r = 0.19, P = .001). Likewise, the MCS also positively correlated with both variables (r = 0.29, P < .001; r = 0.29, P < .000, respectively). Regarding the sociodemographic variables, no significant differences were observed (all P > .05).

Following the recommendations of Baron and Kenny for the inclusion of mediator variables, there must be a significant correlation between both predictors and outcome variables. In order to establish the importance of psychosocial variables and assess whether they should be included in the model, the two mediators proposed here were analysed with predictive (stress) and criterion variables (PCS and MCS). As shown by the analyses described earlier, both resilience and self-efficacy could be included in the route model; therefore, they were included for mediation analysis. Sociodemographic variables were not included as covariates in the mediation model since previous analyses did not indicate statistically significant associations between the said variables and the outcome variables of the study (stress and quality of life).

### TABLE 1 | Sample characteristics (n = 308)

| Variables | Descriptives |
|-----------|-------------|
| Age, mean (SD) | 38.86 (10.29) |
| Sex, n (%) | |
| Female | 268 (87) |
| Male | 40 (13) |
| Employment relationship, n (%) | |
| Fixed | 166 (53.9) |
| Interim | 61 (19.8) |
| Hired for the COVID-19 pandemic | 81 (26.3) |
| Care for patients with COVID, n (%) | 308 (100) |
| No. of COVID patients, n (%) | |
| <5 | 6 (1.9) |
| 5–10 | 30 (9.7) |
| 11–20 | 93 (30.2) |
| >20 | 179 (58.1) |
| Workload during COVID, n (%) | |
| Less than normal workload | 2 (0.6) |
| Same as normal workload | 12 (3.9) |
| More than normal workload | 294 (95.5) |
| No. of working hours/weekly working day, mean (SD) | 45.12 (10.88) |
| Psychosocial characteristics | |
| Theoretical range | Sample range | Mean (SD) |
| Stress | 0–21 | 0–21 | 10.46 (4.31) |
| Self-efficacy | 10–40 | 18–40 | 29.65 (3.69) |
| Resilience | 1–98 | 14–98 | 78.12 (15.31) |
| Physical health component | 0–100 | 15–100 | 87.53 (16.51) |
| Mental health component | 0–100 | 0–100 | 53.98 (22.06) |

Note: Theoretical range is the interval between the maximum value and the minimum value that can be obtained in those dimensions. Instead, the sample range is the interval between the maximum value and the minimum value of the sample in that dimension.

3.2 | SMM analysis

Since two mediators were used and two models were proposed, four different causal models were produced: SMM 1 (stress→self-efficacy→resilience→PCS), SMM 2 (stress→resilience→self-efficacy→PCS), SMM 3 (stress→self-efficacy→resilience→MCS), and SMM 4 (stress→resilience→self-efficacy→MCS). The four models were compared in terms of the significant pathway created by each different causal order of mediators. Only the indirect routes SMM1 and SMM 3 were significant (Figures 1 and 2). For the SMM 1 model, a total effect (B = −1.13, SE = 0.20, t = −5.41, 95% CI = [−1.54, −0.72], P < .001)
of the predictors on PCS was found. Furthermore, there was a significant indirect effect of stress on PCS via self-efficacy and resilience ($B = -0.03; SE = 0.02; 95\% CI = [-0.07, -0.01]$) (Figure 1). That is, lower perception of stress predicted greater self-efficacy, which predicted greater resilience, which, in turn, predicted a higher PCS. There was also a significant simple indirect effect of stress on PCS through self-efficacy ($B = -0.07; SE = 0.05; 95\% CI = [-0.18, -0.03]$). In contrast, no mediating effect was observed through resilience ($B = -0.02; SE = 0.02; 95\% CI = [-0.04, 0.22]$). The contrast test, despite not showing significant differences between the indirect effects compared, shows that the model that represents all mediators in series ($95\% CI = [-0.07, -0.01]$) is slightly superior to the model that represents self-efficacy alone ($95\% CI = [-0.12, -0.09]$). Overall, the effect of stress on PCS in the model accounting for all mediators explained 12% of the variance ($R^2 = 0.12; P < .0001$). However, the variance explained by the model that represents self-efficacy alone explains 7% ($R^2 = 0.07; P = .014$).

For the SMM3 model, the total effect was also observed ($B = -2.14, SE = 0.13, t = -15.80, 95\% CI = [-2.41, -1.88], P < .001$). The effect of stress on the MCS was also completely mediated by self-efficacy ($B = -0.09; SE = 0.04; 95\% CI = [-0.17, -0.14]$) and by the two serial mediators ($B = -0.03, SE = 0.01, 95\% CI = [-0.07, -0.01]$). In contrast, no mediating effect on resilience was observed ($B = -0.04, SE = 0.02, 95\% CI = [-0.05, 0.24]$). The contrast test, despite not showing significant differences between the indirect effects compared, shows that the model that represents all mediators in series ($95\% CI = [-0.07, -0.02]$) is slightly superior to the model that represents self-efficacy alone ($95\% CI = [-0.16, -0.14]$). Overall, the effect of stress on the MCS in the model accounting for all mediators explained 45% of the variance ($R^2 = 0.45$).
The main aim of this study was to elucidate the associations between the perception of stress, self-efficacy, resilience, and health, both physical and mental, in ICU nurses during the COVID-19 pandemic. In accordance with the hypothesis presented, there was a significant indirect effect of perceived stress on PCS, mediated by self-efficacy and resilience. The same happened using MCS as an outcome. That is, lower perceived stress predicted higher self-efficacy scores, which predicted greater resilience, which, in turn, predicted higher levels of PCS and MCS. One possible explanation is that individuals with strong beliefs about their abilities can actively solve problems and adapt better to complex situations. People with these abilities react positively to stress, use resources better, and can more calmly accept the consequences of setbacks. This finding directly supports the model proposed by Lazarus and Folkman, which emphasizes the importance of studying psychological resources to explain the associations between stress processes and the health of individuals. Lazarus and Folkman added the significance of cognitive processes in connection with stress to the previously existing, predominantly functional-organic, stress models. In particular, considering the sequential nature of the model, the primary and secondary assessments affect the outcome of the adjustment process through the use of different coping strategies or psychological resources. Particularly, secondary assessment is directly linked to the perception of individuals’ capabilities of handling the stressor (self-efficacy). From the sequential model, it could be hypothesized that a positive secondary assessment (“I am capable of handling this”) is necessary to elicit adaptive and effective psychological resources (ie, resilience). These results have important practical implications since they show that having these resources allows health care workers, in situations of stress, such as the COVID-19 pandemic, to improve their general health status related to quality of life. Specifically, different studies have focused on the role of resilience in intensive care nursing staff. At an applied level, it is of special interest to understand the concept of resilience so as to be able to provide support and develop programmes to help nurses become and stay resilient. It should be borne in mind that resilience is a resource that arises in especially adverse situations. Specifically, a review carried out in nurses suggested that challenging workplaces, psychological emptiness (ie, a feeling of numbness that is illusory and disturbing, provoking an inability to feel anything emotionally, or the sensation of not having any purpose), diminishing perception of well-being, and a sense of dissonance are contributing factors for resilience. Different strategies have been proposed to promote resilience, such as cognitive reframing, toughening up, grounding connections, work-life balance, reconciliation. It seems fundamental, therefore, to provide adequate training and orientation before assigning nurses to ICU to help, to offer disaster-emergency-preparedness training to allow nurses to be equipped, to provide caring and authentic nursing leadership and to arrange ongoing psychological support to frontline nurses. Different interventions have shown their effectiveness on occupational stress and resilience levels of nurses working in ICUs. Our results additionally show the relevance of self-efficacy as a prior cognitive resource for the implementation of resilience. Given that the effectiveness of cognitive behavioural therapy in improving self-efficacy is well known, showing its benefits on the ICU nurses’ occupational stress, future resilience interventions should include promoting self-efficacy as a prerequisite. In the absence of previous research, it could be hypothesized that the perception of capacity constitutes a necessary cognitive requirement for the implementation of resilience skills.

In the present study, the simple indirect effect of the perception of stress on the PCS and the MCS through self-efficacy was significant. Although this study has focused on ICU nurses, these results are consistent with a study carried out among Wuhan health care staff during the pandemic. However, in contrast to what has been previously been found in health care personnel and in other populations, among ICU nurses involved in this pandemic, it appears that resilience alone does not have a significant mediating effect between stress and PCS and MCS. This could mean that self-efficacy is required as a resource to develop resilience. These findings suggest that it is not resilience per se, but the perception of self-efficacy that is fundamental in explaining the relationship between the perception of stress and PCS and MCP. Thus, it appears that a cumulative protective effect (self-efficacy, resilience) is created by means of multiple resources. Other authors in other contexts have already mentioned this phenomenon previously. For this reason, it is possible that resilience, without other additional protective mechanisms such as self-efficacy, is not enough to moderate the relationship between the perception of stress and the components of physical and mental health. Future studies in this context should focus on the role of other potential positive psychological resources such as social support or self-esteem, among others.

In addition, the findings indicate a direct effect of the perception of stress on physical and mental health components. Similarly, these findings show that the high level of stress to which ICU nurses have been subjected directly contributes to worse health. These results confirm what other authors found in health care personnel in general during the pandemic in Singapore, India, and China.

Finally, the descriptive results show that, despite the stress levels (mean scores in the theoretical range of the scale), our sample exhibits high scores for self-efficacy and resilience (especially with regard to the latter). Regarding quality of life, our results indicate that MCS is significantly affected. However, high scores are observed in PCS, indicating a good quality of life relating to physical components. These data are consistent with previous literature that indicate high indicators of stress, emotional symptoms (anxiety, depression), and in general, impaired mental health in health care personnel during the COVID-19 pandemic. Likewise, different studies have also shown, in accordance with our results, high scores in positive psychological characteristics (ie, resilience, self-efficacy) among health care staff in these circumstances.
5 LIMITATIONS

The present study has a series of limitations to take into account. In first place, it is a correlational study, so causality cannot be established in the results. Furthermore, this was an internet-based study, so the response rate cannot be known and therefore some bias, regarding who answered the survey, could be found. Finally, the sample is made up of Spanish nurses from ICUs during the COVID-19 pandemic, without additional data from ICU nurses or other health care personnel from other countries. Therefore, the results cannot be generalized.

6 IMPLICATIONS FOR CLINICAL PRACTICE

The results obtained have, in our opinion, important practical repercussions. Effective intervention programmes for health care professionals to improve their physical and mental health when caring of critically ill patients must be designed, being even more relevant in pandemic situations. Therefore, it is of special relevance to implement programmes based on the acquisition or improvement of psychological resources such as self-efficacy and resilience.

7 CONCLUSIONS

Due to the magnitude and characteristics of the COVID-19 pandemic, nurses have seen their quality of life reduced in terms of physical and mental health. Therefore, taking into account the results obtained in this study, it is of special relevance to develop programmes for nurses based mainly on improving self-efficacy. The results of this study show that being a resilient person works as a resource in stressful situations. Therefore, it is of special relevance to implement programmes based on the acquisition or improvement of psychological resources such as self-efficacy and resilience.

AUTHOR CONTRIBUTIONS

Cecilia Peñacoba: Conceptualization; methodology; software; validation; formal analysis; investigation; resources; data curation; writing—original draft preparation; writing—review and editing; visualization; supervision; project administration; read and agreed to the published version of the manuscript.

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Fernanda Gil-Almagro: Conceptualization; methodology; validation; formal analysis; investigation; resources; data curation; writing—original draft preparation; writing—review and editing; visualization; supervision; project administration; funding acquisition; read and agreed to the published version of the manuscript.

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