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Impact of COVID-19 pandemic on the mental health of healthcare workers during the first wave in Portugal: a cross-sectional and correlational study

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ABSTRACT

Objectives The COVID-19 pandemic has had a negative impact on the mental health of healthcare workers (HCWs) worldwide. This study aims to identify the degree to which sociodemographic variables and indicators of subjective well-being and psychological resilience are associated, positively and negatively, with the outcomes of burnout, stress, depression and anxiety among Portuguese HCWs observed during the first wave. It also aims to evaluate the strength of association of these variables and indicators with each outcome.

Design Cross-sectional quantitative study. The statistical methods used are simple logistic model, multiple logistic regression model and −2*log-likelihood statistic.

Setting Portuguese HCWs living in Portugal and working in the Portuguese healthcare system.

Participants The study included 1535 professionals, with a mean age of 38 years.

Primary and secondary outcomes measures Psychological variables were measured by Copenhagen Burnout Inventory, the Resilience Scale, the Depression, Anxiety and Stress Scales and the Satisfaction with Life Scale.

Results High levels of personal (55%; n=844), work-related (55.1%; n=846) and client-related burnout (35.4%; n=543) were found. Additionally, participants expressed substantial levels of depression (28.7%; n=441), stress (36.4%; n=558) and anxiety (33.1%; n=508). About 1202 participants (78.3%) demonstrated moderate-to-high levels of resilience. Profession, work regime during the pandemic, having a health problem, resilience and satisfaction with life are independent variables significantly associated with the outcomes of burnout, stress, depression and anxiety. Satisfaction with life was the independent variable that had a major association with all outcomes.

Conclusions Governments and hospital administrations should take action to promote resilience and satisfaction with life as these variables are protective relating to mental health problems. Interventions as educational sessions, psychological support at work, programmes promoting resilience and coping mechanisms and better work conditions may improve mental health. The implementation of measures to protect healthcare students from developing prejudicial outcomes seams very adequate and important.

STRENGHS AND LIMITATIONS OF THIS STUDY

⇒ The study has a cross-sectional design and does not assess the long-term impact of the COVID-19 pandemic.
⇒ A web-based survey was used for data collection, which could have been affected by self-selection bias.
⇒ We need to consider the bias of providing socially desirable answers, where participants have the tendency to reply to a questionnaire in a manner that creates a favourable image of themselves or to comply with the goals of the investigation.
⇒ This was a large-scale study including healthcare workers from several professions who lived challenging conditions resulting from COVID-19 pandemic, and the results may contribute to improve health policies related with mental health.
⇒ This study reinforces the importance of resilience and satisfaction with life in mitigating burnout and suggests the development of strategies to promote this variable and consequently the mental health of healthcare professionals.

INTRODUCTION

The COVID-19 pandemic has had an impact on the mental health of healthcare workers (HCWs) worldwide. The pandemic's first wave was marked by a high workload, difficult daily decisions, constantly changing protocols, limited personal protective equipment, caring for critically ill patients while fearing transmitting the infection to families and a constant feeling of 'dealing with the unknown'.[1–4] Consequently, HCWs were constantly pushed to their limits and forced to make personal sacrifices, such as leaving their homes and families.[5] In fact, exposure to patients infected with COVID-19 is associated with high levels of burnout,[4–10] stress, depression and anxiety.[6 8 11–14]

HCWs as a group are already susceptible to suffering from mental health distress given

their daily contact with debilitated people, strained and hierarchical interpersonal relationships and working hours that include night shifts, all of which contribute to their physical, emotional and cognitive overload.[15 16] Before the COVID-19 pandemic, HCWs already registered a high prevalence of burnout.[15 17 18] In Portugal, a study carried out between 2011 and 2013 concluded that about 44% of physicians and 50% of nurses expressed high levels of burnout.[15] In 2016, in a study by Reis,[19] approximately 66% physicians expressed high levels of emotional exhaustion, 46% expressed high levels of depersonalisation and 48% expressed low levels of professional accomplishment at work.

Since the beginning of the pandemic, studies have been conducted to evaluate the impact of the COVID-19 pandemic on the mental health of Portuguese HCWs.[2 3 20–22] Ferreira and Gomes[20] concluded that 50% of HCWs presented moderate levels of depersonalisation, about 58% presented high levels of emotional exhaustion and about 55% presented high levels of reduced personal accomplishment. Furthermore, Gonçalves *et al*[22] found that about 46%, 44% and 22% of nurses working in palliative care registered high levels of personal burnout, work-related burnout and client-related burnout, respectively. Additionally, Ferreira *et al*[21] affirmed that HCWs registered high levels of anxiety and stress during the first wave.

Burnout is a syndrome defined as a state of mental, emotional and physical exhaustion due to long-term exposure to work situations that cause emotional damage.[23] Kristensen *et al*[24] indicate that the core of burnout is experiencing fatigue and exhaustion in three contexts, that is, personal, client related and work/workplace. It is considered a relevant occupational health hazard among HCWs and has a significant impact on professionals, patients and healthcare institutions.

Resilience is 'the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress, such as family, relationships, health problems, workplace and financial stressors'[25 26] and has been mentioned as an important variable with impact on mental health. It is negatively associated with burnout,[2 3 6 27 28] stress, depression and anxiety.[6 28] Hu *et al*[6] demonstrate that resilience is negatively associated with emotional exhaustion and depersonalisation and positively associated with professional accomplishment. In this way, they suggest that resilience could mitigate the negative impact of work on mental health and act as a mechanism to prevent prejudicial outcomes. In the same way, Qu and Wang[29] found a significant negative correlation between every dimension of job burnout and life satisfaction, suggesting that life satisfaction could also mitigate the effects of burnout in mental health. Additionally, life satisfaction is also negatively correlated with symptoms of depression, anxiety and stress in nurses population.[30–32] Life satisfaction is considered the cognitive component of subjective well-being and is related with the judgmental process that each one makes about the quality of their lives based in their individual criteria.[33 34]

In fact, the COVID-19 pandemic has been responsible for millions of deaths and has impacted social, political and economic structures.[35] Furthermore, it has influenced the mental health of HCWs, resulting in meticulous research to identify mechanisms and strategies to prevent prejudicial outcomes.

Our study aims to identify the degree to which sociodemographic variables and indicators of subjective well-being and psychological resilience are associated, positively and negatively, with the outcomes of burnout, stress, depression and anxiety among Portuguese HCWs observed during the first wave of the COVID-19 pandemic. It also aims to evaluate the strength of association of these variables and indicators with each outcome.

METHODS

Study design, participants and procedures

A cross-sectional quantitative study was developed to survey HCWs living in Portugal and working in the Portuguese healthcare system. It was administered between 9 May and 8 June 2020 as a questionnaire delivered using the Google Forms platform, accessible through a link and shared by direct email and social networks, following a snowball technique. This study was supported by professional organisations and healthcare institutions.

Exposure to COVID-19 during work was defined as those who responded as do not contact directly with infected people, who contact directly with infected people during their work and those who work from home were defined as in total remote work.

A pilot survey was carried out in which the questionnaire was administered to 20 HCWs of both sexes to identify and exclude interpretation biases. Participants could obtain the results at the end of the study if requested via an email created for this purpose.

Measures and instruments

Sociodemographic and professional contextual variables were collected using a self-administered online survey. Psychological variables were collected using the Copenhagen Burnout Inventory (CBI)[24]; the Resilience Scale[36]; the Depression, Anxiety and Stress Scales (DASS-21)[37]; and the Satisfaction with Life Scale (SWLS).[34] All scales were applied in their Portuguese version.

The Portuguese version of the CBI includes 19 items with a Likert-type response scale of five points ranging from never (one) to very often (five). This scale is subdivided into three subscales: personal burnout, work-related burnout and client-related burnout. The personal burnout subscale measures feelings of physical, emotional and mental fatigue and exhaustion. The work-related burnout subscale evaluates the symptoms that participants attribute to work. The client-related burnout subscale assesses feelings of psychological and physical fatigue and exhaustion that individuals associate with their work with patients. The score for each subscale is the average of item scores within the subscale and ranges

from 0 to 100, with scores≥50 considered high-level burnout.[24 38] The Portuguese version of the CBI presented high internal consistency, with a Cronbach's alpha of 0.84 for personal burnout, 0.87 for work-related burnout and 0.84 for client-related burnout.[38] In this study, the Cronbach's alpha was 0.91 for personal burnout, 0.89 for work-related burnout and 0.89 for client-related burnout.

The Portuguese version of the Resilience Scale consists of 25 items with a Likert-type, seven-point response scale varying from disagree (one) to strongly agree (seven). The total score can vary between 25 and 175. According to the authors of the original scale, scores below 121 are considered reduced resilience, moderate resilience is between 121 and 145 and high resilience above 145 points.[39] The Portuguese version of the Resilience Scale has a Cronbach's alpha of 0.94,[26] which represents high internal consistency. The Cronbach's alpha in this study was 0.95.

The Portuguese version of the DASS-21[40] contains 21 items with a Likert-type, four-point response scale ranging from 'did not apply to me at all' (zero) to 'applied to me very much/most of the time' (three). This scale is subdivided into three subscales (each with seven items), created to evaluate the negative emotional states of depression, stress and anxiety. For the present analysis, each subscale was categorised into normal and not normal (including mild, moderate, severe and extremely severe levels). The depression subscale is categorised as follows: normal (0–4), mild (5–6), moderate (7–10), severe (11–13) and extremely severe (14 or more). In the anxiety subscale, categories are as follows: normal (0–3), mild (4), moderate (5–7), severe (8–9) and extremely severe (10 or more). In the stress subscale, categories are as follows: normal (0–7), mild (8–9), moderate (10–12), severe (13–16) and extremely severe (17 or more).[37 40] For DASS-21, the values of α in our study were 0.90, 0.84 and 0.90 for the depression, anxiety and stress subscales, respectively. The Portuguese version of DASS-21 has a Cronbach's alpha of 0.85, 0.74 and 0.81 for depression, anxiety and stress, respectively. In this study, the Cronbach's alpha was 0.90 for depression, 0.84 for anxiety and 0.90 for stress.

The Portuguese version of the SWLS consists of five items with a Likert-type, five-point response scale to evaluate one's global assessment of life satisfaction, with a possible range between 5 and 25 points and high scores indicate higher satisfaction with life.[34 41] The Portuguese version of the SWLS has a Cronbach's alpha of 0.77.[42] In the current study, the Cronbach's alpha was 0.86.

Data analysis

Questionnaire responses were exported from Google Forms to a Microsoft Excel 2016 spreadsheet and data analysis was performed using SPSS Statistics (V.27.0; SPSS) and Jamovi software (The Jamovi project (2021), Jamovi, V.1.6 (computer software), Sydney, Australia). Categorical variables were described using absolute and relative frequencies, n (%), normal quantitative variables were summarised using means and SD and non-normally distributes quantitative variables were summarised using medians and the respective interquartile intervals, Med $[Q_1; Q_3]$, where Q_1 is the first quartile and Q_3 is the third one. The normality of the distributions was assessed by observation of the respective histograms.

To analyse the association between categorical variables, the χ^2 test was used. To compare distributions between two independent samples, the Mann-Whitney test was performed. A significant level of 5% was considered.

For each dichotomised outcome—personal burnout, work-related burnout, client-related burnout, stress, depression and anxiety—a simple logistic regression model was performed for each independent variable of interest within sociodemographic, professional and COVID-19-related variables. For each outcome, the independent variables related to the outcome at p<0.2 were included in the multiple logistic regression model. The final model for each outcome was obtained by removing the independent variable with the highest p value, successively, until only significant predictors (at p<0.05) were kept in the multiple model.

For each final logistic regression model, results are presented inORs, 95% CI and their respective p values. For the final multiple models, adequate fit to the data was assessed using the Hosmer and Lemeshow test of fit. Collinearity issues were assessed by the inspection of correlations between the independent variables in the final multiple models.

In order to assess which variables were most strongly associated with each outcome and provided that there is no consensual approach for this matter in multiple logistic regression (as is the case of partial correlations in multiple linear regression), we focused on the −2*log-likelihood statistic (−2LL) used in the adequacy approach.[43] The −2LL statistic is the lowest for the best adjusted model (the final multiple model), and to assess the impact of each predictor in the model, we compared the decrease in the −2LL when each variable was added to the model, considering another model with all the remaining variables.

Patient and public involvement

The study did not involve patients. Study findings are being made publicly available to participants and the general public by the production of open access journal articles. The study webpages provided contact details for the research team if any individual wished to directly request publications.

RESULTS

Sample characteristics

From a total of 2061 participants, 3 respondents were excluded because of incomplete survey and 50 were excluded for not being health professionals. Of the remaining 2008 participants, the responses of 1535 HCWs living and working in Portugal were included in

the study. We excluded 473 respondents from the statistical analysis for the following reasons: on medical leave, suspended by their employer, on vacation, retired, on maternity leave or providing assistance to dependents or children under 12 years; participants in partial remote work were also excluded because, compared with fully remote workers, exposure to stressor events was not constant, which could skew the results. No significant differences were found between the excluded (n=473) and included (n=1535) participants regarding gender (p=0.889; χ^2 test), marriage status (p=0.417; χ^2 test) and having children (p=0.779; χ^2 test). Significant differences were found in age, with those included having a higher median age (37 years[30 44] vs 34 years[28 42], p<0.001; Mann-Whitney test). Consequently, differences were also found regarding education level (the group of those included has a much higher percentage of postgraduates than the group of excluded ones, 43.2% vs 29.2%, p<0.001; χ^2 test) and professional experience (the group of those included has a higher percentage of participants with more than 15 years of professional experience than the group of excluded ones, 40.1% vs 30.4%, p<0.001; χ^2 test).

Of the participants, 469 (30.6%) were allied health professionals, 465 (30.3%) were physicians, 376 (24.5%) were nurses, 78 (5.1%) were pharmacists, 68 (4.4%) were psychologists, 51 (3.3%) were nutritionists and 28 (1.8%) were dentists. Regarding exposure to COVID-19, 514 (33.5%) HCWs reported having patients infected with COVID-19 in their workplace, 815 (53.1%) did not have contact with patients infected with COVID-19 in their workplace and 206 (13.4%) were fully remote workers without having infected people in their workplace.

About 83.5% (n=1282) of the participants were women and the mean age of HCWs was 38 years (SD=10).

Across all participants, 506 (33%) affirmed that they lived with a person at risk for COVID-19 infection. Moreover, 82 (5.3%) of HCWs lost a relative or a friend during the first wave of the pandemic.

The characteristics of the sample are summarised in table 1.

Table 1 Sample characteristics of participants (n=1535)

Characteristics	N	%
Marriage status		
Single	584	38
Married/non-marital partnership	826	53.8
Divorced or separated	111	7.2
Widowed	14	0.9
Parents		
Yes	787	51.3
No	748	48.7
Education level		
Graduate	872	56.8
Postgraduate	663	43.2
Professional experience		
5 years or less	365	23.8
Between 6 and 15 years	555	36.2
More than 15 years	615	40.1
Frontline working position*		
Yes	1318	85.9
No	217	14.1
Direct contact with infected people		
Yes	514	33.5
No	1021	66.5
Salary reduction		
Yes	355	23.1
No	1180	76.9
Diagnosed health problem		
Yes	410	26.7
No	1125	73.3
COVID-19 tested		
Yes or No, but I'd like to do it	1140	74.3
No, I have no interest	395	25.7

*Frontline healthcare workers were defined as those who worked face to face, full-time or part-time.

Results of burnout, depression, stress, anxiety and resilience

Of all HCWs, about 55% (n=844) revealed high levels of personal burnout, 55.1% (n=846) revealed high levels of work-related burnout and 35.4% (n=543) revealed high levels of client-related burnout. Additionally, 28.7% (n=441), 36.4% (n=558) and 33.1% (n=508) of all participants expressed levels of depression, stress and anxiety, respectively. About 1202 participants (78.3%) demonstrated moderate-to-high levels of resilience.

Results of burnout

Results of the logistic regression analyses for high levels of personal, work-related and client-related burnout are displayed in table 2.

Personal burnout

The variables identified in the multiple model as significantly correlated with personal burnout were gender, profession, exposure to COVID-19 during the pandemic, having a health problem, having been tested for COVID-19, resilience and satisfaction with life (table 2). The final multiple model resulted in an adequate fit of the estimated values and those predicted by the model, according to the Hosmer and Lemeshow test of fit ($\chi^2_{HL}(8) = 6.84; p = 0.554$).

In the multiple model, compared with men, women had 53% (p=0.006) higher odds of experiencing high personal burnout. Allied health professionals, nurses, pharmacists, psychologists and nutritionists showed lower odds of experiencing high personal burnout compared

Table 2 Multiple logistic regression ORs (with respective CIs and p values) of significant sociodemographic, work and mental health independent variables, for outcomes (high/not high level) of personal, work-related and client-related burnout (CBI) (n=1535)

	Personal burnout		Work-related burnout		Client-related burnout	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Gender						
Male	Ref					
Female	1.53 (1.13 to 2.07)	*0.006*				
Age					0.98 (0.97 to 0.99)	*<0.001*
Profession						
Physicians	Ref		Ref		Ref	
Allied health professionals	0.59 (0.44 to 0.79)	*<0.001*	0.51 (0.38 to 0.69)	*<0.001*	0.65 (0.49 to 0.87)	*0.004*
Nurses	0.65 (0.48 to 0.88)	*0.005*	0.68 (0.50 to 0.93)	*0.014*	0.82 (0.61 to 1.10)	0.186
Pharmacists	0.41 (0.24 to 0.70)	*0.001*	0.50 (0.29 to 0.85)	*0.011*	1.74 (1.04 to 2.92)	*0.037*
Dentists	0.47 (0.20 to 1.09)	0.077	2.32 (0.87 to 6.18)	0.094	2.24 (0.99 to 5.07)	0.053
Clinical and health psychologists	0.30 (0.16 to 0.57)	*<0.001*	0.34 (0.18 to 0.65)	*<0.001*	0.33 (0.15 to 0.72)	*0.005*
Nutritionists	0.36 (0.18 to 0.72)	*0.004*	0.44 (0.23 to 0.87)	*0.019*	0.60 (0.29 to 1.27)	0.183
Exposure to COVID-19 during work						
Do not contact directly with infected people	Ref		Ref		Ref	
Contact directly with infected people	1.37 (1.07 to 1.76)	*0.014*	1.43 (1.11 to 1.84)	*0.005*	1.29 (1.01 to 1.65)	*0.045*
Total remote work, no direct contact with infected people	1.02 (0.69 to 1.51)	0.908	1.07 (0.73 to 1.58)	0.731	0.72 (0.48 to 1.10)	0.130
Diagnosed health problem						
No	Ref		Ref			
Yes	1.38 (1.07 to 1.78)	*0.014*	1.44 (1.12 to 1.87)	*0.005*		
COVID-19 tested						
Yes or No, but I'd like to do it	Ref		Ref			
No, I have no interest	0.62 (0.48 to 0.80)	*<0.001*	0.70 (0.54 to 0.90)	*0.006*		
Resilience	0.98 (0.97 to 0.99)	*<0.001*	0.99 (0.98 to 0.99)	*<0.001*	0.99 (0.99 to 1.00)	*<0.001*
Satisfaction with life	0.87 (0.84 to 0.90)	*<0.001*	0.84 (0.81 to 0.87)	*<0.001*	0.89 (0.86 to 0.91)	*<0.001*
Hosmer and Lemeshow tests	$\chi^2_{HL}(8) = 6.84; p = 0.554$		$\chi^2_{HL}(8) = 9.43; p = 0.307$		$\chi^2_{HL}(8) = 9.86; p = 0.275$	

A significance level (p value) of 0.05 was considered (italic values).
CBI, Copenhagen Burnout Inventory; Ref, reference.

with physicians. Regarding exposure to COVID-19, professionals working with patients with COVID-19 in their workplace had 37% (p=0.014) higher odds of experiencing high personal burnout than professionals with no patients infected with COVID-19 in their place of work. Also, participants with a health problem demonstrated 38% (p=0.014) higher odds of presenting high personal burnout than those without a diagnosed health problem. Moreover, professionals who had not been tested for COVID-19, or who were not interested in being tested, exhibited 38% (p<0.001) lower odds of having high personal burnout when compared with professionals who had been or would like to be tested for COVID-19. The odds of having high personal burnout decrease 13% (p<0.001) and 2% (p<0.001) for each point increase in the SWLS and Resilience Scale, respectively.

Work-related burnout

The variables identified in the multiple model as significantly correlated with work-related burnout were profession, exposure to COVID-19 during the pandemic, having a health problem, having been tested for COVID-19, resilience and satisfaction with life (see table 2). The final model resulted in an adequate fit to the data, according to the Hosmer and Lemeshow test of fit ($\chi^2_{HL}(8) = 9.43; p = 0.307$).

In the multiple model, allied health professionals, nurses, pharmacists, psychologists and nutritionists

demonstrated lower odds of experiencing high work-related burnout compared with physicians. Regarding exposure to COVID-19, results showed that professionals working with patients with COVID-19 in their workplace had 43% (p=0.005) higher odds of experiencing high work-related burnout than professionals who had no patients infected with COVID-19 in their place of work. Moreover, participants with a health problem exhibited 44% (p=0.005) higher odds of presenting high work-related burnout than those without a diagnosed health problem. Professionals who had not been tested for COVID-19, or who were not interested in being tested, exhibited 30% (p=0.006) lower odds of having high work-related burnout compared with professionals who had been or would like to be tested for COVID-19. Finally, the odds of having high work-related burnout decreased 16% (p<0.001) for each point increase in the SWLS and 1% (p<0.001) for each point increase in the Resilience Scale.

Client-related burnout

The variables identified in the multiple model as being significantly correlated with client-related burnout were age, profession, exposure to COVID-19 during the pandemic, resilience and satisfaction with life (see table 2). The final model resulted in an adequate fit to the data, according to the Hosmer and Lemeshow test of fit ($\chi^2_{HL}(8) = 9.86; p = 0.275$).

Results for the multiple model showed that the odds of having high client-burnout decrease 2% (p<0.001) for each year increase in participant age. Allied health professionals and psychologists showed lower odds of experiencing high client-related burnout compared with physicians, while pharmacists showed higher odds of high client-related burnout compared with physicians. Regarding exposure to COVID-19, results showed that professionals working with patients with COVID-19 in their workplace had 29% (p=0.045) higher odds of experiencing high client-related burnout than professionals who had no patients infected with COVID-19 in their place of work. Finally, the odds of having high client-related burnout decreased 11% (p<0.001) for each point increase in the SWLS and 1% (p<0.001) for each point increase in the Resilience Scale.

Results for stress, depression and anxiety—logistic regression

Results of the logistic regression analyses for the presence of abnormal levels of stress, depression and anxiety are displayed in table 3.

Stress

The variables identified in the multiple model as significantly correlated with stress were age, profession, exposure to COVID-19 during the pandemic, having a health problem, resilience and satisfaction with life. The final model resulted in an adequate fit to the data, according to the Hosmer and Lemeshow test of fit ($\chi^2_{HL}(8) = 6.309; p = 0.613$).

In the multiple model, only dentists showed higher odds of experiencing stress compared with physicians. Concerning the effect of age, the odds of having stress decreased 2% (p=0.001) for each year of increased age. Regarding exposure to COVID-19, results showed that professionals working with patients with COVID-19 in their workplace had 43% (p=0.005) higher odds of experiencing stress than professionals with no patients infected with COVID-19s in their place of work. Moreover, participants with a health problem exhibited 47% (p=0.003) higher odds of presenting stress than those without a diagnosed health problem. Finally, the odds of having stress decrease 11% (p<0.001) for each point increase in the SWLS and 2% (p<0.001) for each point increase and Resilience Scale.

Depression

The variables identified in the multiple model as significantly correlated with depression were profession, having a health problem, resilience and satisfaction with life. The final model resulted in an adequate fit of the model to the data, according to the Hosmer and Lemeshow test of fit ($\chi^2_{HL}(8) = 12.486; p = 0.131$).

In the multiple model, nurses, pharmacists and clinical/health psychologists showed 33% (p=0.021), 70% (p=0.001) and 55% (p=0.034), respectively, lower odds of experiencing depression compared with physicians. Moreover, participants with a health problem exhibited 37% (p=0.026) higher odds of presenting depression than those without a diagnosed health problem. Finally, the odds of having depression decreased 18% (p<0.001) and 3% (p<0.001) for each point increase in the SWLS and Resilience Scale, respectively.

Anxiety

The variables identified in the multiple model as significantly correlated with anxiety were age, profession, exposure to COVID-19 during the pandemic, having a health problem, having been tested for COVID-19, resilience and satisfaction with life. The final model resulted in an adequate fit to the data, according to the Hosmer and Lemeshow test of fit ($\chi^2_{HL}(8) = 4.515; p = 0.808$).

In the multiple model, allied health professionals and dentists displayed higher odds of experiencing anxiety compared with physicians. Concerning the effect of age, the odds of having anxiety decreased 2% (p=0.006) for each year of increased age. Regarding exposure to COVID-19, professionals working with patients with COVID-19s in their workplace had 49% (p=0.002) higher odds of experiencing anxiety than professionals with no patients infected with COVID-19 in their place of work. Moreover, participants with a health problem exhibited 71% (p<0.00.01) higher odds of presenting anxiety than those without a diagnosed health problem. Finally, the odds of having anxiety decrease 10% (p<0.001) and 2% (p<0.001) for each point increase in the SWLS and Resilience Scale, respectively (see table 3).

Table 3 Multiple logistic regression ORs (with respective CIs and p values) of significant sociodemographic, work and mental health independent variables, for outcomes (not normal/normal) of stress, depression and anxiety (DASS-21)

	Stress		Depression		Anxiety	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Age	0.98 (0.97 to 0.99)	*<0.001*			0.98 (0.97 to 1)	*0.006*
Profession						
Physicians	Ref		Ref		Ref	
Allied health professionals	0.9 (0.67 to 1.2)	0.457	0.78 (0.57 to 1.07)	0.128	1.46 (1.09 to 1.97)	*0.012*
Nurses	0.75 (0.56 to 1.02)	0.071	0.67 (0.47 to 0.94)	*0.021*	1.12 (0.82 to 1.54)	0.470
Pharmacists	0.63 (0.35 to 1.11)	0.107	0.30 (0.15 to 0.60)	*<0.001*	0.74 (0.41 to 1.34)	0.321
Dentists	2.58 (1.13 to 5.88)	*0.024*	1.45 (0.59 to 3.54)	0.417	2.92 (1.29 to 6.62)	*0.010*
Clinical and health psychologists	0.54 (0.28 to 1.06)	0.075	0.45 (0.22 to 0.94)	*0.034*	0.72 (0.36 to 1.43)	0.349
Nutritionists	1 (0.51 to 1.98)	0.998	1.34 (0.68 to 2.65)	0.399	1.14 (0.56 to 2.32)	0.716
Exposure to COVID-19 during work						
Do not contact directly with infected people	Ref				Ref	
Contact directly with infected people	1.43 (1.11 to 1.83)	*0.005*			1.49 (1.15 to 1.92)	*0.002*
Total remote work, no direct contact with infected people	1.12 (0.75 to 1.65)	0.588			1.27 (0.85 to 1.89)	0.246
Diagnosed health problem						
No	Ref		Ref		Ref	
Yes	1.47 (1.14 to 1.89)	*0.003*	1.37 (1.04 to 1.81)	*0.026*	1.71 (1.33 to 2.21)	*<0.001*
COVID-19 tested						
Yes or No, but I'd like to do it					*Ref*	
No, I have no interest					0.74 (0.56 to 0.97)	*0.029*
Resilience	0.98 (0.98 to 0.99)	*<0.001*	0.97 (0.96 to 0.98)	*<0.001*	0.98 (0.98 to 0.99)	*<0.001*
Satisfaction with life	0.89 (0.86 to 0.92)	*<0.001*	0.82 (0.79 to 0.85)	*<0.001*	0.90 (0.87 to 0.93)	*<0.001*
Hosmer and Lemeshow tests	$\chi^2_{HL}(8) = 6.309;\ p = 0.613$		$\chi^2_{HL}(8) = 12.486;\ p = 0.131$		$\chi^2_{HL}(8) = 4.515; p = 0.275$	

A significance level (p value) of 0.05 was considered (italic values).
DASS-21, Depression, Anxiety and Stress Scales; Ref, reference.

No problems of multicollinearity were found between the independent variables in the final multiple logistic regression models since all the bivariate correlations were below 0.6.

Ranking predictors

For personal burnout, the independent variables with major associations with the outcome are satisfaction with life followed by resilience, while having a health problem and exposure to COVID-19 seem to be the weaker variables associated with personal burnout (see table 4).

For work-related burnout, the independent variables with major associations with the outcome are satisfaction with life followed by profession, while having been tested for COVID-19 and work regime seem to be the weaker variables associated with work-related burnout (see table 4).

Regarding client-related burnout, the independent variables with major associations with the outcome are satisfaction with life followed by profession, while work regime and resilience seem to be the weaker variables associated with client-related burnout (see table 4).

Regarding stress, the independent variables with major associations with the outcome are satisfaction with life followed by resilience, while work regime and having a health problem seem to be the weaker variables associated with stress (see table 5).

The independent variables with major associations with depression are satisfaction with life followed by resilience, while having a health problem seems to be the weaker variable associated with depression (see table 5).

Regarding anxiety, the independent variables with major associations with the outcome are satisfaction with life followed by resilience, while having been tested for COVID-19 and age seem to be the weaker variables associated with anxiety (see table 5).

Table 4 Ranking of significant sociodemographic and work independent variables and psychological resilience and satisfaction with life associated with outcomes of personal, work-related and client-related burnout (CBI)

	Personal burnout		Work-related burnout		Client-related burnout	
Full model's –2LL	1833.03		1824.10		1819.16	
Full model without:	–2LL	Δ(–2LL)	–2LL	Δ(–2LL)	–2LL	Δ(–2LL)
Gender	1844.34	11.31				
Age					1836.37	17.21
Profession	1860.26	27.23	1858.03	33.93	1850.90	31.74
Exposure to COVID-19 during work	1839.25	6.22	1831.94	7.84	1826.80	7.64
Diagnosed health problem	1839.16	6.13	1832.01	7.91		
COVID-19 tested	1846.29	13.26	1831.70	7.6		
Resilience	1880.61	47.58	1851.23	27.13	1833.42	14.26
Satisfaction with life	1907.02	73.99	1938.56	114.46	1879.82	60.66
Global model						

CBI, Copenhagen Burnout Inventory; –2LL, –2*log-likelihood statistic.

DISCUSSION

The COVID-19 pandemic has had an impact on the mental health of the entire population, but particularly on that of HCWs, who have a greater predisposition to burnout, stress, depression and anxiety,[15 17 18] all of which the pandemic has exacerbated.

Our study suggests that direct contact with patients infected with COVID-19 is positively associated with the three dimensions of burnout, stress and anxiety, despite being a weak variable. In fact, according to previous studies, HCWs who are exposed to patients with COVID-19 present a high prevalence of burnout[4 8 10 14] and have high levels of stress and anxiety.[6 8 11–14] This could be explained by the exposure risk, increased workload, longer shifts, treatment of more severe patients, management of resources, having to make critical decisions (such as deciding who is most prioritised to receive a ventilator), fatigue, psychological stress and the general fear of becoming infected and transmitting the disease to family.[1–4] In the literature, nurses are the professional group with the highest prevalence of burnout and depression, due to high workload and longer time in direct contact with patients with COVID-19.[4 6 7] However, our results suggest that physicians are at greater risk of exhibiting high levels of the three dimensions of burnout and depression compared with other HCWs. This could be because physicians have to make hard decisions, manage resources and treat more severe patients, taking into account the knowledge that was available to date.

Additionally, in our study, pharmacists were the professional group with the highest risk of client-related burnout. These HCWs are in direct contact with the public and consequently have a greater level of exposure. Roslan *et al*[9] suggest that pharmacists were the HCWs with the highest prevalence of personal burnout due to the unpredictability of the course of the pandemic, emotional exhaustion, direct contact with people, loss of enthusiasm to go to work, physical exhaustion and sleep disturbance. Our findings suggest that the dental profession is associated with high levels of stress and anxiety, which is in line

Table 5 Ranking of significant sociodemographic, work and mental health independent variables associated with outcomes of stress, depression and anxiety (DASS-21)

	Stress		Depression		Anxiety	
Full model's –2LL	1819.22		1479.90		1771.38	
Full model without:	–2LL	Rank	–2LL	Rank	–2LL	Rank
Age	1831.36	12.14			1779.08	7.7
Profession	1834.00	14.78	1504.15	24.25	1788.98	17.6
Exposure to COVID-19 during work	1827.04	7.82			1781.13	9.75
Diagnosed health problem	1827.90	8.68	1484.79	4.89	1788.28	16.9
COVID-19 tested					1776.26	4.88
Resilience	1863.61	44.39	1579.69	99.79	1809.35	37.97
Satisfaction with life	1870.88	51.66	1610.33	130.43	1811.09	39.71

DASS-21, Depression, Anxiety and Stress Scales; –2LL, –2*log-likelihood statistic.

with Ahmed *et al*'s study,[45] due to the high exposure risk in medical dental practice and the fear of transmitting the virus to the family. In truth, dental professionals must remain very close to their patients for extended periods of time while patients are not wearing masks. Additionally, our findings show that, although not statistically significant, high ORs were obtained for stress and anxiety levels for this professional category when compared with physicians. This lack of statistical evidence may be due to the small number of dentists in our sample.

Moreover, we observed that being diagnosed with a health problem is positively and significantly correlated with personal burnout and work-related burnout, which is in accordance with the literature.[9] Additionally, our results showed that this condition is also positively correlated with stress, depression and anxiety. The additional vulnerability felt by these professionals could have had a negative psychological impact.

Furthermore, not being tested for COVID-19 or having no interest in being tested are negatively and significantly associated with personal and work-related burnout. These professionals probably have no fear of becoming infected, have more self-control and better coping mechanisms. The fear of being infected with COVID-19 is positively correlated with burnout.[4]

Our results showed that women were at higher risk of personal burnout compared with men. The female gender is significantly associated with high levels of burnout.[1 7 8] Women expressed the highest levels of emotional exhaustion,[7] which has an important impact on depersonalisation and consequently results in lower levels of personal accomplishment.[44] Additionally, women may have a higher perception of personal burnout due to the professional and home life responsibilities that they assume.[2]

Regarding stress and anxiety, our study did not find a significant relationship with gender, which is not in line with other authors.[11–14]

Younger professionals are more likely to experience burnout than their senior counterparts.[1 7 10 15] Roslan *et al*[9] found a positive association between younger professionals and personal and client-related burnout, which is line with our findings. On the other hand, Lasalvia *et al*[8] suggest that junior residents registered a higher prevalence of burnout compared with residents, given that juniors have limited self-control, intense work demands and a high volume of homework (such as studying, preparing presentations for services and completing clinical reports). Additionally, our study suggests that younger professionals have high levels of stress and anxiety. Xiao *et al*[14] reported that junior HCWs registered higher levels of stress than seniors, probably because juniors had more contact with infected people.

Prior studies suggested that HCWs have a high prevalence of resilience, an independent variable that is negatively and significantly correlated with burnout,[6 27 28] which is in line with our results. In our study, resilience is also associated with a lower prevalence of stress, depression and anxiety, which is reported in the literature.[6 28] Resilience promotes emotional lability and can mitigate the negative impact of work stress on mental health.[2 6]

Satisfaction with life was the independent variable with major associations with the three dimensions of burnout, depression, stress and anxiety. Uchmanowicz *et al*[46] concluded that high levels of satisfaction with life were associated with low levels of burnout. Effectively, individuals with low levels of burnout, stress, depression and anxiety will express more satisfaction with life, which has an important impact on job performance, patient care and professional quality of life.

HCWs are in a 'privileged' position to develop burnout, stress, depression and anxiety. Hospital administrations should implement measures to protect the mental health of their professionals and to promote their satisfaction with life, the independent variable with major associations with the outcomes. Additionally, occupational health professionals should be sensitised to this topic to promote public health and occupational health practices to the mental health of HCWs.[47] On the one hand, it is necessary to verify that shifts are of an appropriate length to allow professionals to rest. Other important measures include working in stable teams, promoting clear guidelines and the availability of social support.[4] Trumello *et al*[5] concluded that HCWs do not ask for psychological help because they do not recognise the symptoms of these mental conditions. Educational programmes and psychosocial support should be implemented to educate HCWs on how to prevent, understand and recognise these symptoms and mental conditions. On the other hand, strategies to develop resilience skills, such as sponsoring seminars or group meetings with psychological support, should also be implemented. Coping strategies and the practice of complementary therapies, such as yoga and mindfulness, should be encouraged.[48 49]

Finally, we should intervene in the academic phase. A meta-analysis showed that medical students have high levels of burnout even before beginning their residency.[50] The implementation of measures such as reducing study loads, providing psychological support and introducing strategies to develop resilience and coping mechanisms is very important at this stage to prevent prejudicial outcomes in the future.[50]

This study has some limitations. First, this investigation was a cross-sectional study, so results should be interpreted with caution. Second, we used a web-based survey shared by email and social networks, which could have been affected by self-selection bias. Third, we must consider the bias of socially desirable answering, whereby participants tend to reply to a questionnaire in a manner that is favourable to their self-image or to comply with the goals of the investigation. Fourth, this study was carried out during the first wave of the pandemic, a time of crisis, and it would therefore be important to carry out a future, longitudinal study to evaluate the effects of the COVID-19 pandemic on HCWs.

The Portuguese healthcare system is supported by HCWs. It is therefore urgent to implement measures to

protect their mental health, to provide better healthcare to patients and to foster HCWs' satisfaction with and professional quality of life.

The WHO defines health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.[51] We, as global society, must pay more attention to mental health and establish more strategies to promote it.

CONCLUSIONS

The COVID-19 pandemic is an emergent public health problem that threatens the mental health of HCWs worldwide. In fact, it has exacerbated existing risk factors for the development of burnout, stress, depression and anxiety in HCWs. Our study concluded that Portuguese HCWs have high prevalence of the three dimensions of burnout: stress, depression and anxiety. Satisfaction with life emerged as the independent variable with major impact on outcomes. Measures must be taken by governments and hospital administrations to promote the mental health and satisfaction with life of these professionals. HCWs need more psychological support at work, programmes to foster resilience and the development of coping mechanisms, better work conditions and security in exercising their functions.

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