PSYCHOLOGICAL DISTRESS, BURNOUT, QUALITY OF LIFE, AND WELLNESS AMONG HEALTHCARE WORKERS

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PSYCHOLOGICAL DISTRESS, BURNOUT, QUALITY OF LIFE, AND WELLNESS AMONG HEALTHCARE WORKERS

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EDITORIAL
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Editorial: Psychological Distress, Burnout, Quality of Life, and Wellness Among Healthcare Workers

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Editorial on the Research Topic

Psychological Distress, Burnout, Quality of Life, and Wellness among Healthcare Workers

The COVID-19 pandemic has increased pressure on health systems, forcing staff to make critical decisions in environments with multiple adverse conditions (Lluch et al., 2022). Certainly, health professionals are under extreme psychological pressure and, consequently, are at risk of developing several psychological symptoms and mental health disorders (Rajkumar, 2020), including anxiety, depression, stress, somatic symptoms, helplessness or loneliness (Barello et al., 2020; Galli et al., 2020; Kotera et al., 2021) Thus, this health crisis is bringing visibility to a problem that already existed. Understanding those factors that improve professionals' wellbeing, as well as the quality of care they provide, is key for adequate healthcare institutions functioning. Indeed, literature has started to link better health and wellbeing of healthcare professionals with better quality of care of patients. This Research Topic collects 13 research articles that develop our understanding of the psychological wellbeing and quality of life of healthcare workers, together with those coping strategies and organizational factors that can improve it, while reducing psychological distress and burnout.

Many of the works gathered in this Research Topic have focused on anxiety and depression of healthcare professionals and students. For example, Yang et al. studied clinical frontline medical staff from Chinese hospitals. These authors found that, in the later stages of the pandemic in China, the occurrence rates of anxiety and depression among medical staff remained high. Among the related variables, age, the need for psychological counseling, and the coexistence of depression were significantly associated with anxiety. Coexisting anxiety was also associated with the occurrence of depression. Peng et al., also in Chinese healthcare workers, analyzed the factors that influenced their mental health status. They explored the relationships of overcommitment, perceived troubles at work, perceived tension, and the capability to persist for >1 month at the current work intensity with anxiety and depression. Results of the Bayesian networks analysis found that the last three factors directly affected anxiety and depression. Other factors associated with anxiety and depression symptoms in Chinese healthcare workers have been suspicious symptoms on their own and in family members, working on the frontline, quarantine, and negative coping style, as reported by Wang et al. In this same line, intensive working schedule and high-risk environment, compounded by unfamiliar work setting and colleagues, local culture adaptation and isolation from usual social circle, were pointed by Khoo et al. as strainers of Chinese deployed healthcare workers. Meanwhile, reciprocal relationships and family relatedness with patients and colleagues, together with organizational support, formed crucial wellbeing resources in sustaining these professionals.

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Also regarding anxiety and depression, but this time in Ecuadorian healthcare students and early-career professionals, Bonilla-Sierra et al. found that inflexibility and loneliness were important predictors of anxiety and depressive mood, specifically by mediating the relation between stress and this symptomatology. Additionally, in an attempt to improve our understanding of the psychological distress experienced by healthcare professionals during the pandemic, Ruiz-Frutos et al. studied predictors of mental health in a sample of Spanish healthcare professionals. These authors found that workload, conflicts, stressful situations, and less job satisfaction and work engagement were significantly related to higher psychological distress.

In Polish nurses, Larysz and Uchmanowicz examined the associations of sociodemographic characteristics and depression. The results showed that higher level of education, more job seniority, and living in a relationship were associated to lower levels of depression. Also in Polish nurses, Uchmanowicz et al. and Kołtuniuk et al. studied rationing of nursing care. This rationing has been reported worldwide, and implies nurses being forced to selectively perform care tasks, while omitting or delaying specific nursing tasks. As such, rationing of nursing care poses a direct threat to patient safety. Uchmanowicz et al. found a positive, statistically significant relation between burnout and rationing of nursing care. Meanwhile, Kołtuniuk et al. found that the patient-to-nurse ratio and the level of job satisfaction were also significant predictors of rationing of nursing care. Thus, these studies made important contributions to the underlying mechanisms of rationing of nursing care, highlighting the importance of burnout, patient-to-nurse ratio, and the level of job satisfaction for improving patient safety.

Important work has also been compiled regarding compassion fatigue of healthcare professionals. Ruiz Fernández et al., for example, studied the role of emotional intelligence and perceived health in relation to compassion fatigue in Spanish nurses. These authors found that the three components of emotional intelligence (attention, clarity, and repair), along with perceived health, influenced compassion fatigue. Nurses with higher levels of compassion fatigue used emotional care as a mechanism of emotional management and had poorer perceived health. Serrão et al. also focused on compassion fatigue, together with compassion satisfaction, this time in Portuguese physicians and nurses. Their results pointed that most of the participants showed moderate levels of compassion fatigue, in its two dimensions: secondary traumatic stress and burnout. Evidence pointed that female gender was significantly associated with more susceptibility to secondary traumatization, whereas factors that contributed to burnout included years of professional experience and the number of work hours per week.

Finally, two more key issues involved in healthcare professionals' wellness were studied in this Research Topic. Schneider et al. studied moral distress in German healthcare workers, with findings pointing that moral distress was strongly correlated with depressive symptoms, anxiety symptoms, occupancy rate at current work section, and contact with COVID-19. They also found that moral distress was higher for nurses and medical technical assistants compared to other groups, such as physicians or psychologists. Therefore, these results indicated that moral distress has arisen as a relevant phenomenon among healthcare workers during the COVID-19 pandemic. In Polish nursing students, Bodys-Cupak et al. studied perceived stress and sleep disorders, and found that most of the students felt high levels of stress, specifically being related to the danger of contracting COVID-19 or to a family member contagion. Regarding sleep disorders, again they were determined mainly by the fear of infection and contact with someone who may be infected with the virus, and they were closely related to the stress level. Coping strategies included denial, taking psychoactive substances, ceasing action, or blaming themselves, with higher levels of stress being related to avoidance behaviors or helplessness.

In view of the findings of this Research Topic, it seems clear that the quality of life of health workers is in danger, especially in the time of pandemic. The high rates of stress, anxiety or depression, together with other phenomena such as compassion fatigue, sleep problems or moral distress, put the health and wellbeing of healthcare workers at risk. In this sense, it is necessary to raise awareness of the psychological needs of healthcare personnel and apply prevention measures. The improvement of working conditions, the development of psychoeducational initiatives, or the strengthen of easy-accessible psychological support services, could be implemented to achieve this goal.

AUTHOR CONTRIBUTIONS

LG drafted the editorial. KK and NS provided opinions and suggestions on the draft. LG, KK, and NS have made a substantial and intellectual contribution to the Research Topic and have approved the editorial for publication.

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Sociodemographic Factors and Depressive Symptoms Among Cardiac Nurses: A Cross-Sectional Study

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Background: The nursing profession is predisposed toward depressed mood and depressive symptoms. The multidirectionality and intensity of stressors in the nurses' occupational environment are of great significance in this respect. The study aimed to evaluate the impact of selected sociodemographic factors on depressive symptoms among cardiac nurses.

Methods: This cross-sectional study included 336 cardiac nurses (302 women and 34 men) and was conducted between December 2019 and September 2020 in four hospital cardiac units in Wroclaw, Poland. Sociodemographic data were collected using a self-developed survey. The following standardized instruments were used for the study outcomes: Patient Health Questionnaire-9 (PHQ-9) and Beck Depression Inventory (BDI).

Results: The study among cardiac nurses showed mild depression in 11.61%, moderate depression in 5.06%, and severe depression in 2.68%. Linear regression models showed that significant ($p < 0.05$) predictors of the PHQ-9 score included (1) higher occupational education (bachelor's degree), graduation "only" from medical high school or "other" education; (2) work experience of 16–20 years; (3) living in a relationship; (4) living in a rural area. Linear regression models showed that significant ($p < 0.05$) predictors of the BDI score included (1) higher occupational education (bachelor's degree); (2) graduation "only" from medical high school or "other" education; (3) living in a relationship.

Conclusions: Depressive symptoms are a significant problem among Polish cardiac nurses. The prevalence of depressive symptoms is affected by the education level, employment form, marital status, and place of residence.

Keywords: cardiac nurses, depression, occupational burnout, mood, anxiety, nurses

INTRODUCTION

Depression and mood disorders are serious health problems, especially in developed countries. It is estimated that 12.9% of the worldwide population is affected by depression, with the highest percentage in South America (20.6%) and the lowest in Australia (7.3%) (Lim et al., 2018). In Poland, approximately 3% of the population suffers from depression (Kiejna et al., 2015), and women are more frequently affected than men (Lim et al., 2018).

Due to the incidence of depression in developed countries, the countries have to bear high economic and social costs (Kessler and Bromet, 2013). Economic costs are associated with the treatment of depression, and therefore, approximately PLN 170 million (about EUR 37.8 million) is spent on this purpose in Poland. The social costs are PLN 1–2.6 billion (about EUR 0.22–0.58 billion) annually (Drapała et al., 2014). It was also reported that the annual cost of inpatient care of depression in 2016 was EUR 491 in Poland and EUR 2,848 in Germany (Zaprutko et al., 2018). In addition, there are also indirect costs linked to sickness absenteeism, which is four times more frequent in individuals with depression, and reduced productivity (Cocker et al., 2014).

It is well known that nursing is a profession that especially predisposes to depression (Duan-Porter et al., 2018). The primary reason is the multidirectional character and intensity of occupational stressors (Sarafis et al., 2016; Yoshizawa et al., 2016), coexisted anxiety (Maharaj et al., 2006), and deteriorated psychosomatic wellbeing (Gu et al., 2019), especially considering among frontline nurses in emergency departments during the COVID-19 outbreak (An et al., 2020). Additional predisposing factors include shift work, multi-tasking, constant readiness to deal with a suffering person, a sense of responsibility for the therapeutic process, problems with autonomy in decision-making, a decreasing number of nurses due to staff shortages, and insufficient psychological and financial compensation (Hersch et al., 2016; Kliszcz, 2017). Previous studies have shown that the incidence of depression in early education, already among nursing students, is ∼ 24% (Cheung et al., 2016). In contrast, the prevalence of depression among active nurses ranges from 8.8% in Norway (Øyane et al., 2013) to 64.25% in Poland (Kubik et al., 2018).

Anxiety, depression, and aggression, as psychopathological representations of negative affective states, are emotions that are frequently suppressed by highly socialized individuals (Neumann et al., 2010; Compare et al., 2014). The way social roles are fulfilled and factors related to the occupational environment itself may imply the emergence of depressive states. The complexity of the aforementioned biopsychosocial conditions determining the essence of nursing as a profession that overexploits physical and mental potential should be noted. Without a doubt, studies on depression in this professional group are still considered important and necessary. The constantly changing work-related occupational factors and the specificity of nurses' work in a given specialty indicate the need to update scientific evidence and current knowledge. Moreover, there are still limited studies on the subject in relation to nurses who specialize in cardiology. Therefore, this study aimed to evaluate the influence of selected sociodemographic factors on the prevalence of depressive symptoms among cardiac nurses.

METHODS

Study Design and Settings

This cross-sectional study included 336 cardiac nurses (302 women and 34 men) aged between 20–60 years and was conducted between December 2019 and September 2020 in four hospital cardiac units in Wroclaw, Poland. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were followed in the design and reporting of this study (von Elm et al., 2007).

Qualification Procedures

The study group consisted of cardiac nurses working in hospital wards in Wroclaw, Poland. The exclusion criteria included nurses who were not specialized in cardiology, those diagnosed with some prior mental disorder, and those who did not give their informed consent to participate in the study.

Data Collection

In this study, cardiac nurses from one academic city of Wroclaw were recruited by convenience sampling through personal contact with the research team. The printed questionnaires were prospectively distributed to the group of 469 nurses by their supervisors, who were informed of the eligibility criteria for participation in the study. Supervisors were also responsible for collecting the completed questionnaires. Nurses were informed that participation in the study is voluntary, and they were assured of complete anonymity. In total, 78% of completed questionnaires were returned with 22% missing data. It means that complete data from 366 cardiac nurses were included in the analysis. Researcher Anna Larysz was responsible for verification of the questionnaires' completeness, data collection, and its implementation into the database.

Sample size was calculated by using formula developed for observational and experimental nursing research studies: $n = \{(Z1-\alpha/2)2\ (p)\ (q)\}/d2$, where prevalence rate for assessment of depression among nurses was considered 40% (Sharma et al., 2020). Based on data from the Supreme Chamber of Nurses and Midwives, nearly 261,000 nurses were employed in Poland at the time of the study. It was determined that a minimum sample size of 334 completed questionnaires was needed to achieve a confidence level of 95% and that the real value is within ±5% of the confidence interval. The final statistical analysis was performed on data received from 366 study participants.

Research Tools

Sociodemographic and other related background data were collected using a self-developed survey for sociodemographic data.

Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 is a standardized self-report questionnaire used for screening to diagnose depressive symptoms in the overall population. It ensures both the diagnosis of depression and the evaluation of the severity of its symptoms (Kroenke et al.,

2001). The Polish version of the PHQ-9 was translated and validated by Tomaszewski et al. (2011). The PHQ-9 consists of nine main questions and one supplementary question. The answer to each question is scored from 0 to 3, depending on the incidence of a given symptom in the past 2 weeks (3—most frequent symptoms). The maximum score was 27, indicating the highest severity of depressive symptoms. The norm is the score of <5; the range of 5–9 indicates mild depression, 10–14 moderate depression, 15–19 moderately severe depression, and 20–27 severe depression (Tomaszewski et al., 2011).

Beck Depression Inventory (BDI)

The BDI is a standardized self-report questionnaire that measures characteristic behaviors and depressive symptoms. The questionnaire consists of 21 questions scored from 0 to 3 points; a higher score indicates more severe symptoms of depression (Beck et al., 1961). Internal consistency for the BDI ranges from 0.73 to 0.92 with a mean of 0.86 (Beck et al., 1988). Thus, the BDI shows high internal consistency, with alpha coefficients of 0.86 and 0.81 for psychiatric and non-psychiatric populations, respectively. This study uses the Polish adaptation by Parnowski and Jernajczyk (1977).

Ethical Considerations

The study protocol was approved by the local Bioethics Committee of the Wroclaw Medical University, Poland (no. KB−164/2019). All nurses gave their written informed consent before participating in the study. The study was conducted following the Declaration of Helsinki and Good Clinical Practice guidelines.

Data Analyses

The analysis of quantitative variables (i.e., expressed by number) was conducted by calculating the mean, standard deviation, median, quartiles, minimum and maximum values. The analysis of qualitative variables (i.e., not expressed by number) was conducted by calculating the number and percentage of occurrences of each value. Univariate and multivariate analyses of the effect of multiple variables on the quantitative variable were conducted using linear regression. The results are presented as values of the regression model's parameters with a 95% confidence interval. A significance level of 0.05 was adopted in the analysis. The analysis was conducted using the R program, version 4.0.3 (R Core Team, 2019).

RESULTS

Participants' Characteristics

A total of 336 cardiac nurses, including 302 (89.88%) women and 34 (10.12%) men, were included in the study. There were 16.67% nurses from the age group of 20–30, 42.43% nurses from the age group of 31–40, 33.33% nurses from the age group of 41–50, and 28.57% from the group of 51–60. The master's degree in nursing was held by 25% nurses, a bachelor's degree by 30.36% nurses, while as many as 30.95% nurses graduated from medical high school. As many as 54.68% of nurses had the greatest seniority that is more than 20 years. Moreover, the majority of the respondents (52.68%) had one job. Most surveyed nurses, 72.02%, were employed under an employment contract. The most typical monthly amount of working time was 101–180 h, and it concerned 57.74% of nurses. Typical working conditions included teamwork (75.60%) and shift work in the form of 12-h duty shifts (75.0%). The vast majority of respondents were in a relationship (69.94%) and lived in a city > 100,000 residents (63.69%) (**Table 1**).

Findings of Standardized Tools

The PHQ-9 questionnaire assesses the severity of depression in a respondent. The tool has standards that ensure the interpretation of scores. A total of 141 out of 336 survey participants (41.96%) had no depressive symptoms, 117 respondents (34.82%) suffered from mild depression, 53 (15.77%) had moderate depression, 17 (5.06%) had moderately severe depression, and 8 (2.38%) suffered from severe depression (**Table 2**).

The BDI provides an assessment of the severity of depressive symptoms in an individual completing the questionnaire. In addition, the BDI has standards that enable the interpretation of the obtained score (**Table 2**).

No depression was found in 271 out of 336 survey participants (80.65%), mild depression in 39 respondents (11.61%), moderate depression in 17 respondents (5.06%), and severe depression in 9 respondents (2.68%) (**Table 2**).

Effects of Sociodemographic Characteristics on the PHQ-9

Univariate Analyses

Linear regression models (separate for each of the analyzed characteristics) showed that significant ($p < 0.05$) predictors of the PHQ-9 score include (1) higher vocational education (bachelor's degree): the regression parameter is 1.873 thus it elevates the PHQ-9 score by 1.873 pts on average compared to a master's degree; (2) graduation "only" from medical high school or "other" education: the regression parameter is 1.557 thus it elevates the PHQ-9 score by 1.557 pts on average compared to a master's degree; (3) job seniority of 16–20 years: the regression parameter is −3.21 thus it lowers the PHQ-9 score by 3.21 pts on average compared to job seniority <5 years; (4) living in a relationship: the regression parameter is −2.338 thus it lowers the PHQ-9 score by 2.338 pts on average compared to being single or widowed; (5) living in a rural area: the regression parameter is −1.7, thus it lowers the PHQ-9 score by 1.7 pts on average compared to living in a city >100,000 residents (**Table 3**).

Multivariate Analysis

The multivariate linear regression model showed that significant ($p < 0.05$) independent predictors of the PHQ-9 score include (1) higher vocational education (bachelor's degree): the regression parameter is 2.173 thus it elevates the PHQ-9 score by 2.173 pts on average compared to master's degree education; (2) graduation "only" from medical high school or "other" education: the regression parameter is 2.301 thus it elevates the PHQ-9 score by 2.301 pts on average compared to a master's

TABLE 1 | Sociodemographic characteristics of surveyed cardiac nurses.

Parameter		Total (*N* = 336)
Age (years)	20–30	56 (16.67%)
	31–40	72 (21.43%)
	41–50	112 (33.33%)
	51–60	96 (28.57%)
Sex	Women	302 (89.88%)
	Men	34 (10.12%)
Education	Medical high school	104 (30.95%)
	Medical vocational school	45 (13.39%)
	Bachelor's degree	102 (30.36%)
	Master's degree	84 (25.00%)
	Other	1 (0.30%)
Job seniority (years)	0–5	54 (16.07%)
	6–10	33 (9.82%)
	11–15	37 (11.01%)
	16–20	28 (8.33%)
	>20	184 (54.76%)
Number of jobs	1	177 (52.68%)
	2	112 (33.33%)
	3	29 (8.63%)
	4	11 (3.27%)
	>5	7 (2.08%)
Employment form	Employment contract	242 (72.02%)
	Contract of mandate/contract for specific work	14 (4.17%)
	Contract	22 (6.55%)
	Employment contract + other form	55 (16.37%)
	Contract + individual practice	2 (0.60%)
	Contract of mandate/contract for specific work + contract	1 (0.30%)
Workload per month (hours)	≤100	5 (1.49%)
	101–180	194 (57.74%)
	181–230	96 (28.57%)
	231–300	31 (9.23%)
	≥301	10 (2.98%)
Nature of work	I work independently	65 (19.35%)
	I work in a group	254 (75.60%)
	I lead a group of employees	17 (5.06%)
System of work	Eight-hour duty	68 (20.24%)
	12-h shift system	252 (75.00%)
	Other	16 (4.76%)
Marital status	Single	66 (19.64%)
	In a relationship	235 (69.94%)
	Widow/widower	13 (3.87%)
Place of residence	City >500,000 residents	214 (63.69%)
	City <100,000 residents	79 (23.51%)
	Rural area	43 (12.80%)

N, number of participants.

degree; (3) job seniority of 16–20 years: the regression parameter is −5.96 thus it lowers the PHQ-9 score by 5.96 pts on average compared to job seniority <5 years; (4) job seniority >20 years: the regression parameter is −4.563 thus it lowers the PHQ-9 score by 4.563 pts on average compared to job seniority <5 years; (5) living in a relationship: the regression parameter is −1.833 thus it lowers the PHQ-9 score by 1.833 pts on average compared to being single or widowed (**Table 3**).

TABLE 2 | Scores and standards for the PHQ-9 and BDI questionnaires.

Tool	*N*	Lack of data	Mean	SD	Median	Min	Max	Q1	Q3
PHQ-9	336	0	6.51	5.19	6	0	27	2	9
BDI	336	0	7.59	7.85	5	0	40	1	12
Tool	**Number of points**		**Interpretation**				***n***	**%**	
PHQ-9	0–4		No depression				141	41.96%	
	5–9		Mild depression				117	34.82%	
	10–14		Moderate depression				53	15.77%	
	15–19		Moderately severe depression				17	5.06%	
	20–27		Severe depression				8	2.38%	
BDI	0–13		No depression				271	80.65%	
	14–19		Mild depression				39	11.61%	
	20–28		Moderate depression				17	5.06%	
	29–63		Severe depression				9	2.68%	

N, number of participants; PHQ-9, Patient Health Questionnaire-9; BDI, Beck Depression Inventory; SD, standard deviation; Min, minimum; Max, maximum; Q1, lower quartile; Q3, upper quartile.

Effects of Sociodemographic Characteristics on BDI

Univariate Analyses

The linear regression models (separate for each of the analyzed characteristics) showed that significant ($p < 0.05$) predictors of the BDI score include (1) higher vocational education (bachelor's degree): the regression parameter is 3.151; thus, it elevates the BDI score by 3.151 pts on average compared to a master's degree; (2) graduation "only" from medical high school or "other" education: the regression parameter is 4.031 thus so it elevates the BDI score by 4.031 pts on average compared to a master's degree; (3) living in a relationship: the regression parameter is −3.551 thus it lowers the BDI score by 3.551 pts on average compared to being single or widowed (**Table 4**).

Multivariate Analysis

The multivariate linear regression model showed that significant ($p < 0.05$) independent predictors of the BDI score include (1) higher vocational education (bachelor's degree): the regression parameter is 3.083 thus it elevates the BDI score by 3.083 pts on average compared to a master's degree; (2) graduation "only" from medical vocational school: the regression parameter is 3.723 thus it elevates the BDI score by 3.723 pts on average compared to a master's degree; (3) graduation "only" medical high school or "other" education: the regression parameter is 4.503 thus it elevates the BDI score by 4.503 pts on average compared to a master's degree; (4) a form of employment other than an employment contract (solo trader or employment contract combined with another contract): the regression parameter is −3.314 thus it lowers the BDI score by 3.314 pts on average compared to an employment contract; (5) living in a relationship: the regression parameter is −3.42 thus it lowers the BDI score by 3.42 pts on average compared to being single or widowed; (6) living in a rural area: the regression parameter is −2.76 thus it lowers the BDI score by 2.76 pts on average compared to living in a city >100,000 residents (**Table 4**).

DISCUSSION

Previous research on the prevalence of depression among active nurses showed wide geographic variation. In highly developed countries, i.e., Norway or Canada, the prevalence is 8.8% and 9.1%, respectively. In the studies conducted in the Philippines, it was shown that depression affects one in five nurses (Batalla et al., 2019), while one in four nurses in Brazil (Schmidt et al., 2011), and one in three active nurses and India (Shajan and Nisha, 2019). The studies conducted in Yoon and Kim (2013), in Japan by Furihata et al. (2020), and in China by Xie et al. (2020) showed that 38.0, 41.7, and 43.83% of nurses, respectively, have depression-related symptoms.

In contrast, a study conducted in Poland by Kubik et al. (2018) showed that depression affects approximately two-thirds of nurses. In this study, the percentage of nurses who were diagnosed with symptoms indicative of depression varied due to a type of screening tool. In the assessment using BDI, <20% of the respondents had symptoms indicating depression, while according to the PHQ-9 scale, almost 60% of the respondents had depression. Due to differences in the tools used for assessing the presence of symptoms indicative of depression, it is complicated to compare the outcomes of the studies. However, some trends can be observed—in highly developed countries where health care funding is significantly higher, the percentage of nurses reporting a depression-related problem is significantly lower. This may be affected by better working conditions and access to professional psychological support, which nurses can use when needed. In the study by Kubik et al. (2018), more than 80% of nurses declared their willingness to use the help of a psychologist or psychotherapist in difficult situations.

The analysis showed that cardiac nurses with education lower than a master's degree were more likely to experience depressive symptoms. This association is consistent with the findings obtained by Ning et al. (2020), who found that depression was more prevalent among younger employees (≤40 years) and medical staff with junior titles. Nurses holding a master's degree

TABLE 3 | Univariate and multivariate analyses for PHQ-9.

Characteristic		Univariate models				Multivariate models			
		Parameter	95% CI		*p*	Parameter	95% CI		*p*
Age (years)	20–30	Ref.				Ref.			
	31–40	−1.375	−3.189	0.439	0.138	1.821	−1.598	5.24	0.297
	41–50	−0.714	−2.38	0.952	0.401	3.917	−0.231	8.066	0.065
	51–60	−0.708	−2.42	1.003	0.418	3.365	−0.898	7.627	0.123
Sex	Women	Ref.				Ref.			
	Men	0.703	−1.137	2.544	0.454	0.32	−1.779	2.42	0.765
Education	Master's degree	Ref.				Ref.			
	Bachelor's degree	1.873	0.391	3.355	0.014*	2.173	0.621	3.725	0.006*
	Medical vocational school	−0.3	−2.158	1.558	0.752	0.844	−1.19	2.878	0.417
	Medical high school, other	1.557	0.085	3.03	0.039*	2.301	0.549	4.053	0.011*
Job seniority [years]	0–5	Ref.				Ref.			
	6–10	−2.101	−4.334	0.132	0.066	−2.617	−6.151	0.916	0.148
	11–15	−1.483	−3.64	0.673	0.179	−2.613	−6.43	1.204	0.181
	16–20	−3.21	−5.564	−0.857	0.008*	−5.96	−10.383	−1.537	0.009*
	>20	−1.345	−2.909	0.219	0.093	−4.563	−8.873	−0.253	0.039*
Number of jobs	1	Ref.				Ref.			
	2	0.18	−1.046	1.406	0.774	−0.098	−1.663	1.468	0.903
	3	1.993	−0.041	4.027	0.056	1.699	−0.534	3.931	0.137
	>4	0.64	−1.872	3.152	0.618	0.183	−2.437	2.804	0.891
Employment form	Employment contract	Ref.				Ref.			
	Employment contract + other form	0.155	−1.369	1.678	0.842	−1.316	−3.292	0.66	0.193
	Other	−0.09	−1.849	1.67	0.92	−0.862	−2.915	1.191	0.411
Workload per month[hours]	≤180	Ref.				Ref.			
	181–230	0.209	−1.054	1.472	0.746	0.307	−1.251	1.865	0.699
	>230	1.259	−0.484	3.003	0.158	1.404	−0.636	3.445	0.178
Nature of work	I work independently	Ref.				Ref.			
	I work in a group	0.464	−0.952	1.881	0.521	1.014	−0.559	2.587	0.208
	I lead a group of employees	0.199	−2.577	2.975	0.888	1.154	−1.699	4.007	0.429
System of work	8-h duty	Ref.				Ref.			
	12-h shift system	0.261	−1.13	1.651	0.713	−0.239	−1.885	1.407	0.776
	Other	1.765	−1.062	4.592	0.222	1.307	−1.714	4.329	0.397
Marital status	Single	Ref.				Ref.			
	In a relationship	−2.338	−3.64	−1.036	<0.001*	−1.833	−3,243	−0.423	0.011*
Place of residence	City >100,000 residents	Ref.				Ref.			
	City <100,000 residents	0.532	−0.8	1.863	0.434	0.7	−0.652	2.053	0.311
	Rural area	−1.7	−3.391	−0.01	0.049*	−1.387	−3.098	0.324	0.113

**Statistically significant relationship ($p < 0.05$).*

N, number of participants; CI, confidence interval; p, level of statistical significance; PHQ-9, Patient Health Questionnaire-9; BDI; Ref., referral position.

may have better job salaries and benefits, so they have less opportunity to worry about Ariapooran (2019).

Ariapooran (2019) and Chiang and Chang (2012) showed that nurses with less seniority reported more depressive symptoms than those with more seniority, which was confirmed in this study in which nurses with more than 20 years of seniority were less likely to experience depressive symptoms than those with less seniority. Nurses with less seniority suffer more severe stress when caring independently for patients with difficult clinical conditions due to less work experience (Ning et al., 2020). It was confirmed that this might translate into an increased risk of depression development (Cheung et al., 2016).

Also, individuals in a relationship had a lower risk of developing depression than those who were single or widowed. This is consistent with the findings of Yoon and Kim (2013) and Ariapooran (2019), according to which single nurses had particularly high levels of depressive symptoms. Our results support the hypothesis that marriage provides greater emotional support to counteract stress reactions among nurses. Beam et al. (2017) showed that marriage reduces the genetic influence of

TABLE 4 | Univariate and multivariate analyses for BDI.

Characteristic		Univariate models				Multivariate models			
		Parameter	95% CI		p	Parameter	95% CI		p
Age (years)	20–30	Ref.				Ref.			
	31–40	−1.534	−4.276	1.209	0.274	0.217	−4.903	5.337	0.934
	41–50	0.062	−2.456	2.581	0.961	2.562	−3.651	8.774	0.42
	51–60	0.213	−2.375	2.801	0.872	2.362	−4.021	8.746	0.469
Sex	Women	Ref.				Ref.			
	Men	1.01	−1.774	3.794	0.478	2.134	−1.01	5.278	0.184
Education	Master's degree	Ref.				Ref.			
	Bachelor's degree	3.151	0.92	5.381	0.006*	3.083	0.758	5.407	0.01*
	Medical vocational school	2.542	−0.255	5.339	0.076	3.723	0.677	6.768	0.017*
	Medical high school, other	4.031	1.814	6.247	<0.001*	4.503	1.879	7.127	0.001*
Job seniority [years]	0–5	Ref.				Ref.			
	6–10	0.175	−3.216	3.566	0.919	1.804	−3.488	7.096	0.505
	11–15	−3.253	−6.529	0.022	0.052	−2.945	−8.662	2.771	0.313
	16–20	−0.001	−3.575	3.573	0.999	−1.852	−8.476	4.773	0.584
	>20	−0.189	−2.564	2.186	0.876	−2.989	−9.443	3.465	0.365
Number of jobs	1	Ref.				Ref.			
	2	0.665	−1.198	2.529	0.484	−0.275	−2.62	2.069	0.818
	3	0.884	−2.208	3.975	0.576	0.176	−3.167	3.519	0.918
	>4	0.746	−3.072	4.564	0.702	−0.616	−4.541	3.308	0.758
Employment form	Employment contract	Ref.				Ref.			
	Employment contract + other form	0.962	−1.327	3.251	0.411	−0.056	−3.015	2.904	0.971
	Other	−2.377	−5.022	0.267	0.079	−3.314	−6.388	−0.24	0.035*
Workload per month (hours)	≤180	Ref.				Ref.			
	181–230	0.352	−1.563	2.267	0.719	0.539	−1.794	2.871	0.651
	>230	1.023	−1.62	3.667	0.448	1.436	−1.62	4.492	0.358
Nature of work	I work independently	Ref.				Ref.			
	I work in a group	1.891	−0.238	4.02	0.083	1.938	−0.418	4.294	0.108
	I lead a group of employees	−1.039	−5.211	3.134	0.626	−0.003	−4.276	4.269	0.999
System of work	8-h duty	Ref.				Ref.			
	12-h shift system	1.892	−0.206	3.99	0.078	0.682	−1.783	3.147	0.588
	Other	1.787	−2.479	6.053	0.412	0.657	−3.868	5.182	0.776
Marital status	Single	Ref.				Ref.			
	In a relationship	−3.551	−5.519	−1.582	<0.001*	−3.42	−5.531	−1.308	0.002*
Place of residence	City >100,000 residents	Ref.				Ref.			
	City <100,000 residents	1.015	−0.999	3.029	0.324	1.168	−0.857	1.168	0.259
	Rural area	−2.459	−5.016	0.098	0.06	−2.76	−5.322	−0.198	0.036*

**Statistically significant relationship ($p < 0.05$).*

N, number of participants; CI, confidence interval; p, level of statistical significance; BDI, Beck Depression Inventory; ref., referral position.

perceived stress on depressive symptoms but does not reduce the influence of environmental factors. Furthermore, marriage may reduce the heritability of depressive symptoms associated with perceived stress. In contrast, Chiang and Chang (2012) and Cheung and Yip (2015) found that married nurses were more likely to have depressive symptoms than those who were single.

This study has also shown that the place of residence of cardiac nurses determined the occurrence of depressive symptoms—individuals living in rural areas had a lower intensity of symptoms indicative of depression. It is possible that communing with nature after work hours and pursuing more active outdoor leisure activities enable nurses to better cope with stressful situations that arise in the workplace.

Study Limitations

The strengths of this study were the large sample size and the use of standardized instruments to measure symptoms of depression. However, there were several potential limitations in

terms of methodological aspects. The main limitation of the study was linked to the data collection methods used, which were considered a one-time point rather than longitudinal. The study enrolled mainly women, which may be its bias. The method for the selection of the nurses was purposive sampling; the study was conducted among cardiac nurses of four hospitals but within one academic center; therefore, the conclusions cannot be generalized to the broader population of cardiac nurses. Also, some variables associated with depression, such as social support, health status, and pre-existing psychiatric disorders, were not examined. Due to the cross-sectional design of the study, causality between depression and other variables was unable to be investigated.

Furthermore, future research should focus on better recognition of depression among cardiac nurses and the entire nursing professional group, which is essential to consider interventions to improve working conditions and reduce important risk factors for depressive symptoms. Moreover, it is crucial to observe the direct impact of depressive symptoms and professional burnout syndrome on the quality of care provided and, above all, on patient safety. Such findings could be useful for preventing mental health problems among nurses.

Practical Implications

Depression is a common problem among cardiac nurses. Therefore, considering the negative impact of depression on quality of care, health authorities should organize regular screening targeting depression and develop preventive measures to alleviate the risk of depression by providing a timely provision of financial support, online psychological counseling service, or on-site psychological guidance.

CONCLUSIONS

Depression is a widely prevalent condition among Polish cardiac nurses. The prevalence of depressive symptoms is negatively affected by a lower level of education (lower than a master's degree) and living alone, while it is positively affected by more seniority (over 16 years) and living in a rural area.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Bioethics Committee of the Wroclaw Medical University, Poland (approval no. KB−164/2019). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AL contributed to study conception and design, data acquisition, analysis and interpretation of data, and drafting of the manuscript. IU contributed to study conception and design, analysis and interpretation of data, and critical revision of the manuscript. All authors approved the final version of the manuscript.

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Psychological Inflexibility and Loneliness Mediate the Impact of Stress on Anxiety and Depression Symptoms in Healthcare Students and Early-Career Professionals During COVID-19

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Background: The current mental health state of healthcare professionals and students during the COVID-19 pandemic in Ecuador remains understudied and how to improve their mental health is a challenge.

Objective: This study aimed to explore the anxiety and depressive symptomatology among healthcare students and professionals in Ecuador and to examine the role of psychological inflexibility, loneliness, and psychological stress as predictors of anxiety and depression symptoms.

Methods: A total of 191 undergraduate and graduate healthcare students in clinical practice (early-career healthcare professionals) in Ecuador were surveyed between January and March 2021 using standardized measures of psychological stress (PSS), psychological inflexibility (AAQ), loneliness (UCLA), alcohol consumption (AUDIT-C), and anxiety and depressive symptomatology (PHQ). Macro Process for SPSS (models 4 and 7) were used to test mediation effects.

Results: Alcohol consumption varied between men and women and anxiety and depression symptomatology was generally low among the sample. Psychological inflexibility and loneliness mediated the impact of stress on anxiety and depressive mood in participants, regardless of gender and previous personal history of COVID-19.

Discussion: Implications of psychological inflexibility and the prevention and coping with stress in healthcare professionals during COVID-19 are further discussed.

Keywords: psychological stress, psychological inflexibility, anxiety and depression, loneliness, healthcare professionals

INTRODUCTION

Quarantine and lockdown measures in the context of the COVID-19 pandemic have been related to an increased risk of mental health problems (Campion and Knapp, 2018; Campion et al., 2020). Among them, anxiety and depressive symptoms show the highest prevalence, reaching almost one in three people (Salari et al., 2020). Although reports indicate that the psychological impact on the general population is almost double that on health personnel, the anxiety rate of the latter (nurses, doctors) is relevant (Lozano-Vargas, 2020). Moreover, given that physical distancing and self-isolation are the most widespread means to mitigate this pandemic, loneliness is also expected to increase. Social connection helps regulate people's emotions, cope with stress, and remain resilient during adverse times. Conversely, loneliness and social isolation worsen the burden of stress and often produce deleterious effects on mental, cardiovascular, and immune health (Hawkley and Cacioppo, 2010). In fact, perceived loneliness is one of the main predictors of mental health for the general population during the Covid-19 pandemic (González-Sanguino et al., 2021).

However, COVID-19 related distress itself should not be considered a mental disorder. Anguish and anxiety are normal emotions that may allow people to better adapt to the process and can be influenced by different genetic and environmental conditions, as well as previous experiences (Southwick and Charney, 2012; Vinkers et al., 2020). Indeed, from a stress model perspective, the perceptions of uncertainty and uncontrollability are core predictors of increased stress and, therefore, increase risk of anxiety and depression (Vinkers et al., 2020; Batista et al., 2021) or drug abuse or alcohol (Wu et al., 2008; European Monitoring Centre for Drugs Drug Addiction, 2021).

A new paradigm is beginning to emerge in mental health questioning the validity and utility of the medical illness model of mental disorders, shifting from focusing on diseases to using process-based therapies that target the mediators and moderators of those diseases (Hofmann and Hayes, 2019). The most well-known transdiagnostic variable associated with mental health is psychological flexibility (Kashdan and Rottenberg, 2010; Levin et al., 2014; Gloster et al., 2017). Psychological flexibility is defined as the ability to "remain in the present moment and engage in values-based behavior, even in the presence of unpleasant internal experiences" (Kroska et al., 2020, p. 29). People with psychological flexibility feel that existence is meaningful and purposeful, directed and motivated by valued life goals and their importance and show experiential acceptance, accept internal experiences despite being unpleasant, and maintain values-based behaviors (Spatola et al., 2014). Higher psychological flexibility predicts mental health and healthy behaviors, promotes well-being, and could stimulate resilience (Kroska et al., 2020; Hernández-López et al., 2021). On the other hand, psychological inflexibility refers to a rigid tendency to control aversive private events, such as memories, feelings, or thoughts, by avoiding or escaping from them (Kashdan and Rottenberg, 2010; Levin et al., 2014; Gloster et al., 2017). Thus, psychological inflexibility represents a form of generalized psychological vulnerability (Kashdan et al., 2006; Kashdan and Rottenberg, 2010; Levin et al., 2014) associated with greater depressive symptoms (Kato, 2016), anxiety, psychopathological conditions, and an increased risk for the deterioration of mental (Hernández-López et al., 2021) and physical health (Spatola et al., 2014).

Healthcare professionals are considered one of the most vulnerable groups for negative mental effects from COVID-19 (Siddaway, 2020), particularly anxiety and depressive symptoms (Badahdah et al., 2020). This situation could be exacerbated by prolonged quarantine, fear of infection, frustration, boredom, inadequate supplies, false information, the insecurity of an unclear and disease-free future, increased workload, lack of adequate protection, fear of becoming infected and infecting their loved ones, social stigma, loneliness, misinformation, among others (Brooks et al., 2020). Unexperienced professionals, as well as students with direct clinical experience during the pandemic, might also suffer some of these consequences. For example, a study with medical students in China during the COVID-19 outbreak showed that the pandemic negatively impacted their stress and feelings of loneliness (Zheng et al., 2021). The same study revealed that loneliness mediated the relationship between perceived mental stress and influence on career choice.

Like other countries, Ecuador has also been affected by the pandemic and its population has suffered personal and economic losses. Due to COVID-19, Ecuador has a high mortality rate and it is one of the most affected territories in Latin America (Servicio Nacional de Gestión de Riesgos y Emergencias, 2021). The pandemic collapsed its health system, forcing physical distancing and changing the lifestyle of its people. Studies during the pandemic show that healthcare workers in Ecuador presented moderate levels of burnout and compassion fatigue (Cuartero-Castañer et al., 2021). Also, around 20% of people in epidemiological surveillance for COVID-19 showed moderate to severe symptoms of depression and anxiety (Paz et al., 2020). Regarding sociodemographic factors, being female and living in the coastal region were associated with more anxiety and depression symptoms (Paz et al., 2020). Similar results were found in the general population where between 10 and 19% of the people showed severe or extremely severe symptoms of depression, anxiety, and stress (Tusev et al., 2020). However, the prevalence of mental health problems such as anxiety and depressive symptomatology among healthcare students in clinical practice and professionals (early career professionals) during COVID-19 in Ecuador remains unknown, as well as the role of transdiagnostic variables, such as psychological inflexibility or loneliness, that might mediate the negative impact of psychological stress. This study aimed to explore the prevalence of anxiety and depressive symptomatology among early-career healthcare professionals in Ecuador and to examine the role of psychological inflexibility and loneliness on the impact of psychological stress in anxious and depressive symptomatology among this population.

METHODS

Participants

This article analyses the data from a convenience sample of 191 early-career healthcare professionals which include senior undergraduate and graduate students of healthcare careers

(medicine, nursing, and clinical psychology) from two private universities in Ecuador. To be part of the study, participants had to be enrolled as undergraduate or graduate students and have direct supervised clinical experience in their field during the COVID-19 pandemic.

Measures

In addition to sociodemographic variables such as gender, age, marital status, workload (h/week), professional category, specific training in COVID-19, and personal history of COVID-19 (diagnosis or presence of compatible symptoms), the following standardized scales were assessed in Spanish:

UCLA Loneliness Scale-Revised, short version (Hughes et al., 2004). This is a brief three-item scale that evaluates the subjective feeling of loneliness, understood as the perception of less-than-desired availability of social support. We used a translation previously used in Ecuador (Ruisoto et al., 2016; López et al., 2019). Participants respond based on their agreement with statements in a Likert-type response (1 = "hardly ever," 2 = "sometimes," and 3 = "often"). Total scores range from 0 to 9. Higher scores indicate a greater feeling of loneliness or a lack of social support. The Cronbach's alpha coefficient for internal consistency was $\alpha = 0.857$.

Perceived Stress Scale (PSS-14). We used the Ecuadorian version (Ruisoto et al., 2020). This scale has 14 items that assess the degree to which people perceive a lack of control in their daily lives. Participants respond to a five-point Likert-type scale ranging from 0 (never) to 4 (very often). Total scores range from 0 to 56. Higher scores indicate higher levels of stress. It has good psychometric properties and correlates with cortisol measurements in the blood and saliva. Cronbach's alpha coefficient for internal consistency reliability was $\alpha = 0.883$.

Avoidance and Action Questionnaire (AAQ-7, Bond et al., 2011). This is the most widely used general measure of psychological inflexibility, defined as rigidity in the handling of emotions or unpleasant internal events. We used a translation previously used in Ecuador (Ruisoto et al., 2020). It consists of seven items and participants respond to a seven-point Likert-type scale, from 1 (never) to 7 (always). Scores range from 7 to 49. Higher scores indicate higher psychological inflexibility. The reliability of the scale was $\alpha = 0.944$.

Patient Health Questionnaire of Depression and Anxiety (PHQ-4, Löwe et al., 2010). This questionnaire assesses depression and anxiety associated with symptom burden, functional impairment, and disability we applied a version previously used in Ecuadorian population (López et al., 2019). The scores range from 0 to 12. A higher score indicates a greater anxiety and depression symptoms. The Cronbach's alpha of the questionnaire was $\alpha = 0.884$.

Alcohol Use Disorders Identification Test (AUDIT-C, Bush et al., 1998; Bradley et al., 2003). It is composed of the three first items of the full 10 items version of the AUDIT. It is used to screen for alcohol consumption. Participants respond based on the frequency or amount of alcohol participants consume. Scores below 3 points are consistent with normal alcohol consumption. We used a version validated in Ecuador (López et al., 2019). The Cronbach's alpha coefficient for internal consistency reliability was $\alpha = 0.775$.

Design and Procedure

A descriptive quantitative cross-sectional study was conducted. Data were collected between January and March 2021 through a recruitment email distributed to the target audience by the universities' mail servers. The email contained a link to an anonymous online survey on SurveyMonkey. At the time of the study, classes were still remote and there were several mobility restrictions due to the COVID-19 pandemic. The study was approved by the Human Research Ethics Committee (*Comité de Ética de Investigación en Seres Humanos, CEISH*) of the Ministry of Public Health of the Republic of Ecuador (No. 014-2020) and was conducted according to the principles expressed in the Declaration of Helsinki (World Medical Association, 2013). Informed consent was displayed on the first page of the survey. After reading it, those who voluntarily wanted to participate had to accept it before continuing to the rest of the survey which took around 15 min to complete.

Data Analysis

All data analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 21 for Mac (IBM, Madrid, Spain). The descriptive analysis of the sample included the means and standard deviations (M ± SD) for the quantitative variables, while frequencies and percentages were used for the nominal variables. Student's *t*-test was used to analyze differences between men and women in the measured variables. The effect size was calculated using Cohen's *d*. Independent hierarchical multiple regression models were also applied to examine the effects of sociodemographic (Step 1) and psychological variables (Step 2) on anxiety and depressive symptoms among healthcare professionals. A standard method of entry was used for variable selection (enter method); thus, the effect of all independent variables was analyzed at the same time. The detection of multicollinearity was performed using the Variance Inflation Factor (VIF), with VIF > 5 as the cut-off point for the diagnosis of collinearity (Sheather, 2009). For multiple regressions, the R2 was obtained. Additionally, residual plots were used to assess the goodness of fit for the regression model. Finally, the indirect effect of both psychological inflexibility on the effect of psychological stress on anxiety and depressive mood were examined using the bootstrap method with the Process macro version 3.3 (Hayes, 2018) for SPSS (model 4). The number of bootstrap samples was set to 10,000. A complementary mediational triangle was used to visually display the mediation effects (Baron and Kenny, 1986). The significance level was set to $p < 0.05$.

RESULTS

Sample Description

A total of 191 early-career healthcare professionals in Ecuador participated in the study. These included senior undergraduate and regular graduate students in healthcare careers such as medicine, nursing, and clinical psychology, with direct

supervised experience caring for patients either in person or by telemedicine or telepsychology during the COVID-19 pandemic. From the total sample, 29.8% were men and 70.2% women. The average response rate was 47.8%. Age ranged from 18 to 47 years old, with an average age of 26.29 years ($SD = 5.48$). Age for men was M = 26.5 years ($SD = 6.02$) and, for women, $M = 26.34$ years ($SD = 5.5.1$). A total of 70.2% of the sample was single, 25.1% married or common law couple, and 4.7% separated or divorced.

A total of 29.8% of the sample worked full-time and 71.2% part time (34.6% employed with <10 h per week). Most participants worked in the public sector (72.7%), with 27.3% working in private institutions. A total of 39.3% failed to report any specific training about COVID-19 (60.7% did).

Table 1 shows the descriptive statistics and correlations of the variables. Age was negatively related to psychological inflexibility, anxiety and depressive symptoms, as well as to alcohol consumption. The outcome variables (perceived stress, loneliness, psychological inflexibility, and anxiety and depression symptoms) showed a significant positive correlation, while alcohol consumption was only related to perceived stress.

Gender differences in the outcome variables for this study are shown in **Table 2**. Only the difference in alcohol consumption varied significantly, and men showed higher consumption than women. Regarding the history of COVID-19, only 9.52% of the sample have tested positive for the virus. However, this value may underestimate the real number due to asymptomatic patients and a lack of general screening tests. **Table 3** shows the differences between early-career healthcare professionals with and without a positive history of COVID-19 diagnosis. There were no statistically significant differences.

Hierarchical Regression Analysis

Hierarchical multiple regression (**Table 4**) showed that the sociodemographic variables age and history of COVID-19 failed to predict anxiety and depressive symptoms (step 1). However, when adding the psychological variables, gender was significant, as well as the transdiagnostic psychological variables. Stress, psychological inflexibility, and loneliness predicted anxiety and depressive mood (step 2). Alcohol consumption was not a significant variable in the analysis.

Mediation Analysis

Psychological inflexibility and loneliness mediated the impact of stress on anxiety and depressive symptoms in early-career healthcare professionals during the COVID-19 pandemic (**Figure 1**). This finding was consistent regardless of gender and positive or negative diagnosis of COVID-19.

DISCUSSION

The COVID-19 pandemic has strained health systems and their workers. Although a previous study in Ecuador indicates that healthcare professionals show average levels of burnout and compassion fatigue (Cuartero-Castañer et al., 2021), we must advocate for better efforts to prevent other negative consequences of the pandemic. In Spain, for example, suicidal thoughts and behaviors have been common among healthcare professionals due to different factors such as lack of communication, coordination, personnel, and supervision (Mortier et al., 2021). Despite growing concern about mental health, most healthcare professionals, even those working in COVID-19 units, fail to receive any training in providing mental healthcare. Indeed, healthcare students and professionals will benefit, not only from raising awareness about the mental health impact of COVID-19 but from learning how to intervene to reduce stress (Folkman and Greer, 2000; Duan and Zhu, 2020).

The current study explored the anxiety and depressive symptomatology among early-career healthcare professionals in Ecuador. Results indicate that, on average there are low levels of these symptoms. We also examined how stress, psychological inflexibility, and loneliness relate to anxiety and depressive symptomatology in early-career healthcare professionals. One main result of this study is the double mediation model which shows the key role of psychological inflexibility and loneliness as mediators of the negative impact of psychological stress on anxiety and depressive symptomatology among the sample. Interestingly, gender and a COVID-19 diagnosis did not influence this mediation. In other cultural contexts such as the United States (Kroska et al., 2020), Italy (Pakenham et al., 2020), and Sweden (McCracken et al., 2021), psychological flexibility has also been identified as a resilience factor and inflexibility as a predictor of peritraumatic stress. Our results highlight the cross-cultural importance of psychological flexibility and the role of transdiagnostic processes in mental health, consistent with pre-pandemic studies (Kashdan and Rottenberg, 2010; Levin et al., 2014; Gloster et al., 2017; Hayes et al., 2019; Hofmann and Hayes, 2019).

Our results contribute to the literature showing that loneliness is a significant predictor of anxiety and depressive symptomatology in the studied context. These agree with previous studies that indicate that loneliness is a risk factor for illnesses such as dementia (Livingston et al., 2020) and that it is related to decreased physical and health, increased mortality, as well as decreased cognitive functioning (Hawkley and Cacioppo, 2010). It has also been found that dispositional loneliness predicts depressive and anxiety symptomatology and, along with fear of COVID-19, it is a risk factor for these symptoms (Rossi et al., 2020).

Furthermore, our model showed that loneliness, along with psychological inflexibility, mediated the negative impact of psychological stress on anxiety and depressive symptomatology among early-career healthcare professionals. This result is of great interest, especially considering that distancing and lockdown served a bigger purpose -to stop the spread of the virus- and thus, the possible perception of loneliness may have been part of the required adaptation to the circumstances (Walsh, 2020) and may have adopted a different meaning. Additionally, all guidelines suggested avoiding isolation and keeping in touch with loved ones through technology (e.g., World Health Organization, 2020; CDC, 2021). Also, given the sample composition, it is fair to assume that participants had access to interact with others through classes, professional practicum, clinical supervision, and work. Despite these multiple opportunities, it seems that the loneliness experienced during this time still had detrimental

TABLE 1 | Descriptive statistics and correlations for main study variables.

Variable	*M*	*SD*	1	2	3	4	5	6
1. Psychological stress	27.52	8.79	–					
2. Loneliness	7.61	2.43	0.48**	–				
3. Psychological inflexibility	23.22	10.18	0.68**	0.49**	–			
4. Anxiety and depression symptoms	4.62	3.39	0.72**	0.46**	0.71**	–		
5. Alcohol consumption	5.96	2.54	0.15*	0.08	0.11	0.10	–	
6. Age	26.29	5.48	−0.10	−0.10	−0.22**	−0.14*	-0.18**	–

*$p < 0.05$. **$p < 0.01$.

TABLE 2 | Gender differences in outcome variables.

Variables	Males M (SD) ($n = 57$)	Females M (SD) ($n = 134$)	t	*p*	*d*
Psychological stress	26.01 (9.57)	28.05 (8.37)	−0.146	0.146	0.227
Loneliness	7.08 (2.78)	7.79 (2.26)	−1.851	0.092	0.280
Psychological inflexibility	21.19 (10.08)	24.01 (10.13)	−1.752	0.083	0.279
Anxiety and depressive symptomatology	4.66 (3.3)	4.61 (3.4)	0.090	0.929	0.015
Alcohol consumption	6.61 (2.7)	5.66 (2.45)	2.375	0.019*	0.368

*Cohen's d.

effects. Future research and interventions for this population must promote interaction and social support, proven-effective strategies to reduce loneliness and thus reduce stress and promote well-being (Elmer et al., 2020).

Moreover, our results emphasize the importance of psychosocial factors to promote well-being and prevent mental health problems in early-career healthcare professionals in Ecuador. They point to integrating approaches to comprehend, avoid, and treat diseases in complex circumstances. Our results are consistent with other authors who go beyond COVID-19 as a pandemic and illustrate the need to frame it as a syndemic, an approach that reveals other interactions between conditions, states, and individuals for prognosis, treatment, and policy (Horton, 2020). This way, health policy could include the existing inequalities and reveal the importance of the interactions between biological and social factors to effectively prevent and respond to other illnesses while facing COVID-19 and its consequences (Horton, 2020).

Collaboration and mutual aid should become widespread in response to COVID-19 urging us to act for the common good (Carter et al., 2015; Bavel et al., 2020). Other countries such as Ecuador could review international efforts and implement them for their own workers. In Spain, for example, some hospitals developed psychological intervention programs for healthcare professionals treating COVID-19 patients (Priede et al., 2021). These included individual and group psychoeducation, mindfulness, and cognitive-behavioral techniques to improve emotional regulation, reduce physiological arousal, and to improve communication skills. Although authors suggest reviewing the efficacy of the programs, their benefits are highlighted. Our contribution to these psychological interventions is to include improving psychological flexibility as an explicit objective.

Special attention should be placed on more vulnerable populations. Like other studies in the same cultural context (Paz et al., 2020; Cuartero-Castañer et al., 2021; Mautong et al., 2021), our results show that younger people are more at risk. We found that younger age correlated to higher psychological inflexibility, more anxiety and depression symptoms, and more alcohol consumption. Consistent with the same research, females report higher levels of stress, although the level of significance was $p = 0.05$. This study also indicates that being female is a significant predictor of anxiety and depressive symptoms. This sociodemographic risk factor may be explained by all the restriction measures in place (e.g., remote education, curfews) that may have added to the already existing gender inequalities in the country (Castellanos-Torres et al., 2020). On the other hand, male respondents in the sample reported higher alcohol consumption than females. Even though research from other cultural contexts shows that people in educational, welfare, and health fields had less likelihood for increased drinking compared to other sectors during the pandemic (Oksanen et al., 2021), this information should also be taken into consideration when planning strategies to help early-career healthcare workers face the pandemic and its consequences.

Despite the relevance of this study, its limitations must be acknowledged. First, the results should be considered with caution since their conclusions are based on self-reported measures on an online survey. Future research should explore whether these results can be replicated in other populations with different sampling methods. Second, the participants were undergraduate and graduate students in clinical practice during

TABLE 3 | Differences in outcome variables by history of COVID-19.

Variables	History of COVID-19 M (SD) (n = 18)	No history of COVID-19 M (SD) (n = 171)	t	p	d^*
Psychological stress	27.78 (7.18)	27.41 (8.93)	0.166	0.868	0.045
Loneliness	7.16 (1.94)	7.63 (2.48)	−0.765	0.445	0.211
Psychological inflexibility	24 (9.91)	23.09 (10.22)	0.359	0.360	0.092
Anxiety and depressive symptomatology	5.83 (3.74)	4.5 (3.31)	1.595	0.112	0.381
Alcohol consumption	6.61 (1.94)	5.66 (2.61)	−0.779	0.437	0.413

**Effect-size r for Cohen's d.*

TABLE 4 | Hierarchical regression analysis for anxiety and depressive symptomatology.

Regression models (steps and predictors)	b	Standard error	η_p^2	Confidence interval (95%)	p	VIF
Step 1 (R^2 =0.043)						
Gender (men/women)	0.124	0.547	0.000	−0.956/−1.204	0.821	1.032
Age (years)	−0.081	0.046	0.016	−0.171/0.009	0.078	1.032
History of COVID-19	−1.439	0.836	0.016	−3.089/0.211	0.087	1.010
Alcohol consumption	0.120	0.100	0.007	−0.077 /0.316	0.232	1.063
Step 2 (R^2 =0.624)						
Gender (men/women)	−0.810	0.346	0.029	−1.493/−0.127	0.020	1.062
Age (years)	0.005	0.029	0.000	−0.063 /0.052	0.086	1.084
History of COVID-19	−1.146	0.523	0.009	−2.178 /−0.113	0.300	1.018
Alcohol consumption	−0.030	0.063	0.000	−0.155/0.094	0.630	1.090
Psychological stress	0.163	0.025	0.088	0.114 /0.212	<0.001	2.004
Loneliness	0.124	0.075	0.006	−0.023/0.272	0.023	1.402
Psychological inflexibility	0.131	0.022	0.074	0.088/0.173	<0.001	2.067

"b" = unstandardized coefficient.

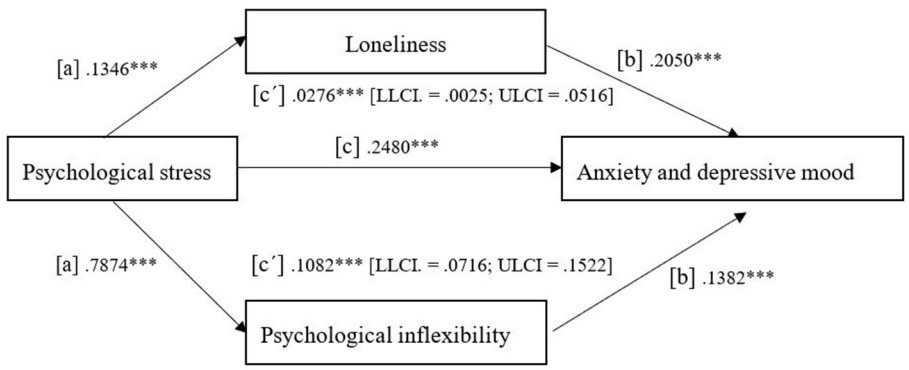

FIGURE 1 | The unstandardized regression coefficients for the mediating effect of psychological inflexibility and loneliness on the relationship between psychological stress and anxious and depressive mood. ***$p < 0.001$.

the pandemic from two private universities in two different cities in the country; we did not systematically collect data from all early-career healthcare professionals in Ecuador, thus the small sample size and composition. Third, given the nature of the study, all participants had supervision from their universities and/or from the sites they attended patients. This may have affected their responses and a future comparative study between early-career professionals with and without supervision is needed to understand the role of this variable. Finally, the cross-sectional design of the study implies some limitations that only future longitudinal studies could overcome. Nevertheless, by predicting anxiety and depressive mood and analyzing the mediating effect of psychological inflexibility on the relationship between them and stress in an Ecuadorian sample, this study

makes a novel contribution. In sum, mental health should be part of an integrated response to COVID-19 with long-lasting positive effects that may outlast the pandemic. To reach this goal, it is a priority to develop psychological interventions to meet the mental health problems in both COVID-patients and healthcare professionals (Duan and Zhu, 2020). Those measures should include improving psychological flexibility which is negatively related to burnout and anxiety and positively related to life satisfaction in healthcare workers (Montaner et al., 2021). Such interventions can mitigate the detrimental effects that stress and stressful situations as the pandemic can have on mental health and the professional quality of life of early-career healthcare workers.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Human Research Ethics Committee (Comité de Ética de Investigación en Seres Humanos, CEISH) of the Ministry of Public Health of the Republic of Ecuador (No. 014-2020). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

PB-S has contributed to the funding and design of the study. PB-S, AM-G, and PH-A have contributed to data collection and drafting the manuscript. PR has contributed to the selection of measures, data curation, statistical analysis and writing of the manuscript. PH-A has contributed to writing, reviewing, and editing the manuscript. Finally, all authors have read and agreed to the published version of the manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.729171/full#supplementary-material

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Satisfaction With Life, Satisfaction With Job, and the Level of Care Rationing Among Polish Nurses—A Cross-Sectional Study

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Background: Rationing of nursing care is a serious issue that has been widely discussed throughout recent years in many countries. The level of satisfaction with life and of satisfaction with job as the nurse-related factors may significantly affect the level of care rationing.

Aim: To assess the rationing of nursing care among the Polish nurses and the impact of nurse-related variables, i.e., satisfaction with life and satisfaction with job on the level of nursing care rationing.

Materials and Methods: A cross-sectional study was conducted among 529 Polish registered nurses employing in two University Hospitals. Three self-report scales in the Polish version were used in this study, namely, Basel Extent of Rationing of Nursing Care-revised version (BERNCA-R), Satisfaction with Life Scale (SWLS), and Satisfaction with Work Scale (SWWS).

Results: The respondents indicated that the most frequently rationed activity is studying the situation of individual patients and care plans at the beginning of the shift. The least frequently rationed activity indicated by the respondents was adequate hand hygiene. The patient-to-nurse ratio and the level of satisfaction with job are significant independent factors affecting the level of care rationing.

Conclusions: The assessment of the level of satisfaction with life and identification of factors affecting this assessment will enable reducing the occurrence of care rationing.

Keywords: care rationing, satisfaction with job, satisfaction with life, nurse, care, BERNCA-R

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WHAT IS ALREADY KNOWN ABOUT THE TOPIC?

- The level of satisfaction with job depending on the attitudes and feelings of the employee toward the performed profession is a factor that affects the rationing of nursing care significantly.
- Satisfied employees are usually more productive and feel stronger attached to their workplace.

It was also demonstrated that the level of satisfaction with job affects the level of satisfaction with provided services among the patients.

INTRODUCTION

Each patient has a right to the high quality of care provided by a competent nursing team regardless of its clinical condition (New Zealand Nurses Organisation, 2014), Numerous studies (Chegini et al., 2020; Dhaini et al., 2020; Friganovic et al., 2020; Gurková et al., 2020; Jaworski et al., 2020; Kalánková et al., 2020; Uchmanowicz et al., 2020b; Zeleníková et al., 2020) performed throughout recent years demonstrated that, regrettably, the nurses fail to perform all activities planned in the nursing process when delivering care to the patient. This phenomenon was described for the first time by Kalisch (2006) while the literature is replete with many terms defining it, i.e., nursing care left undone (Aiken et al., 2001), unfinished nursing care (Sochalski, 2004), missed nursing care (Kalisch, 2006), implicit care rationing (Schubert et al., 2007, 2008), task incompletion (Al-Kandari and Thomas, 2009), unmet nursing care needs (Lucero et al., 2010), care left undone (Ausserhofer et al., 2014), work left undone (Leary et al., 2014), nursing tasks left undone (Bekker et al., 2015), failure to maintain (Bail, 2016), or the unfinished task of nursing care (Kebede et al., 2017). All these define the condition in which the patient is left without adequate nursing care. This may lead to many undesired events, i.e., falls (Schubert et al., 2008; Lucero et al., 2010; Kalisch et al., 2012), bedsores (Schubert et al., 2008), infections (Lucero et al., 2010), and even increased mortality (Schubert et al., 2012).

To prevent rationing, the studies were performed aiming at the identification of the determinants for the level of nursing tasks left undone. These determinants (factors) were divided into patient-related [i.e., age, type of disease, form (severe/chronic), concomitant diseases, diagnosing, and treatment plan], associated with the working environment (i.e., management, interdisciplinary cooperation, autonomy, and responsibility, as well as material resources and staff shortage), and nurse-related (i.e., experience, knowledge, and skills, as well as psychological factors, e.g., professional burnout, satisfaction with life, and satisfaction with job) (Kalisch et al., 2009; Schubert et al., 2013; Bragadóttir et al., 2017; Griffiths et al., 2018; Jaworski et al., 2020; Mandal et al., 2020; Uchmanowicz et al., 2020a).

Satisfaction with life is defined as the state of balance between the current situation and personal expectations. The more our needs are fulfilled, the more we are satisfied with life (Loewe et al., 2014). According to the studies performed to date, nurses are generally satisfied with life; however, there are some areas of life that could be improved (Piotrkowska et al., 2019; Bartosiewicz et al., 2020; Jaworski et al., 2020). The impact on the level of satisfaction with life in nurses is multifactorial and includes age and education level, among others (Piotrkowska et al., 2019; Bartosiewicz et al., 2020). It was also demonstrated that the nurses with a higher level of satisfaction with life tend to ration nursing care less frequently (Jaworski et al., 2020).

Also, the level of satisfaction with job depending on the attitudes and feelings of the employee toward the performed profession is a factor that affects the rationing of nursing care significantly (Jaworski et al., 2020; Uchmanowicz et al., 2020a). Satisfied employees are usually more productive and feel stronger attached to their workplace. It was also demonstrated that the level of satisfaction with job affects the level of satisfaction with provided services among the patients (Janicijevic et al., 2013).

The aim of this study was to assess the phenomenon of care rationing among the Polish nurses and the impact of nurse-related variables, i.e., satisfaction with life and satisfaction with job on the level of rationing of nursing care in the patients hospitalized at the medical treatment wards.

MATERIALS AND METHODS

Setting, Design, and Participants

This study was performed among surgical nurses from two University Hospitals in Poland (in Wrocław and Katowice) between July and December 2019. The criterion for inclusion in this study was full-time employment in the surgical ward for at least 6 months, work in direct patient care in the ward, and consent to participate in this study. The exclusion criterion was incorrect or incomplete completion of the questionnaires or withdrawal of consent to participate in this study. It included 529 respondents. Participation was voluntary, and respondents were completely anonymous. Of note, 89% of the surveys collected were completed, and 529 respondents were included in the analysis. Questionnaires were administered by pencil-and-paper in a packet completed at one time over 15–20 min. The STROBE guidelines (Strengthening the Reporting of Observational Studies in Epidemiology) were followed.

Ethical Considerations

This study used survey methods. All respondents received information about the study procedure and aim and provided informed consent to participate. Full anonymity was guaranteed. This study used standardized research questionnaires and a survey collecting sociodemographic data. The study protocol was accepted and approved by the Bioethics Committee of Medical University of Silesia (PCN/0022/KB/17/20).

Qualification Procedure

The inclusion criteria were as follows: work experience of more than 6 months, work at surgical wards, and consent to participate in this study. The exclusion criteria were as follows: work experience under 6 months and lack of consent to participate in this study.

Research Instruments

For the purpose of this study, the following instruments were used: the BERNCA questionnaire (Schubert et al., 2007) in Polish version (Uchmanowicz et al., 2019a), the Satisfaction with Life Scale (SWLS) (Diener et al., 1985) in Polish version (Juczyński, 2001), the Satisfaction with Job Scale (Zalewska, 2003), and the questionnaire designed by the authors who asked questions about sociodemographic characteristics. Questions included age,

marital status, education, specialization, seniority, the number of places of work, and the number of patients being under nurse care at the unit.

The BERNCA-R Questionnaire

The Basel Extent of Rationing of Nursing Care-revised version (BERNCA-R) questionnaire was created by Schubert et al. (2007). This tool consists of 32 questions concerning necessary activities and tasks in the work of nurses that might potentially not be performed in everyday work due to a shortage of nursing resources. The questionnaire is divided into five dimensions, namely, daily activities, care and support, rehabilitation and education, monitoring and safety, and documentation. Responses are given on a five-point Likert scale (0—not required, 1—never, 2—rarely, 3—sometimes, and 4—often) and refer to the last seven working days. For each response, the measure of the rationing frequency is the mean score of overall 32 items; the mean rationing score ranged from 0 to 4.0. The Polish version was adopted by Uchmanowicz et al., and Cronbach's alpha for the unidimensional scale was 0.96 (Uchmanowicz et al., 2019a).

The Satisfaction With Life Scale

The SWLS was developed by Diener et al. (1985), and the Polish-language version used in this research study was developed by Juczyński (2001). It is a five-item scale that measures global cognitive judgments of the life satisfaction of an individual. Participants indicate how much they agree or disagree with each of the five items using a seven-point scale that ranges from 7 "strongly agree" to 1 "strongly disagree." Scores range from 5 to 35 points—the higher the score, the greater the sense of life satisfaction. After standardization of the general results in the sten scale, the sten scores between 1 and 4 are considered low satisfaction, from 7 to 10 as high satisfaction, and 5 and 6 as average satisfaction. Cronbach's alpha for the Polish version is 0.81, and for the original SWLS 0.87.

The Satisfaction With Work Scale

The Satisfaction with Work Scale (SWWS) was developed in 1991, and the Polish-language version used in this research was developed by Zalewska (2003). It is five-item scale that measures cognitive judgments of the spheres of work of employees. The respondents answer particular statements about their job satisfaction on a seven-point scale (1—I definitely do not agree, 2—I do not agree, 3—I rather do not agree, 4—it is difficult to say whether I agree or do not agree, 5—I rather agree, 6—I agree, and 7—I definitely agree). The overall score ranges from 5 to 35, with higher scores indicating higher job satisfaction. Cronbach's alpha for the Polish version is 0.86.

Statistical Analysis

The BERNCA-R scores in two groups were compared using the Mann-Whitney *U* test. The BERNCA-R scores in three and more groups were compared using the Kruskal-Wallis tests. Upon identifying the statistically significant differences, the *post-hoc* analysis using Dunn's test to identify the statistically significantly differing groups was performed. Correlations between quantitative variables and the BERNCA-R scores were analyzed using the Spearman correlation coefficient. Multifactorial analysis on the effect of independent multiple variables on the BERNCA-R score was performed using the linear regression method. The results are presented in the form of regression model parameter values with 95% CI.

The significance level adopted for analysis is 0.005. Any and all *p*-values below 0.05 are interpreted as demonstrating significant correlations.

The analysis was performed using the R software version 4.0.2, R Foundation, Vienna, Austria.

RESULTS

Sociodemographic Characteristics of Respondents

The analysis of research materials demonstrated that the most represented groups among the respondents were the persons aged 40–50 years (41.97%), being in a relationship (73.37%), with secondary vocational education (41.59%). Detailed data are presented in **Table 1**.

The BERNCA Questionnaire Results

Analysis of data obtained from the BERNCA questionnaire revealed that the mean total score for the studied group was 1.53, which means that the frequency of care rationing by the respondents falls within the range of between "never" and "rarely" (**Table 2**).

The respondents indicated that the most frequently rationed activities included the following (**Table 3**):

- studying the situation of individual patients and care plans at the beginning of shift (question 29)—(mean 1.95),
- assessment of the needs of newly admitted patients (question 30)—(mean 1.93),
- administering prescribed medication or infusion on time (question 23)—(mean 1.89),
- setting up care plans for the patients (question 31)—(mean 1.89),
- providing emotional or psycho-social support to the patient (question 10)—(mean 1.8).

The least frequently rationed activities indicated by the respondents included (**Table 3**):

- adequate hand hygiene (question 27)—(mean 1.08),
- providing the patients with sufficient information on planned tests or therapies (question 12)—(mean 1.2),
- restraining of confused patients due to inability to ensure sufficient monitoring (question 20)—(mean 1.26),
- applying necessary disinfection measures (question 28)—(mean 1.29)
- preparing the patients for planned tests or therapies (25)—(mean 1.3).

The SWLS Results

The analysis of the obtained data revealed that 224 among 529 of the questionnaire respondents (42.34%) declared a moderate

TABLE 1 | Characteristics of groups.

Parameter		*n*	Percentage (%)
Age	23–30 years	60	11.34
	31–40 years	43	8.13
	41–50 years	222	41.97
	>50 years	204	38.56
Seniority	0–5 years	67	12.67
	6–15 years	35	6.62
	16–20 years	41	7.75
	>20 years	386	72.97
Education	MSc. in nursery/obstetrics	83	15.69
	Bachelor in nursery/obstetrics	152	28.73
	Medical high school	74	13.99
	Medical college and "other" education	220	41.59
Specialty	No	370	69.94
	Yes	159	30.06
Number of jobs	One	361	68.24
	Two or more	168	31.76
Patient-to-nurse ratio	1–5 patients	32	6.05
	6–15 patients	300	56.71
	16–25 patients	136	25.71
	>25 patients	61	11.53
Marital status	In a relationship	404	76.37
	Single	125	23.63

TABLE 2 | Total mean scale score: 1.53 ($SD = 0.79$).

BERNCA-R [score]									
Scale range	**N**	**No data**	**Mean**	**SD**	**Median**	**Min**	**Max**	**Q1**	**Q3**
0–4	529	0	1,53	0,79	1,5	0	4	1,06	1,91

level of satisfaction with life, 175 respondents (33.08%) declared a high level of satisfaction with life, while 130 respondents (24.57%) exhibited a low level of satisfaction with life.

The SWWS Results

According to the analysis, the mean SWWS score amounted to 18.5 points, which gives 3.7 points per question. Thus, the respondents were neither satisfied nor dissatisfied with their job.

Impact of Variables on the Level of Rationing of Nursing Care

Analysis of the obtained data demonstrated that the frequency of care rationing was significantly higher:

- among the persons aged 23–30, 31–40, and 41–50 years compared with the persons aged >50 years,
- among the persons with seniority between 0 and 5 years compared with the persons with seniority >20 years,
- in persons serving 6–15 patients compared with the persons serving 16–25 and >25 patients, in whose it was significantly higher than in persons serving 1–5 patients (**Table 4**).

It was also demonstrated that the level of satisfaction with life had no significant impact on the level of rationing of nursing care ($r = -0.06$, $p > 0.05$), while the level of satisfaction with job significantly affects the level of rationing ($r = -0.232$, $p < 0.001$). This means that the higher level of satisfaction with the job, the lower level of rationing of nursing care.

The linear regression model revealed that the significant ($p < 0.05$) independent predictors of the BERNCA-R score include the following:

- 6–15 served patients: regression parameter is 0.675, which increases the BERNCA-R score by 0.675 points on average comparing with 1–5 patients,
- 16–25 served patients: regression parameter is 0.466, which increases the BERNCA-R score by 0.466 points on average comparing with 1–5 patients,
- >25 served patients: regression parameter is 0.379, which increases the BERNCA-R score by 0.379 points on average comparing with 1–5 patients,
- SWWS: regression parameter is −0.045, thus each point in SSP decreases the BERNCA-R score by 0.045 points on average (**Table 5**).

TABLE 3 | Distribution of answers of the BERNCA-R guestionnaire.

Question/Items	There was no need (0) (%)	Never (1) (%)	Rarely (2) (%)	Sometimes (3) (%)	Often (4) (%)	No responses (%)	Mean
1. Sponge bath	39.32	25.52	15.50	13.99	5.67	0.00	1.21
2. Partial sponge bath	36.48	32.14	17.77	10.78	2.84	0.00	1.11
3. Skin care	25.33	33.08	24.95	12.10	4.54	0.00	1.37
4. Oral hygiene	29.68	28.54	21.55	13.23	6.99	0.00	1.39
5. Dental hygiene	30.62	24.76	22.31	14.93	7.37	0.00	1.44
6. Assist food intake	24.95	33.84	27.79	11.34	2.08	0.00	1.32
7. Mobilization	20.42	22.12	35.35	17.20	4.91	0.00	1.64
8. Change of the position	22.50	29.68	29.68	13.42	4.73	0.00	1.48
9. Change of the bed linen	19.66	24.39	34.59	13.04	8.32	0.00	1.66
10. Emotional and psychological support	17.39	18.34	34.22	20.04	10.02	0.00	1.87
11. Necessary conversation	19.09	17.77	33.46	21.36	8.32	0.00	1.82
12. Information about therapies	17.39	39.13	24.95	14.74	3.78	0.00	1.48
13. Continence training (diapers)	30.06	29.87	19.85	15.50	4.73	0.00	1.35
14. Continence training (insert catheter)	34.22	33.27	16.45	10.59	5.48	0.00	1.2
15. Activating or rehabilitating care	33.65	13.99	15.31	14.74	22.31	0.00	1.78
16. Education and training	27.22	21.55	28.17	15.12	7.94	0.00	1.55
17. Preparation for discharge	21.36	23.82	28.54	19.47	6.81	0.00	1.67
18. Monitoring patients as described by physician	15.12	32.14	27.22	18.34	7.18	0.00	1.7
19. Monitoring patients as the nurse felt necessary	13.80	26.09	33.65	19.28	7.18	0.00	1.8
20. Monitoring of confused patients and use of restrains	40.64	23.06	15.31	12.10	8.88	0.00	1.26
21. Monitoring of confused patients and use of sedatives	34.40	25.33	16.07	16.26	7.94	0.00	1.38
22. Delay in measure because of a physician delay	24.20	34.40	19.66	16.64	5.10	0.00	1.44
23. Administration of medication. infusions	10.96	23.82	37.24	21.17	6.81	0.00	1.89
24. Change of wound dressings	17.20	43.10	24.20	12.29	3.21	0.00	1.41
25. Preparation for test and therapies	13.80	53.88	23.06	6.99	2.27	0.00	1.3
26. Keep patient waiting who rung	15.12	41.59	24.01	13.99	5.29	0.00	1.53
27. Adequate hand hygiene	27.98	46.88	16.82	5.48	2.84	0.00	1.08
28. Necessary disinfection measures	9.83	63.52	17.77	5.67	3.21	0.00	1.29
29. Studying care plans	9.83	23.44	36.67	22.31	7.75	0.00	1.95
30. Assessment of newly admitted patient	9.83	21.17	41.40	21.17	6.43	0.00	1.93
31. Set up care plans	9.26	26.28	37.62	20.04	6.81	0.00	1.89
32. Documentation and evaluation of the care	8.70	28.73	39.32	17.96	5.29	0.00	1.82

The R^2 coefficient for this model is 17.66%, which means that 17.66% of the BERNCA-R score variability was explained by the variables adopted in the model. The remaining 82.34% depends on the variables not included in the model and on random factors.

DISCUSSION

Care rationing seems to be both an increasingly recognized and relatively common practice in nursing care. Understanding the mechanisms of care rationing is very important (Scott et al., 2019). The purpose of this study was to assess the occurrence of care rationing among nurses working in surgical wards. An analysis of the obtained data demonstrated that the total mean BERNCA score is 1.53, which means that the frequency of care rationing by the respondents falls within the range between "never" and "rarely." Similar results were also obtained by Jaworski et al. (2020), Schubert et al. (2013), and Uchmanowicz et al. during a validation study of the Polish version of the BERNCA questionnaire (Uchmanowicz et al., 2019a) and also

TABLE 4 | Impact of sociodemographic variables on the level of rationing of nursing care.

Parameter	Group	BERNCA-R [score]			*p*
		Mean ± SD	Median	Quartiles	
Age	23–30 years (*N* = 60)—A	1.68 ± 0.73	1.59	1.43–1.91	$p = 0.006$*
	31–40 years (*N* = 43)—B	1.7 ± 0.58	1.62	1.34–1.97	
	41–50 years (*N* = 222)—C	1.55 ± 0.8	1.53	1.04–1.91	B.A.C > D
	>50 years (*N* = 204)—D	1.43 ± 0.83	1.38	0.97–1.84	
Seniority	0–5 years (*N* = 67)—A	1.7 ± 0.72	1.59	1.34–1.97	$p = 0.031$*
	6–15 years (*N* = 35)—B	1.63 ± 0.52	1.69	1.5–1.88	
	16–20 years (*N* = 41)—C	1.5 ± 0.84	1.53	1.09–1.81	A > D
	>20 years (*N* = 386)—D	1.5 ± 0.82	1.44	1–1.84	
Education	MSc in nursery/obstetrics (*N* = 83)	1.47 ± 0.85	1.5	0.97–1.78	$p = 0.056$
	Bachelor of nursery/obstetrics (*N* = 152)	1.62 ± 0.76	1.56	1.16–1.94	
	Medical high school (*N* = 74)	1.32 ± 0.52	1.46	1.25–1.56	
	Medical college and "other" education (*N* = 220)	1.57 ± 0.86	1.52	0.97–2.06	
Specialty	No (*N* = 370)	1.54 ± 0.78	1.5	1.16–1.87	$p = 0.66$
	Yes (*N* = 159)	1.52 ± 0.82	1.5	1–1.92	
Number of jobs	One (*N* = 361)	1.54 ± 0.79	1.5	1.09–1.84	$p = 0.903$
	Two or more (*N* = 168)	1.52 ± 0.81	1.5	1.03–1.98	
Patient-to-nurse ratio	1–5 patients (*N* = 32)—A	0.96 ± 0.65	0.89	0.52–1.33	$p < 0.001$*
	6–15 patients (*N* = 300)—B	1.67 ± 0.84	1.59	1.09–2.06	
	16–25 patients (*N* = 136)—C	1.44 ± 0.62	1.47	1.16–1.69	B > C.D > A
	>25 patients (*N* = 61)—D	1.39 ± 0.77	1.47	0.91–1.78	
Marital status	In a relationship (*N* = 404)	1.49 ± 0.78	1.5	1.02–1.82	$p = 0.038$*
	Single (*N* = 125)	1.68 ± 0.82	1.62	1.16–2.03	

**Statistically significant correlation ($p < 0.05$).*

the studies conducted among nurses working in a public hospital (Uchmanowicz et al., 2020a, 2021).

This study demonstrates that the activities most frequently rationed in patient care include analyzing the situation of individual patients and care plans at the beginning of the shift, assessment of the needs of newly admitted patients, administration of prescribed medication or infusion on time, setting up care plans for the patients, and providing emotional or psycho-social support to the patient, which is consistent with the results obtained by other authors (Schubert et al., 2013; Uchmanowicz et al., 2020a). In a study by Uchmanowicz et al. (2019a), the nurses declared that the most frequently rationed activities included activating or rehabilitating care, and due to inability to provide sufficient monitoring, they had to restrain confused patients or administer sedatives. Many authors also demonstrated that comfort talk with patients (Al-Kandari and Thomas, 2009; Ausserhofer et al., 2014; Bekker et al., 2015) and timelines of response to requests (Jones, 2014, 2015; Jarošová and Zeleníková, 2019; Gurková et al., 2020; Kalánková et al., 2020; Zeleníková et al., 2020) are the activities most frequently rationed when providing care to the patient.

This study reveals that nurses most frequently ration the activities related to the first and second stage of the caring process (diagnosing the bio-psycho-social condition of the patient and planning activities aimed at solving the problems of patients), which finally translates into lower quality of provided care and worse treatment outcomes for patients (Campagna et al., 2020). In contrast, the positive aspect is that, as has been demonstrated, the least frequently rationed activities include applying necessary disinfection measures and preparation of patients for planned tests or therapies, which is also confirmed by other authors (Schubert et al., 2013; Uchmanowicz et al., 2019a). The due performance of these activities enables the prevention of hospital-acquired infections and minimizes the risk of adverse events related to medical procedures or treatment.

Analysis of the obtained data demonstrated that the frequency of care rationing is significantly higher in persons working <5 years compared with nurses with seniority exceeding 20 years and among younger nurses (aged below 50 years) compared with persons aged above 50 years, which complies with the results obtained by Jarošová and Zeleníková (2019) and Al-Kandari et al. (Al-Kandari and Thomas, 2009).

It was also demonstrated that the factor of the patient-to-nurse ratio during a shift has a significant impact on the level of care rationing. Increasing the patient-to-nurse ratio results in more frequent non-completion of tasks planned during nursing care. Many authors (Schubert et al., 2013; Ausserhofer et al., 2014; Zhu et al., 2019) indicated that lower patient-to-nurse ratios are connected with lower levels of nursing care left undone.

An analysis of the obtained data revealed that the vast majority of the respondents (42.34%) declared a moderate level of satisfaction with life, which complies with the results achieved

TABLE 5 | Results of regression analysis.

Feature		Parameter	95%CI		*p*
Age	23–30 years	Ref.			
	31–40 years	0.127	−0.254	0.508	0.513
	41–50 years	0.023	−0.386	0.432	0.913
	>50 years	−0.026	−0.46	0.408	0.907
Seniority	0–5 years	Ref.			
	6–15 years	−0.111	−0.513	0.29	0.587
	16–20 years	−0.298	−0.718	0.123	0.166
	>20 years	−0.217	−0.627	0.193	0.299
Education	MSc in nursery/obstetrics ($N = 83$)	Ref.			
	Bachelor of nursery/obstetrics ($N = 152$)	0.081	−0.12	0.281	0.431
	Medical high school ($N = 74$)	−0.222	−0.487	0.042	0.1
	Medical college and "other" education ($N = 220$)	0.124	−0.077	0.326	0.227
Specialty	Yes	Ref.			
	No	−0.066	−0.21	0.079	0.373
Number of jobs	One	Ref.			
	Two or more	0.024	−0.114	0.163	0.731
Patient-to-nurse ratio	1–5 patients	Ref.			
	6–15 patients	0.675	0.404	0.945	<0.001*
	16–25 patients	0.466	0.17	0.763	0.002*
	>25 patients	0.379	0.053	0.704	0.023*
Marital status	In a relationship	Ref.			
	Single	0.135	−0.017	0.287	0.082
SWLS	[score]	0.014	0	0.027	0.059
SWWS	[score]	−0.045	−0.058	−0.033	<0.001*

p—multifactorial linear regression.
**Statistically significant correlation ($p < 0.05$).*

by other authors (Marilaf Caro et al., 2017; Kupcewicz et al., 2018; Piotrkowska et al., 2019; Lorber et al., 2020). While the study by Uchmanowicz et al. (2019b) demonstrated that nurses and midwives most frequently assess their level of life satisfaction as high. The difference in the results may be due to the characteristics of the study group, as the average age of the respondents in this study was significantly lower. While in the Iranian study, the vast majority of the respondents were definitely not satisfied with life (Yazdanshenas Ghazwin et al., 2016), which was affected by work-related factors (no satisfaction with remuneration and work environment) and associated with everyday emotions and stress. Practicing the profession of nurse is associated with experiencing strong stress and chronic fatigue, which clearly affects the perception and assessment of life satisfaction (Uchmanowicz et al., 2021).

In this study, no significant impact of the level of life satisfaction was on the level of rationing of nursing care (despite the result was borderline statistically significant), while a study by Uchmanowicz et al. (2021) demonstrated that nurses with a low or medium level of life satisfaction tend to leave nursing care unfinished more frequently compared with nurses who assess their level of life satisfaction as high.

Job satisfaction had a significant positive effect on the nurse-assessed quality of care (Boamah et al., 2017). An analysis of the material also demonstrated that the level of job satisfaction among the nurses in the study group was 18.5 points, which means that the nurses are neither satisfied nor unsatisfied with their job, which is consistent with the results obtained by other authors (Uchmanowicz et al., 2019b, 2020a; Jaworski et al., 2020). Aiken et al. (2013) revealed that the proportion of nurses unsatisfied with their job dramatically differ depending on the country of their work—in the Netherlands, only 11% of surveyed nurses reported no satisfaction with work, compared with 56% in Greece. The level of satisfaction with job should be continuously monitored by the management, since it was demonstrated that nurses unsatisfied with job ration the nursing care from 2.6 (White et al., 2019) to 3.4 (Clark and Lake, 2020) times more frequently compared with nurses reporting satisfaction with job, which was proved in studies conducted by other authors (Jones, 2014; Clark and Lake, 2020; Friganovic et al., 2020; Gurková et al., 2020; Uchmanowicz et al., 2020a,b; Zeleníková et al., 2020), as well as in this study. A low level of satisfaction with job also translates into a greater willingness to resign from work, and consequently, into staff shortages. Insufficient staff resources are a factor significantly

affecting the level of rationing of nursing care (Alsubhi et al., 2020).

CONCLUSIONS

The most frequently rationed care interventions identified in the implicit rationing approach were activities related to care plans. The assessment of the level of satisfaction with work and identification of affecting factors will enable reducing the occurrence of care rationing among the nurses working at the surgical wards in Polish hospitals.

LIMITATION

This study has some limitations. Care workers might not report the actual level of care rationing. Also, the results are based on the self-reported measure of satisfaction with job and satisfaction with life. The final limitation is the use of a cross-sectional study design, which did not allow us to arrive at firm conclusions regarding the causality of predictors.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because personal data in the data set. Requests to access the datasets should be directed to aleksandra.koltuniuk@umed.wroc.pl.

ETHICS STATEMENT

The study was carried out following the guidelines of the Declaration of Helsinki and Good Clinical Practice. Participation in the study was voluntary and anonymous. The study protocol was approved by the Bioethics Committee of Wrocław Medical University in Poland (permission no. KB-41/2019).

AUTHOR CONTRIBUTIONS

AK, IW, AM, KC, and IU: conceptualization, methodology, investigation, and writing—original draft preparation. AK and IW: formal analysis. AK: resources, data curation, writing—review and editing, and funding acquisition. IU: visualization. AK and IU: supervision. All authors have read and agreed to the published version of the manuscript.

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Rationing of Nursing Care and Professional Burnout Among Nurses Working in Cardiovascular Settings

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Introduction: Nursing needs close interpersonal contact with the patient and emotional involvement, therefore can contribute to professional burnout and rationing of nursing care.

Aim: Assessing the relationship between the rationing of nursing care and professional burnout in nursing staff.

Materials and Methods: The study included a group of 219 nurses working in cardiovascular facilities. This was a cross-sectional study designed to investigate the relationship between factors of the care rationing and professional burnout. The survey data was collected with standardised and research instruments such as the revised Basel Extent of Rationing of Nursing Care questionnaire (BERNCA-R) and the Maslach Burnout Inventory (MBI).

Results: The total mean BERNCA-R score was 1.38 (SD = 0.62), while the total MBI score amounted to 38.14 (SD = 22.93). The specific components of professional burnout yielded the values: emotional exhaustion (M = 44.8), job dissatisfaction (M = 40.66), and depersonalisation (M = 28.95). Multiple linear regression showed that independent predictors of BERNCA-R score were emotional exhaustion, depersonalisation, job dissatisfaction, and multi-jobs activity ($p < 0.001$).

Conclusion: The level of rationing of nursing care in cardiovascular facilities increases along with emotional exhaustion, depersonalisation and job dissatisfaction, and multi-jobs activity.

Keywords: rationing of nursing care, burnout, nurses, BERNCA-R, MBI, job satisfaction, emotional exhaustion, depersonalisation

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INTRODUCTION

Rationing of nursing care is defined as a complete or partial omission of the required patient care. This phenomenon has been first described by Kalisch (2006), an American nurse. Kalisch (2006) have proposed a conceptual model of missed nursing care. According to this model, the rationing of nursing care results from several malfunction factors: insufficient resources to provide patients with

required care (reduction in nurse employment), time-consuming handling on new technologies used in medical care, medical record-keeping, individual factors (tiredness, family issues), working environment factors (conflicts among co-workers), medical facility management system (numerous changes to the organisation and senior management), and communication (Kalisch et al., 2009; Wakefield, 2014).

Given priorities of nursing tasks and malfunctioning individual and organisational factors, the nurses are forced to selectively perform care tasks, and specific nursing tasks may be omitted or delayed (Ulrich, 2016). In addition, care rationing could also be affected by the nurses' clinical knowledge, attitudes, and judgements toward allocating resources for the patients (Schubert et al., 2008). The nursing profession depends on the skills and acquired competencies of nurses, but also specific personality traits and optimistic attitudes about the world and people. According to recent reports, the more optimistic thinking and higher job satisfaction, the lower risk of missed nursing care (Jaworski et al., 2020; Uchmanowicz et al., 2020).

Rationing of nursing care has been reported worldwide. It poses a direct threat to patient safety (Kalisch et al., 2009; Uchmanowicz and Gotlib, 2018). Prior research suggests that this issue applies to nearly 84% of nurses, who miss at least 1 out of 15 nursing tasks (Hessels et al., 2015; Park et al., 2018). As reported by Liu et al. (2018), rationing of nursing care and nurse burnout were mediators negatively associated with patient safety. Rationing of nursing care is one of the leading causes underlying adverse events and medical errors, posing a threat to patient's health and lives (Hessels et al., 2019). In the study by O'Connor et al. (2017), medical errors were associated with professional burnout in approximately 64% of cases.

The findings reviewed here implicate the significant relationship between the rationing of nursing job satisfaction and the risk of professional burnout (Ntantana et al., 2017). For example, the existing studies demonstrate the strong correlation between nurses' job satisfaction and patients' satisfaction with healthcare services (Liu et al., 2016). It was shown that lower job satisfaction increased missed nursing care (Blackman et al., 2015). Fewer professional success and more failures reported by nurses were due to close interpersonal contact with the patient and excessive involvement in nursing care (Rizo-Baeza et al., 2018).

Professional burnout is associated with poor psychological wellbeing related to emotional exhaustion, negative assessment of personal and depersonalisation (Hall et al., 2016). Zander et al. (2014) reported the associations between inefficient leadership, inadequate organisation of nursing work, as well as high emotional exhaustion and rationing of nursing care. These reports suggest that the relationship between burnout, missed nursing care, and individual factors should be examined more closely. According to Maslach et al. (2001), emotional exhaustion is manifested by discouragement toward work, lowered and pessimistic professional activity, psycho-physical tension (irritability) and somatic conditions, including tiredness, headaches, insomnia, gastric disorders, and susceptibility to regular colds. Reduced personal accomplishment is characterised by low confidence in one's own capabilities, no satisfaction with professional achievements, inability to solve professional issues, and an aggressive and avoidant attitude in relations with others. Depersonalisation is described by indifference, cynicism, superficiality, shortening contact time, and distancing from the patients' care needs. Healthcare personnel belong to the professional group at particularly high risk of burnout phenomenon due to specific organisational conditions, individual characteristics of the nursing profession and nursing requirements. This condition results from failure to adapt to the working environment and it negatively impacts work effectiveness and social and family life (Maslach et al., 2001). Professional burnout became a serious social issue, diminishing the quality of provided nursing care (Bridgeman et al., 2018). Several studies have found that work-related stress nursing is associated with burnout, job satisfaction, and diminished physical and mental health outcomes (Khamisa et al., 2015). Stressors contributing to work-related stress and increased professional burnout include experiences of conflicts with peers and patients, high job demands, and overtime (Garrosa et al., 2010; Nowrouzi et al., 2015). The recent research also shows the effects of professional burnout among medical personnel on patient dissatisfaction with provided medical care. Diminished satisfaction with work, professional burnout and frustration caused by negligible effects of provided care on the patient health are found primarily among the bedside nurses working directly with patients in hospitals or at homes. Overall, lower patient satisfaction with the quality of care is observed in healthcare facilities, where nurses often experience burnout and dissatisfaction with their working conditions (McHugh et al., 2011). The literature shows that there is the association between healthcare professionals' well-being and burnout with regard patient safety.

To date, the literature attempted to determine the associations between professional burnout and rationing of nursing care (Kalisch et al., 2011). However, some important issues have been omitted because the prior research was more focused on nurses' job satisfaction. It seems that studies analysing specific determinants linking job dissatisfaction, professional burnout, and exhaustion are insufficient. There is still a gap in research investigating professional burnout given specific healthcare organisations and cultural settings in the countries. The findings of professional burnout and the missed nursing care cannot be easily generalised because the existing studies cover various healthcare facilities employing nurses and consider highly specific medical environments. There is little evidence of the above-mentioned adverse phenomena among nurses working in cardiology departments. Therefore, the aim of this study was to assess the relationship between the rationing of nursing care and professional burnout in nursing staff.

MATERIALS AND METHODS

Study Group Selection

The study used a cross-sectional design and analysed the diagnostic survey data selected collected from a group of nurses

working at non-invasive cardiology wards of four hospitals in Wrocław, Poland. It was carried out between January and May 2020. The study included 219 nurses based on the following inclusion criteria: (1) consent to participate in the survey, (2) valid nursing licence, (3) working full time, and (4) no recent sick leave or holiday leave exceeding 3 months.

Study Procedure

As the study was based on the cross-sectional design, the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were followed (von Elm et al., 2007). The research was performed upon approval of the Bioethics Committee of the Wrocław Medical University, Poland. The subjects were informed that their participation is voluntary and anonymous. Upon obtaining written consent, the surveys were conducted in line with the recommendations of Good Clinical Practice (Vijayananthan and Nawawi, 2008) and the Helsinki Declaration of the World Medical Association (2013).

Description of the Questionnaire and the Applied Measures

The Basel Extent of Rationing of Nursing Care questionnaire (BERNCA-R) questionnaire was elaborated by Schubert et al. (2007). This instrument has proven to be effective for evaluating the rationing of nursing care in a hospital environment. The study used the Polish language version of the questionnaire adapted by Uchmanowicz et al. (2019). The surveys data were collected using the standardised research instruments: the revised BERNCA-R and the Maslach Burnout Inventory (MBI).

The BERNCA-R evaluates the frequency of rationing of nursing care by the respondents. It consists of 32 items, examining events and situations in which care rationing happens to occur. Each question is scored according to the 4-point scale, where 0 = "There was no need"; 1 = "Never"; 2 = "Rarely"; 3 = "Sometimes"; 4 = "Often." The total score of the care rationing is the mean across 32 questions. The total care rationing score ranges from 0 to 4 and can be interpreted analogically to the interpretation of a single item (Uchmanowicz et al., 2019).

Burnout was measured using the MBI, a validated, standardised Polish adaptation by Pasikowski (2006). The MBI assesses a professional burnout level on three subscales: emotional exhaustion, depersonalisation, and lack of job satisfaction. Each subscale score ranges from 0 to 100 points, where the higher score indicates higher professional burnout. In addition, the total burnout rate is the mean score of the three subscales. There are no standards for evaluating the levels of respondents' professional burnout. The assessments of professional burnout in nurses based on MBI have been reported worldwide and proven effective for the measures of burnout reduction in healthcare policy planning (Poghosyan et al., 2009; Choi et al., 2019).

In addition, the study used a self-designed socio-demographic survey including the questions about age, job experience, education, specialisations, multi-jobs activity at healthcare centres, number of patients, and marital status.

Statistical Methods

The survey data were systematised and arranged by quantitative and qualitative variables. The analysis of quantitative variables included the mean (M), standard deviation (SD), median, quartiles, minimum, and maximum. For qualitative variables, the frequency and percentage of occurrences were calculated. The group differences in the BERNCA-R scores were examined with the Mann–Whitney test. Comparisons between three or more groups was performed with the Kruskal–Wallis test. Identification of statistically significant effects was performed with the *post hoc* Dunn test. Correlations between were analysed using Spearman's correlation coefficient. Multiple regression analysis was used to examine the impact of explanatory variables on the BERNCA-R score. The resulting quality of the model was assessed by the R^2 determination coefficient. The regression model parameters included the 95% confidence intervals. The results were considered statistically significant at the level of $p < 0.05$. Calculations were performed using the R Core Team, 4.0.2 version (R Core Team, 2019).

RESULTS

Study Group

The study included 219 cardiac nurses. The majority of the respondents (81.28%) declared living with a partner. The largest number of respondents reported bachelor (36.99%) or secondary education (33.79%), while higher education (master's degree) was indicated by 18.26% of respondents. Only 10.96% of respondents reported other medical education. And 17.81% of respondents completed postgraduate studies with a specialisation in nursing. The most numerous group included nurses with 20-years of working experience (55.25%), while 21.92% reported the shortest working experience. Approximately 5% of respondents had 10- or 15-year job experience. The highest number of respondents declared one job (68.49%); two jobs were declared by 25.11% of respondents, while 14 persons (6.39%) reported more than two jobs. The respondents usually declared that a salary level matters (91.78%), while nine persons had no opinion on this subject (4.11%), and only four respondents (1.83%) believed that salary is insignificant for job satisfaction. Nearly half of the respondents (43.84%) reported nursing care to 16–25 patients, and 31.05% of respondents declared up to 16 patients, approximately 9% of respondents provided care to 26–35 patients; 36 of respondents declared providing care to more than 35 patients (16.44%). The detailed sociodemographic characteristics are shown in **Table 1**.

Rationing of Nursing Care

The analysis demonstrated that the mean total BERNCA-R score was 1.38 (SD = 0.62). The highest results for rationed nursing tasks were observed for activating and rehabilitating care (M = 2.03), studying the situation of individual patients and care plans at the beginning of shift (M = 1.8), assessment of newly admitted patients' needs (M = 1.84), providing emotional or psycho-social support to the patient (M = 1.79) as well as

TABLE 1 | Characteristics of study participants (n = 219).

Parameter		*n*	%
Age	23–30 years	41	18.72
	31–40 years	29	13.24
	41–50 years	89	40.64
	>50 years	60	27.40
Job seniority	0–5 years	48	21.92
	6–10 years	11	5.02
	11–15 years	13	5.94
	16–20 years	26	11.87
	>20 years	121	55.25
Education	MSc in nursing/obstetrics	40	18.26
	Bachelor's degree in nursing/obstetric	81	36.99
	Medical secondary school	74	33.79
	Medical college and "other" education	24	10.96
Specialisation	No	180	82.19
	Yes	39	17.81
Number of working places?	One	150	68.49
	Two	55	25.11
	Three or four	14	6.39
Patient-to-nurse ratio	1–15 patients	68	31.05
	16–25 patients	96	43.84
	26–35 patients	19	8.68
	>35 patients	36	16.44
Marital status	In a relationship	178	81.28
	Single	41	18.72

administration of prescribed medication or infusion on time (M = 1.77).

According to the Mann–Whitney test, the frequency of rationing of nursing care was higher among nurses aged 41–50 and >50 compared to those aged 23–30 and 31–40 (p = 0.001). In addition, rationing of nursing care was higher among respondents with 6–10 years of job experience compared to those with 16–20 and >20 years of job experience (p = 0.001). Moreover, a higher level of care rationing was observed in respondents with 0–5 years of job experience than nurses with more than 20 years of working experience (p = 0.001). The Kruskal–Wallis statistics demonstrated increased nursing care rationing in nurses with a bachelor's degree compared to other educational levels (p = 0.001). Detailed results are presented in **Table 2**.

Professional Burnout

The MBI measures demonstrated that the mean burnout rate across all subscales was 38.14 (SD = 22.93). The main components of professional burnout in respondents were emotional exhaustion (M = 44.8), followed by job dissatisfaction (M = 40.66) and depersonalisation (M = 28.95), respectively.

Analysis of Spearman's correlation coefficient showed the positive correlations between the BERNCA-R score and the total MBI score (r = 0.249, $p < 0.001$) and the subscales of emotional exhaustion (r = 0.287, $p < 0.001$) and depersonalisation (r = 0.383, $p < 0.001$). The results are presented in **Table 3**.

Basel Extent of Rationing of Nursing Care questionnaire Independent Predictor

For the regression model combining the burnout subscales, the R^2 determination coefficient was 36.04%. The regression analysis demonstrated that the independent predictors of BERNCA-R score were emotional exhaustion, depersonalisation, lack of job satisfaction (all $p < 0.001$); the analysis showed that the significant predictor was also job activity at three or four healthcare centres (p = 0.038). The regression results of the model for the subscales combined are presented in **Table 4**.

For the regression model testing the explanatory variable of the total MBI score, the R^2 determination coefficient was 23.31% (see **Table 5**). The model indicated that overall burnout score was the predictor of the rationing of nursing care ($p < 0.001$).

DISCUSSION

This study examined the relationship between rationing of nursing care and professional burnout in nurses working in cardiovascular settings. The study showed that rationing of nursing care correlated positively with total MBI score and subscales of emotional exhaustion and depersonalisation. In the study by Rizo-Baeza et al. (2018), the factors affecting professional burnout of nurses working at palliative care wards included extensive work (more than 6 h a day), medium and high workload, raising a child alone, the unfriendly working

TABLE 2 | Demographic characteristics of the study group compared to the rationing of nursing care.

Parameter	Group	BERNCA-R (score)			*p*
		Mean ± SD	Median	Quartiles	
Age	23–30 years (*N* = 41) – A	1.57 ± 0.67	1.59	1.47–1.78	$p = 0.001$*
	31–40 years (*N* = 29) – B	1.61 ± 0.44	1.56	1.34–1.84	
	41–50 years (*N* = 89) – C	1.32 ± 0.61	1.47	1–1.69	B.A > C.D
	>50 years (*N* = 60) – D	1.22 ± 0.65	1.4	1.03–1.53	
Job seniority	0–5 years (*N* = 48) – A	1.58 ± 0.64	1.58	1.34–1.84	$p = 0.001$*
	6–10 years (*N* = 11) – B	1.73 ± 0.23	1.75	1.53–1.81	
	11–15 years (*N* = 13) – C	1.41 ± 0.59	1.66	1.25–1.69	B > D.E A > E
	16–20 years (*N* = 26) – D	1.36 ± 0.81	1.53	0.86–1.76	
	>20 years (*N* = 121) – E	1.26 ± 0.57	1.44	1.16–1.59	
Education	MSc in nursing/obstetrics (*N* = 40) – A	1.24 ± 0.79	1.39	0.74–1.78	$p = 0.01$*
	Bachelor's degree in nursing/obstetrics (*N* = 81) – B	1.55 ± 0.6	1.56	1.34–1.78	
	Medical secondary school (*N* = 74) – C	1.32 ± 0.52	1.46	1.25–1.56	B > C.A.D
	Medical college and "other" education (*N* = 24) – D	1.21 ± 0.59	1.48	0.86–1.61	
Specialisation	No (*N* = 180)	1.42 ± 0.61	1.48	1.25–1.67	$p = 0.476$
	Yes (*N* = 39)	1.2 ± 0.67	1.5	0.72–1.77	
Number of working places	One (*N* = 150)	1.43 ± 0.58	1.53	1.34–1.71	$p = 0.089$
	Two (*N* = 55)	1.21 ± 0.64	1.44	0.84–1.59	
	Three or four (*N* = 14)	1.46 ± 0.95	1.31	0.76–1.78	
Patient-to-nurse ratio	1–15 patients (*N* = 68)	1.31 ± 0.63	1.47	1.04–1.72	$p = 0.64$
	16–25 patients (*N* = 96)	1.43 ± 0.55	1.5	1.34–1.69	
	26–35 patients (*N* = 19)	1.32 ± 0.97	1.47	0.53–2.08	
	>35 patients (*N* = 36)	1.4 ± 0.59	1.46	1.18–1.57	
Marital status	In a relationship (*N* = 178)	1.35 ± 0.62	1.47	1.17–1.66	$p = 0.084$
	Single (*N* = 41)	1.5 ± 0.64	1.53	1.28–1.78	

*p – comparison of two groups: Mann–Whitney test; comparison of >two groups: Kruskal–Wallis test + post hoc analysis (Dunn test). *Statistically significant correlation ($p < 0.05$).*

condition (decreased personal accomplishments). The above study showed that emotional exhaustion occurred in 37.3% of respondents, while depersonalisation in the percentage of 35.1%. Our analyses of the nurse sample found that professional burnout was primarily underlaid by emotional exhaustion, while depersonalisation was less frequent.

Nurses belong to the professional group with the highest risk of professional burnout because of continuous exposure to stressful situations at work. The main reason behind this unfavourable phenomenon is the psycho-social nature of contacts with other humans seeking care and help, which requires a continuous nurses' focus on the other person's needs. The study by Khamisa et al. (2013) revealed that stress at work resulting from relations with other personnel affects each aspect of professional burnout. Shortage of nursing staff causes significant emotional exhaustion (16%), depersonalisation (13%), and negative assessment of personal accomplishments (10%). We obtained similar findings because respondents' professional burnout in respondents arose mainly from emotional exhaustion ($M = 44.8$) and depersonalisation ($M = 28.95$), as indicated by the positive correlations. In literature, the surveyed nurses, mostly aged 51 and above (51%), 62% had more than 1 year of job experience, while 62% had a higher education degree. Similar results were demonstrated by our research, showing that higher education was held by the majority of respondents. At the same time, rationing of nursing care occurred most frequently in the respondents with the bachelor's degree. This finding suggests the effect of the young age of nurses who land their first job and have no professional experience. Similarly to our research, the vast majority of respondents was aged 41–50 and above, while the results showed that rationing of nursing care occurred most frequently among nurses with secondary education. In addition, the present analysis demonstrated that emotional exhaustion, depersonalisation, job dissatisfaction, and multi-jobs activity (at more than two centres) were significantly correlated with rationing of nursing care ($p < 0.001$). Given the data available in this study, one cannot

TABLE 3 | Correlations between professional burnout and rationing of nursing care.

MBI	BERNCA-R
	Spearman's correlation coefficient
Overall MBI score	$r = 0.249$*
Emotional exhaustion	$r = 0.287$*
Depersonalisation	$r = 0.383$*
Lack of job satisfaction	$r = -0.042$

Statistically significant correlation ($p < 0.05$).

TABLE 4 | Multiple regression model of nursing care rationing for the MBI subscales.

Characteristic		Parameter	95% CI		*p*
Age	23–30 years	ref.			
	31–40 years	0.019	−0.326	0.365	0.912
	41–50 years	−0.091	−0.468	0.285	0.634
	>50 years	−0.016	−0.439	0.407	0.942
Job experience	0–5 years	ref.			
	6–10 years	0.084	−0.343	0.511	0.7
	11–15 years	−0.051	−0.492	0.39	0.82
	16–20 years	−0.075	−0.469	0.32	0.711
	>20 years	−0.289	−0.67	0.092	0.139
Education	MSc in nursing/obstetrics	ref.			
	Bachelor's degree in nursing/obstetrics	0.072	−0.144	0.288	0.514
	Medical secondary school	−0.006	−0.252	0.24	0.96
	Medical college and "other" education	−0.247	−0.534	0.041	0.094
Specialisation	No	ref.			
	Yes	−0.024	−0.221	0.174	0.815
Number of working places	One	ref.			
	Two	−0.057	−0.231	0.117	0.523
	Three or four	0.335	0.02	0.65	0.038*
Patient-to-nurse ratio	1–15 patients	ref.			
	16–25 patients	0.082	−0.096	0.259	0.369
	26–35 patients	−0.042	−0.321	0.237	0.767
	>35 patients	−0.023	−0.251	0.206	0.846
Marital status	In a relationship	ref.			
	Single	0.085	−0.104	0.274	0.377
Emotional exhaustion		0.008	0.005	0.012	<0.001*
Depersonalisation		0.006	0.003	0.009	<0.001*
Lack of job satisfaction		−0.007	−0.01	−0.003	<0.001*

*p – multiple linear regression. *Statistical significance for $p < 0.05$.*

determine the casual pathway between rationing of nursing care, nurse burnout, and stress. This study aimed at investigating rationing of nursing care, but not analysing their stress levels. Examinations of stress in nursing staff should be considered in future studies.

The present study analysed the associations between the socio-demographic characteristics of a sample of cardiovascular nurses and the rationing of nursing care. Following the other researchers' approach, increased susceptibility to stress and emotional exhaustion are associated with a subjective feeling of getting tired of work. Such tiredness decreases the capacity to work and motivation to continue it, and increases the risk of making medical errors (Chang et al., 2009). The study by Młynarska et al. (2020) demonstrated that the greater tiredness, the more frequent rationing of nursing care at emergency wards. Similar findings were reported by research on the effects of the socio-demographic factors on missed nursing care. For example, according to Młynarska et al. (2020), gender, age, residence, education, job experience, and type of employment regarding to working hours have no impact on the rationing of nursing care. In contrast to our study, suggesting the negative impact of the number of hours on rationing of nursing care ($p = 0.038$).

One recognises the feeling of lack of job satisfaction as a critical cause of professional burnout syndrome. It stems from many unfavourable phenomena and situations specific to the nursing profession. In this study, rationing of nursing care was higher in nurses reporting a lack of job satisfaction ($p < 0.001$). Zeleníková et al. (2020) found that the relationship between job satisfaction and rationing of nursing care depended on nurses' working environment and interpersonal relations among medical personnel. These results were confirmed by an international study by Bragadóttir et al. (2020) performed on 7.079 nurses from Turkey, Australia, United States and Ireland, aged up to 45. The authors demonstrated that job satisfaction was associated with rationing of nursing care and influenced by the country, the nursing team position, type of ward and hospital, professional experience, and human resources. These findings are consistent with our study, suggesting that job dissatisfaction affects the rationing of nursing care. In contrast to the above-mentioned findings, the present study suggests that the age of nursing staff can affect the rationing of nursing care. It occurs more frequently in older nurses and those with shorter job experience. These differences can be explained by the younger age of respondents studied by Bragadóttir et al. (2020) and usage of other diagnostic measurements. A multicentre study by Jaworski et al. (2020) obtained similar results where older nurses and nurses with the shortest job experience rationed nursing care more often.

TABLE 5 | Multiple regression model of nursing care rationing for the overall MBI score.

Feature		Parameter	95% CI		*p*
Age	23–30 years	ref.			
	31–40 years	0.046	−0.323	0.415	0.806
	41–50 years	−0.093	−0.498	0.311	0.652
	>50 years	−0.068	−0.516	0.381	0.768
Work experience	0–5 years	ref.			
	6–10 years	0.116	−0.344	0.576	0.622
	11–15 years	−0.089	−0.568	0.39	0.716
	16–20 years	−0.132	−0.557	0.294	0.545
	>20 years	−0.264	−0.671	0.142	0.204
Education	Master of nursing/midwifery	ref.			
	Bachelor of nursing/midwifery	0.177	−0.055	0.409	0.136
	Medical school	−0.027	−0.294	0.24	0.843
	Medical college and "other" education	−0.105	−0.414	0.204	0.505
Specialisation	No	ref.			
	Yes	−0.029	−0.244	0.185	0.79
Number of jobs	One	ref.			
	Two	−0.111	−0.3	0.077	0.249
	Three or four	0.16	−0.176	0.496	0.351
Number of patients cared for	1–15 patients	ref.			
	16–25 patients	0.066	−0.127	0.259	0.504
	26–35 patients	−0.156	−0.458	0.145	0.312
	>35 patients	0.034	−0.213	0.281	0.787
Civil status	In the relationship	ref.			
	Single	0.115	−0.089	0.32	0.271
Overall MBI score		0.01	0.006	0.014	<0.001*

*p – multiple linear regression. *Statistical significance for $p < 0.05$.*

According to the authors, low job satisfaction and pessimistic attitude to reality increase the rationing of nursing care (Jaworski et al., 2020).

To date, there have been reports on the relationship between nurses' job satisfaction and remuneration and overtime hours (Khamisa et al., 2013). In the study by Serafin et al. (2019), the nurses working at Swedish surgical wards had higher job satisfaction than their Polish counterparts. These results for the Polish nurses can be explained by dissatisfaction with their remuneration, which is in line with our study and other reports above referred. The issue of rationing of nursing care in Sweden was surveyed by Ball et al. (2016), who revealed that this phenomenon applies to nearly 74% of nurses and may be associated with the working environment. In our study, the remuneration amount had no impact on the rationing of nursing care compared to the results concerning professional burnout. In Sweden, rationing was associated primarily with working shifts, human resources, and the number of patients under nursing care. According to Maslach et al. (2001), improvements in patient satisfaction and better protection against undesired effects due to improper nursing care depend on improving job satisfaction of nurses. A U*nited S*tates study concerning 95.499 nurses demonstrated that lack of job satisfaction and professional burnout were associated primarily with nurses' dissatisfaction with provided healthcare services (McHugh et al., 2011).

Our study indicated that the component of depersonalisation burnout affected rationing of nursing care, served mainly by older nurses (41–50 and >50). Other research on professional burnout among nurses have reported similar correlations. For example, according to Dębska et al. (2019), Polish nurses were significantly older than Slovakian and Czech nurses, and they, importantly, exhibited depersonalisation ($p = 0.055$) and negative assessment of personal accomplishment ($p = 0.058$). Similarly, Parola et al. (2017) indicated high rate of professional burnout occurred among palliative care nurses, where emotional exhaustion (19.5%) and depersonalisation (8.2%) were the key components contributing to this high result.

CONCLUSION

All aspects of professional burnout in a sample of Polish nurses, i.e., emotional exhaustion, depersonalisation, and lack of job satisfaction, correlated with rationing of nursing care. Nurse' jobs activity at several healthcare centres may be the important socio-demographic factor affecting rationing of nursing care in cardiovascular wards.

Methodological Limitations

The present study used the cross-sectional design ad and the small studied group ($n = 219$) selected from one region of

Poland (Lower Silesian Voivodeship). This necessitates caution in generalising our results to general populations of nurses worldwide. However, despite these limitations, the significance of our study is supported by similar findings reported in other studies and publications. The present study contributes to a better understanding of the rationing of nursing care and professional burnout among cardiovascular nurses. Certainly, further research is needed to collect more groups of nurses in a multi-centre condition. Replication this study with the larger data set and more robust longitudinal designs will warrant confirmation of these results.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Bioethics Committee of the Wrocław Medical University, Poland. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

IU contributed to study conception and design, acquisition, analysis and interpretation of data, and drafting and critical revision of the manuscript. GK contributed to acquisition, analysis and interpretation of data, and drafting of the manuscript. BS contributed to study conception and design, and drafting of the manuscript. AK and PG contributed to study conception and design, analysis and interpretation of data, and critical revision of the manuscript. EK contributed to study conception and design, acquisition of data, and drafting of the manuscript. All the authors approved the final version of the manuscript.

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Analysis of Psychological Trends and Policy Recommendations of Medical Staff in Northern China in the Latter Stages of the COVID-19 Pandemic

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Aim: Since the 2019 coronavirus disease (COVID-19) outbreak, medical staff have faced greater psychological stress and are prone to psychological problems such as anxiety and depression, as confirmed by several studies. This study further clarifies the psychological status of Chinese medical staff during the stable phase of the pandemic through a cross-sectional investigation in a large population sample in northern China.

Methods: Subjects: Clinical frontline medical staff from seven hospitals in Liaoning Province were recruited from November 2020 to February 2021.

Research Tools: The research tools used were the Self-Rating Anxiety Scale (SAS), Self-Rating Depression Scale (SDS), Simplified Coping Style Questionnaire (SCSQ), and General Status Questionnaire.

Statistical Analysis: SPSS 22.0, ANOVA variance analysis, and multiple logistics regression were used for statistical analysis. *P*-values of <0.05 indicated significant statistical differences.

Results: A total of 3,144 medical staff completed the survey (599 men [19.1%] and 2,545 women [80.9%]; 1,020 doctors [32.4%] and 2,124 nurses [67.6%]). Among all subjects, the rates of anxiety and depression were 21.1% (663/3,144) and 43.9% (1,381/3,144), respectively. Multiple logistic comparative analysis revealed that age (OR = 1.272, 95% CI = 1.036–1.561, $P = 0.022$), the need for psychological counseling (OR = 1.566, 95% CI = 1.339–1.830, $P < 0.001$), and the coexistence of depression (OR = 0.050, 95% CI = 0.038–0.066, $P < 0.001$) were significantly associated with anxiety. Coexisting anxiety was also associated with the occurrence of depression (OR = 0.050, 95% CI = 0.038–0.065, $P < 0.001$).

Conclusions: In the later stages of the pandemic in China, the occurrence rates of anxiety and depression among medical staff remain high. In addition to age, there is little correlation between anxiety or depression and general factors such as gender and profession. As a special group, medical staff show different psychological changes at various times during a stressful event. Concerning for the psychological needs of medical staff and different psychologically oriented policy implementation are needed.

Keywords: psychological status, medical staff, China, COVID-19, anxiety, depression

INTRODUCTION

Since the end of December 2019, a severe acute respiratory disease known as the novel coronavirus spread across several countries, causing a major global outbreak. The World Health Organization (WHO) officially named the disease the 2019 novel coronavirus disease, or COVID-19, on February 11, 2020. COVID-19 is a potential zoonotic disease with low to moderate mortality rate (about 2–5%). Human-to-human transmission occurs through droplet inhalation or contact transmission through droplets, which endangers frontline medical staff (Wu, Y. C., et al., 2020). COVID-19 has a serious impact not only on physical health but also on mental health (i.e., increased anxiety, depressive symptoms, and insomnia), which also affects daily behaviors, economic and preventive decision-making by government officials, and the operation of medical institutions and centers (Torales et al., 2020).

In China, at the beginning of the pandemic, medical staff on the frontline actively displayed professional skills and played an important role in the prevention and control of the pandemic. However, the occurrence of COVID-19 was sudden and uncertain and coupled with work and environmental pressures. Thus, medical staff, especially frontline workers, often faced increased psychological stress and experienced burnout characterized by emotional exhaustion and/or depersonalization even Burnout syndrome (BO), (Baro Vila et al., 2021; Cyr et al., 2021), such as anxiety about infection, leading to the occurrence of psychological problems in many countries including the countries with special backgrounds such as war (Elhadi et al., 2020b). A meta-analysis of several studies from multiple countries, including China, suggested that the rates of anxiety and depression remain the most severe psychological problem among populations such as medical staff, the general population, and COVID-19 patients (Luo et al., 2020).

Since the beginning of the COVID-19 pandemic, studies of medical staff have been conducted in China, and it has been found that the occurrence of psychological problems is high. Specifically, rates are higher in medical professionals than in non-clinical workers, the general population, and college students (Huang et al., 2020; Wu, W., et al., 2020; Zhang et al., 2020; Zhu et al., 2020). Frontline medical staff are more likely to feel fear, depression, and anxiety, particularly those who are exposed to infection and working in departments such as respiratory, emergency, infectious disease, and ICUs (Lu et al., 2020).

The mental health of medical staff should be emphasized, and further psychological measures and targeted research are needed. From the beginning of the crisis to the current normalized management of the pandemic, the psychological changes of medical staff also show some trends and characteristics. On the basis of previous research, in this study, the psychological status changes in medical staff in Liaoning Province in the latter stages of the pandemic are analyzed and interpreted. The impact of related factors on depression and anxiety is further clarified, and the relationship between psychological change and psychological response is discussed. These methods are achieved by studying the combination of specific data, adjustments in government policy, and specific policy changes in hospitals. This paper provides scientific advice for subsequent preventive and coping measures and scientific support for further related research.

METHODS

Subjects

From November 2020 to February 2021, clinical frontline medical staff working in seven general and psychiatric specialties hospitals (four general hospitals and three psychiatric specialties hospitals) were from five cities of Liaoning Province including the provincial capital city (Shenyang). They were investigated randomly in a cross-sectional study. The clinical frontline medical staff defined in this study is engaged in the clinical work, and involved in the examination and treatment of patients directly or indirectly. All the participants in this study are all clinical frontline medical staff. It was needed to meet the inclusion criteria: 18 years of age or older, from clinical departments, having good educational level and comprehension, and the exclusion criteria: no serious physical or mental illness, and no mental developmental disorders. All the participants provided their written informed consent and all information about the participants was confidential. The study was approved by the Ethics Committee of Liaoning Provincial People's Hospital.

Research Tools

Online psychological scale surveys "Questionnaire Star" served as the research tools, which included the following scales: Self-Rating Anxiety (SAS; standard score of $\geq$50 points indicates symptoms of anxiety, and higher scores indicate more severe anxiety); Self-Rating Depression Scale (SDS; standard score of $\geq$50 points indicates depressive symptoms, higher scores indicate more severe depression); and Simplified Coping Style

TABLE 1 | Sociodemographic characteristics of participants and outbreak-related issues ($N = 3,144$).

Variables	No. (%)
Gender	
Males	599 (19.1%)
Females	2,545 (80.9%)
Age	
18–28	697 (22.2)
29–44	1,663 (52.9%)
45–60	780 (24.8)
60 years old above	4 (0.1%)
Smoking history	
No	2,932 (93.3%)
Less or 10/day	113 (3.6%)
More than 10 /day	99 (3.1%)
Alcohol drinking history	
No	2,730 (86.8%)
Less or 3 times/week	374 (11.9%)
More than 3 times/week	40 (1.3%)
Status of only child	
Yes	1,623 (51.6%)
No	1,521 (48.4%)
Marital status	
Unmarried	759 (24.1%)
Married	2,265 (72.0%)
Divorced	110 (3.5%)
Widowed	10 (0.3%)
Educational level	
Below undergraduates	603 (19.2%)
Undergraduates	2,093 (66.6%)
Above undergraduates	448 (14.2%)
The number of parenting children	
None	1,150 (36.6%)
One child	1,783 (56.7%)
Two and above	211 (6.7%)
Family history of mental illness	
Yes	69 (2.2%)
No	3,075 (97.8%)
Work position	
Doctors	1,020 (32.4%)
Nurses	2,124 (67.6%)
Department-professions	
Internal medicine	803 (25.5%)
Surgery	354 (11.3%)
Ophthalmology and otorhinolaryngology	47 (1.5%)
Obstetrics and gynecology	102 (3.2%)
Pediatrics	49 (1.6%)
Psychiatric	1,154 (36.7%)
Others	635 (20.2%)
The change and affecting factors about COVID-19	
Work position change during the outbreak	
Stick to previous department	2,712 (84.2%)
Full-time in fever outpatient department	100 (3.1%)
Participated in fever outpatient department	91 (2.8%)
Others	176 (5.5%)
Assisted Hubei's work	65 (2.0%)
Impact on own work after COVID-19 outbreak	
No	358 (11.4%)
Slight	1,171 (37.2%)
Significant	1,313 (41.8%)
Huge	302 (9.6%)
Fear of infection	
Yes	1,585 (50.4%)
No	1,559 (49.6%)
The need for psychological counseling	
No need	958 (30.5%)
Sufficient	1,857 (59.1%)
Not sufficient	329 (10.5%)

Questionnaire (SCSQ; a total of 20 entries, score of 0–60, after conversion, response tendency value of >0 indicates that the subject under stress mainly had a positive response to the stress, value of <0 indicates adoption of negative coping style). A general status questionnaire and investigation of the situation related to COVID-19 were used in the study.

Statistical Analysis

Statistical analysis was performed using SPSS 22.0 statistical package (SPSS Inc., Chicago). The sociodemographic characteristics of participants and outbreak-related issues were descripted by frequency analysis. The SAS, SDS, and positive and negative coping scores (M ± SD) were compared across different groups. All variances analysis in anxiety and depression groups of the whole sample was followed by a single-factor analysis (ANOVA). Moreover, multiple logistics regression analysis was used to assess the association between outcome variables (the reported level of anxiety and depression) and potential factors affecting the occurrence of anxiety and depression. The results were indicated by frequency, percentage (%), and average and standard difference (mean ± SD). *P*-values of <0.05 indicated significant statistical differences.

RESULTS

A total of 3,144 out of 3,295 medical staff (95.42%) successfully completed the survey (age range: 19–66 years, average age: 36.50 ± 11.03 years), including 599 men (19.1%), 2,545 women (80.9%), 1,020 doctors (32.4%), and 2,124 nurses (67.6%). The rate of no response was 4.58% and there was no effect on the final statistics. The subjects covered internal medicine (803, 25.5%), surgery (354, 11.3%), department of ophthalmology and otorhinolaryngology (47, 1.5%), obstetrics and gynecology (102, 3.2%), pediatrics (49, 1.6%), psychiatric (1,154, 36.7%) and other professional departments (635, 20.2%). The general characteristics of subjects were as follows, as shown in **Table 1**.

Among the subjects meeting the anxiety and depression score, SAS, SDS, and positive and negative coping scores were compared across different groups (**Table 2**), followed by a single-factor ANOVA analysis of the whole sample (**Table 3**). In the ANOVA analysis of anxiety, the number of parenting children ($F = 3.457$, $P = 0.032$), need for psychological counseling ($F = 139.793$, $P < 0.001$), coexistence of depression ($F = 1,813.251$, $P < 0.001$), and positive or negative coping style

TABLE 2 | Comparison of scores between the anxiety and depression subgroups, health subgroups, and whole sample.

Mean ± standard difference	The whole sample	Anxiety		Depression	
M ± SD	*N* = 3,144	Anxiety subjects 663 (21.1%)	No anxiety subjects 2,481(78.9%)	Depression subjects 1,381 (43.9%)	No depression subjects 1,763 (56.1%)
SAS	43.32 ± 10.26	58.69 ± 7.81	37.21 ± 6.08	50.33 ± 9.59	37.83 ± 6.85
SDS	47.33 ± 13.40	61.01 ± 8.69	43.68 ± 12.00	60.46 ± 6.25	37.04 ± 6.96
Positive coping average scores	1.80 ± 0.61	1.54 ± 0.59	1.87 ± 0.60	1.61 ± 0.63	1.96 ± 0.54
Negative coping average scores	1.11 ± 0.56	1.30 ± 0.56	1.06 ± 0.54	1.19 ± 0.61	1.06 ± 0.51

($F = 3.918$, $P = 0.048$) were significantly related to anxiety scores. In the ANOVA analysis of depression, only the need for psychological counseling ($F = 52.962$, $P < 0.001$) and coexistence of anxiety ($F = 1{,}213.181$, $P < 0.001$) were significantly related to depression scores.

Among all subjects, the rate of anxiety was 21.1% (663/3,144; average score: 58.69 ± 7.81), of which 217 were doctors (32.7%), and 446 (67.3%) were nurses. The rate of depression was 43.9% (1,381/3,144; average score: 60.47 ± 6.24), of which 350 (25.3%) were doctors and 1,031 (74.7%) were nurses. In the sample of doctors, the rates of anxiety and depression were 21.3% (217/1,020) and 44.8% (457/1,020), respectively. In the sample of nurses, the rates of anxiety and depression were 21.0% (446/2,124) and 43.5% (924/2,124), respectively.

In further multiple logistic analysis (**Table 4**), age factor ($R = 1.272$, 95% CI = 1.036–1.561, $P = 0.022$), the need for psychological counseling (OR = 1.566, 95% CI = 1.339–1.830, $P<0.001$), and the coexistence of depression (OR = 0.050, 95% CI = 0.038–0.066, $P < 0.001$) were significantly associated with anxiety. Coexisting anxiety was also associated with the occurrence of depression (OR = 0.050, 95% CI = 0.038–0.065, $P < 0.001$).

Although the rate of anxiety in males was lower than that in females (124/599, 20.7% vs. 539/2,545, 21.2%), the rate of depression in males was lower than in females (258/599, 43.1% vs. 1,123/2,545, 44.1%). However, statistical analysis showed no statistical differences between gender and the occurrence of anxiety and depression (*P*-values were 0.554 and 0.531, respectively). Regarding profession, the highest rates of anxiety and depression occurred in the ophthalmology and otorhinolaryngology departments at 31.9% (15/47) and 53.2% (25/47), respectively. The pediatric department showed the lowest rates of anxiety and depression at 14.3% (7/49) and 32.7% (16/49), respectively.

The sample sizes of the departments with the highest and lowest rates of anxiety and depression were both small. Statistical analysis revealed no statistical differences between the different departmental specialty groups and levels of anxiety ($R = 0.994$, 95% CI = 0.954–1.037, $P = 0.785$) or depression ($R = 1.009$, 95% CI = 0.975–1.045, $P = 0.591$). Family history of mental illness was not related to anxiety or depression (*P*-values were 0.709 and 0.220, respectively). There were no significant statistical differences between coping style and the anxiety-free ($P = 0.094$) or depression-free ($P = 0.548$) group, and the other factors were not related to the occurrence of anxiety or depression (**Table 4**).

DISCUSSION

In China, mental health problems caused by COVID-19 have brought great challenges to traditional forms of mental health services, but this has also brought new development and change. However, based on past prevention measures and management of mental health and mental illness in China, these experiences may be beneficial to the prevention and control of COVID-19 and to other countries. Relevant studies can provide a scientific basis for further research and policy formulation. For medical staff, especially psychiatrists, who were not only impacted by COVID-19 but also served as implementers of specific policies, mental status should be emphasized. Through this investigative research, the psychological status of medical staff in Liaoning Province was elucidated, and some useful data were provided. The following analysis was performed by combining past comparative studies with the status quo of prevention and control measures.

Comparative Analysis of Past Studies and Related Factors

Previous studies have shown that the rates of depression and anxiety in medical staff were higher than other populations, although they were lower than those in COVID-19 patients. For example, the prevalence of depression was 43.1% in COVID-19 patients in Hubei Province Isolation Hospital (Ma et al., 2020). In a small sample of patients, the risk of anxiety and depression was even higher (55.3% and 60.2%, respectively), and depressive symptoms were more prominent than anxiety (Guo, Q., et al., 2020). Compared to other populations, some studies performed in the early stages of the 2020 COVID-19 outbreak showed that the prevalence of anxiety and depression in adults in isolated populations from large families and communities was 32.7% (Guo, Y., et al., 2020).

Additionally, the prevalence of post-traumatic stress disorder (PTSD) and depression among college students was 2.7% and 9.0%, respectively. But due to special background effects such as war, the incidence of anxiety and depression among the college students during the COVID-19 outbreak may be very high (64.5 and 88%, respectively), (Elhadi et al., 2020a). The rates of anxiety and depression were 14 and 19% in the general public in Hong Kong, respectively (Choi et al., 2020; Tang et al., 2020). For medical staff, a certain percentage of medical staff had anxiety, depression, burnout or clinically-relevant psychosocial distress, confirmed by investigation studies conducted in other countries such Kenya, Japan, and Canada (Binnie et al., 2021;

TABLE 3 | Single-factor analysis of potential factors and anxiety/depression scale scores.

Variables	The anxiety scores of whole sample			The depression scores of whole sample		
	(X±s)	T/F	*P*	(X±s)	T/F	*P*
Gender						
Males	43.25 ± 10.54			47.32 ± 13.14		
Females	43.33 ± 10.19	0.030	0.862	47.33 ± 13.46	0.001	0.977
Age						
18–28	42.54 ± 10.15			46.60 ± 13.32		
29–44	43.53 ± 10.46			47.56 ± 13.45		
45–60	43.58 ± 9.89			47.54 ± 13.33		
60 years old above	39.68 ± 5.72	1.903	0.127	36.63 ± 10.08	1.942	0.121
Smoking history						
No	43.32 ± 10.20			47.30 ± 13.43		
Less or 10/day	43.26 ± 11.18			47.93 ± 12.97		
More than 10 /day	43.24 ± 10.98	0.005	0.995	47.44 ± 12.98	0.123	0.885
Alcohol drinking history						
No	43.39 ± 10.27			47.39 ± 13.47		
Less or 3 times/week	43.05 ± 10.06			47.22 ± 12.69		
More than 3 times/week	41.25 ± 10.99	0.999	0.368	44.63 ± 15.03	0.853	0.426
Status of only child						
Yes	43.40 ± 10.25			47.68 ± 13.39		
No	43.23 ± 10.26	0.231	0.631	46.96 ± 13.40	2.23	0.135
Marital status						
Unmarried	42.88 ± 10.22			46.55 ± 13.17		
Married	43.44 ± 10.29			47.51 ± 13.47		
Divorced	44.16 ± 9.93			49.26 ± 13.06		
Widowed	40.38 ± 8.94	1.085	0.354	45.75 ± 15.93	1.797	0.145
Educational lever						
Below undergraduates	42.99 ± 9.66			46.96 ± 13.11		
Undergraduates	43.46 ± 10.40			47.46 ± 13.49		
Above undergraduates	43.09 ± 10.38	0.642	0.526	47.21 ± 13.38	0.351	0.704
The number of parenting children						
None	42.96 ± 10.10			46.93 ± 13.31		
One child	43.70 ± 10.41			47.68 ± 13.43		
Two and above	42.08 ± 9.65	3.457	**0.032**	46.54 ± 13.54	1.495	0.224
History of mental illness						
Yes	43.77 ± 9.46			49.02 ± 12.88		
No	43.31 ± 10.27	0.135	0.713	47.29 ± 13.41	1.124	0.289
Work position						
Doctors	43.29 ± 10.16			47.60 ± 13.45		
Nurses	43.33 ± 10.31	0.012	0.914	47.20 ± 13.37	0.613	0.434
Department-professions						
Internal medicine	43.11 ± 10.30			47.23 ± 13.64		
Surgery	43.17 ± 9.75			46.96 ± 13.26		
Ophthalmology and otorhinolaryngology	47.37 ± 12.48			50.43 ± 12.40		
Obstetrics and gynecology	42.72 ± 8.79			47.92 ± 13.29		
Pediatrics	41.68 ± 8.96			43.49 ± 13.57		
Psychiatric	43.34 ± 10.59			47.08 ± 13.45		
Others	43.56 ± 9.95	1.614	0.139	48.09 ± 13.09	1.588	0.147

(Continued)

TABLE 3 | Continued

Variables	The anxiety scores of whole sample			The depression scores of whole sample		
	(X±s)	T/F	*P*	(X±s)	T/F	*P*
The change and affecting factors about COVID-19						
Work position change during the outbreak						
Stick to previous department	43.36 ± 10.15			47.44 ± 13.34		
Full-time in fever outpatient	43.53 ± 11.03			47.86 ± 13.40		
Participated in fever outpatient	42.76 ± 11.17			46.52 ± 14.48		
Others	43.27 ± 11.27			46.38 ± 13.54		
Assisted Hubei's work	42.38 ± 9.52	0.222	0.927	45.46 ± 14.08	0.706	0.588
Impact on own work after COVID-19 outbreak						
No	43.02 ± 10.79			47.31 ± 14.08		
Slight	42.97 ± 9.71			46.97 ± 13.35		
Significant	43.63 ± 10.49			47.30 ± 13.25		
Huge	43.64 ± 10.62	1.051	0.369	48.86 ± 13.37	1.589	0.190
Fear of infection						
Yes	43.24 ± 9.91			47.46 ± 13.03		
No	43.39 ± 10.60	0.169	0.681	47.20 ± 13.77	0.297	0.586
The need for psychological counseling						
No need	43.64 ± 10.29			47.51 ± 13.06		
Sufficient	41.70 ± 9.02			46.03 ± 13.20		
Not sufficient	51.51 ± 12.48	139.793	**<0.001**	54.14 ± 13.39	52.962	**<0.001**
Depression/anxiety coexisting or no						
Yes	50.33 ± 9.59			61.01 ± 8.69		
No	37.83 ± 6.85	1,813.251	**<0.001**	43.48 ± 12.00	1,213.181	**<0.001**
Coping style						
Positive	42.95 ± 9.96			47.06 ± 13.26		
Negative	43.67 ± 10.52	3.918	**0.048**	47.59 ± 13.53	1.206	0.272

The values shown in bold in the table indicate that the p-value is less than 0.05.

Kwobah et al., 2021; Matsuo et al., 2021). In this study, the rates of anxiety and depression were 21.1 and 43.9% in the whole sample, respectively, which were lower than those in COVID-19 patients or the people with a special background and higher than those in other populations. It was found that the factors associated with COVID-19 infection are still important to the occurrence of anxiety and depression. The findings regarding the medical staff are also similar to the results of a previous study by Huang et al. The incidences of anxiety and PTSD were 23.04 and 27.39%, respectively (Huang et al., 2020). This study also found that depressive symptoms were more pronounced than anxiety symptoms and the coexistence of depression was significantly associated with the occurrence of anxiety ($P < 0.001$). It revealed that depression and anxiety were reciprocal risk factors and that the presence of anxiety and depression increased the risk of reoccurrence or coexistence of both depression and anxiety.

Additionally, it was found that work stress of Chinese medical staff during the past severe acute respiratory syndrome (SARS) period was linked to concerns about infection and corresponded to findings in studies with larger samples. Increased work stress and fear of infection are still causes of worsened mental status (Tian et al., 2003). A February 2020 study by Liu et al. that surveyed medical staff in Hubei Province found that direct contact between COVID-19 patients was an important factor in the occurrence of anxiety, but socio-demographic characteristics (i.e., gender, age, education, and marital status) were not (Liu et al., 2020), which suggests that the medical staff's concerns were related to infection. In this study, about half (50.4%) of medical staff were concerned about infection, but statistical analysis showed that this was not significantly associated with anxiety or depression (*P*-values were 0.363 and 0.393, respectively). These results may be related to improved progress and adjustments in prevention and control measures, as well as the rapid improvements in COVID-19 protective measures, which both reduced the risk and fear of infection among medical staff.

Previous studies have found that other factors are associated with anxiety and depressive symptoms, such as age, reduced income, other diseases, COVID-19 infection, living alone, family conflicts, sleep problems. A study by Guo Yan et al. also showed that people at high risk of anxiety or depressive symptoms or COVID-19 patients needed urgent psychological support during the COVID-19 pandemic, including online psychological support, relaxation training, and online consulting (Guo, Q., et al., 2020; Guo, Y., et al., 2020). In this study, part of the medical staff showed a need for psychological counseling. A total of 329 medical staff (10.5%) were not eligible for existing counseling, which was significantly correlated with the

TABLE 4 | Multiple logistics analysis of independently related factors of anxiety and depression.

Variables	Anxiety				Depression			
	Anxiety subjects *N*(%)	OR	95% CI	*P*-value	Depression subjects *N*(%)	OR	95% CI	*P*-value
Gender								
Males	124 (20.7%)				258 (43.1%)			
Females	539 (21.2%)	0.918	0.691–1.219	0.554	1,123 (44.1%)	1.075	0.857–1.349	0.531
Age								
18–28	113 (16.2%)				290(41.6%)			
29–44	383 (23.0%)				753(45.3%)			
45–60	167 (21.4%)				338(43.3%)			
60 years old above	0 (0%)	1.272	1.036–1.561	**0.022**	0(0%)	0.928	0.789–1.090	0.361
Smoking history								
No	618 (21.1%)				1,286(43.9%)			
Less or 10/day	23 (20.4%)				52(46.0%)			
More than 10 /day	22 (22.2%)	1.136	0.771–1.674	0.520	43(43.4%)	0.915	0.668–1.253	0.579
Alcohol drinking history								
No	583 (21.4%)				1,209 (44.2%)			
Less or 3 times/week	74 (19.8%)				160 (42.8%			
More than 3 times/week	6 (15.0%)	1.089	0.796–1.490	0.594	12 (30.0%)	0.951	0.746–1.213	0.688
Status of only child								
Yes	336 (20.7%)				731 (45.04%)			
No	327 (21.5%)	1.061	0.852–1.321	0.597	650 (42.7%)	0.870	0.729–1.039	0.124
Marital status								
Unmarried	143 (18.8%)				314 (41.4%)			
Married	490 (21.6%)				1,009 (44.5%)			
Divorced	28 (25.5%)				54 (49.1%)			
Widowed	2 (50.0%)	0.946	0.726–1.234	0.684	4 (40.0%)	1.179	0.951–1.463	0.133
Educational lever								
Below undergraduates	111 (18.4%)				248 (41.1%)			
Undergraduates	457 (21.8%)				934 (44.6%)			
Above undergraduates	95(21.2%)	1.222	0.977–1.528	0.079	199 (44.4%)	0.997	0.836–1.188	0.971
The number of parenting children								
None	215 (18.7%)				493 (42.9%)			
One child	409 (22.9%)				797 (44.7%)			
Two and above	39 (18.5%)	1.048	0.846–1.298	0.671	91 (43.1%)	0.940	0.790–1.118	0.482
Family history of mental illness								
Yes	15 (21.7%)				35 (50.7%)			
No	648 (21.1)%	1.133	0.589–2.180	0.709	1,346 (43.8%)	0.714	0.418–1.222	0.220
Work position								
Doctors	217 (21.3%)				457(44.8%)			
Nurses	446 (21.0%)	1.277	0.967–1.686	0.085	924(43.5%)	0.897	0.718–1.121	0.340
Department-professions								
Internal medicine	167 (20.8%)				358(44.6%)			
Surgery	80 (22.6%)				146(41.2%)			
Ophthalmology and otorhinolaryngology	15 (31.9%)				25(53.2%)			
Obstetrics and gynecology	16 (15.7%)				47(46.1%)			
Pediatrics	7 (14.3%)				16(32.7%)			
Psychiatric	250 (21.7%)				491(42.5%)			
Others	128 (20.2%)	0.994	0.954–1.037	0.785	298(46.9%)	1.009	0.975–1.045	0.591

(Continued)

TABLE 4 | Continued

Variables	Anxiety				Depression			
	Anxiety subjects *N*(%)	OR	95% CI	*P*-value	Depression subjects *N*(%)	OR	95% CI	*P*-value
The change and affecting factors about COVID-19								
Work position change during the outbreak								
Stick to previous department	570 (21.01%)				1,195(44.1%)			
Full-time in fever outpatient	25 (25.0%)				45(11.3%)			
Participated in fever outpatient	19(20.9%)				41(45.1%)			
Others	39(22.2%)				74(42.0%)			
Assisted Hubei's work	10(15.4%)	1.010	0.926–1.101	0.830	26(40.0%)	0.976	0.910–1.046	0.489
Impact on own work after COVID-19 outbreak								
No	72(20.1%)				158(44.1%)			
Slight	231 (19.7%)				504(43.0%)			
Significant	297 (22.6%)				568(43.3%)			
Huge	63 (20.9%)	1.050	0.925–1.193	0.448	151(50.0%)	1.023	0.922–1.136	0.670
Fear of infection								
Yes	333 (21.0%)				707(44.6%)			
No	330 (21.2%)	1.103	0.893–1.364	0.363	674(43.2%)	0.928	0.781–1.102	0.393
The need for psychological counseling								
No need	210 (21.9%)				416(43.4%)			
Sufficient	276 (14.9%)				755(40.7%)			
Not sufficient	177 (53.8%)	1.566	1.339–1.830	**<0.001**	210(63.8%)	1.061	0.922–1.221	0.407
Depression/anxiety coexisting or no								
Yes 1381 663	598 (43.3%)				598(90.2%)			
No 1763 2481	65 (3.7%)	0.050	0.038–0.066	**<0.001**	783(31.6%)	0.050	0.038–0.065	**<0.001**
Coping style								
Positive 1543	310 (20.1%)				676(43.8%)			
Negative 1601	353 (22.0%)	1.185	0.971–1.446	0.094	705(44.0%)	0.952	0.810–1.118	0.548

The values shown in bold in the table indicate that the p-value is less than 0.05.

occurrence of anxiety ($P < 0.001$) but not with the occurrence of depression ($P = 0.407$). This may be because the need for psychological counseling of the more anxious medical staff was stronger. Previous studies have also found that the occurrence of adverse psychological problems coexists with obvious gender and work position characteristics. For example, the occurrence rate of adverse psychological problems in nurses was higher than doctors, and the occurrence of adverse psychological problems in women was higher than men (Huang et al., 2020; Binnie et al., 2021; Kwobah et al., 2021). However, in this study, the rates of anxiety (20.7 vs. 21.2%) and depression (43.1 vs. 44.1%) in men and women were similar, and the rates of anxiety (21.3 vs. 21.0%) and depression (44.8 vs. 43.5%) in doctors and nurses were also similar.

In further statistical analysis, gender and work position were not significantly correlated with anxiety (*P*-values were 0.554 and 0.085, respectively) or depression (*P*-values were 0.531 and 0.340, respectively). This indicates that gender and work position are not the main factors affecting the occurrence of anxiety or depression. In this study, age was the only general factor related to the occurrence of anxiety ($P = 0.022$), and other factors (i.e., status of only child, educational level) were not related to the occurrence of anxiety or depression. However, the results also provide insight into interventions that may better mitigate risk factors and warrant further study of other relevant factors.

As for the impact of profession, previous longitudinal studies have found that after the outbreak of COVID-19, some professions, such as surgeons, experienced higher prevalence of anxiety and depression compared to the past (Xu et al., 2020). In this study, because of the lack of basic research data before the outbreak, it is not possible to draw accurate and scientific conclusions. However, in horizontal comparisons between different professions, previous studies have shown that clinicians display higher levels of anxiety and depression than non-clinical staff, especially those in departments working closely with infected patients (Lu et al., 2020). However, there was no detailed and specific analysis of the relationship between specific profession and the occurrence of psychological problems.

In this study, the rates of anxiety and depression were highest in the ophthalmology and otorhinolaryngology department (31.9 and 53.2%, respectively) and lowest in the pediatric department (14.3 and 32.7%, respectively). However, statistical analysis found no correlation between professional specialty and anxiety or depression (*P*-values were 0.785 and 0.591, respectively). Work position change during the outbreak was also not related to anxiety or depression (*P*-values were 0.830 and 0.489, respectively), suggesting that profession and change in work position were not main factors in the later period of the COVID-19. However, the bias may have been caused because the sample

sizes of the professional department were small and because the sample distribution was not scientific.

Research data from studies of medical staff in Germany, Poland, France, and other countries found that depression and anxiety were associated with factors such as age, gender, occupation, profession, type of activity, intensity of work stress, proximity to COVID-19 patients (Azoulay et al., 2020; Bohlken et al., 2020; Hoseinabadi et al., 2020; Maciaszek et al., 2020). In the study described here, it was found that the above factors, including age, are not related to the occurrence of anxiety or depression. This may be due to specific national conditions, race, genetics, personality characteristics, timing of the research, and different sample sizes. However, impacts of the intensity and pressure of work are also consistent with the later analysis of policy impact; the decline of depression, anxiety, and other psychological problems that declined in the later stages of the pandemic was due to the reduction in stress-related workload and work intensity. However, the relevant data from this study can serve as a reference for further research, more comprehensive assessment of risk factors, and scientific policy formulation.

Incidence of Psychological Conditions From the Perspective of Stress

Differences in individual psychological stress patterns may lead to different individual responses to COVID-19 outbreak stress. Stress refers to the response to harmful stimuli by an organism. Psychological stress is a process of adaptation or response in an individual when perceiving (through cognition and evaluation) a threat or challenge from environmental change (stress source), and it is a multifactorial, interactive system. With changes in modern medical models of biology-psychology-society, it has been found that the mechanisms of disease can involve important psychological factors, which broadens the vision of disease prevention and treatment (Tang, 2012). Therefore, the occurrence of many diseases is related to psychological stress patterns. By combining methods used in studying current pandemic prevention and control and related research, changes in individual psychological status have been found to be related to psychological stress patterns. However, in this study, individual coping style was not related to the occurrence of anxiety or depression (*P*-values were 0.094 and 0.548, respectively). Additionally, only a relationship between coping style and anxiety was found in a single-factor analysis ($P = 0.048$).

No supporting evidence was found regarding the effects of individual stress response pattern on the occurrence of depression and anxiety. However, the improvements in individual psychological quality level and stress pattern maybe reduce the occurrence of adverse psychological problems. It was also found in this study that educational level was not related to the occurrence of anxiety or depression (*P*-values were 0.079 and 0.971, respectively). This suggests that general education cannot replace mental health education and training, which is still necessary. For example, the popularization of continuing education may also improve the psychological ability to combat stress experienced by medical staff, regarding the knowledge and skills related to psychology, mental disorders, and psychological crisis intervention. In the future, in-depth research about more personality characteristics should be conducted, which can serve as a reference for other countries.

Psychological Impact of Government Policy Measures and Hospital Prevention and Control Pattern on Medical Staff

After the outbreak, hospitals in China set up an emergency fever outpatient department, in which patients with fever were specially managed. Emergency channels were opened normally, but patients with general disease status were recommended a choice of treatment. Some medical staff assisted Hubei's work in the wards with COVID-19 patients and outpatient individuals with fever. Medical staff faced a higher risk of infection and showed a higher risk of depression and anxiety than non-clinical staff. This was due to special working conditions, work intensity, and separation from families, especially for the frontline medical staff fighting COVID-19 (Wu and Wei, 2020).

Since the outbreak began, policies were quickly adjusted, and medical staff learned about constantly changing COVID-19-related guidelines through continuing education and hospital norms, carding and perfecting diagnoses, and adhering to treatment and protection standards. The policies helped strengthen the understanding of COVID-19. Besides, the measures played an important role in reducing the risk of anxiety and depression, strengthened the use of proper protective equipment, reduced infection risk, encouraged more reasonable scheduling, substantially reduced the number of confirmed and suspected patients, reduced work intensity, and promoted good labor compensation and life assistance. Some factors affecting the psychological status of medical staff have also been studied by Zhou et al. (Zhou et al., 2020). Moreover, teamwork was used in both routine prevention and control work or assistance to hospitals in Hubei. Working together provided a good atmosphere for medical staff and also satisfied the psychological need for human support. All of the above techniques are important measures for the improvement of mood in medical staff.

During more stable stages, the deployment of COVID-19 prevention and control measure was more scientific, and social productivity began to resume, with the improvement of public environment. While emphasizing the more normalized measures fighting COVID-19 in hospitals, more medical staff covered routine work, and specialized professionals rotated duty regarding COVID-19 prevention and control work. However, this study showed that the psychological status of medical staff should be a focus during the stable phase of the pandemic. In this study, the occurrence of anxiety and depression was weakly associated with general socio-demographic characteristics. Therefore, from the aspect of policy control, changes in psychological status were consistent with the improvements and implementation in prevention and control system as well as policy.

Regarding the occurrence of major health events, the government's decision-making as well as the improvement of counseling systems for meeting psychological needs play

an important role in adjusting social order, reducing the stress levels of the public and medical staff, and reducing the occurrence of psychological problems. At the same time, psychological screening systems in hospitals should be improved, and routine psychological screening after major public health events should be conducted. Staff members struggling with their psychological well-being should be further identified and given special psychological intervention, if necessary.

Psychological Intervention

At all points during an outbreak, attention to individual's psychological needs is necessary. In the early stages of the pandemic, a psychological consulting hotline was set up to provide psychological help to the general public, as well as online and offline guidance and consultation for medical personnel with depression and anxiety. In Hubei, medical staff were specially equipped with psychologists, individual and group interventions, and even drug treatment for those in need. During isolation, psychologists are also specially equipped with tools, such as decompression equipment, to help relieve bad moods. These psychological interventions also play an important role in the reduction of adverse psychological conditions. It has been shown that psychological intervention has a positive effect on maintaining the mental health of medical staff, and further research will also compare the specific effects of psychological intervention on mental state. Finally, this study will help to further improve psychological intervention systems so that they can better respond to public health crises and other emergencies.

Restoration of the Human Environment

From the beginning of the pandemic, the Chinese government released COVID-19-related information using transparent methods. Understanding of the national COVID-19-related data is clear in media coverage. With the significant reduction in cases and deaths in the later period of the pandemic, the improved the humanity and custom environment gradually reduced the public panic. At the same time, the establishment of support by other family members enabled medical staff to have appropriate relaxation time and psychological acceptance of the regularization of COVID-19 prevention and control. In other countries, the importance of providing transparent and understandable information also has been discussed (Bäuerle et al., 2020). Therefore, from the perspective of psychological well-being, for future emergencies, China's mature treatment and information release methods are in line with individual psychological needs, which is also related to the reduction and mitigation of the poor mental states of medical staff.

Shortcomings of the Study

This study had some limitations. First, the sample size of medical staff was sufficient for psychological state analysis and represented the status of medical staff in Liaoning Province. However, the sample source is unitary and there is no precise calculation of the sample size, which can lead to bias and less scientific data support. Second, although the survey method is anonymous, it is still possible that subjective dodge behavior will affect the results and presentation of objective facts, which impacts the final results and conclusions. Third, although conventional factors were selected, the factors studied may be one-sided and other factors affecting the occurrence of depression and anxiety may be ignored such as resilience, perceived organizational support, or social support satisfaction, studied by other studies (Cyr et al., 2021). Fourth, although the psychiatric medical staff have been investigated, no relevant investigations were conducted for medical staff in some special professions like other studies, such as health care professionals treating opioid use disorder (Blevins et al., 2021). Finally, this study found that the medical staff from ophthalmology and otolaryngology departments had the highest incidence of anxiety and depression, who are not from the departments involving in the examination and treatment of COVID-19 patients directly. However, because of the lack of basic research data before the COVID-19 outbreak, there is no way to make a comparison and explain whether the changes in the psychological status of the medical staff are related to the epidemic. Therefore, in the future, a larger sample of data from surveys is needed and more basic data is needed to get. Additionally, there is a need to minimize the generation of bias through more rigorous scientific design of research methods, improved processes and tools, and strengthened scientific analysis of more relevant factors.

Moreover, further analysis should be conducted through follow-up research, such as the effects of psychological interventions on mental status or the longitudinal impact of changes and differences in profession. In summary, continuous improvement of relevant research is needed to provide further scientific basis for policy making.

CONCLUSION

The COVID-19 pandemic has hugely burdened health care, and mental symptoms need to be considered an important aspect. In the later phase of the pandemic in China, the prevalence of anxiety and depression of medical staff remains high. In addition to age, general factors such as gender, work position, profession, educational level, and other factors were found to be not related. On the contrary, concern for the psychological needs of medical staff is necessary through psychological counseling. Although there were some limitations in this study, the relevant data from this study can serve as a reference for further research, more comprehensive assessment of risk factors. Moreover, the sample survey suggests that medical staff, as a special group, show different psychological changes at various times during a stressful event. Thus, different psychologically oriented policy implementation that reduces adverse stress events is needed. It is also important to draw on past research experience in order to deal with current medical and health public events more quickly and efficiently.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the People's Hospital of Liaoning Province. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

XY and RH: study design, data collection and analysis. JM: data collection and analysis. WF, LW, SS, HL, NW, XW, and ML: data collection. XY, JM, and RH: drafting of the manuscript. XY and RH: critical revision. All authors contributed to the article and approved the submitted version.

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Moral Distress in Hospitals During the First Wave of the COVID-19 Pandemic: A Web-Based Survey Among 3,293 Healthcare Workers Within the German Network University Medicine

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Objective: The present study aimed to investigate the correlation between moral distress and mental health symptoms, socio-demographic, occupational, and COVID-19-related variables, and to determine differences in healthcare workers' (HCW) moral distress during the first wave of the COVID-19 pandemic.

Method: Data from 3,293 HCW from a web-based survey conducted between the 20th of April and the 5th of July 2020 were analyzed. We focused on moral distress (Moral Distress Thermometer, MDT), depressive symptoms (Patient Health Questionnaire-2, PHQ-2), anxiety symptoms (Generalized Anxiety Disorder-2, GAD-2), and increased general distress of nurses, physicians, medical-technical assistants (MTA), psychologists/psychotherapists, and pastoral counselors working in German hospitals.

Results: The strongest correlations for moral distress were found with depressive symptoms, anxiety symptoms, occupancy rate at current work section, and contact with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Nurses and MTA experienced significantly higher moral distress than physicians, psychologists/psychotherapists, and pastoral counselors. The average level of moral distress reported by nurses from all work areas was similar to levels which before the pandemic were only experienced by nurses in intensive or critical care units.

Conclusion: Results indicate that moral distress is a relevant phenomenon among HCW in hospitals during the COVID-19 pandemic, regardless of whether they work at the frontline or not and requires urgent attention.

Keywords: COVID-19, moral distress, healthcare, healthcare workers, mental health, depression, anxiety

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INTRODUCTION

The worldwide wave of infection with the novel coronavirus (SARS-CoV-2) was classified as a pandemic by the WHO on 12th March 2020 (World Health Organization, 2020). The COVID-19 pandemic poses a major challenge to health systems worldwide, and healthcare workers (HCW) play an essential role in coping with this global crisis (Petzold et al., 2020). When they stop working as a result of acute stress, exhaustion, and mental illness (Petzold et al., 2020), limited functioning of the health care system may result (Shultz et al., 2016). Previous research revealed that the COVID-19 pandemic adversely affects the psychological well-being and mental health of HCW in hospitals (Chen et al., 2020; Morawa et al., 2021). Therefore, it is essential to identify factors causing stress or mental illness to thwart the (temporal) loss of HCW during the ongoing and future pandemics.

An emerging factor in this context is moral distress (Giannetta et al., 2020). It is assumed to occur when a person considers a certain action to be morally right but is prevented from acting according to his or her ethical beliefs by hierarchical or institutional restraints (Jameton, 1984). Past research has shown that failing to tackle HCWs' moral distress have adverse effects on their personal and professional lives (Allen et al., 2013) and can promote turnover among HCW (Fournier et al., 2007; Sasso et al., 2016). Moral distress might even harm patients due to its potential negative effect on quality and safety of patient care (McCarthy and Gastmans, 2015). This stresses the importance of gaining a deeper understanding of the construct to support HCW.

Background

Moral distress frequently occurs among HCW in hospitals (Fournier et al., 2007; Brown-Saltzman et al., 2015; McCarthy and Gastmans, 2015). During a pandemic moral distress is even increased and associated with more demanding and strenuous working conditions (Borges et al., 2020; Jacobs and Manfredi, 2020), for instance, severely limited communication with patients and their relatives due to restraining orders and the fear of contagion (Jacobs and Manfredi, 2020). Especially at the beginning of a pandemic, staff is often not thoroughly trained in infection prevention. As such moral distress is positively associated with general distress (Alkrisat, 2016) and decreased well-being (Lamiani et al., 2017). Furthermore, moral distress is correlated with anxiety (Sasso et al., 2016; Jacobs and Manfredi, 2020), and the development of depressive symptoms among HCW (Sasso et al., 2016; Lamiani et al., 2018).

However, so far research on moral distress in the medical sector mostly focused on nurses (Lamiani et al., 2017; Jacobs and Manfredi, 2020). Nurses often complained higher moral distress compared to physicians (Mehlis et al., 2018; Pergert et al., 2019). It has been proposed that one reason why nurses might be particularly at risk for experiencing moral distress is that they have to act more often contrary to their ethical and moral beliefs without possessing definite power of decision (Lomis et al., 2009; Sajjadi et al., 2017). This is also true for other medical professions like psychologists/psychotherapists, pastoral counselors, and medical-technical assistants (MTA; MTA duties include assistance during surgery, taking care of patients before and after surgery, and the measurement of their body functions; Akademie für Gesundheitsberufe, Universitätsklinikum Ulm, 2021). For instance, during the COVID-19 pandemic MTA duties included working in direct patient care. They often worked in intensive care units where they took care of severely ill COVID-19 patients (Vereinigung Medizinisch-Technischer Berufe in der Deutschen Röntgengesellschaft e.V, 2021). Furthermore, novel research on mental burden during the COVID-19 pandemic revealed increased levels of depressive symptoms and mental distress among MTA compared to physicians (Morawa et al., 2021). Such results highlight the importance to close the knowledge gap of the occurrence of moral distress among other medical professions.

Occupational variables like contact with SARS-CoV-2 infected patients or contaminated material at work are potential sources of conflicts on protection management (Jacobs and Manfredi, 2020). Occupancy rate displays another potential source of moral distress because an increased occupancy at the current work section results in less time per patient and more general workload (Jacobs and Manfredi, 2020). During the first wave of the pandemic, some wards were highly used, while others had a reduced occupancy rate. The relationship between professional experience and moral distress is inconsistent (Ohnishi et al., 2010; Hamaideh, 2014).

Regarding the influence of demographic variables, previous research reveals inconsistent results concerning the relationship between gender and moral distress (O'Connell, 2015; Shoorideh et al., 2015). Age also seems to be of importance. Significantly higher levels of moral distress were observed in younger nurses (Hamaideh, 2014; Wolf et al., 2019).

Objective

We aimed to explore moral distress among HCW working in hospitals during the first wave of the COVID-19 pandemic by answering the following research questions:

I. Do HCW experience significantly higher moral distress in our sample during the COVID-19 pandemic than HCW in comparable studies conducted before the onset of the pandemic?
II. Are increased general distress, depression and anxiety symptoms, gender, age, professional experience, occupancy rate, contact with SARS-CoV-2, and the number of confirmed COVID-19 cases associated with moral distress? Specifically, we predicted a positive relationship between increased general distress, depression and anxiety symptoms, as well as occupancy rate and contact with SARS-CoV-2 with moral distress among HCW. We also expected the increasing numbers of confirmed COVID-19 cases in Germany as an indicator of the (rapid) spread of the pandemic to be positively associated with moral distress among HCW. Age was supposed to be negatively correlated with moral distress. No clear hypothesis for gender and work experience could be formulated.

III. Are there differences in the prevalence of moral distress between various medical professions?

MATERIALS AND METHODS

Background and Data Collection

The background for this study came from a research group on resilience in religion and spirituality funded by the German Research Foundation. Data collection was performed within the so-called VOICE survey as a collaboration of five university hospitals. Data evaluation was performed as part of the collaborative research project egePan Unimed within the newly set-up German Network University Medicine. The aim of egePan Unimed is to examine and coordinate management concepts of the pandemic in Germany and internationally, to evaluate their practicability using scientific methods, and to manage them within a framework plan. Superior aims include an adequate control of resources within a region to avoid an inefficient occupancy and intensive care supply in an inpatient setting and case management for both hospitalized and non-hospitalized patients.

Data collection for the VOICE online survey took place between April 20 and July 5, 2020. The link was provided through mailing lists (employees, professional associations, hospital boards, etc.) and intranet advertising by the psychosomatic departments of the university hospitals of Bonn, Erlangen, Ulm, Cologne, and Dresden. Participation was also encouraged by several other hospitals and online platforms. The 15 min survey consisted of 77 items and was conducted in German. It could be accessed *via* two academic online survey tools, Unipark[1] and SoSci Survey.[2] Inclusion criteria for participation were a minimum age of 18 years, employment as a HCW in Germany, and the submission of informed consent.

Measures

The 11-point single-item Moral Distress Thermometer (MDT; Wocial and Weaver, 2013) was used to assess moral distress. After been given a brief explanation of the term moral distress ("Moral distress is a form of distress that occurs when you believe you know the ethically correct thing to do, but something or someone restricts your ability to pursue the right course of action."; Wocial and Weaver, 2013, S.169), participants rated how much moral distress they have been experiencing related to work in the past 2 weeks on a scale ranging from 0 = "None" to 10 = "Worst possible."

Existing literature was screened for reference values of moral distress measured by the MDT before the onset of the pandemic. Wocial and Weaver (2013) validated the MDT among 529 nurses working in inpatient settings in US hospitals. Further reference values included a US sample of 41 nurses working in general pediatric inpatient units (Rodrigues et al., 2018), 167 US nurses working in critical care units (Wolf et al., 2019), a German sample of 39 physicians and 50 nurses working in a university hospital with advanced cancer inpatients (Mehlis et al., 2018), and 262 German nurses working in intensive care units (Graeb, 2019).

Participants were asked to rate general distress during and before the COVID-19 pandemic (five-point *not at all – very strong* response scale). The difference between the items (during the pandemic – before the pandemic) was calculated for further analysis to assess an increase in general distress through the pandemic. A positive difference indicates increased general distress during the COVID-19 pandemic.

Depressive and anxiety symptoms were measured by the four-item Patient Health Questionnaire (PHQ-4; Löwe et al., 2010), which consists of a two-item depression scale (Patient Health Questionnaire-2, PHQ-2) and the two-item Generalized Anxiety Disorder Screener (GAD-2; 4-point *not at all – nearly everyday* response scale). Sum scores for the PHQ-4 and GAD-2 could reach up to 6, with values of three or higher considered clinically significant. The Spearman-Brown coefficient was 0.75 for the PHQ-2 and 0.77 for the GAD-2.

For demographic, occupational, and COVID-19-related variables, participants were asked to state their gender, age, professional experience ("How long have you been involved in patient care?"), the occupancy rate at the current work section ("How occupied has the ward you work in been for the last 2 weeks, including today?"), and whether they get in touch with SARS-CoV-2 infected patients or contaminated material at work. Based on data of the Robert Koch-Institute (RKI, Germany), the total number of confirmed COVID-19 cases in Germany at the week of participation (interval: Thursday to Wednesday the following week in each case) was added to the data set.

Data Analysis

The software IBM SPSS Statistics, Version 27 for Windows was used for statistical analysis. Spearman's correlation coefficient was used to calculate bivariate relationships between variables ($r \geq 0.10$ = small, $r \geq 0.30$ = medium, and $r \geq 0.50$ = strong correlation coefficient; Cohen, 1988). In the results section, only correlations with relevant effect sizes ($r \geq 0.10$) are reported. To investigate the complex network of the ultimate association of derived correlates on moral distress, they were included in a multiple regression model with the forced entry method to answer research question two ($\beta = \geq 0.10$ = small, $\beta \geq 0.30$ = medium, and $\beta \geq 0.50$ = strong beta coefficients; Cohen, 1988). In the results section, only correlates with relevant effect sizes ($\beta \geq 0.10$) are reported. R^2 was used as coefficient of determination ($R^2 \geq 0.02$ = small goodness-of-fit, $R^2 \geq 0.13$ = moderate goodness-of-fit, and $R^2 \geq 0.26$ = high goodness-of-fit; Cohen, 1988). Age and professional experience were assessed in groups of different widths and therefore dummy coded before conducting regression analyses. The dummy variables correlating significantly with moral distress were included as predictors in the multiple regression analysis. To answer research question 1 and 3, group differences for moral distress were analyzed by the

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independent samples *t*-test or Welch's analysis of variance. Games-Howell *post hoc* analyses for the latter with Bonferroni adjusted *p* values were conducted. Effect sizes (Cohen's *d*, η^2) are reported for significant results ($d \geq 0.20$ = small, $d \geq 0.50$ = medium, and $d \geq 0.80$ = strong effect; $\eta^2 \geq 0.01$ = small, $\eta^2 \geq 0.06$ = medium, and $\eta^2 \geq 0.14$ = large effect; Cohen, 1988). Values of $p < 0.05$ were considered statistically significant except for the case of alpha error correction (then explicitly reported in the text).

RESULTS

Participants

The current paper focused on physicians, nurses, MTA (consisting of medical assistants, medical-technical laboratory assistants, medical technical radiology assistants, and pharmaceutical-technical assistants), psychologists/psychotherapists, and pastoral counselors working in German hospitals ($N = 4{,}001$). Participants were excluded if they did not work in patient care ($n = 404$), their responses were not available for all variables of interest in the main analyses ($n = 248$) or a combination of these criteria ($n = 56$). This resulted in a final sample of 3,293 (73% female, 27% male). **Table 1** presents characteristics of the total sample and the five medical professions. The sample consisted of 1,149 nurses (35%), 966 physicians (29%), 905 MTA (27.5%), 149 psychologists/psychotherapists (5%), and 124 pastoral counselors (4%). About 872 (27%) were between 31 and 40 years old, 825 (25%) between 51 and 60 years; 2,486 (76%) indicated working in inpatient care for more than 6 years; 2,053 (62%) reported getting in contact with SARS-CoV-2 infected patients or contaminated material at work. Due to the heterogeneous recruitment strategy, the response rate of the total sample could not be measured; however, we can report some response rates for the four university hospitals with the largest proportions of respondents, which were study centers or cooperation partners. The highest average response rate was found for the MTA (16.1%) followed by physicians (9.2%), and nurses (8.0%). The response rate for pastoral workers and psychologist/psychotherapists could not be measured as we had no knowledge about the total number of pastoral workers and psychologist/psychotherapists working at the hospitals at the time of publication. Over 90% of the HCW participated within the first month after the study was launched (April 20–May 19).

The mean moral distress score in the present sample was 4.08 ($SD = 2.70$: range 0–10). The prevalence of depression and anxiety (cut-off-value of ≥3) in the current sample was 21% and 20%. The mean increase in general distress during the COVID-19 pandemic was 0.51 ($SD = 1.26$: range −4–4).

TABLE 1 | Characteristics of the study sample.

	Total sample	Physicians	Nurses	MTA	Psychologists/ psychotherapists	Pastoral counselors
	N = 3,293	*n* = 966	*n* = 1,149	*n* = 905	*n* = 149	*n* = 124
Gender, *n* (%)						
Female	2,414 (73.3)	567 (58.7)	874 (76.1)	783 (86.5)	122 (81.9)	68 (54.8)
Male	879 (26.7)	399 (41.3)	275 (23.9)	122 (13.5)	27 (18.1)	56 (45.2)
Age, years, *n* (%)						
18–30	711 (21.6)	140 (14.5)	322 (28.0)	197 (21.8)	52 (34.9)	0 (0.0)
31–40	872 (26.5)	336 (34.8)	291 (25.3)	194 (21.4)	48 (32.2)	3 (2.4)
41–50	714 (21.7)	230 (23.8)	242 (21.1)	206 (22.8)	21 (14.1)	15 (12.1)
51–60	825 (25.1)	207 (21.4)	248 (21.6)	267 (29.5)	23 (15.4)	80 (64.5)
above 60	171 (5.2)	53 (5.5)	46 (4.0)	41 (4.5)	5 (3.4)	26 (21.0)
Workplace, *n* (%)						
University hospital	2052 (62.3)	568 (58.8)	893 (77.7)	448 (49.5)	114 (76.5)	29 (23.4)
Other hospital	1,241 (37.7)	398 (41.2)	256 (22.3)	457 (50.5)	35 (23.5)	95 (76.6)
Professional experience, *n* (%)						
<3 years	366 (11.1)	125 (12.9)	78 (6.8)	85 (9.4)	54 (36.2)	24 (19.4)
3–6 years	441 (13.4)	128 (13.3)	160 (13.9)	98 (10.8)	36 (24.2)	19 (15.3)
>6 years	2,486 (75.5)	713 (73.8)	911 (79.3)	722 (79.8)	59 (39.6)	81 (65.3)
Occupancy rate, *n* (%)						
Well below average	486 (14.8)	209 (21.6)	121 (10.5)	112 (12.4)	29 (19.5)	15 (12.1)
Slightly below average	1,010 (30.7)	343 (35.5)	277 (24.1)	291 (32.2)	48 (32.2)	51 (41.2)
Average	991 (30.1)	227 (23.5)	414 (36.0)	262 (29.0)	51 (34.2)	37 (29.8)
Slightly above average	530 (16.1)	118 (12.2)	227 (19.8)	151 (16.7)	18 (12.1)	16 (12.9)
Well above average	276 (8.4)	69 (7.1)	110 (9.6)	89 (9.8)	3 (2.0)	5 (4.0)
Contact with SARS-CoV-2, *n* (%)						
Yes	2053 (62.3)	587 (60.8)	680 (59.2)	707 (78.1)	15 (10.1)	64 (51.6)
No	1,240 (37.7)	379 (39.2)	469 (40.8)	198 (21.9)	134 (89.9)	60 (48.4)

MTA, medical-technical assistant; occupancy rate, occupancy rate at current work section.

Moral Distress Before and During the COVID-19 Pandemic

Results of independent samples *t*-tests between moral distress of the study sample and scores of reference samples are shown in **Table 2**. Nurses' moral distress in our sample ($M = 4.52$, $SD = 2.66$: range 0–10) was significantly higher than moral distress scores of nurses before the COVID-19 pandemic in inpatient settings in US hospitals (Wocial and Weaver, 2013; $M = 2.9$, $SD = 2.5$), US nurses in general pediatric inpatient units (Rodrigues et al., 2018; $M = 2.64$, $SD = 2.00$), and nurses in a German university hospital with advanced cancer inpatients (Mehlis et al., 2018; $M = 2.3$, $SD = 2.3$: range 0–9), $t(1,676) = 11.81$, $p < 0.001$, $d = 0.62$; $t(1,188) = 4.48$, $p < 0.001$, $d = 0.71$; and $t(1,197) = 5.81$, $p < 0.001$, $d = 0.84$. The effect sizes correspond to medium and strong effects (Cohen, 1988). There was no statistically significant difference between moral distress of nurses across all work sections during the pandemic in the study and US nurses working in critical care units (Wolf et al., 2019; $M = 4.2$, $SD = 2.6$) as well as German nurses working in intensive care units (Graeb, 2019; $M = 4.46$, $SD = 2.57$) before the pandemic, $t(1,314) = 1.47$, $p = 0.14$; $t(1,409) = 0.34$, $p = 0.73$.

Moral distress was significantly higher for physicians in our sample ($M = 3.42$, $SD = 2.61$: range 0–10) compared to physicians working in a German university hospital with advanced cancer inpatients before the COVID-19 pandemic (Mehlis et al., 2018; $M = 1.5$, $SD = 1.4$: range 0–6), $t(1,003) = 4.56$, $p < 0.001$, $d = 0.74$. The effect size was found to correspond the convention of Cohen (1988) for a medium effect.

Correlates of Moral Distress

Bivariate correlations between study variables are shown in **Table 3**. Higher moral distress was significantly ($r = 0.14$–0.35, all $p < 0.01$) associated with (in descending order of effect size): depressive symptoms, anxiety symptoms, higher occupancy rate at the current work section, having more general distress than before the pandemic, and being in direct contact with SARS-CoV-2 patients or material.

We performed a multiple linear regression analysis for the total sample to examine the association of derived correlated on moral distress. The model explained 21% ($R^2 = 0.21$, adjusted $R^2 = 0.20$) of the variance of moral distress in HCW, indicating a moderate goodness-of-fit (Cohen, 1988). Correlates significantly predicted moral distress, $F(10, 3,282) = 84.79$, $p < 0.001$, $\eta^2 = 0.21$. **Table 4** shows regression results using moral distress as the criterion. Higher moral distress was significantly predicted by: depression symptoms, $\beta = 0.20$, $p < 0.001$, anxiety symptoms, $\beta = 0.18$, $p < 0.001$, occupancy rate, $\beta = 0.15$, $p < 0.001$, and being in direct contact with SARS-CoV-2 patients or material, $\beta = 0.11$, $p < 0.001$.

Differences in Moral Distress Between Medical Professions

Differences in moral distress were examined for nurses ($M = 4.52$, $SD = 2.66$: range 0–10), MTA ($M = 4.49$, $SD = 2.68$: range 0–10), physicians ($M = 3.42$, $SD = 2.61$: range 0–10), psychologists/psychotherapists ($M = 3.42$, $SD = 2.66$: range 0–9), and pastoral counselors ($M = 3.08$, $SD = 2.36$: range 0–9). Experienced moral distress differed statistically significant between medical professions, Welch's $F(4, 532.38) = 36.22$, $p < 0.001$, $\eta^2 = 0.04$. The effect size was found to correspond the convention of Cohen (1988) for a small effect. Games-Howell *post hoc* analysis revealed significantly higher moral distress among nurses and MTA compared to the remaining professions (p's < 0.001). Results of pairwise comparisons with Bonferroni adjusted alpha error correction are shown in **Table 5**.

DISCUSSION

This paper provides an account of HCW's moral distress during the first wave of infection of the COVID-19 pandemic in 2020 by exploring its prevalence and differences among several medical professions working in German hospitals and investigating the relationship between moral distress and mental health symptoms, several socio-demographic, occupational, and COVID-19-related variables.

Moral Distress Before and During the COVID-19 Pandemic

Significantly higher levels of moral distress among nurses and physicians in our sample compared to the pre-pandemic reference samples revealed that moral distress occurs more frequently

TABLE 2 | Results of independent samples *t*-tests between moral distress scores in study sample and reference samples.

Samples	Nurses		*t*	*p*	Cohen's *d*	Physicians		*t*	*p*	Cohen's *d*
	M (SD)	*n*				*M (SD)*	*n*			
Study sample (VOICE, 2020)	4.52 (2.66)	1,149				3.42 (2.61)	966			
Wocial and Weaver, 2013	2.9 (2.5)	529	11.81	< 0.001	0.62					
Rodrigues et al., 2018	2.64 (2.00)	41	4.48	< 0.001	0.71					
Wolf et al., 2019	4.2 (2.6)	167	1.47	0.143	0.12					
Mehlis et al., 2018	2.3 (2.3)	50	5.81	< 0.001	0.84	1.5 (1.4)	39	4.56	< 0.001	0.74
Graeb, 2019	4.46 (2.57)	262	0.34	0.731	0.02					

M, mean, SD, standard deviation, and p, significance p value. Results are displayed for comparison of each sample with the study sample VOICE (2020). Wocial and Weaver (2013): nurses in US inpatient settings. Rodrigues et al. (2018): nurses in US general pediatric inpatient settings. Wolf et al. (2019): nurses in US critical care units. Mehlis et al. (2018): nurses and physicians in German advanced cancer inpatient units. Graeb (2019): nurses in German intensive care units.

TABLE 3 | Spearman correlations for study variables.

Variable	1	2	3	4	5	6	7	8	9
1. Moral distress									
2. Increase in general distress	0.160**								
3. GAD-2	0.330**	0.231**							
4. PHQ-2	0.348**	0.186**	0.600**						
5. Gender	−0.049**	−0.063**	−0.088**	−0.054**					
6. Age	−0.060**	0.067**	0.000	−0.079**	0.054**				
7. Professional experience	0.034	0.085**	0.007	−0.025	0.000	0.556**			
8. Occupancy rate	0.222**	0.170**	0.108**	0.126**	−0.045**	−0.059**	−0.008		
9. Contact with SARS-CoV-2	0.137**	0.035*	0.061**	0.040*	0.027	−0.045**	0.032	0.064**	
10. COVID-19 cases	0.062**	−0.072**	−0.026	−0.009	−0.035*	−0.006	0.023	0.150**	−0.053**

*$p < 0.05$.

**$p < 0.01$, two-tailed.

N = 3,293. Increase in general distress = difference of general distress before the onset of the COVID-19 pandemic and during the COVID-19 pandemic. A positive value indicated an increase in general distress during the COVID-19 pandemic. For gender, 0 = female, 1 = male. For age, 1 = 18–30, 2 = 31–40, 3 = 41–50, 4 = 51–60, and 5 = above 60. For professional experience, 1 = less than 3 years, 0 = more than 3 years. For occupancy rate, 1 = well below average, 2 = slightly below average, 3 = average, 4 = slightly above average, and 5 = well above average. For contact with SARS-CoV-2, 0 = no, 1 = yes. COVID-19 cases = total number of confirmed COVID-19 cases in Germany at the week of participation (interval: Thursday to Wednesday the following week in each case).

during the pandemic than before. A potential cause might be the exposure to a higher number of moral dilemmas (Borges et al., 2020; Jacobs and Manfredi, 2020) or conflicts (Kühlmeyer et al., 2020) associated with the fight against the pandemic. Although nurses in our sample worked in various hospital sections, their moral distress levels were comparable only to those reported before the pandemic among nurses in intensive and critical care units (Graeb, 2019; Wolf et al., 2019). We assume that, in non-pandemic times, moral dilemmas largely concern existential decisions in patient care typical for critical care units (O'Connell, 2015; Jacobs and Manfredi, 2020). In the COVID-19 pandemic, however, these dilemmas may spill over to all care units in the hospital, and additionally, new dilemmas such as the distribution of protective material (Jacobs and Manfredi, 2020), may arise, and might be associated with the observed increase in the general level of moral distress.

Correlates of Moral Distress

The strongest relationships with moral distress were found in depression and anxiety symptoms, occupancy rate at the current work section, and contact with SARS-CoV-2 patients or contaminated material. This is consistent with previous research linking moral distress to anxiety (Sasso et al., 2016; Jacobs and Manfredi, 2020) and the development of depressive symptoms among HCW (Sasso et al., 2016; Lamiani et al., 2018). However, no causal direction of these associations can be drawn from the data collected. Higher moral distress may lead to increased levels of depression and anxiety, but it is also conceivable that those who are more depressed and/or anxious may be less able to adapt and may experience some situations as more conflictual and morally distressing. Results furthermore confirmed our assumption of a positive relationship between contact with SARS-CoV-2 infected patients or contaminated material and occupancy rate with moral distress. One source of moral distress specific to the COVID-19-pandemic could be caused by situations in which HCW feel that more protection against infection is needed but are not able to provide it for themselves or their patients. An increased occupancy rate at the current work section, which results in less time per patient and more general workload (Jacobs and Manfredi, 2020), was shown to be another potential source of moral distress in the current sample. However, beta coefficients of all mentioned variables were lower than 0.30, implying a small predictive power of moral distress by the individual variables.

Our findings point out that additional research investigating moral distress among HCW in hospitals during a pandemic is crucial to identify organizational as well as individual protective and risk factors linked to its occurrence.

Differences in Moral Distress Between Medical Professions

Results revealed that moral distress is a phenomenon often experienced by HCW during the COVID-19 pandemic and does not only affect nurses, but also MTA, physicians, psychologists/psychotherapists, and pastoral counselors. Nurses and MTA experienced the highest levels of moral distress in the current sample. For nurses, this is in line with findings of other studies (Mehlis et al., 2018; Pergert et al., 2019) where they reported higher moral distress than physicians. However, MTA's moral distress levels were equally high as the ones of nurses. Just like nurses, MTA also often may not have the opportunity to act according to their ethical and moral beliefs as they do not possess high degrees of decision-making power, which represents an increased risk of experiencing moral distress (Lomis et al., 2009; Sajjadi et al., 2017). It is possible that this does not apply for pastoral counselors and psychologists/psychotherapists, who, like physicians, often might have more authority and/or autonomy in their field of work than nurses and MTA. Therefore, a promising approach of reducing moral distress among nurses and MTA might be to give them more authority or autonomy in their field of work.

To our knowledge, the present study was the first one to examine moral distress among MTA, psychologists/psychotherapists, and pastoral counselors working in German

TABLE 4 | Summary of multiple regression analysis for the total sample ($N = 3,293$) using moral distress as the criterion.

Predictor	b 95% CI [LL, UL]	SE	Beta	*t*	*p*
(Intercept)	0.16 [−0.67, 0.98]	0.42		0.38	0.707
Increase in general distress	0.12 [0.06, 0.19]	0.04	0.06	3.53	<0.001
GAD-2	0.32 [0.25, 0.39]	0.04	0.18	8.63	<0.001
PHQ-2	0.38 [0.30, 0.45]	0.04	0.20	9.90	<0.001
Gender	−0.08 [−0.27, 0.11]	0.10	−0.01	−0.81	0.419
Age 18–30	0.45 [0.22, 0.68]	0.12	0.07	3.86	<0.001
Age > 60	−0.13 [−0.51, 0.24]	0.19	−0.01	−0.70	0.487
Professional experience	−0.71 [−1.01, −0.42]	0.15	−0.08	−4.69	<0.001
Occupancy rate	0.36 [0.29, 0.44]	0.04	0.15	9.48	<0.001
Contact with SARS-CoV-2	0.59 [0.42, 0.76]	0.09	0.11	6.72	<0.001
COVID-19 cases	9.26E-6 [0.00, 0.00]	0.00	0.06	3.47	<0.001

b, unstandardized regression weights, CI, confidence interval, LL, lower limit of a confidence interval, UL, upper limit of a confidence interval, SE, standard error, and Beta, standardized regression weights. p, significance p value. Increase in general distress = difference between general distress before the onset of the COVID-19 pandemic and during the COVID-19 pandemic. A positive value indicated an increase in general distress during the COVID-19 pandemic. For gender, 0 = female, 1 = male. For age 18–30, 1 = 18–30, and 0 = above 30. For age > 60, 1 = above 60, and 0 = 18–60. For professional experience, 1 = less than 3 years, 0 = more than 3 years. Occupancy rate = occupancy rate at current work section. For occupancy rate, 1 = well below average, 2 = slightly below average, 3 = average, 4 = slightly above average, and 5 = well above average. For contact with SARS-CoV-2, 0 = no, 1 = yes. COVID-19 cases = total number of confirmed COVID-19 cases in Germany at the week of participation (interval: Thursday to Wednesday the following week in each case).

TABLE 5 | Games-Howell post-hoc test for pairwise comparisons of moral distress between medical professions.

(I) Profession	(J) Profession	Mean difference I – J, (*SE*)	95% CI for Difference [LL, UL]
1. Physicians	2	−1.10*** (0.12)	[−1.55, −0.65]
(*n* = 966)	3	−1.07*** (0.12)	[−1.54, −0.59]
	4	0.00 (0.23)	[−0.93, 0.92]
	5	0.34 (0.23)	[−0.57, 1.24]
2. Nurses	1	1.10*** (0.12)	[0.65, 1.55]
(*n* = 1,149)	3	0.04 (0.12)	[−0.43, 0.50]
	4	1.10*** (0.23)	[0.18, 2.02]
	5	1.44*** (0.23)	[0.54, 2.34]
3. MTA	1	1.07*** (0.12)	[0.59, 1.54]
(*n* = 905)	2	−0.04 (0.12)	[−0.50, 0.43]
	4	1.06*** (0.24)	[0.13, 2.00]
	5	1.41*** (0.23)	[0.49, 2.32]
4. Psychologists/	1	0.00 (0.23)	[−0.92, 0.93]
psychotherapists	2	−1.10*** (0.23)	[−2.02, −0.18]
(*n* = 149)	3	−1.06*** (0.24)	[−2.00, −0.13]
	5	0.34 (0.30)	[−0.85, 1.54]
5. Pastoral	1	−0.34 (0.23)	[−1.24, 0.57]
counselors	2	−1.44*** (0.23)	[−2.34, −0.54]
(*n* = 124)	3	−1.41*** (0.23)	[−2.32, −0.49]
	4	−0.34 (0.30)	[−1.54, 0.85]

****p < 0.0025 according to Bonferroni adjusted alpha error correction.*
N = 3,293. SE, standard error, CI, confidence interval, LL, lower limit of a confidence interval, and UL, upper limit of a confidence interval. MTA, medical-technical assistant.

hospitals. Beyond that, to our knowledge, this is the first study to also compare moral distress among nurses, physicians, MTA, psychologists/psychotherapists, and pastoral counselors in the hospital setting. Even though the moral distress levels of physicians, psychologists/psychotherapists, and pastoral counselors were slightly lower than the ones of nurses and MTA, it can be assumed that they all were affected by the negative correlates of the phenomenon which include: turnover (Sasso et al., 2016; Lamiani et al., 2017), decreased wellbeing (Lamiani et al., 2017), and burnout (Ajoudani et al., 2019; Jacobs and Manfredi, 2020).

Limitations, Implications, and Recommendations for Future Research

The present study is limited by some points: moral distress was only assessed with one item, which makes it unlikely that we could capture the construct in its entirety. However, this makes the MDT suited for large surveys, and its validity has been shown to be sufficient (Wocial and Weaver, 2013). Another limitation includes the MDT's non-specific definition of moral distress, leaving the question of the specific situations in which it has occurred unanswered. The wording of the MDT might have had differing effects on the different medical professions and a variant meaning or understanding of the construct could have influenced results. Another limitation lies in the unbalanced sample sizes of subgroups (e.g., medical professions, age groups, and years of professional experience), and a sole examination of HCW in the in-patient healthcare sector. As this limits generalizability of results, they must be interpreted with caution. Furthermore, general distress before the pandemic was assessed retrospectively. The occurrence of a recall bias cannot be excluded here.

Our findings underline that moral distress among HCW needs urgent attention. It is crucial to understand its root causes to support HCW's mental health, thwart the (temporal) loss of health professionals (Sasso et al., 2016; Lamiani et al., 2017), and improve patient security during the ongoing and future pandemics. Providing HCW of all professions with additional education about moral distress and its consequences (Heilmann et al., 2021) and setting a special focus on their experiences during the COVID-19-pandemic might be a promising starting point to decrease their moral distress (Toronto and LaRocco, 2019) and strengthen their coping capacities (Jacobs and Manfredi, 2020).

Future research in the domain should additionally identify situations, as well as risk and protective factors that lead to moral distress among different medical professions. A follow-up of our survey is in its final phase, and further assessments are planned with the aim of a longitudinal exploration. The gained knowledge could help to develop preventive evidence-based interventions targeted at the causes of moral distress in dealing with the ongoing and future pandemics.

CONCLUSION

Workers in health-related professions play an essential role in coping with the COVID-19 pandemic (Petzold et al., 2020). However, up to date, it remains unclear how to maintain their

mental health in this exceptional situation (Chen et al., 2020). Results of the present study demonstrated that moral distress is a relevant phenomenon among HCW in hospitals during the COVID-19 pandemic, regardless of whether they work at the frontline or not and requires urgent attention. As the pandemic is likely to have physical and psychological long-term effects on the population (Borges et al., 2020), we can expect that the extreme demands on our health systems and HCW will continue to exist (Frawley et al., 2020). Reducing the occurrence of moral distress and enabling staff to better cope and develop moral resilience is crucial.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because the authors cannot disclose individual level data due to ethical and legal data protection restrictions and have included group level data in the paper and tables. The dataset from this study is held securely in coded form at the Clinic for Psychosomatic Medicine (CPM) as part of the University Clinic and Medical Faculty of Bonn. While national data protection laws and ethical regulations as well as cooperation agreements prohibit the CPM from making the dataset publicly available, requests for access to anonymized or pooled data may be sent to the Data Access Committee of the CPM. Requests to access the datasets should be directed to Sabine Müller, sabine.mueller@ukbonn.de.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the Rheinische Friedrich Wilhelm University of Bonn and the Friedrich-Alexander University Erlangen-Nürnberg. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

YE, EM, FG, PB, and LJ-B designed the study. NH, YE, EM, MK-R, FG, PB, LJ-B, CA, HB, SS-S, and KW conducted the study. JNS analyzed the data and wrote this manuscript. NH and FG contributed to manuscript writing. MK-R, LJ-B, PB, CA, KW, SS-S, LR, JH, and JS provided critical revision of the manuscript for important intellectual content. All authors contributed to the article and approved the submitted version.

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Emotional Intelligence and Perceived Health Related to Expressed Compassion Fatigue: A Study in Health Sector at Regional Level

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Background: The work of health professionals often involves physical as well as psychological strain. They constantly deal with traumatic situations of pain and suffering, which destabilize the sense of well-being. Compassion fatigue is a feeling that appears in these cases and is related to other variables such as burnout or emotional drain.

Aims: The principal aim of this project was to deepen the analysis of compassion fatigue and how it could be explained through the relationship with other constructs such as emotional intelligence and perceived health.

Methods: This work followed the STROBE checklist for cross-sectional studies. In this study 1,521 nurses (M_{age} = 47.32; SD = 8.44) participated. The responses reported by the nurses were analyzed by classifying them as high or low compassion fatigue and the differences of both groups were analyzed for the variables of emotional intelligence, perceived health and quality of professional life.

Results: It was obtained significant differences for all factors except for emotional intelligence factor. A linear regression analysis showed both emotional intelligence and perceived health helped to explain (12%) compassion fatigue.

Conclusion: This study provides light on comprehending the conception of compassion fatigue. It highlights the importance of intervention programs that improve the quality of professional life.

Keywords: burnout—professional, perceived health, quality of professional life, emotional well-being, fatigue, public health

INTRODUCTION

Healthcare requires professionals to be physically, emotionally and spiritually highly dedicated (Han et al., 2018), which is heightened by caring for people who are suffering or experiencing pain (Feeley et al., 2019). The repeated contact over time by professionals in traumatic contexts increases the risk of suffering physical and emotional problems (Hemsworth et al., 2020). The professional

begins to experience anxiety, stress, and progressive wear and tear on a physical and emotional level (Kim, 2020). The consequences may be negative on their work and personal life, with the appearance of health problems (Parola et al., 2017).

The symptoms eventually developed by the healthcare provider are closely related to Compassion Fatigue (CF) syndrome (Roney and Acri, 2018). Compassion Fatigue is considered to be a phenomenon that occurs when professionals develop a diminished capacity for empathy, or compassion, as they deal daily with the discomfort or even the death of their patients (Peters, 2018). This concept is related to the secondary post-traumatic stress suffered by professionals, who in order to offer their help, experience the suffering and pain of their patients (Figley, 1995).

According to the current literature, a high percentage of health professionals end up suffering from Compassion Fatigue (Ortega-Campos et al., 2020). CF is considered one of the negative aspects of helping those who experience pain and suffering (Hemsworth et al., 2020). In contrast, as a positive aspect of helping patients is the compassion satisfaction, this is defined by a feeling of gratitude in caring for and relieving the pain of someone who is suffering (Jang et al., 2016). These constructs are measured through the Professional Quality of Life (QOL), understood as the sense of well-being that comes from the balance perceived by the individual and associated with the burden of the profession, in addition to the psychological, organizational, and relational resources that health professionals have to manage their emotional states derived from their working day (Rodarte-Cuevas et al., 2016). When measuring QoL, burnout is analyzed along with compassion fatigue and compassion satisfaction. Burnout is described as a pathological state of the "burnt-out" professional, arising from physical and psychological exhaustion due to experiences during and because of work. It has been shown that health professionals are at risk of suffering from compassion fatigue and burnout due to the characteristics of their work (Rivera-Ávila et al., 2017). In addition, the danger for the professional of suffering from any of these syndromes means that their general health is affected, taking into account that there is no evidence of a general (non-psychotic) psychiatric morbidity (Sabery et al., 2019). Most studies have emphasized the relevance of organizational factors and the appearance of syndromes such as CF (Sinclair et al., 2017) as predictive variables of the general health status observed in professionals (Turgoose and Maddox, 2017).

Notwithstanding, in the last decade, researchers have directed their focus toward those aspects of intelligence more linked to emotions and feelings (Crowne et al., 2017). They propose the idea that a person's emotional intelligence (EI) may be a better predictor of work and social efficiency (Carragher and Gormley, 2017). Emotional intelligence as a multidimensional construct is defined as the ability to understand and manage their own emotions and other people's emotions, as well as the ability to regulate and modify them (Kaya et al., 2018).

Health professionals are continually faced with psychological challenges in caring for people in critical situations (Borges et al., 2019). In particular, nursing professionals are the most exposed to direct contact with patients (Durkin et al., 2019). This is because nurses establish a relationship with patients and their families while trying to respond to a health demand (Shahar et al., 2019). When the desire to resolve this response is psychologically overwhelmed in facing suffering (de Oliveira et al., 2019) and the patient's expectation, the nurse may experience anxiety, stress, and a progressive burnout (Gentry and Shockney, 2018).

Based on recent research it is known that emotional intelligence can be considered a moderating factor in nursing practice (White and Grason, 2019), and would influence the probability of developing symptoms such as stress (Huang et al., 2019) or suffering psychosocial risks leading to syndromes such as Compassion Fatigue (Amir et al., 2019). Nevertheless, studies relating emotional intelligence to compassion fatigue and the perceived health of nursing professionals are scarce. Therefore, the aim of this research was to examine the relation between emotional intelligence, perceived health and compassion fatigue.

MATERIALS AND METHODS

Design

In this project, questionnaires were implemented in different health centers at a provincial level (Andalusia), following a cross-sectional design. The Strengthening the Reporting of Observational studies in Epidemiology was followed for the organization and structure of this investigation.

Participants

The participants for this research corresponded to 1,521 nurses. The sample is representative of the Andalusian territory, all of them work in the public sector of the Andalusian community. The subjects according to official and public data from the Andalusian government on the total number of nurses working in 2015 (N = 22,533) show that the participants in this study offer an adequate number to be considered representative at the level of a 95% confidence interval and a 3% accuracy. The criteria established for participation in this study was the condition that the job performed involved direct contact with the patient. Thus, professionals working in areas such as administration, laboratories or management were excluded from the research.

Instruments

A record of the **participants' socio-demographic** variables was made, including information on gender and age.

Professional Quality of Life

Short form of ProQOL v.IV questionnaire has a 30-item self-report instrument designed to measure positive and negative effect of helping others, who experience suffering and trauma. Developed by Stamm (2005), and adapted to Spanish by Morante Benadero et al. (2006) and has been used in healthcare professionals (Buceta et al., 2019). This instrument has 30 items, 10 items to measure each of the three subscales that measure the positive and negative effects of helping people in suffering: (1) Compassion satisfaction (α = 0, 87)—satisfaction in doing the job by providing good to others and society; (2) Burnout (α = 0. 72)—feeling of discouragement, hopelessness and that efforts at work

make no difference; and (3) Compassion fatigue (α = 0.80)—state of stress from the indirect experience of another person's trauma, constantly resuming images of trauma and trying to avoid situations that might remind one of the event. According to Galiana et al. (2017) scores higher or equal to 17 denote high compassion fatigue, medium 9–17, and low scores less than 8. Responses are recorded on a six-point Likert scale (0 = never; 1 = rarely; 2 = a few times; 3 = somewhat often; 4- often; 5 = very often).

Emotional Intelligence

Trait Meta-Mood Scale-24

The TMMS-24 (Fernandez-Berrocal et al., 2004) is a self-report test, its first English version was developed by Salovey et al. (2002). It is composed of 24 items from a 5-point Likert scale divided into three dimensions of EI: emotional perception or attention to feelings, emotional understanding or clarity, and emotional regulation or repair. Emotional attention refers to the awareness we have of our emotions, the ability to recognize our feelings and know what they mean. Emotional clarity: This refers to the ability to know and understand emotions, knowing how to distinguish between them, understanding how they evolve and integrating them into our thinking. Emotional repair: Refers to the ability to regulate and control positive and negative emotions. While high scores on clarity and repair are adequate, the same is not true of emotional attention, which can lead to hypervigilance of emotions and sensations, and consequently, hypochondriac (excessive fear and worry that some illness will be generated) can occur. Contrary to the assumption of many users of this questionnaire, the TMMS was not designed to provide an overall score, which should be taken into account when analyzing data and interpreting results derived from its application. This test consists of an internal consistency reported by its authors of α = 0.90 for perception, α = 0.90 in understanding and α = 0.86 for regulation of emotions.

General Health

General Health Questionnaire—12

The GHQ-12 is a 12-item, 4-point Likert-type scale that is frequently used as screening for psychological disorders (Goldberg and Williams, 1988; Spanish Version by Rocha et al., 2011). Respondents are asked to indicate the degree to which they have recently experienced a range of common symptoms of distress. The usual form of the GHQ score when used for case identification is the 0-0-1-1 method by Lobo and Muñoz (1996), where 0 is given for *Not at all* and *Same as usual*; and 1 is given for *More than usual*, and *Much more than usual*. Validation studies in 15 countries have found reliability results between alphas of 0.82 and 0.85 (Goldberg et al., 1997).

Procedure

This research was organized at the regional level thanks to the participation of researchers from the eight provinces that make up Andalusia, Spain. The data collection was carried out in different health centers of the Public Health Service: a total of 48 information collection points among which are hospitals, and primary care centers. For this purpose, the principal investigators of this study contacted the management teams of the different healthcare centers in the Community of Andalusia to request their approval and collaboration in the study. Once the participating centers had been confirmed, the contacts of the heads or ward managers were provided to facilitate their instruction in the application of the questionnaires. Secondly, the participants were informed about the purpose of the study and in turn about the anonymous and voluntary nature of the study. Those who decided to participate gave their informed consent in writing. The Declaration of Helsinki marked throughout the course of the research the established ethical principles that were assumed and practiced. This research project followed the current national regulations on the protection of personal data (Organic Law 3/2018 on the Protection of Personal Data and the Guarantee of Digital Rights). The estimated time for completing the tests was 15 min.

Data Analysis

Missing data were treated by a multiple imputation method. The first analysis conducted were the descriptive statistics. Secondly, the sample was analyzed for normality using the Kolmogorov-Smirnov test. According to the central limit theorem (Martínez González et al., 2020), parametric tests were carried out, albeit a number of variables did not comply with this criterion. Both parametric and non-parametric tests were convergent. Thirdly, different analyses were carried out to find out the relatedness among the diverse variables under study. In order to compare means, the Student's *t*-test was used for independent samples. To determine the statistical significance, a threshold of 95% was established. The Pearson correlation was employed for the analysis of bivariate correlations. Finally, a linear stepwise regression model was created on the basis of the least-squares method. The dependent variable was the specific dimension of PRoQoL, compassion fatigue, and the explanatory variables were the different sub-dimensions of TMMS-24 (i.e., attention, clarity, and repair) and the measure of general health. A three-step linear regression analysis was performed to analyze the predictive power of the dimensions of emotional intelligence and general health on compassion fatigue. The Durbin-Watson statistic (1.64) was calculated, with values between 1.5 and 2.5 indicating independence of the residuals; and the values of tolerance and IVF as indicators of collinearity, with values close to 1 indicating no collinearity. Regression was controlled for gender and age The goodness of fit was obtained by using the determination coefficient (R^2) and its fit version. Data treatment was performed with the statistical program SPSS V25 (IBM).

RESULTS

Descriptive Statistics

Participants in this study ranged in age from 23 to 64 years old (M_{age} = 47.32; *SD* = 8.44). From the total of 1,521 participants, 75.5% were women, of whom 69.8% were married,

and 59.5% had a stable employment situation. Most of the professionals worked in hospital environments (55%) and most of the centers were placed in city areas (89.5%). In terms of areas of work, 36.3% worked in the inpatient department, 23.6% in the critical and emergency department, 15.7% in the surgical area, 13.1% in pediatrics, and less than 12% for the support service, outpatient, mental health, palliative care, rehabilitation and others. Their most common working turns were the morning shift (32.1%) and the morning/afternoon/night shift (29%). Their average employment history was 275.36 months (*SD* = 110.42) and their average length of service was 146.81 months (*SD* = 117.52). The different descriptive statistics for each of the variables used in this study are shown in **Table 1**.

Bivariate Analyses Between the Dimensions' Object of Study

Correlation analysis (**Table 2**) showed positive associations between the three dimensions of the emotional intelligence scale, negative correlations for satisfaction in relation to burnout and fatigue, while satisfaction maintained a positive relationship with the variables of clarity and repair. Overall health showed a positive relationship with attention, burnout and fatigue and a negative correlation with clarity and repair.

Differences Between the Two Populations With High and Low Fatigue

In **Table 3** it can be seen the different means obtained for the different variables in a sample of people who present high compassion fatigue, observed means that show that attention, clarity and repair should be improved according to the instructions of the TMMS-24, the means for the dimensions of professional quality of life also show a low level and the average of general health (0.18) also reveals a low result. Also, it can be seen the different means obtained for a sample of people who present low compassion fatigue, observed means that show adequate attention, clarity and repair according to the instructions of the TMMS-24, the means for the dimensions of quality of professional life also show a high satisfaction and low burnout and fatigue; and the average of general health (0.05) the lack of detection of psychological disorders.

In addition, the differences between the means were significant with the exception of the repair variable whose *p*-value was 0.053. The group presenting high fatigue shows higher levels of attention, burnout, fatigue, and health, while the group manifesting low fatigue presents higher levels in clarity, repair, and satisfaction.

Linear Regression Analysis

Table 4 reflects the results of predicting the variables of emotional intelligence and general health, controlling for gender and age. If we look at step two, the EI variables such as attention, clarity and repair helped explain 10% of compassion fatigue. Incorporation into the health model (step three) increased the explained variance of compassion fatigue by 12%. In fact, considering all the psychological variables considered in the model, it can be seen that clarity dimension was shown to be the greatest predictor of fatigue ($\beta = -0.28$, $p < 0.001$) and attention dimension ($\beta = 0.22$, $p < 0.001$).

TABLE 1 | Descriptive statistics for the total number of participants.

Variable (instrument)	Subscales	*N*	*M*	*SD*	Skewness	Kurtosis
TMMS-24	Attention	1,521	25.02	5.45	0.076	−0.113
	Clarity	1,521	27.63	5.39	0.156	−0.207
	Repair	1,521	29.43	5.33	−0.266	0.002
ProQol-IV	Satisfaction	1,521	35.48	7.40	−0.038	−0.899
	Burnout	1,521	23.44	5.29	−0.318	0.009
	Fatigue	1,521	20.74	7.88	−0.026	−0.636
GHQ	General health	1,521	0.16	0.19	1.734	3.349

N, number of subjects; M, medium; SD, standard deviation; TMMS-24, Emotional Intelligence; ProQol-IV, Quality of professional life; GHQ, General Health.

TABLE 2 | Bivariate correlations between the different variables under study.

Variables	1	2	3	4	5	6	7
1. Attention	–	0.29***	0.18***	0.03	0.07**	0.19***	0.10***
2. Clarity		–	0.54***	0.23***	−0.24***	−0.17***	−0.15***
3. Repair			–	0.13***	−0.17***	−0.30	−0.19***
4. Satisfaction				–	−0.42***	−0.49***	−0.03
5. Burnout					–	0.58***	0.31***
6. Fatigue						–	0.25***
7. General health							–

****p < 0.001; **p < 0.01.*

TABLE 3 | Student's *t*-test.

		M (*SD*)	*t*	*p*-value
Attention	High fatigue	25.48 (5.09)	5.47	0.000
	Low fatigue	22.24 (5.72)		
Clarity	High fatigue	26.94 (4.91)	−5.56	0.000
	Low fatigue	30.39 (6.01)		
Repair	High fatigue	29.22 (4.90)	−1.96	0.053
	Low fatigue	30.50 (6.36)		
Satisfaction	High fatigue	33.07 (6.69)	−12.93	0.000
	Low fatigue	42.11 (6.55)		
Burnout	High fatigue	25.15 (4.47)	17.43	0.000
	Low fatigue	16.88 (5.12)		
Fatigue	High fatigue	25.03 (5.27)	80.22	0.000
	Low fatigue	6.26 (1.67)		
General Health	High fatigue	0.18 (0.19)	10.26	0.000
	Low fatigue	0.05 (0.01)		

M, mean; SD, standard deviation; t, Student's t-test. Significance level p < 0.05.

TABLE 4 | Linear regression analysis predicting compassionate fatigue from gender, age, emotional intelligence, and general health.

	F	*B* (β)	*SE B*	R^2	*t*	Tolerance	FIV
Step 1	3.72*			0.00	24.72		
Age		0.00 (0.06*)	0.00			0.996	1.004
Gender		−0.05 (−0.04)	0.04			0.996	1.004
Step 2	32.85***			0.10	15.94		
Age		0.01 (0.08**)	0.00			0.982	1.018
Gender		−0.04 (−0.03)	0.04			0.993	1.007
Attention		0.03 (0.25***)	0.00			0.895	1.117
Clarity		−0.03 (−0.30***)	0.00			0.895	1.117
Repair		0.01 (0.07*)	0.00			0.913	1.093
Step 3	34.41***			0.12	14.75		
Age		0.01 (0.08**)	0.00			0.982	1.018
Gender		−0.03 (−0.02)	0.04			0.988	1.012
Attention		0.03 (0.22***)	0.00			0.873	1.122
Clarity		−0.03 (−0.28***)	0.00			0.883	1.119
Repair		0.01 (0.10**)	0.00			0.899	1.115
General health		0.51 (0.16***)	0.08			0.930	1.075

*F, Fisher-Snedecor test; B, non-standardized regression coefficients; β, standardized regression coefficients; SE B, standard error of B; R^2, variance explained; t, Student's t-test; *p < 0.05; ** p < 0.01; ***p < 0.001.*

DISCUSSION

The aim of this research was to analyze the influence of emotional intelligence and perceived health on compassion fatigue. It has been observed that the three components of emotional intelligence (i.e., attention, clarity, and repair), along with perceived health influence compassion fatigue. Nurses with high levels of compassion fatigue use emotional care as a mechanism of emotional management and have poorer perceived health. However, participants with low levels of compassion fatigue experience emotional clarity and repair, resulting in better perceived health.

In this research the levels of compassion fatigue in nursing professionals are high, much higher than the average score obtained by Stamm (2005) in different groups. This result is consistent with other studies that have determined that nurses have high levels of compassion fatigue. The prevalence is even higher in services such as critical care, emergency medicine and oncology (Sacco et al., 2015; Ortega-Campos et al., 2020). Thus, among professionals working in services exposed to traumatic situations, pain and suffering (Durkin et al., 2019). On the basis of the fact that 55% of the nursing professionals in this study work in the hospital environment, this data could be aligned with these studies.

Emotional intelligence is a factor that may influence compassion fatigue, as found in this study, being a clear predictor of compassion fatigue, with the dimensions of clarity and attention being the best predictors. According

to some studies, emotional intelligence is related to the management of job stress in nursing professionals (Nagel et al., 2016). Thus, it has been observed to improve emotional drain and burnout in health professionals (Al Barmawi et al., 2019). Furthermore, it is considered a moderating factor that could improve job satisfaction among nurses (Weng et al., 2011). Studies examining the role of emotional intelligence on compassion fatigue are scarce in health professionals. However, it has been observed that emotional intelligence is protective in the development of compassion fatigue (Amir et al., 2019). Compassion is the ability of human beings to respond to suffering, which means to understand the suffering of others and oneself and to respond with the actions necessary to alleviate it, which impacts on emotional satisfaction and well-being (Durkin et al., 2019). In order to provide adequate care, it is helpful to be compassionate with oneself, and professionals need to feel emotionally secure with themselves (Heffernan et al., 2010). With repeated exposure to painful or traumatic experiences, health professionals become emotionally numb, flooded and self-protective, and enter into a dysfunctional emotional loop. This is why the high compassion care nurses in this research are focused on emotional care and are not able to understand, or regulate, emotional states as they are in those nurses who have low compassion care fatigue. In Amir et al. (2019) research, mental health professionals who understood their emotions and were able to manage them decreased the likelihood of experiencing compassion fatigue.

In addition, compassion fatigue leads to nurses having a poorer perception of their overall health and health-related quality of life (Ruiz-Fernández et al., 2020). When the desire to alleviate suffering exceeds the possibility of being able to carry it out, it implies a psychological overstrain that culminates in anxiety, stress, and emotional burnout (Gentry and Shockney, 2018; de Oliveira et al., 2019). This is why nursing professionals with high levels of compassion fatigue in our research report a perceived poorer health.

The limitations of this study must be addressed. On the one hand, although it is a representative sample of the professionals who currently work in the Andalusian Public Health System (Spain), it is a mostly homogeneous sample because the participants were mostly middle-aged nurses, with a greater proportion of women and with extensive work experience. Furthermore, it is a transversal study, which allows the study of the relationships between the variables but not the establishment of cause and effect relationships between them. On the other hand, it is necessary to mention the risk of bias that is present due to the convenience sampling when filling out the questionnaires. It would be interesting for a better understanding of this topic to extend the study to a larger sample and to include new constructs related to compassion fatigue, such as clinical relevance and former experiences and empathy ability (Gleichgerrcht and Decety, 2013; Hunsaker et al., 2015).

CONCLUSION

This study has a number of implications for health professionals and health services. Firstly, it has been observed that levels of compassion fatigue in nurses are very high. Second, that emotional intelligence and perceived health is highly related to compassion fatigue. Nurses with high levels of compassion fatigue have poorer perceived health and pay more attention to their emotions. The opposite is the case for professionals who have low compassion fatigue, who have better perceived health and who are able to understand and regulate emotional states. Therefore, health systems should offer intervention programs focused on cultivating or training compassion that include emotional regulation. Professionals who care for patients are exposed to stressful and traumatic situations. It cannot be overlooked that contact with suffering has certain psychological and physical implications, culminating in burnout and the emergence of certain syndromes in health professionals such as compassion fatigue. Research determines that cultivating compassion decreases the emotional cost of health professionals (Delaney, 2018). As an essential element, health professionals must be able to identify, understand and manage their own emotions and treat themselves with kindness through the exercise of self-compassion. In this way, emotional intelligence can help decrease the level of compassion fatigue and therefore protect mental health and emotional well-being. Therefore, it could be useful to introduce into nurses' training programs the necessary content on coping, managing emotions or cultivating compassion and self-compassion that would allow nurses, from the beginning of their professional careers, to be able to effectively deal with the continuous contact with suffering.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Research Ethics Committee of Almería Centro (CEI-27 September 2017), which was extended to the rest of Andalusia as a single authorization. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MR and ÁO-G designed the research, to which the rest of the authors contributed (M-JL, JR-P, RO-A, OI-M, and SR). M-JL

contributed to the data analysis. MR, ÁO-G, and M-JL wrote the first version of the manuscript, which was critically reviewed by all signatories, who approved the final version. All authors contributed to the interpretation of the results and critical review of the manuscript, and have read and agreed to the published version of the manuscript.

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Risk and Protective Factors for the Mental Wellbeing of Deployed Healthcare Workers During the COVID-19 Pandemic in China: A Qualitative Study

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Background: Though many literatures documented burnout and occupational hazard among healthcare workers and frontliners during pandemic, not many adopted a systemic approach to look at the resilience among this population. Another under-studied population was the large numbers of global healthcare workers who have been deployed to tackle the crisis of COVID-19 pandemic in the less resourceful regions. We investigated both the mental wellbeing risk and protective factors of a deployed healthcare workers (DHWs) team in Wuhan, the epicenter of the virus outbreak during 2020.

Method: A consensual qualitative research approach was adopted with 25 DHWs from H province through semi-structured interviews after 3 months of deployment period.

Results: Inductive-Deductive thematic coding with self-reflexivity revealed multi-layered risk and protective factors for DHWs at the COVID-19 frontline. Intensive working schedule and high-risk environment, compounded by unfamiliar work setting and colleagues; local culture adaptation; isolation from usual social circle, strained the DHWs. Meanwhile, reciprocal relationships and "familial relatedness" with patients and colleagues; organizational support to the DHWs and their immediate families back home, formed crucial wellbeing resources in sustaining the DHWs. The dynamic and dialectical relationships between risk and protective factors embedded in multiple layers of relational contexts could be mapped into a socio-ecological framework.

Conclusion: Our multidisciplinary study highlights the unique social connectedness between patient-DHWs; within DHWs team; between deploying hospital and DHWs; and between DHWs and the local partners. We recommend five organizational strategies as mental health promotion and capacity building for DHWs to build a resilient network and prevent burnout at the disaster frontline.

Keywords: COVID-19 pandemic, deployed healthcare workers, mental health, risk and protective factors, qualitative study, resilience, system

INTRODUCTION

The COVID-19 pandemic is an unprecedented healthcare crisis worldwide that triggered series of disaster responses. One year and counting at the frontline, many healthcare workers (HWs) and first responders were exhausted due to the heavy psychological and physical tolls (Renwick, 2020), with many at risk of mental disorder (Dutheil et al., 2020). Sadly, some have resorted to suicide due to occupational hazard and moral injury (Cheney, 2020; Elwafaii, 2020; Watkins et al., 2020).

The pandemic's scale and duration entail health workforce shortages (Rasmussen et al., 2020). In response, some countries resort to deploying medical teams, both domestically and internationally, for much-needed relief. During the peak of the epidemic in Wuhan, China, in February–April 2020, 42,000 Chinese deployed healthcare workers (DHWs) from across China were sent to the frontline in Hubei province to combat the outbreak (Liu Q. et al., 2020). Unlike other countries where the healthcare system is privatized and capitalized, China operates on a centralized healthcare system, where the central government plays a vital role in coordinating and integrating human resources nationally. These resources could be mobilized based on the needs of other provinces, especially in times of disaster (Dong and Phillips, 2008)Their participation was crucial to the subsequent control of the outbreak and ended the 76-day lockdown of the city (Zhang L. et al., 2020).

The involvement of DHWs was common in previous healthcare disaster, including the severe acute respiratory syndrome (SARS) outbreak in 2003 (Posid et al., 2005) and the Ebola outbreak in 2014 (Draper and Jenkins, 2017). Besides disease control, DHWs play an imminent role in providing immediate assistance during natural disasters, outbreaks, and emergencies (Europe WROF., 2020). Foreseeing increased demand for emergency medical needs during the current COVID-19 pandemic, the WHO has been establishing DHW teams globally, particularly in areas where the pandemic was severe with depleted health resources, such as Italy, Ethiopia, Azerbaijan, Armenia and Kyrgyzstan (European Commission, 2020; Europe WROF., 2020).

Existing research on frontline HWs' wellbeing has shown that they are highly susceptible to both short and long-term psychological consequences (Kang et al., 2020a; Lai et al., 2020; Li et al., 2020), with the reasons ranging from fear of infection, infections and deaths among HWs, ineffective public health policy, shortages of Personal Protective Equipment (PPE) and medical resources, stigma from the public and social circles, down to personal characters and preferences (Bozdag and Ergun, 2020; Chew et al., 2020; El-Hage et al., 2020; Kang et al., 2020a; Nguyen et al., 2020; Spoorthy et al., 2020). There were also protective factors found to enhance resilience of HWs during this time, such as recognition and appreciation by the public, team support, personal coping abilities, and a strong sense of duty and identity as HWs (Cai et al., 2020; Kang et al., 2020a; Liu Y. E. et al., 2020; Zhang Y. et al., 2020).

Although existing studies have investigated mental wellbeing among HWs in the COVID-19 pandemic (Liu Y. E. et al., 2020), at the time of our writing no study has surveyed the mental wellbeing of DHWs at the initial stage of the outbreak, when little was known about the virus. Studies on humanitarian workers in previous disaster relief and emergency responses revealed unique stressors such as adjusting to a new workplace and team in an emergency mode, language barriers with patients and local staff, cultural differences, limited contact with family, isolation from usual support circles, and post-deployment challenges such as transition back to normal life (Bakhshi et al., 2014; Brooks et al., 2015; Rubin et al., 2016). Yet there is no evidence to show that DHWs would face similar challenges, and how to curb the stressors of their challenges.

We therefore aim to investigate the mental wellbeing of DHWs by identifying the mental health risk and protective factors from a socio-ecological perspective. We gained agreement from an early deployment team from a hospital (from H province) to participate in this study in the early phase of the COVID-19 outbreak. Our research questions are twofold: (1) What are the risk factors for these DHW's well-being during the whole process of deployment? (2) What are the protective factors for these DHW's well-being during the whole process of deployment? With improved understanding, the collected evidence may better inform methods of burnout prevention for DHWs amid the demanding environment of acute disasters such as COVID-19 pandemic and promote occupational health for the individuals involved.

MATERIALS AND METHODS

Qualitative research methods were employed in this study since we were seeking to explore and understand the first-hand experience of the COVID-19 DHWs team at the beginning of COVID-19 outbreak. Due to the rarity and representativeness of such a population, qualitative study method was adopted for in-depth exploration. The one-to-one interview procedure in data collection allowed the participants to share extensively about their frontline experience and speak for themselves using their

own words, rather than being confined to the limited options of responses typically found in quantitative research. This in turn offered a more comprehensive picture of the participants' voices and perspectives through multilevel themes and domains (Braun and Clarke, 2019). We reported the study in accordance with the Combined Criteria for Reporting Qualitative Studies (COREQ) checklist, which is commonly used in the reporting of qualitative research to ensure standardized quality. The checklist has 32-item covering 3 categories–research team and reflexibility; study design; data analysis and reporting, to aid in explicit and comprehensive reporting of qualitative research among the authors (Tong et al., 2007).

Study Participants

The participants' pool came from a deployment team from H hospital (in H province), which responded to the COVID-19 outbreak in Wuhan from late January–March 2020. The interviews were conducted in April 2020, during the team's 2-week quarantine post-deployment. Composed of doctors and nurses, the H team was among the first responders to arrive in Wuhan in late January. Shortly after their arrival at the repurposed COVID-19 hospital, they set up three COVID wards alongside other deployment teams and took over patient care from their local counterparts who ran out of capacity. Prior to commencement of the interviews, written information about the study as well as consent forms were distributed electronically to all team members. Twenty-five out of 29 team members consented to be interviewed (86%), four declined due to personal reasons. Of the 25 participants, 8 were doctors and 17 were nurses. All were certified health professionals, consisting of 14 females and 11 males. More than half (N = 13) were in the age range 31–40 years old. The majority (N = 23) held a bachelor's degree and above. Their healthcare working experience ranged from one–37 years. The interviewee with the longest working years in healthcare (37 years) was the chief team leader. Eighteen interviewees were married, whereas seven were single. Most (N = 18) lived together with their families (**Table 1**). The sample size of 25 also allowed for data saturation typical for a qualitative study especially that all of interviewees were sharing common experiences at frontline (Grady, 1998). In fact, thematic saturation was reached around the 10th interview in our coding study.

Study Design and Procedure

The study was approved by the Ethics Committee of XXX University [MASKED FOR REVIEW]. All participants were informed of the purpose of the study and consented in writing to participate.

We conducted one-to-one semi-structured interviews to explore the participants' experiences (Tong et al., 2007). Seven open-ended questions were drafted by the research team to probe into the in-depth live experiences of the DHWs during different phases of deployment. Then the interview questions were piloted with a member of the target group, whose roles at the frontline included patient care, training of team members and liaising with the local hospital, therefore able to provide a relatively comprehensive picture of the group's frontline experience. While the number of interview questions maintained after the pilot interview, some probes were omitted such as those detailed questions concerning work roster and length of shift since they were standardized among team members (See **Table 2**).

Due to the nature of the pandemic, all interviews were conducted over the telephone, lasting from 45 min to 2 h. The interview team included the first author, a senior researcher and five postgraduate students. All interviewers were fluent in Mandarin and conducted the interviews in Mandarin. Interviewers were briefed and trained to conduct the interview protocol and the data collection process. Written consent was gained from all the participants, including audio recording. Researcher reflexivity was utilized through interview memos. All audio recordings were transcribed verbatim into Chinese by postgraduate students. The chance of cross-checking their own interview transcripts was offered to all participants but only three responded (Tong et al., 2007). It was a voluntary participation, hence not all transcripts were being cross-checked by the participants themselves for accuracy. Comments and/or corrections made by them were mainly concerning information that was not captured clearly due to the poor quality of recording at the time of the interviews, such as the names of the medications used to treat patients.

Qualitative Coding Procedures

A Consensual Qualitative Research (CQR) approach (Hill et al., 2005) was adopted for the study, in conjunction with deductive-inductive Thematic Analysis (Braun and Clarke, 2006). CQR is an approach ideally used for examining infrequently occurring phenomena and exploring inner experiences, beliefs, attitudes etc., but from a more objective collective stance. It served the purpose of our study well since we were exploring inner experiences of the DHWs confronting an unknown disease in a deadly outbreak. Expanding from the Thematic Analysis (TA), CQR allows for collective coding across every step of coding procedure to ensure certain objectivity among the research team. The consensus process allows for integration of multiple perspectives to depict a closest to the actual truth picture. In our study, we incorporated CQR with the deductive-inductive TA which starts with an open-coding process, and then later derives its themes and domains from the narrative across all transcripts for consistency. The incorporation of CQR into classical TA increased the rigorisity of our methodology as it minimizes the blind spot and subjectivity of a single coder through a team discussion and decision-making process, though it is more time-consuming.

The coding team included two independent coders and two internal auditors. Both coders have conducted similar qualitative studies in China and are trained in the mental health discipline. Both are Chinese citizens with a good grasp of Chinese culture and language. To avoid loss of nuance, the coding was done using the original Chinese transcripts. Microsoft Excel online files were used for team coding and analysis since it allows for the team members to comment and cross-checking with each other's coded transcripts and is more convenient for codebook merging than some coding software which only allows for single coder.

TABLE 1 | Demographic characteristics of 25 study interviewees from the medical deployment team.

Interviewee ID.	Male/Female	Age	Education Level	Profession	Healthcare experience (years)	Marital status	Living together with family
C01	Male	31–40	Masters	Doctor	7	Married	Yes
C02	Female	51–60	Masters	Nurse	37	Married	Yes
C03	Female	31–40	Bachelors	Nurse	14	Married	Yes
C04	Female	21–30	Bachelors	Nurse	10	Single	No
C05	Female	41–50	Doctorate	Doctor	20	Married	Yes
C06	Male	21–30	Diploma	Nurse	1	Single	No
C07	Male	21–30	Bachelors	Nurse	6	Married	Yes
C08	Male	21–30	Bachelors	Nurse	6	Single	No
C09	Female	31–40	Bachelors	Nurse	20	Married	Yes
C10	Female	31–40	Masters	Doctor	9	Married	Yes
C11	Male	31–40	Masters	Doctor	6	Married	Yes
C12	Female	31–40	Bachelors	Nurse	10	Single	Yes
C13	Female	31–40	Masters	Nurse	5	Married	Yes
C14	Male	21–30	Bachelors	Nurse	5	Married	Yes
C15	Female	21–30	Bachelors	Nurse	9	Single	Yes
C16	Female	41–50	Masters	Doctor	21	Married	Yes
C17	Male	41–50	Masters	Doctor	18	Married	Yes
C18	Male	31–40	Masters	Doctor	Not reported	Married	No
C19	Female	31–40	Bachelors	Nurse	14	Married	Yes
C20	Female	21–30	Bachelors	Nurse	5	Single	No
C21	Male	31–40	Masters	Doctor	12	Married	Yes
C22	Male	31–40	Bachelors	Nurse	14	Married	No
C23	Female	31–40	Bachelors	Nurse	9	Married	Yes
C24	Male	21–30	Diploma	Nurse	3	Single	No
C25	Female	31–40	Bachelors	Nurse	10	Married	Yes

Figure 1 illustrates the six phases of data analysis for the current study. The two coders first started with data familiarization. Next, they proceeded to systematically code the anonymized transcripts for the initial first-level codes. Then, they met and reviewed each other's work to achieve consensus before further evaluation by the first auditor (the first author); the three were then joined by a second auditor (the second author) with extensive research experience to resolve any remaining discrepancies. In the third phase, around 2,000 first-level codes were combined into subthemes by the coders and audited by the auditors; this process was repeated to generate themes; themes were further collated into domains after the team discussion and reaching consensus. In the fourth phase, domains and themes were refined and defined by the authors. Codebooks were then created to ensure consistency across the whole data set through deductive coding process. In the fifth phase, numbers and percentages of domains and themes appearing among the 25 cases were calculated. Finally, major domains and themes were translated and presented in percentage ranking according to the research questions. Any discrepancies along the process were resolved by continuous discussion between the coders and auditors until a consensus was reached. In the process, they continually referred to the transcriptions and recordings of the interviews, to ensure that all members had correctly understood the participants' words against the background.

Lastly, translation of the Thematic tables and quotations from Chinese into English was done by the first author, an accredited English and Chinese translator. The translation was examined for accuracy by the second author, who is a clinical psychologist and senior lecturer in Psychology and a fluent speaker of both languages.

TABLE 2 | Interview protocol.

(1) Please describe your daily work at the frontline.

(2) Were there any difference between the early and later stages of deployment? (Probe: how was the deployment compared to your work back at the H hospital?)

(3) Please share about your interpersonal relationship and interaction during deployment? (Probe: Family/Team members/Patients)

(4) What were the emotional impacts brought about by the deployment?

(5) How did you manage emotional impacts? (Probe: were HWs provided formal psychosocial support while at the frontline?)

(6) Coming back from the frontline, how have you helped yourself with transitioning back to pre-deployment work and life? (Probes: What do you think others (family members, friends, colleagues) could do to help you transition back to pre-deployment work and life? What is your view on the HWs being called "COVID-19 frontline heroes"?)

(7) What was your greatest gain from the deployment?

RESULTS

Risk Factors for Deployed Healthcare Workers

Thematic analysis revealed risk factors across seven domains, with major and minor themes falling under it (See **Table 3**): working environment, clinical ward interactions,

TABLE 3 | List of domains, themes and subthemes of risk factors for the well-being of the 25 interviewees.

Domains	Themes	Frequency (%)	Subthemes
Working environment		25 (100)	
	Inadequate frontline resources	24 (96)	Shortages of medical supplies in the early stage
			Hospital bed shortages
			Inadequate professional mental health support
			Inadequate logistical arrangements
	PPEs related problems	24 (96)	Adverse physical effects from wearing PPEs
			Inconvenience at work due to wearing PPEs
			No guarantee of PPEs quality
			PPE overuse
	High work demands	21 (84)	Lack of adequate rest
			Go beyond the physical limit
			High work intensity
			Unfamiliar work settings
			Multiple roles (beyond medical care)
			Being in the leadership role
	High risk of infection	21 (84)	High rate of virus transmission
			Lack of knowledge about the virus (at the early stage)
			Close patients contact
			Other HWs being infected
			Insufficient protection
			Infectious surroundings
			Risk of team members transmission
	Suppressive frontline atmosphere	16 (64)	Suppressive atmosphere at the hospital
			Suppressive atmosphere in the epicenter (Wuhan)
			Intense situation
			Rumors and fake news
Clinical ward interactions		23 (92)	
	Negative impacts from the patients	20 (80)	Affected by the patients' negative emotions
			Negative interaction with the patient
			Uncooperative patients
	Poor prognosis of patients	19 (76)	Deaths of patients
			Critical conditions of patients
			High fatality rate
National/organizational policies		23 (92)	
	Inadequate workplace pandemic control mechanism	15 (60)	Lack of transparency about the frontline situation
			Ambiguity in the length of deployment
	Inadequate national pandemic control effort	15 (60)	Inconsistent information about the virus outbreak
			The abruptness of the deployment
			Ineffective local government disease control
	Uncertainties in treatment protocols from the government	10 (40)	No cure against the virus
			Uncertain treatment protocols
Individual		18 (72)	
	Personal characteristics	15 (60)	Mental burden
			Lack of relevant working experiences
	Custom adjustment difficulties	13 (52)	Language barriers
			Not used to local food
			Mistrust toward professional counselors
			Missing family during important festival
Social		14 (56)	
	Family burdens	14 (56)	Concerns for family members
			Family members not understanding
			Unable to be with the families
			Incidents occurred with family members
Team		9 (36)	
	Team norming process	9 (36)	Lack of communication between team members in the early stage
			Inability to share their fears
			Unfamiliar with other team members
			Lack of understanding from the leaders
Post-deployment risk-factors		9 (36)	
	Individual challenges	9 (36)	Adapting to the new norm of living
			Re-connecting with family and friend
			Concerned with reintegration into pre-deployment work
			Isolation due to Quarantine
			Pressure of "heroism", "I am not a hero"

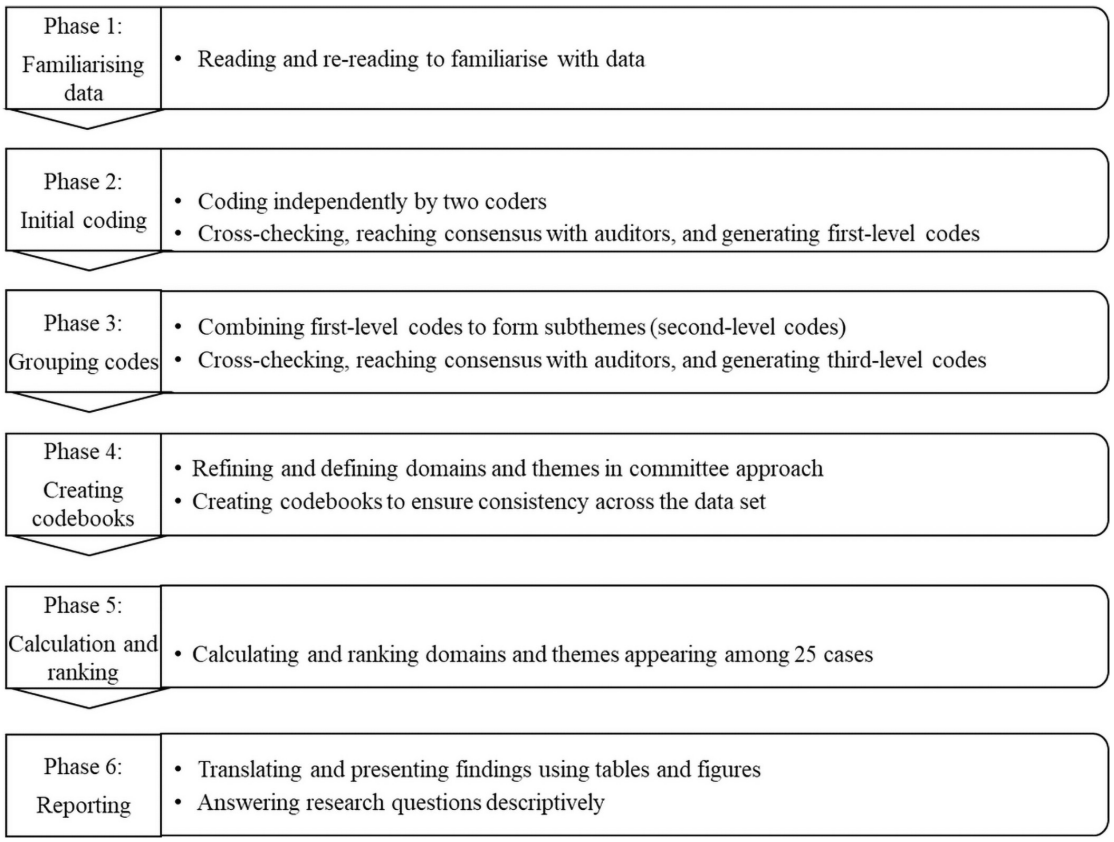

FIGURE 1 | Six phases of qualitative coding.

national/organizational policies, individual, social, team and post-deployment adjustment.

Working Environment

All interviewees reported the frontline working environment to be challenging during deployment. Resources were scarce especially in their early stage of deployment. When the team first arrived in Wuhan, the repurposed COVID-19 hospital was ill-equipped, lacking essential medical equipment such as ventilators. One interviewee reported that: "We could hardly find any of [the common medical equipment], only a few non-invasive ventilators, which were inadequate for critical care and resuscitation. . .the environment was not what we expected at all" (C07).

Besides lacking medical equipment, hospital capacity was also overloaded. There were more than 700 patients in the outpatient department at the time of the team's arrival. Although three COVID wards with a total of 111 beds capacity were established within days, it was nowhere near meeting the demand: "There were hundreds of accumulated patients at the outpatients and emergency departments [where we were stationed] . . .due to shortages of hospital beds" (C21).

Some interviewees said that if professional mental health support were provided, they could have coped better at the early stage when the situation was dire. A few reported improper rests when they had to stay all night at the hospital despite on 4-h shifts. Initially, transportation was only available in the morning to ferry all night shift staff back to the hotel. More ferrying service was later added to address this issue.

The infectious nature of COVID-19 made it imperative for all HWs to be protected with PPE. However, before the pandemic, PPE was rarely used by these DHWs. None of them, except for two doctors, had previous experience using PPE. Hence it was common to find that almost all interviewees reported PPE-related problems as one of their work stressors. Most interviewees (N = 22) reported having to cope with adverse physical effects from wearing PPE: "[The goggles] fogged up easily. . .there was also a choking odor coming from the disinfected masks, causing discomfort in my throat. . .[the masks] were too tight. . .my eyes were itchy" (C01).

It was also problematic for the interviewees to work in multiple layers of PPE: "We were working in heavy and bulky PPE. . .daily tasks as simple as reaching out for things became inconvenient" (C07). Some interviewees were concerned with the quality of donated PPE: "The public donated PPE out of kindness. . .not knowing that many of the PPE were not meeting the standards" (C02).

Twenty-one interviewees reported being challenged by the intense and demanding frontline work. The impact was typically

felt at the later stage: they were physically and mentally exhausted from working for 2 months consecutively at the frontline.

We worked without a day off. . .after around 1.5 months I was physically exhausted, mentally I wanted a break too. But we were aware of the large number of patients. We had no choice; there weren't any people to replace us, (and we just) couldn't cease admitting and treating patients. (C07).

Some of them struggled to adjust to the frontline working environment in the beginning. Some were juggling multiple roles and tasks: "The hospital, the environment and everything else were new and unfamiliar to us. We didn't even know the whereabouts of the treatment equipment" (C03).

The high rate of virus transmission, lack of knowledge about the virus (at the early stage), close patient contact, infections of other HWs, insufficient protection, infectious surroundings and risk of team members transmission all contributed to the anxiety of the interviewees ($N = 21$).

Witnessing other HWs being infected put them on edge. One interviewee commented, "We are ordinary humans. . .with the same risk of infection [as those infected]. We were neither in armor nor impenetrable" (C21). Interviewees also reported the psychological stress of having to treat other HWs while fearing for their own safety.

Some interviewees were caught off-guard by the suppressive frontline atmosphere. They described Wuhan as a "haunted city" and the wards "gloomy." Initially, verbal communication between the team members was suppressed, and they were hesitant to share negative emotion at work.

Clinical Ward Interactions

Twenty-three interviewees described being negatively impacted by the patients in the wards, predominantly in the early stage. Among the stressors was potential patient's aggression against HWs.

[Prior to arrival] we heard that there were emotionally unstable [patients] and [they] would probably assault the HWs. Later [in our COVID hospital]. . .a doctor's PPE was ripped off by a patient's family, but the patient said s/he couldn't recall the incident. That was why we were fearful when entering the wards. (C18)

In the early stage, due to the lack of capacity, only critically ill patients were admitted. Their prognoses were poor. Some interviewees were shocked by the speed at which the patients were declining and dying.

A patient seemed fine when I talked to him at noon. . .then he passed away that very night, I could hardly believe nor accept it; [another nurse] brought her patient oranges [the day after they had spoken] only to find the patient already passed away. (C02).

National/Organizational Policies

Almost all interviewees ($N = 23$) reported anxiety due to unclear national and organizational pandemic control policies. At the hospital level, there seemed to be a lack of transparency about the frontline situation. The team departed to the Wuhan frontline with minimal information briefed: "We had no idea if we were going to a hospital or a quarantine center. Neither did we know about the [working] environment, the material supplies, nor personal protection measures" (C03).

Ambiguity in the length of deployment had also caused unease among the team members.

We had no idea when the epidemic would end and when we could return home. We felt at a loss and hopeless about the future. . .toward the end, it was the extended period of exhaustion which had possibly caused severe psychological problems. (C25).

Due to the top-down national policy, the abruptness of the deployment was an issue for some of the interviewees. The team arrived in Wuhan within 24 h of the expression of interest for deployment. Some of them did not feel prepared for the deployment, both physically and mentally.

We received confirmation of enlistment on the first evening of Chinese New Year at 10:30 pm. The next day at 7:00 pm, we were already in Wuhan. Everything happened in less than 24 h; we did not have enough time to pack our stuff and prepare ourselves mentally. (C17).

There were also discrepancies between what they heard from the news or social media and what they witnessed with their own eyes. A few were upset by the way the local government handled the disease control: "I was thinking about Dr. Li Wenliang, the whistle-blower. When he raised the alarm about a possible coronavirus outbreak, not only did the government give no attention, they warned him [to stop spreading rumors]. I was quite disturbed (C19)."

Treatment planning was a challenge in the early stage of deployment. The interviewees were needing to catch up with the constantly evolving treatment plans implemented by the government. Moreover, they needed to adapt the rather passive treatment plans to more proactive ones in order to reduce the fatality rate: "To provide treatment references and specifications, the government has been constantly updating the treatment plans. Those were, however, too passive if followed strictly. In order to bring down the death rate. . .we had to improvise. . ." (C16).

Individual Factors

Eighteen interviewees reported stressors at a more personal level. Some interviewees reported personal characteristics that were prone to anxiety, "Sometimes when being alone, I would ruminate about random things" (C06). Some showed a lack of confidence due to their lack of relevant working experiences, "I have never involved in infectious disease medical relief work" (C04).

Unlike the local HWs, the deployed interviewees faced the added challenge of adapting to local customs, with the most significant obstacle being language barriers.

Despite us coming from a neighboring province, there were communication barriers, particularly with the elderly patients, who spoke only local dialects, which we couldn't understand. . .In addition, we were all covered up in PPE which caused difficulty in hearing. . .worst still, some patients were wearing oxygen mask. . .All things added up, communication was no doubt a huge problem. (C19).

Some interviewees were having trouble adapting to the local food, which they found rather greasy and oily.

Social Relationships

Fourteen interviewees carried family burdens while at the frontline. They worried about the health and safety of their family members. Some were upset when their family members failed to show understanding. Some felt guilty that they could not be with family members, especially those with elderly parents and young children.

For one, most of us are at an age where our parents are aging, and they relied on us for caregiving; then there are those team members with young children too. . . We left them at a time when they needed us most. (C15).

One interviewee had to suppress the grief of losing her mother just before the team's deployment, while another was distressed when his elderly father broke his leg while he was at the frontline.

Teamwork

Facing tremendous stress and worry, nine interviewees reported that they could not gain much support from their team members, mainly at early deployment when team members were yet to know each other: "Even though we are from the same hospital, many of us did not know each other since we are from different departments" (C17).

Post-deployment Adjustment

Nine interviewees experienced post-deployment adjustment difficulties. Retreating from the strenuous frontline to the quiet quarantine hotel, an interviewee reported, "All of a sudden I went from being extremely busy to having not much to do. I felt a bit anxious" (C14), some worried about reconnecting with family and friends after their frontline experience; having spent 2 months away, some concerned with re-entering into the pre-deployment work environment; one interviewee resisted being addressed as a "hero."

Protective Factors for Deployed Healthcare Workers

From the thematic analysis, eight domains of protective factors emerged with major and minor themes falling under it (**Table 4**): clinical ward interactions, working environment, team, individual, national/organizational policies, social support system, cultural and national resources as well as post-deployment self-care.

Clinical Ward Interactions

All 25 interviewees found interactions with patients and local HWs helpful in boosting their work spirit. They recounted their positive interaction with patients with a sense of fondness, "The reciprocity between the patients and us. . .could be likened to the family bonding between parents and children" (C03). Apart from that, care from the patients had also touched the interviewees.

The patients were having lunch when we went in. Instantly they gestured for us not to come closer until they put on their masks. They said: "The last thing we want is to pass the virus to you." I was deeply touched. (C07).

Another critical support for the interviewees came from the local HWs partners. Their cooperation, good morale (after gaining some respite), and appreciation toward DHWs helped reducing stress for some interviewees (N = 12): "We had a very good relationship with the Wuhan hospital. We worked well together. . .. I felt at home" (C09).

Working Environment

All but one interviewee (N = 24) appreciated the reasonable working arrangement, particularly the adequate logistics arrangement: "There were designated buses to commute us to and from work. . .if we missed mealtimes due to our shifts, there were packed meals ready for us" (C24).

The provision of orientation training, albeit brief, had helped better prepare the interviewees for their frontline task. Pre-deployment tasks delegation and scientific work management were also reported to lessen stress.

Many interviewees (N = 20) found that work-life balance had helped sustained them at the frontline. There was an emphasis on the team's physical health and reasonable work schedule; the deploying hospital provided mental health support *via* Wechat (a Chinese social media tool), and they were allowed time for respite and recuperation: "There were outdoor space and sports equipment available to us" (C25).

Team Level

All interviewees reported organizational support as crucial to their wellbeing. They were appreciative of the teamwork and emotional support, despite coming from different departments of their deploying hospital: "We weren't calculative at workloads. . .we helped each other out. . .we were comrades, great support for each other" (C23).

An interviewee (C18) recounted an incident when a doctor stepped in to help when her fogged-up goggles obscured her vision resulting in difficulty dispensing the medication. He said to her: "let me be your eyes." Little gestures from teammates like this provided emotional support and companionship.

Besides work collaboration, the team's cohesion, professionalism, and unified spirit were all reported to contribute to the team's wellbeing positively. Many have unanimously spoken: "[Despite] coming from different departments of the hospital, we were one very united team" (C08); "We took our work seriously and provided attentive care. All patients were treated equally, there was no verbal discontentment. None of us were impatient, showing dislike, nor reluctant to carry out tasks" (C02).

Also, zero infection within the team helped to reduce their anxiety while working together, ". . .even though [the virus] is highly contagious, with proper protection none of us showed any symptoms of infection. . ." (C21).

Individual Factors

Five individual protective factors were identified across all interviewees: personal adaptiveness, personal physical protection, previous working experience, professionalism and personal characteristics. These personal abilities and beliefs helped to build resilience in stressful environments.

Those with previous crisis response experience seemed more prepared, "The rapid response was from years of accumulated

TABLE 4 | List of domains, themes, and subthemes of protective factors for the well-being of the 25 interviewees.

Domains	Themes	Frequency (%)	Subthemes
Clinical ward interactions		25 (100)	
	Reciprocal doctor-patient relationship	25 (100)	Positive interaction with patients
			Received appreciation from patients
			Received care from patients
			Patients' conditions improved
			Patients' optimism
	Supports from the local HWs	12 (48)	Cooperation from the local HWs
			Local HWs in good morale
			Appreciation from local HWs
Working environment		25 (100)	
	Reasonable working arrangement	24 (96)	Adequate logistics arrangement
			Orientation training
			Pre-deployment tasks delegation
			Scientific work management
	Work-life balance	20 (80)	Emphasis on team's physical health
			Reasonable work schedule
			Providing mental health support
			Time for respite and recuperation
Team		25 (100)	
	Mutual support among the team members	25 (100)	Work support among team members
			Communication among team members
			Emotional support from team members
			Companionship from team members
			Support from the team leaders
			Team morale boosting
	High team morale	19 (76)	Team cohesion
			Team professionalism
			High team spirit
			Zero infection within the team
Individual		25 (100)	
	Personal adaptiveness	25 (100)	Individual psychological adjustment
			Adapting to work routine
			Emotional coping
			Distraction as coping
	Personal physical protection	24 (96)	Personal safety protection
			Maintaining physical health
			Physical relaxation
			Personal lifestyle protection
	Previous working experience	22 (88)	Having prior work experience
			Familiarity in treatment task
			Possession of relevant knowledge
	Professionalism	20 (80)	Sense of duty
			Fully dedicated to work
			Being proactive in problem-solving at work
			Sense of accomplishment from work
	Personal characteristics	17 (68)	Passionate in volunteerism
			Personal convictions
			Meaning finding
			Sense of calling
			Sense of being needed
National/organizational policies		24 (96)	
	Workplace Pandemic control mechanism	23 (92)	Implementing team safety measures
			Adequate PPE supplies
			Adequate medical supplies
			Ensuring PPEs qualities
	National effort in pandemic control	17 (68)	Positive impact through media platforms
			National medical support
			National COVID control measures
			Supportive public policies
			Timely pandemic control and prevention

(Continued)

TABLE 4 | (Continued)

Domains	Themes	Frequency (%)	Subthemes
Social		24 (96)	
	Familial support	24 (96)	Immediate family support
			Contact with family members
			Caring for the family members
	Other social supports	12 (48)	Support of the deploying hospital unit
			Support from friends
			Contact with friends
			Support from the wider social circle
Culture/national context		16 (64)	
	National context	11 (44)	Support from the larger community
			Improvement of the pandemic situation
			The power of the Communist Party
			Warmth and appreciation of the local (Wuhan) people
	Cultural resources	10 (40)	Taste of home-cooking
			Spirit of collectivism
			Cultural mindset of "Take it as it comes"
Post-deployment protective factors		23 (92)	
	Individual level	21 (84)	Physical relaxation
			Individual Psychological adjustment
			Emotional coping
			Meaning finding
			Keeping daily routine
			Maintaining physical health
	Policy level	15 (60)	Supportive public policies
			Reasonable recognition and appreciation
			Safe quarantine environments
	Teamwork	12 (48)	Support among team members
			Emphasis on team physical health
	Social support	8 (32)	Support from families and friends
	Cultural belonging	5 (20)	Sense of cultural root
	Organizational support	2 (8)	Support from the deploying hospital unit

experience. . .without which. . .one won't be able to respond [to the COVID situation]" (C02).

A sense of duty seemed to shelter the interviewees from being overwhelmed, "Owing to my strong sense of responsibility, I do not allow myself to be affected much by [the negative] emotions" (C04).

Optimism and positive belief also played a part in the resilience building for some interviewees, "I had a conviction then, that I can defeat the disease" (C08).

Some also found a new meaning from the deployment, "I think that my heart has become purified. . .life is much more meaningful when you help others" (C10).

National/Organizational Policies

Two levels of policies were reported by 24 interviewees as helpful factors – workplace pandemic control mechanism and national effort. At the workplace, implementation of team safety measures, provision of adequate PPE and PPE quality screening measures had helped most of the interviewees (N = 23) felt safe: "When entering the wards to treat patients, we always paired up. . .This helped to reduce fear to a great extent" (C09).

Seventeen interviewees commended the government's effort in shaping positive impact through media platforms, providing medical support from national level, implementing national COVID control measures and public policies in a timely manner: "The media played a huge role in the efforts to defeat the virus. . .there was much positive energy through TV propaganda. . .I was encouraged and feared no more" (C10).

Social Support System

At the social level, support from home and others was appreciated by almost all the interviewees (N = 24). They reported drawing strength from the immediate family support: "The support from the family was of utmost importance. Sometimes (my husband) offered very good advice. . .other times, it was just simple communication, but enough to relieve my stress" (C02). Many maintained daily contacts with family members: "I contacted my family daily, talking to them on video calls during mealtimes" (C12). The interviewees appreciated their families' understanding of the frontline situation: "My parents were very understanding. . .they tried not to call me. . .it was basically the same with my husband. As for me, I contacted them every 3–4 days, just so they knew that I was doing fine" (C09).

Around half of the interviewees (N = 12) cited support from other sources, such as the deploying hospital unit, friends, and the wider social circle: "Every week, the (H) hospital sent fresh produce to our families back home. . . Knowing that our families were well looked after. . .I won't have any regrets or worries, even if something bad happened to me at the frontline" (C21).

Cultural and National Resources

More than half of the interviewees (N = 16) attributed their strength to the national unity and cultural resources: "Under harsh circumstances, we Chinese people are very unified and would not be distracted by other forces or issues" (C09). "The public donated instant braised noodles to us, and spicy soup. . .. Local people here were trying their best to cater to our preferred taste," one interviewee (C12) recalled feeling touched when receiving foods that fitted their cultural cuisine and taste.

Post-deployment Self-Care

During the quarantine period, similar protective factors at the individual, policy, team, social, cultural, and organizational levels had helped the interviewees (N = 23) cope with the transition and isolation. Among all, individual activities such as physical relaxation and psychological adjustment were regarded as particularly important for their wellbeing maintenance during this period. After their intensive frontline task, many made use of the quarantine period to resume self-care activities, ". . .during this recuperation period we focus on getting back into shape. The females, for example, aim to lose weight, whereas the males aim to get fit again through exercises such as jogging." (C22).

DISCUSSION

As DHW's assistance was particularly crucial in large scale epidemics that strained the local health workforce and medical resources, our findings showed their multitude of challenges during the COVID-19 epidemic. Compared to local HWs, DHWs face extra layers of complication at the frontline – the need to rapidly adapt to an unfamiliar work environment, disruption to previous lifestyle, new dynamics with team members and local HWs, isolation from usual social circle, new cultural norm, post-deployment adjustments, among others. Our findings showed that the dialectical relationships between risk factors and protective factors for the interviewees, and the dynamic interaction between multiple domains and systems of these factors could be conceptualized through the ecological system model. Originally developed by Bronfrenbrenner, the ecological system model is a framework for examining individuals' relationship within communities and the wider society across different time spans (Bronfenbrenner, 1979). We further adopted the model to explain the interaction of both protective and risk factors identified in the four levels of systems–individual, social, institutional and policy/culture domains, that directly impacted the well-being of DHWs in the context of pandemic (See **Figure 2**). The overlapping rings in the model illustrate how factors at one level interact with factors at another level. The comprehensive model allows the application of a "whole-health model" defined by WHO (2001) to the wellbeing of the frontliners, to design systemic intervention in burnout prevention among DHW's. For example, our findings suggested that individual DHW's resilience was impacted by the communal resilience of Wuhan city and the government system as a whole. *Vice versa*, the cultural atmosphere was shaped by the individual level of emotional reaction, which collectively escalated the fear in public and DHWs.

The systemic approach also revealed the role of protective factors in the multiple systems of a strong-ties society. In strong-ties societies like China (Ting and Sundararajan, 2017), a holistic intervention that capitalizes on kinship network, familial interaction, and patriotism would be more efficient in cultivating a resilient frontline culture among DHWs. While there are universal guidelines on promoting psychosocial supports for HWs, those are based on an individualistic and weak-ties society framework (Granovetter, 1973)and might not uniformly apply to the diverse societies struck by a global crisis. For instance, many guidelines place greater emphasis on individualistic approach to self-care strategies, whereas Chinese DHWs value reciprocal relationships, familial relationships, and support from the local community. Notably, mental health support interventions proposed in the WHO guidelines did not always respond to the lived experiences of staff, as some reported not being able to participate in those online psychological interventions because of understaffing, exhaustion or clashing schedules (Vera San Juan et al., 2020). Therefore, our findings proposed the following systemic supportive guidelines for organizations to mitigate the risk of burnout among DHWs:

Cultivating Resilience Factors in the Deployed Healthcare Workers Environment

Cultivation of personal resilience are essential for DHWs. As previous research found, resilience in the Chinese context is not just a personal trait but a multidimensional process that depends on the resources in their environment (Ting et al., 2021; Xie and Wong, 2021). Our finding confirmed that DHWs tapped into external resources, in particular peer support, for their wellbeing during deployment. Since they perceived disclosing negative emotions might further burden their immediate families, their "comrades" or "work partners" became the only witnesses to their personal journey. This is consistent with the findings of large-scale quantitative studies on HWs in other countries, for example the study by Gilleen et al. (2021) showed that resilience and social support at work would reduce mental health risks. This is even more so for DHWs, who do not have access to their usual support network like the local HWs do. Practically, the deployment nature forms a new system of ecology with other resources available to the DHWs. Therefore, encouraging the utilization of the new resources, including organizing physical activities in a team setting; building a safe space for DHWs to talk and share spontaneously, implementing a buddy system for DHWs to monitor and help each other; and mentoring of DHWs by more

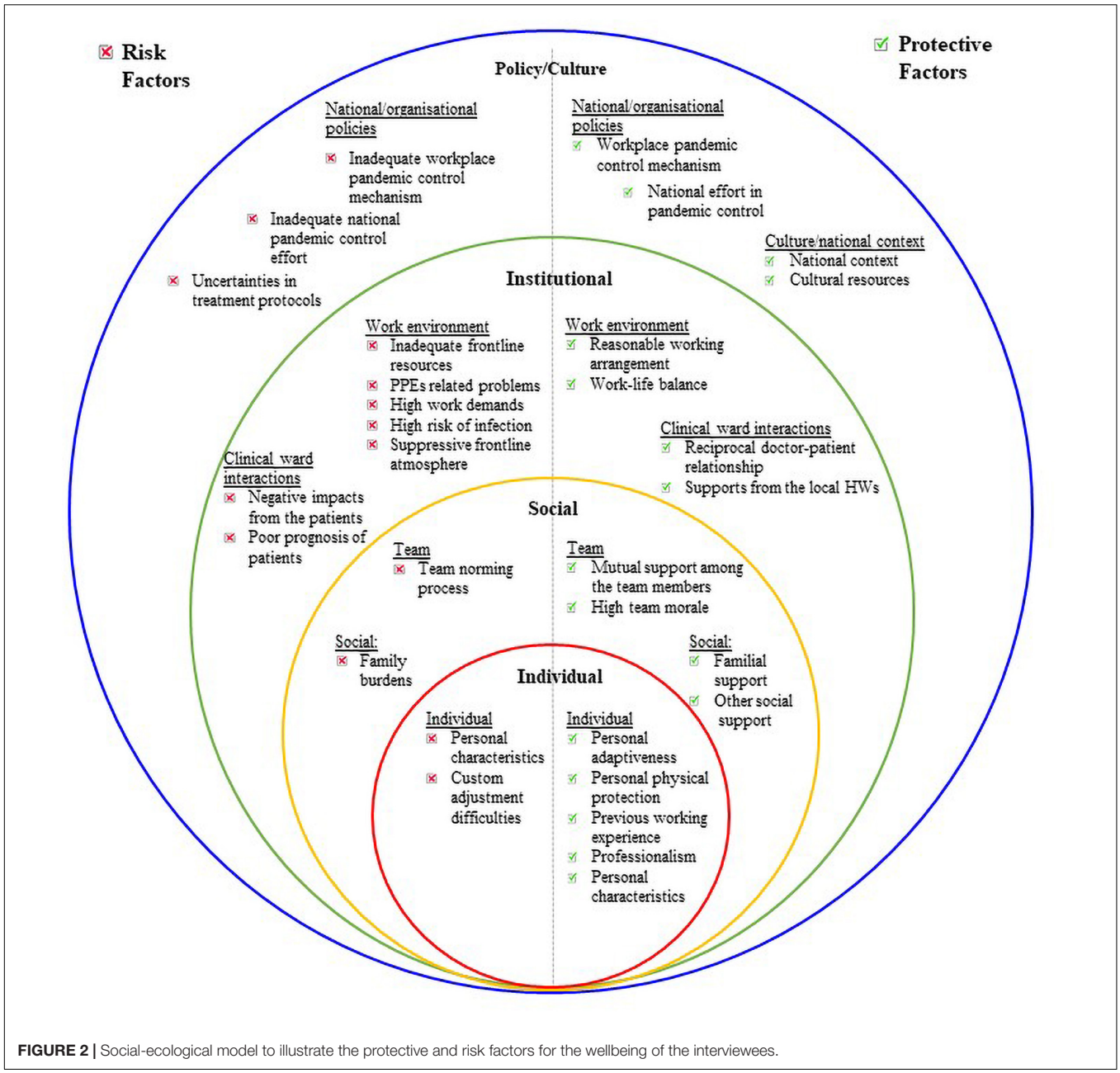

FIGURE 2 | Social-ecological model to illustrate the protective and risk factors for the wellbeing of the interviewees.

experienced teammates could help boost the personal resilience and prevent burnout among DHWs during the epidemic.

Cultivating a Reciprocal Relationship at the Healthcare System

To counteract the negative impact of "cultural shock," it is important to consider cultivating a "reciprocal relationship" as a protective factor in the frontline ward. Consistent with Asian values of reciprocity and relational cognition (Fiske, 1992; Sundararajan, 2015), Chinese DHWs tended to draw their optimism based on the positive interaction with their patients. Reciprocal relationship is particularly important under the strenuous safety and mobility restrictions, where the patients' wards are in total isolation, and the DHWs play the role of the only "care-taker" or "familial presence" to the patients inevitably. For instance, our interviewees addressed patients with familial terms such as "grandpa, grandma, uncle and auntie." Some related elderly patients to their grandparents, depicting the Chinese philosophy of "treating other elders like your own." While this type of familial bonding became natural, DHWs may grieve with the patients and form an empathetic rapport to fight the despair. Reciprocal relationships also enable them to feel appreciated and meaningful in the workplace despite the high work demands. Asian public healthcare system could capitalize on these unique kinship spirits and ethics embedded

in a "strong-ties" society (Ting et al., 2018; Sundararajan, 2020) during a global crisis.

Attending to the Welfare of Deployed Healthcare Worker's Family Members or Dependents

Due to the high infection risk, many HWs chose to distance themselves from their loved ones to protect them, which inevitably created misunderstandings and emotional alienation during the pandemic (El-Hage et al., 2020). It was even more challenging for the DHWs, given the geographical distances. The fact that the deployment happened during the Chinese New Year festival disrupted the family reunion and created an additional psychological loss among our interviewees. Therefore, the thoughtful gesture of the deploying hospital to regularly send food supply to their families was particularly appreciated by the DHWs, since filial piety and family obligation are highly valued by Chinese families (Bedford and Yeh, 2019).

In the future, deploying hospitals could consider allowing buffer time for the DHWs to bid farewell to their family. Providing reassurance of caregiving to the needed families of DHWs would also be helpful in reducing the family burden. Besides, offering additional benefits or allowance (such as life insurance) to the dependent family members may help reduce worries on both parties. Mental health and psychosocial supports should also be extended to the family members of the DHWs, especially in a strong-ties society where the self is embedded in the larger family unit (Ting et al., 2018; Sundararajan, 2020).

Providing Adequate Workplace Briefing and Training

Workplace stress was the top risk factor reported by our interviewees, while organizational support was found to be helpful in mitigating the risk. A multi-country meta-analysis by Kisely et al. (2020) confirmed that organizational supports such as clear communication, training and education around infectious disease, access to psychological support helped mitigate psychological risks of HWs working with patients in novel viral outbreaks. Organizations should therefore endeavor to enhance disaster preparedness of HWs in normal times through ways such as routine professional development training on disaster management, basic mental health literacy, and Psychological First Aid training, all of which were cited as desirable by our interviewees. Adequate briefing and training pre-deployment could help better prepare the DHWs, both emotionally and cognitively, for the realities of their tasks, as a previous study on deployed disaster workers indicated (Brooks et al., 2015). While at the frontline, ensuring timely communication and empowering DHWs with up-to-date information can help them reduce anxiety and restore a sense of control (Wu et al., 2020).

As previous studies and current study showed that there are still some mental health risks after the deployment (Cherepanov, 2020; Wang et al., 2020), long-term follow-up care is essential at an organizational level. For example, some DHWs may have delayed traumatic responses, and others may need support to adjust to "mundane daily life" after the adrenaline rush at the frontline. Buffer time that allows them to recuperate physically, reunite with their families, and readjust to the new norm of life, would be beneficial. The deploying organization could also organize debriefing sessions with DHWs post-deployment, to explore the change of life meaning and identity after mission accomplished.

Utilizing Cultural and National Supports

In our study, cultural and national resources were found to have cultivated the collective identity and national resilience among DHWs. Under national propaganda, COVID-19 was perceived as a "national threat" in China, hence warranted a "national response" in unity. Chinese frontline HWs repeatedly experienced empathy and compassion from the public as they were being perceived as "the heroes" for the sacrifices they made to the country. Public donation of all kinds, from local and overseas Chinese, flooded the medical facilities. In contrast, HWs in some other countries reported feeling "unsafe at work, being taken advantage of, disposable like I didn't matter" (Hennein and Lowe, 2020). In our study, the locals donated food that catered to the DHWs' taste bud, despite scarcity of resources during the Wuhan lockdown. Since the Chinese culture embodies mind-body unity (Ting and Zhang, 2021), it is unsurprising that this became a vital supportive factor for the DHWs.

The public recognition of DHWs' efforts was also evident in social media, where the team was escorted and saluted by the public when leaving Wuhan. China's success in creating an accepting attitude and culture toward DHWs could be a lesson shared with other healthcare settings, especially in countries where assaults and stigma toward HWs were sadly reported (Dye et al., 2020; McKay et al., 2020). As WHO guidelines stipulated that the healthcare system should provide security, as well as take broader measures that prevent social discrimination, violence, and stigma against HWs (Gedik, 2020), the positive cultural resources found in this study could perhaps provide some insights on to the occupational health campaign.

Lastly, our study found that only few interviewees have utilized the mental health intervention services made available to frontline HWs in Wuhan (Kang et al., 2020b), partly due to cultural stigma toward such services. It is therefore advisable for mental health intervention to be culturally sensitive, and more communal and relational-based, especially in societies where strong ties are often a source of support and resilience.

Strengths and Limitations of This Study

First, the qualitative data collection method allowed more time for in-depth interviews with each interviewee, and hence the rich narratives on their frontline experience was retained. Second, the response rate of interviewees is rather high (86%), showing their high motivation and needs to tell their stories post-deployment. There are, however, possible issues of non-representativeness since all the interviewees were from the same deployment team. In addition, the interviews were conducted toward the end of the team's post-deployment quarantine. Having returned from the strenuous frontline and well-rested with the prospect of reuniting with their families soon, some less

desirable experiences might have been toned down, resulting in more positive experiences reported. Furthermore, for the wellbeing of the interviewees, the interviewers had intentionally not probed the interviewees' traumatic frontline experience. This ethical imperative could result in more protective factors being identified. Also, we acknowledge that researcher biases are inevitable in the qualitative coding process, given that we each have different experiences and understandings which influence how we interpret the data. We tried to minimize the bias through a rigorous approach of CQR where we vigilantly cross checked our interpretation of the data with each other through reflexivity in order to arrive at the best representation of the data at each level (Hill et al., 2005). Multiple rounds of team meetings and discussion which amounted to 16 h (in addition to nearly 200 h of individual coding) took place within 3 months of the coding process, before we arrived at the consensus of the final codebook. Lastly, more than a year has passed since the interviews were conducted. With a better understanding of the virus, availability of vaccines (Li et al., 2021), better preparation and equipment for DHWs, and improved COVID response policies, it is likely that DHWs nowadays might have frontline experiences differ from their early counterparts'. Since strong-ties relationship has been a protective factor found in our sample, it would be interesting for future study to look into the impact of cultural factors in the mental health outcomes of HWs between East and West societies (e.g., China vs. United States).

CONCLUSION

Though other studies showed that social support is crucial in reducing the mental health and burnout risks among HWs, our study further nuanced the nature of "social connectedness" by discovering the theme of "familial relatedness" between patient-DHWs, between DHWs, between deploying hospital and deployed team, between DHWs and local people. Our study participants were members of the first response teams during the COVID-19 outbreak before it was declared "pandemic." They entered the frontline with limited knowledge about the nature of this virus and the extent of its harms. These uncertainties were certainly anxiety-provoking for them, which made them more vulnerable than the normal HWs. We hope this important discovery could encourage the collaboration between the global healthcare system and health psychology, in fostering a strong-ties network at frontlines for capacity and resilience building for the deployed team during pandemic era to ensure sustainability.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Xi'an Jiaotong University Health Science Center, Xi'an, Shaanxi, China. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

VK and LZ conceived and planned the study. CS, XF, and VK carried out the study. XW, YL, RT, and VK extracted and analyzed the data. RT, JS, JO, JM, and LZ contributed to the interpretation of the results. VK took the lead in writing the manuscript. RT and LZ supervised the study. All authors provided critical feedback and helped shape the research, analysis, and manuscript.

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Analysis of Factors That Influenced the Mental Health Status of Public Health Workers During the COVID-19 Epidemic Based on Bayesian Networks: A Cross-Sectional Study

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Background: Public health workers are essential to responding to the coronavirus disease 2019 (COVID-19) epidemic, but research on anxiety and stress among public health workers during the epidemic is limited. This study aimed to evaluate related factors affecting mental health among public health workers during the epidemic.

Methods: Between February 19 and 25, 2020, an online, cross-sectional study was conducted among public health workers in a city in China. Mental health status was assessed using the Chinese versions of the Generalized Anxiety Disorder-7 (GAD-7) scale and Patient Health Questionnaire-9 (PHQ-9), both with a cutoff score of 5. Work-related variables, workloads and sacrifices, and personal perceptions were also assessed.

Results: The prevalence of anxiety and depression were 49.2% and 45.7%, respectively, among public health workers. Three risk factors and one protective factor, namely, overcommitment (OR = 1.10∼1.20, $p < 0.001$), perceived troubles at work (OR = 1.14∼1.18, $p < 0.001$), perceived tension (OR = 1.11, $p < 0.001$) and the capability to persist for more than 1 month at the current work intensity (OR = 0.41∼0.42, $p < 0.001$) were found to be independently associated with anxiety and depression in the multivariable logistic regression analyses after propensity score matching. But the Bayesian networks analysis found that the last three factors directly affect anxiety and depression.

Conclusion: Psychological responses to COVID-19 were dramatic among public health workers during the severe phase of the outbreak. To minimize the impact of the epidemic, working conditions should be improved, and easily accessible psychological support services should be implemented.

Keywords: Bayesian network, COVID-19, anxiety, depression, public health workers

INTRODUCTION

Mental health is an important component of health, and the concept of "no health without mental health" as proposed by the World Health Organization (WHO) has become the consensus view. Mental health problems are currently a prominent challenge worldwide. General estimates suggest that 11–18% of the world's population meets the criteria for a diagnosable psychiatric disorder at any given time (Wainberg et al., 2017). The drivers of poor mental health include multiple transitions affecting the global population, such as the increasing rates of some social determinants (pandemics, conflict, and displacement) and environmental threats (increased natural disasters associated with climate change) (Yokoyama et al., 2014; Patel et al., 2018). Alarmingly, in crisis situations, such as natural disasters or humanitarian emergencies, the prevalence rate of mental health disorders can reach nearly 22%, which is nearly double the general prevalence (Charlson et al., 2019).

Many studies have suggested that infectious disease epidemics, including severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and 2009 novel influenza A (H1N1), are associated with mental health problems among the general population (Cowling et al., 2010; Taha et al., 2014), healthcare workers (HCWs) (Bai et al., 2004; Lee et al., 2018), and patients (Lee et al., 2007; Wang et al., 2011).

At the end of December 2019, an outbreak of coronavirus disease 2019 (COVID-19) occurred in Wuhan, Hubei Province, China (Wang et al., 2020). In only a month, the disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was declared a public health emergency by the WHO, and it was declared an epidemic in March 2020 (World Health Organization (WHO), 2020a). Due to the severe situation in the early stage of the epidemic, requiring a substantial amount of work in a short time, health systems were strained by the effort to contain the disease, which spread to over 200 countries throughout the world (World Health Organization (WHO), 2020b). In particular, healthcare workers, including public health workers, are the main persons involved in the screening and treatment of this disease, and they remain under great pressure.

The epidemic is still in a severe stage. As of 16 June 2021, there were about two hundred million confirmed cases of COVID-19, including 4,265,903 fatalities, reported to the WHO (World Health Organization (WHO), 2020c). Due to the limited effectiveness and insufficient supply of currently available vaccines, preventive measures, including controlling the sources of infection, impeding transmission, and protecting susceptible populations, are the most effective strategies to contain the spread of the disease (Li et al., 2020). Therefore, public health systems still face significant challenges in countries and regions where local epidemics remain severe. Public health systems vary among countries (Donaldson, 2008); China's public health system comprises specialized institutions [e.g., the Centers for Disease Control and Prevention (CDC)] as well as primary healthcare institutes (PHIs, e.g., community health centers in urban areas and village clinics in rural areas) (World Health Organization (WHO), 2015). Public health workers are usually affiliated with the CDC or PHIs and are mainly responsible for various prevention and control tasks, including the development of technical instructions, epidemiological investigation of patients and close contacts, surveillance of high-risk populations, collection and examination of specimens, and collection and reporting of data. A high level of overcommitment easily leads to physical and mental stress and exhaustion in healthcare workers (Siegrist, 2008), which, in turn, leads to anxiety and depression. Individuals who are overcommitted wish to be recognized and respected (Siegrist and Li, 2016) and are especially sensitive to work pressure and negative emotions (Du Prel et al., 2018); thus, they face an increased chance of feeling misunderstood and wronged, among other troubles. During the epidemic, public health workers experienced rapid increases in work intensity and work pressure. During periods of intense work, they faced an increased risk of self-perceived work difficulties, which caused physical and mental stress and thus led to anxiety and depression. Overwork has taken a great toll on the physical and mental health of health care workers in particular. Therefore, studying the factors that influence the mental health of public health workers during the COVID-19 epidemic will provide reference data for other countries, protect the health of public health workers and help contain the epidemic.

Studies have shown that epidemics cause serious psychological distress among the general public and healthcare workers (Pappas et al., 2009). Several recent studies have shown that due to overwork, inadequate preparation, and emotional disturbances (such as fear of infection and concerns about family members) attributable to the COVID-19 epidemic, there is a high prevalence of mental health symptoms among medical professionals, including depression, insomnia, anxiety and posttraumatic stress disorder (PTSD) (Cai et al., 2020; Hou et al., 2020; Lai et al., 2020). However, most of the research on the factors influencing mental health has focused on doctors and nurses in hospital settings, rather than public health workers who are mainly affiliated with the CDC and PHIs.

Among the methodologies used to carry out such analyses, the classical methods predominated; such methods include descriptive statistics, multiple linear regressions, hierarchical linear regression, and multivariate logistic regression, among others. Most of these techniques do not allow descriptions of the complex, direct or conditional, and linear or non-linear relationships between the variables considered in the model (García-Herrero et al., 2017). In reality, these factors may not be independent of each other and may have complex network relationships. Bayesian networks (BNs), also called belief networks, combine graph theory and probability theory to explore relationships between variables and are easily interpretable by means of the resulting graph (Larrañaga and Moral, 2011). The model has no strict requirements regarding data distribution; therefore, it can incorporate all the data to reveal the influences of various factors on mental health and the relationships between them. BNs have been widely used in many fields, including social and behavioral science (Aghaabbasi et al., 2020), clinical science (Beaudequin et al., 2020), occupational health (García-Herrero et al., 2017). However, no study to date has used a BN model to investigate the psychological impacts of the COVID-19 epidemic on populations.

Therefore, the aims of the current study were to investigate the mental health status of public health workers during the outbreak and the influences on their mental health by using a BN model and to provide reference data for the development of targeted interventions for this population to improve their mental health during the COVID-19 epidemic. These goals are important for controlling the COVID-19 epidemic and improving public health workers' long-term health. Moreover, the findings from this investigation will be critical in addressing future outbreaks of emerging infectious diseases.

MATERIALS AND METHODS

Study Design

This cross-sectional study was conducted from February 19 to 25, 2020. Data were collected from a city in China. First, the city was divided into 5 districts and 2 counties according to the administrative plan, and 2 districts and 1 county were randomly selected. Each district/county selected 8 PHIs. The CDC staff of each district/county and the selected PHI staff participated in the survey, which was conducted entirely in China. The link to the questionnaire was distributed among participants (such as CDC workers) through WeChat/QQ working groups.

Sample Size

According to the purpose of the survey, the World Health Organization (WHO), 1991) recommended formula was used to estimate the total sample size required for this survey:

$$n = \frac{Z^2 P(1-P)}{d^2} \times deff$$

P was estimated based on a previously published study on mental health services during the COVID-19 outbreak in *The Lancet Psychiatry*; the prevalence of anxiety and depression among healthcare workers in Wuhan Province, China, were 44.7% and 50.7%, respectively. Considering that this study was conducted in early February when the epidemic was most severe, the *P*-value was 40% (Liu et al., 2020). *Z* was 1.96 considering a 0.05 type I error. *deff* (design effect) was 2.0. *d* (the allowable absolute error level) was 5%. Considering a response rate of 90%, at least 800 public health workers were required to complete the online survey.

Participant Recruitment and Online Survey Completion

The participants met the following inclusion criteria: (1) aged 18 years or older; (2) worked at the CDC or PHI of that city during the study period; and (3) participated in COVID-19 control and prevention-related work. All participants were informed of the background, aims, anonymous nature and length (approximately 10–15 min to complete the questionnaire) of the survey. Before the investigation, we conducted rigorous training for the investigators. We limited the training to 1 participant per unique internet protocol (IP) address. Only a completed questionnaire could be submitted. Questionnaires were quality-checked by a researcher to ensure accuracy. A total of 834 participants responded in this study. After strict quality control, 23 participants were excluded because of logical errors. Thus, 811 (97.24%) participants effectively completed the survey. The studies involving human participants were reviewed and approved by the Chongqing Medical University. Completion of the questionnaire indicated informed consent of the participants.

Measurements

The questionnaire was obtained from the Cultivation Project of the "Three Major" Construction Scientific Research Projects of Sun Yat-sen University in 2020. Data on demographic characteristics [e.g., age, sex, job title, institution, and whether they had children under 6 years old (i.e., the school age)]; COVID-19 control and prevention work-related variables (e.g., type of work, time spent receiving COVID-19 training, knowledge of COVID-19 control and prevention strategies, difficulties in COVID-19 control and prevention); workloads and sacrifices (e.g., number of days with overtime work, number of hours of sleep per day on average, number of days with overnight work, number of working hours per day on average, practices to avoid infecting your family); perceptions related to COVID-19 and work, including whether one persist with more than 1 month or not at their current work intensity; the scores of 2 self-constructed scales (perceived distress at work and perceived tension at work); and the score of the Effort-Reward Imbalance (ERI) scale were collected (Niedhammer et al., 2004).

The primary psychological outcomes included symptoms of anxiety and depression, measured by the 7-item Generalized Anxiety Disorder (GAD-7) scale (Spitzer et al., 2006) and the 9-item Patient Health Questionnaire (PHQ-9) (Wang et al., 2014), respectively. Probable mild anxiety and depression symptoms were defined by a minimum score of 5 points on the respective scales (Kroenke et al., 2001; Spitzer et al., 2006; Liu et al., 2020).

Definition and Application of Bayesian Networks

Bayesian networks (Koller and Friedman, 2009) consist of directed acyclic graphs (DAGs) and a set of conditional probability distributions (p). Nodes represent random variables, and directed edges represent the direct probability dependence between the corresponding variables x_i and π_i. If there is an edge from π_i to x_i and the arrow points to x_i, then π_i corresponds to the parents of x_i. In this case, the joint probability distribution can be factored in terms of conditioned probabilities:

$$p(x_1, x_2, \ldots, x_n) = \prod_{i=1}^{n} p(x_i|\pi_i)$$

Based on the data, both the graph and probabilities can be automatically constructed (Neapolitan, 2004) following structural learning and parameter learning. First, we need to define a score function to evaluate the degree of fit between the Bayesian network and the training data, and then find the Bayesian network with the best structure based on this score function. In this study, the Akaike information criterion

TABLE 1 | Demographic characteristics of the anxiety groups before and after PSM (*n*, %).

Demographics	Anxiety (GAD-7 score)					
	Before PSM			After PSM		
	≥5 (*n* = 399)	<5 (*n* = 412)	Statistics[a]	≥5 (*n* = 339)	<5 (*n* = 339)	Statistics[a]
Sex						
Male	134 (33.58%)	161 (39.08%)	2.643	122 (35.99%)	115 (33.92%)	0.318
Female	265 (66.42%)	251 (60.92%)		217 (64.01%)	224 (66.08%)	
Age	37.96 ± 9.52	41.69 ± 10.40	5.329***	39.37 ± 9.40	39.42 ± 9.71	0.602
Children under 6 years						
No	305 (76.44%)	347 (84.22%)	7.788**	277 (81.71%)	276 (81.42%)	0.010
Yes	94 (23.56%)	65 (15.78%)		62 (18.29%)	63 (18.58%)	
Job title						
Junior	212 (53.13%)	220 (53.40%)	0.540	179 (52.80%)	180 (53.10%)	0.776
Intermediate/senior	115 (28.82%)	111 (26.94%)		95 (28.02%)	102 (30.09%)	
Other (e.g., volunteer)	72 (18.05%)	81 (19.66%)		65 (19.17%)	57 (16.81%)	
Institution						
CDC	142 (35.59%)	122 (29.61%)	3.298	123 (36.28%)	104 (30.68%)	2.391
PHI	257 (64.41%)	290 (70.39%)		216 (63.72%)	235 (69.32%)	

GAD-7, 7-item Generalized Anxiety Disorder; PSM, propensity score matching; CDC, Centers for Disease Control and Prevention; PHI, primary healthcare institute.
[a] χ^2 analysis was used to test for differences between categorical variables and anxiety groups, and the Student's t-tests was used to test for differences between continuous variables and anxiety groups.
***p < 0.01.*
****p < 0.001.*

TABLE 2 | Demographic characteristics of the depression groups before and after PSM (*n*, %).

Demographics	Depression (PHQ-9 score)					
	Before PSM			After PSM		
	≥5 (*n* = 371)	<5 (*n* = 440)	Statistics[a]	≥5 (*n* = 305)	<5 (*n* = 305)	Statistics[a]
Sex						
Male	114 (30.72%)	181 (41.14%)	9.422**	109 (35.74%)	103 (33.77%)	0.260
Female	257 (69.27%)	259 (58.86%)		196 (64.26%)	202 (66.23%)	
Age	37.72 ± 9.70	41.66 ± 10.17	5.612***	39.41 ± 9.66	38.67 ± 10.18	−0.918
Children under 6 years						
No	279 (75.20%)	373 (84.77%)	11.697**	249 (81.64%)	244 (80.00%)	0.264
Yes	92 (24.80%)	67 (15.23%)		56 (18.36%)	61 (20.00%)	
Job title						
Junior	197 (53.10%)	235 (53.41%)	6.627*	160 (52.46%)	166 (54.43%)	0.394
Intermediate/senior	116 (31.27%)	110 (25.00%)		93 (30.49%)	86 (28.20%)	
Other (e.g., volunteer)	58 (15.63%)	95 (21.59%)		52 (17.05%)	53 (17.38%)	
Institution						
CDC	151 (40.70%)	113 (25.68%)	20.679***	114 (37.38%)	99 (32.46%)	1.623
PHI	220 (59.30%)	327 (74.32%)		191 (62.62%)	206 (67.54%)	

PHQ-9, 9-item Patient Health Questionnaire; PSM, propensity score matching; CDC, Centers for Disease Control and Prevention; PHI, primary healthcare institute.
[a] χ^2 analysis was used to test for differences between categorical variables and depression groups, and the Student's t-tests was used to test for differences between continuous variables and depression groups.
**p < 0.05.*
***p < 0.01.*
****p < 0.001.*

(AIC) algorithm is preferred. This algorithm was proposed by the Japanese statistician Akaike (1974). It is based on the concept of entropy as a standard to measure the quality of a statistical model. The smaller the AIC, the better the model is. The next step was to use maximum likelihood estimation (MLE) (Scutari and Denis, 2014) to learn the parameters to obtain the conditioned probabilities. The goal of MLE is to find a set of parameters θ to maximize the

TABLE 3 | Univariate analysis results of variables related to anxiety after PSM (*n*, %).

Variables	Anxiety (GAD-7 score)			
	≥5 (*n* = 339)	<5 (*n* = 339)	Statistics[#]	*P*
COVID-19 control and prevention work-related variables				
Type of work				
Field work/non-field work	62 (18.29%)	87 (25.66%)	5.376	**0.020**
Both	277 (81.71%)	252 (74.34%)		
Time spent in COVID-19 training				
≤8 h	70 (20.65%)	71 (20.94%)	3.029	0.220
1–2 days	51 (15.04%)	36 (10.62%)		
>2 days	218 (64.31%)	232 (68.44%)		
Sufficient knowledge of COVID-19 prevention and control measures				
Inadequate/very inadequate	5 (1.47%)	5 (1.47%)	0.509	0.775
Average	88 (25.96%)	80 (23.60%)		
Adequate/relatively adequate	246 (72.57%)	254 (74.93%)		
Number of difficulties in COVID-19 control and prevention				
≤5	110 (32.45%)[a]	192 (56.64%)	46.761	**<0.001**
6–10	176 (51.92%)[b]	129 (38.05%)		
>10	53 (15.63%)[c]	18 (5.31%)		
Workloads and sacrifices				
Number of days with overtime work				
≤5	33 (9.73%)	42 (12.39%)	4.316	0.229
6–10	51 (15.04%)	63 (18.58%)		
11–15	43 (12.68%)	48 (14.16%)		
>15	212 (62.54%)	186 (54.87%)		
Average sleep hours per day				
<5 h	12 (3.54%)[a,b]	11 (3.24%)	14.647	**0.001**
5–6 h	207 (61.06%)[b]	159 (46.90%)		
>6 h	120 (35.40%)[a]	169 (49.85%)		
Number of days with overnight work				
0 days	189 (55.75%)	202 (59.59%)	1.259	0.533
1–3 days	94 (27.73%)	82 (24.19%)		
>3 days	56 (16.52%)	55 (16.22%)		
Average work time per day				
≤8 h	76 (22.42%)[a]	127 (37.46%)	19.732	**<0.001**
9–15 h	242 (71.39%)[b]	201 (59.29%)		
>15 h	21 (6.19%)[b]	11 (3.24%)		
Number of practices to avoid infecting your family				
0	40 (11.80%)	39 (11.50%)	2.145	0.342
1–3	244 (71.98%)	258 (76.11%)		
4–7	55 (16.22%)	42 (12.39%)		
Perceptions				
How long one can persist with your current intensity of work				
<1 month	261 (76.99%)	184 (54.28%)	38.77	**<0.001**
≥1 month	78 (23.01%)	155 (45.72%)		
Perceived distress at work	13.42 ± 3.26	10.47 ± 3.10	−12.06	**<0.001**
Perceived tension	29.18 ± 5.46	24.07 ± 5.68	−11.94	**<0.001**
Overcommitment	14.78 ± 2.19	13.12 ± 2.39	−9.41	**<0.001**
the effort-reward balance				
No	145 (42.77%)	104 (30.68%)	48.497	**<0.001**
Yes	194 (57.23%)	235 (69.32%)		

GAD-7, 7-item Generalized Anxiety Disorder; PSM, propensity score matching; COVID-19, coronavirus disease 2019.

[#] χ^2 analysis was used to test for differences between categorical variables and anxiety groups, and the Student's t-tests was used to test for differences between continuous variables and anxiety groups.

Each superscript (a,b,c) letter denotes a subset of variables whose row proportions do not differ significantly from each other at $p \leq 0.05/3 = 0.0167$ level. Different subscript letter assignment between groups denotes a significantly different pair of values based on post hoc testing with the Bonferroni correction.

Variables with a p-value < 0.05 are in bold.

probability of the model producing the observed data as follows:

$$\hat{\theta}_{MLE} = \arg max \sum_{i=1}^{n} logP(x_i; \theta)$$

This set of parameters is the conditional probability of each node of the Bayesian network.

Statistical Analysis

Continuous variables are presented as means ± standard deviations. Categorical variables are presented as percentages. Univariate analyses were performed using Student's *t*-tests for continuous variables and chi-square tests for categorical variables. We used chi-square tests with the Bonferroni correction for multiple comparison. So, the tripartite variables' the typical significance level of p-value ≤ 0.05 was adjusted to p-value $\leq 0.05/3 = 0.0167$; and the p-value of the variable divided into four groups was adjusted to p-value $\leq 0.05/4 = 0.0125$. Due to the heterogeneity of the data, the demographic variables were not balanced. The measure implemented to control for demographic variables (age, sex, job title, institutions, and having children under 6 years old) was propensity score matching (PSM). The anxiety group and normal group and the depression group and normal group were 1:1 propensity-score matched, and the caliper value was set at 0.02. The data obtained after matching were used in the univariate analyses. The matched data were used for subsequent statistical analyses.

Multivariate forward stepwise logistic regression models were constructed to identify the factors that influenced the anxiety and depression status of the respondents; all the COVID-19-related variables that were found to be significant in the univariate analyses after PSM were entered into the multivariate analysis. Finally, independent factors were identified, and two outcomes (anxiety and depression) were included in the BN analysis. The statistical significance of all analyses was set at $p < 0.05$. IBM SPSS Statistics 20, R 4.0.3 and GeNIe 2.4 Academic were used for data analysis.

RESULTS

Univariate Analysis of Potential Factors Related to Anxiety and Depression Before and After Propensity Score Matching

According to the score of GAD-7 and PHQ-9, all participants were divided into the score ≥5 (anxiety or depression) and the score <5 (non-anxiety or non-depression) groups. Of the 811 participants, 399 (49.2%) suffered from anxiety and 371 (45.7%) suffered from depression, as shown in **Tables 1**, **2**. More participants in the anxiety/depression group were younger and had children under 6 years than those in the non-anxiety/non-depression group. In addition, participants in the depression group were likely to be female, CDC worker and intermediate or senior job title than those in the non-depression group.

To further investigate the relationship between COVID-19-related variables and mental health, PSM was used to control

TABLE 4 | Univariate analysis results of variables related to depression after PSM (*n*, %).

Variables	Depression (PHQ-9 score)			
	≥5 (*n* = 305)	<5 (*n* = 305)	Statistics[#]	*P*
COVID-19 control and prevention work-related variables				
Type of work				
Field work/non-field work	63 (20.66%)	84 (27.54%)	3.952	**0.047**
Both	242 (79.34%)	221 (72.46%)		
Time spent in COVID-19 training				
≤8 h	61 (20.00%)	66 (21.64%)	2.848	0.241
1–2 days	47 (15.41%)	33 (10.82%)		
>2 days	197 (64.59%)	206 (67.54%)		
Sufficient knowledge of COVID-19 prevention and control measures				
Inadequate/very inadequate	5 (1.64%)	3 (0.98%)	1.163	0.559
Average	76 (24.92%)	68 (22.30%)		
Adequate/relatively adequate	224 (73.44%)	234 (76.72%)		
Number of difficulties in COVID-19 control and prevention				
≤5	105 (34.43%)[a]	173 (56.72%)	33.427	**<0.001**
6–10	156 (51.15%)[b]	113 (37.05%)		
>10	44 (14.43%)[b]	19 (6.23%)		
Workloads and sacrifices				
Number of days with overtime work				
≤5	31 (10.16%)[a,b]	43 (14.10%)	8.690	**0.034**
6–10	42 (13.77%)[a]	63 (20.66%)		
11–15	42 (13.77%)[a,b]	37 (12.13%)		
>15	190 (62.30%)[b]	162 (53.11%)		
Average sleep hours per day				
<5 h	11 (3.61%)[a,b]	8 (2.62%)	10.701	**0.005**
5–6 h	181 (59.34%)[b]	144 (47.21%)		
>6 h	113 (37.05%)[a]	153 (50.16%)		
Number of days with overnight work				
0 days	172 (56.39%)	187 (61.31%)	1.610	0.447
1–3 days	81 (26.56%)	74 (24.26%)		
>3 days	52 (17.05%)	44 (14.43%)		
Average work time per day				
≤8 h	82 (26.89%)[a]	115 (37.70%)	8.485	**0.014**
9–15 h	207 (67.87%)[b]	179 (58.69%)		
>15 h	16 (5.25%)[a,b]	11 (3.61%)		
Number of practices to avoid infecting your family				
0	32 (10.49%)	39 (12.79%)	1.499	0.473
1–3	235 (77.05%)	222 (72.79%)		
4–7	38 (12.46%)	44 (14.43%)		
Perceptions				
How long one can persist with your current intensity of work				
<1 month	238 (78.03%)	174 (57.05%)	30.629	**<0.001**
≥1 month	67 (21.97%)	131 (42.95%)		
Perceived distress at work	13.27 ± 3.29	10.70 ± 3.15	−9.883	**<0.001**
Perceived tension	28.95 ± 5.67	24.24 ± 5.49	−10.427	**<0.001**
Overcommitment	14.61 ± 2.25	13.30 ± 2.51	−6.773	**<0.001**
The effort-reward balance				
No	130 (42.62%)	206 (67.54%)	38.271	**<0.001**
Yes	175 (57.38%)	99 (32.46%)		

PHQ-9, 9-item Patient Health Questionnaire; PSM, propensity score matching; COVID-19, coronavirus disease 2019.

[#] χ^2 analysis was used to test for differences between categorical variables and depression groups, and the Student's t-tests was used to test for differences between continuous variables and depression groups.

Each superscript (a,b) letter denotes a subset of variables whose row proportions do not differ significantly from each other (the tripartite variables' p-value was adjusted to ≤0.05/3 = 0.0167; and the p-value of the variable divided into four groups was adjusted to p-value ≤ 0.05/4 = 0.0125). Different subscript letter assignment between groups denotes a significantly different pair of values based on post hoc testing with the Bonferroni correction.

Variables with a p-value < 0.05 are in bold.

for potential covariates. By searching the previous literature and consulting experts, we confirmed that certain demographic variables are risk factors for anxiety and depression (Kisely et al., 2020; Manh Than et al., 2020; Pappa et al., 2020; Xiao et al., 2020). Furthermore, young children are vulnerable to SARS-CoV-2 infection and children under the age of 6 are more likely than older children to have severe and critical cases (Dong et al., 2020); therefore, parents of having children under 6 years old might feel especially burdened by the risk to their families. Rubin and Thomas (1996) suggested that all variables that might be associated with the outcome should be included in PSM. Therefore, we determined that sex, age, children under 6 years, job title, and institution should be included as covariables in the PSM analysis. There were 339 matches between the anxiety group and the normal group and 305 matches between the depression group and the normal group after PSM (**Tables 1**, **2**).

The results of the univariate analyses of potential factors related to anxiety and depression symptoms after PSM are shown in **Tables 3**, **4**. Participants in the anxiety group tended to do both field work and non-field work (81.71% performing both types vs. 18.29% performing only one or the other, $p = 0.020$), have 6–10 difficulties in COVID-19 control and prevention (51.92%, compared to 32.45% with 5 or fewer difficulties; $p < 0.001$, Bonferroni correction), sleep an average of 5–6 h per night (61.06%, compared to 35.40% sleeping more than 6 h per night; $p < 0.001$, Bonferroni correction), work 9–15 h per day (71.39%, compared to 22.42% working 8 or fewer hours per day; $p < 0.001$, Bonferroni correction), be able to persist less than 1 month at their current work intensity (76.99%, compared to 23.01% persist 1 month or more, $p < 0.001$), and perceived the effort-reward balance (57.23%, compared to 42.77% perceiving an imbalance, $p < 0.001$).

Furthermore, participants in the depression group also tended to do both field work and non-field work (79.34% performing both types vs. 20.66% performing only one or the other, $p = 0.047$), have 6–10 difficulties in COVID-19 control and prevention (51.15%, compared to 34.43% with 5 or fewer difficulties; $p < 0.001$, Bonferroni correction), work overtime more than 15 days (62.30%, compared to 13.77% working overtime 6–10 days; $p = 0.012 < 0.0125$, Bonferroni correction), sleep an average of 5–6 h per night (59.34%, compared to 37.05% sleeping more than 6 h per night; $p = 0.001$, Bonferroni correction) and work 9–15 h per day (67.87%, compared to 26.89% working 8 or fewer hours per day; $p = 0.006 < 0.0167$, Bonferroni correction) per day, be able to persist less than 1 month with current work intensity (78.03%, compared to 21.97% persist 1 month or more, $p < 0.001$), and perceived the effort-reward balance (57.38%, compared to 42.62% perceiving an imbalance, $p < 0.001$). Moreover, participants with depression and anxiety had greater perceived distress, perceived tension, and overcommitment than those without depression or anxiety.

Multivariate Stepwise Logistic Regression Analysis

The associations between influencing factors and anxiety and depression symptoms among public health workers during

TABLE 5 | Associations between mental health status and background variables (multivariate stepwise logistic regression)[a].

Variables	Anxiety		Depression	
	OR (95% CI)	*P*	OR (95% CI)	*P*
How long one can persist with your current intensity of work				
<1 month				
≥1 month	0.41 (0.28–0.60)	<0.01	0.42 (0.28–0.62)	<0.01
Perceived distress at work	1.18 (1.11–1.26)	<0.01	1.14 (1.07–1.21)	<0.01
Perceived tension	1.11 (1.07–1.15)	<0.01	1.11 (1.07–1.15)	<0.01
Overcommitment	1.20 (1.10–1.31)	<0.01	1.10 (1.01–1.19)	<0.01

CI, confidence interval; OR, odds ratio.
[a]*Variables that were significant in the univariate analyses in **Tables 3**, **4** entered into the forward stepwise models after adjusting for sociodemographic variables with propensity score matching (sex, age, a child <6 years, job title and institution).*

the COVID-19 epidemic are shown in **Table 5**. In the multivariate stepwise logistic regression analysis, persistence for more than 1 month at the current work intensity (OR = 0.41∼0.42, $P < 0.001$) was a significant protective factor against anxiety and depression symptoms, while perceived destress at work (OR = 1.14∼1.18, $P < 0.001$), perceived tension (OR = 1.11, 95% CI: 1.07–1.15, $P < 0.001$), and overcommitment (OR = 1.10∼1.20, $P < 0.001$) were positively associated with anxiety and depression.

Bayesian Network Models

According to the result of the multivariate stepwise logistic regression analysis, anxiety and depression had the same 4 influencing factors. **Table 6** lists and assigns these 4 influencing factors and outcome variables, which were used in the BN analysis. **Figures 1**, **2** show BN models of the influencing factors of anxiety and depression symptoms among public health workers during the COVID-19 epidemic, respectively. Persistence, tension, and difficulty directly affected both anxiety and depression.

Overcommitment was dependent on tension and difficulty. Tension was dependent on difficulty. Difficulty was dependent on persistence. Health status (anxiety and depression) and overcommitment were conditionally independent of tension.

Conditional Probability Distribution

Tables 7, **8** are conditional probability tables. Because of limited space, we present only a random selection of the conditional probability results.

As shown in **Tables 7**, **8**, P (anxiety = 1| difficulty = 2, tension = 2, persistence = 1) ≈ P (anxiety = 1| difficulty = 2, tension = 2, persistence = 2) = 0.81, P (depression = 1| difficulty = 2, tension = 2, persistence = 1) = 0.81, and P (depression = 1| difficulty = 2, tension = 2, persistence = 2) = 0.79. Through this expression, we can draw the following conclusions. If persistence at the current work intensity occurred for more or less than a month and the scores of perceived troubles at work and perceived tension were high, the probabilities of anxiety and depression were very high (0.81 and 0.79–0.81, respectively).

TABLE 6 | Variable descriptions and assignments.

Variables	Name	Variable assignment
How long one can persist with your current intensity of work	Persistence	<1 month = 1, ≥1 month = 2
Perceived distress at work	Difficulty	The final score in the lower two-thirds of the range = 1 (low level), the final score in the upper third of the range = 2 (high level)
Perceived tension	Tension	The final score in the lower two-thirds of the range = 1 (low level), the final score in the upper third of the range = 2 (high level)
Overcommitment	Overcommitment	The final score in the lower two-thirds of the range = 1 (low level), the final score in the upper third of the range = 2 (high level)
Anxiety	Anxiety	GAD-7 score <5 = 0, GAD-7 score ≥5 = 1
Depression	Depression	PHQ-9 score <5 = 0, PHQ-9 score ≥5 = 1

DISCUSSION

The present results show that during the COVID-19 epidemic, mental health problems were prominent among public health workers, with 49.2% and 45.7% suffering from anxiety and depression, respectively. These high prevalence rates were similar to the rates reported in a previous study, which found that the prevalence of anxiety and depression among 1,563 medical staff were 44.7% and 50.7%, respectively, using the same measurements and cutoff points (Liu et al., 2020). The mental health of public health workers during the COVID-19 epidemic is of great concern.

Before PSM, there were demographic differences between the groups with different health conditions (anxiety and non-anxiety, depression and non-depression). Research variables related to COVID-19 (e.g., knowledge mastery, perceived troubles at work, perceived tension) may be affected by demographic factors (e.g., age, sex, and professional title). Thus, it is difficult to accurately assess the influence of COVID-19-related variables on mental

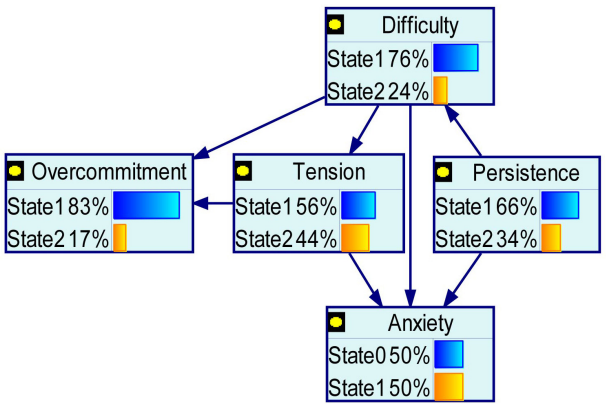

FIGURE 1 | Bayesian network for anxiety. Anxiety and the significant COVID-19-related variables in the multivariate analyses after propensity score matching entered into Bayesian network.

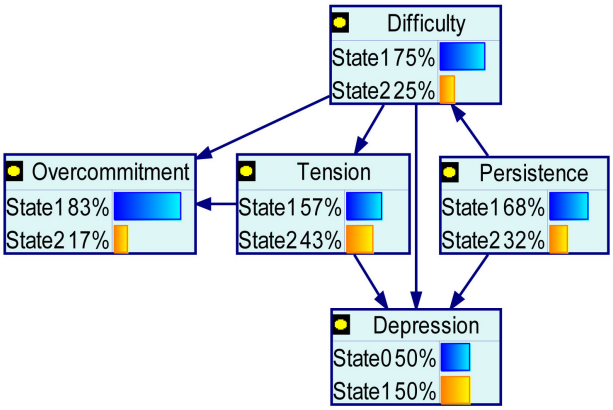

FIGURE 2 | Bayesian network for depression. Depression and the significant COVID-19-related variables in the multivariate analyses after propensity score matching entered into Bayesian network.

TABLE 7 | Conditional probability of anxiety.

Difficulty	Tension	Persistence	Anxiety	
			0	1
1	1	1	0.61	0.39
1	1	2	0.87	0.13
2	1	1	0.31	0.69
2	1	2	0.33	0.67
1	2	1	0.30	0.70
1	2	2	0.49	0.51
2	2	1	0.19	0.81
2	2	2	0.19	0.81

*Variable assignments are shown in **Table 6**.*

TABLE 8 | Conditional probability of depression.

Difficulty	Tension	Persistence	Depression	
			0	1
1	1	1	0.59	0.41
1	1	2	0.83	0.17
2	1	1	0.43	0.57
2	1	2	0.63	0.37
1	2	1	0.31	0.69
1	2	2	0.50	0.50
2	2	1	0.19	0.81
2	2	2	0.21	0.79

*Variable assignments are shown in **Table 6**.*

health status. For reasons involving time and cost, most of the current studies on mental health among various populations during the epidemic are retrospective studies, which cannot be randomized to control for confounding factors to reduce their interference with outcome effect estimates. Therefore, by using PSM to control for confounding factors, the relationships between COVID-19-related variables and the mental health of public health workers could be thoroughly explored.

Univariate analysis after PSM showed that public health workers in the anxiety and depression group were more likely to work 9–15 h and sleep an average of 5–6 h per day than to work 8 or fewer hours and sleep more than 6 h per day. Working long hours potentially reduces the sleep time of public health workers (Marjanovic et al., 2007; Afonso et al., 2017). Those who reported insufficient sleep had adverse mental health effects, similar to the findings in other studies (Simon et al., 2020). During the most severe period of the epidemic in China, a study noted that medical workers had insufficient time to rest (Chen et al., 2020). Public health workers experienced psychological distress were more likely to encounter 6–10 difficulties at work than to encounter five or less, such as poor communication (Naushad et al., 2019) and shortages of medical protective equipment (Guangming Online, 2020; World Health Organization (WHO), 2020d). Moreover, public health workers suffering from anxiety and depression tended to be the effort-reward unbalance. The reason may be that they are not widely understood or respected by the public (Hellewell et al., 2020). During the epidemic, the prevention and control work they perform, such as isolating close contacts (at home or in a designated hotel) and conducting home inspections, is often met with non-cooperation and even opposition. This conflict not only hinders prevention efforts but also has a negative impact on the mental health of public health workers. Time-consuming paperwork and data analyses, especially in emergency situations, may further increase people's physical and mental health burdens (World Health Organization and International Labour Organisation (WHO and ILO), 2000).

To avoid potentially false associations between the research variables and the dependent variable in the univariate analysis, we performed multivariate logistic regression analysis. The results showed that the impacts of type of work, number of difficulties in COVID-19 control and prevention, average sleep time per day (hours), average work time per day (hours), and work/life balance on mental health were offset. This may be

related to the insufficient sample size or the collinearity of independent variables.

Research has shown that overcommitment is a risk factor for declining mental health (Hinsch et al., 2019). If public health workers overexert themselves at work and fail to obtain a reward, their frustration at work increases, potentially leading to anxiety and depression. Public health workers in anxious and depressed states had increased scores for perceived distress; these states were mainly due to their work not being understood, feeling wronged and unfairly treated at work, and regular work pressure. These factors may be related to poor social support, high labor intensity, and high personal costs among public health workers. In the fight against COVID-19, public health workers have been under tremendous pressure and are overworked and exhausted from long hours of intense work, while worrying about themselves and their families contracting the infection (Kang et al., 2020). Persistent internal physical and mental tension may manifest as psychotic symptoms in many public health workers during the epidemic.

Given that a multivariate logistic regression analysis usually considers each influencing factor under the assumption of independence and reveals only the independent factors influencing mental health, a BN model was used to construct a network diagram and conditional probability table to further describe how each factor was interrelated and affected the occurrence of anxiety and depression. The time at current work intensity, perceived troubles at work, and perceived tension were directly related to anxiety and depression, consistent with the results of the multivariate logistic regression analysis.

Mental health issues affect the attention, understanding, and decision-making abilities of public health workers, thereby hindering the fight against COVID-19 and affecting their overall health. Therefore, various interventions should be established to protect the mental health of public health workers. For example, the unit should reasonably schedule working hours, recruit volunteers with medical backgrounds and provide adequate training, thereby distributing the burden of basic public health work and relieving work-related pressure on public health workers. Moreover, social support and public awareness of the importance of public health work should be increased through media campaigns. The difficulties encountered by public health workers should be reduced by the provision of adequate protective equipment, the simplification of reporting data and the introduction of a reasonable and fair system of rewards and punishments. Finally, timely psychological interventions targeting public health workers should be implemented to alleviate stress during the epidemic.

This study has several limitations. First, our study was a cross-sectional study that extracted data from only one point in time. Changes in the mental health status of public health workers in different periods during the epidemic should be investigated. Second, to prevent the potential spread of COVID-19, an online questionnaire was administered. Therefore, there was non-response bias in the study. Third, all the measures relied on self-reported questionnaires, which are dependent on individuals' subjective accounts and are vulnerable to reporting bias.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Chongqing Medical University. Written informed consent for participation was not required for this study in accordance with the National Legislation and the Institutional Requirements.

AUTHOR CONTRIBUTIONS

JG and HZ were responsible for conceiving and designing the study. XJ and QZ collected the data. XP and YP conducted statistical analyses and drafted the manuscript. XP and DD commented and revised the manuscript. All authors contributed, reviewed, and approved the final manuscript.

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Psychological Distress Among Occupational Health Professionals During Coronavirus Disease 2019 Pandemic in Spain: Description and Effect of Work Engagement and Work Environment

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The impact of the coronavirus disease 2019 (COVID-19) pandemic on the mental health of hospital health professionals has been widely described, but few studies have focused on occupational health professionals. Therefore, the objective of this study was to assess psychological distress (PD) of occupational health workers and its relationship with their work engagement (WE) and work environment characteristics. A cross-sectional survey was conducted. A sample of 499 nurses and physicians participated in the study. Variables included demographic data, work environment characteristics, work engagement Utrecht Work Engagement Scale (UWES-9) and psychological distress General Health Questionnaire (GHQ-12). The Chi-square Automatic Interaction Detection method was performed for data analysis. Data collection took place *via* the internet between April 23 and June 24, 2020. A total of 65.53% of the participants had PD, and the total mean score of the UWES-9 scale was 34.80 (SD = 10.69). Workload, conflicts, stressful situations, and less job satisfaction were significantly related to a higher percentage of PD ($p < 0.05$). Participants with low engagement showed higher levels of PD (76.7%; $p < 0.001$). The dedication was revealed as the most significant dimension. Interventions aimed at promoting resilience and coping strategies are suggested. WE should be fostered as a preventive measure against PD among occupational health workers. By protecting workers, occupational health departments have a shared responsibility with public health in containing the pandemic. Therefore, it is essential to prevent the psychological impact that this responsibility may have on occupational health workers by implementing prevention measures.

Keywords: COVID-19, psychological distress, work engagement, occupational health, healthcare professionals, occupational medicine, nursing

INTRODUCTION

The health crisis caused by the coronavirus disease (COVID-19) has been considered an unprecedented global pandemic that threatens the entire world. Public health interventions have been implemented to minimize the negative effect of the pandemic on the physical and mental health of the population (Pan et al., 2020). Regarding physical health, the symptoms and prognosis of COVID-19 patients are remarkably diverse. Symptoms and signs present with unpredictable intensity, ranging from asymptomatic to severely compromised, leading to death (Adhikari et al., 2020). Due to this variability, in addition to the unavailability of a specific treatment against the virus, the most effective approach to protecting the population is preventive measures to avoid exposure to the virus and vaccination (Singhal, 2020).

Regarding mental health, the evidence suggests that anxiety, depression, and stress are the common and expectable reactions to the COVID-19 pandemic (Rajkumar, 2020). Health professionals are a particularly vulnerable group to psychological distress (PD), due to their level of exposure and the nature of their work (Chew et al., 2020). Previous studies have described the psychological impact of the pandemic on healthcare professionals, resulting in anxiety and depression (Suryavanshi et al., 2020; Xiang et al., 2020; da Silva and Neto, 2021), insomnia (Pappa et al., 2020; da Silva and Neto, 2021), post-traumatic stress (Preti et al., 2020), and physical and mental exhaustion or emotional disorders (Kang et al., 2020). Health professionals under quarantine, those who worked caring for patients with COVID-19, or those who had relatives or friends infected by the virus developed considerably more anxiety, depression, frustration, fear, and post-traumatic stress than those who had not been subjected to these conditions (Xiang et al., 2020). The risk of PD increases when working directly with patients suffering from COVID-19, due to fear of their own contagion and concern for the health of their relatives (Babicki et al., 2021). This entails the need to ensure adherence of healthcare professionals to appropriate infection prevention measures during the health crisis (Temsah et al., 2020).

In this scenario, occupational health faces a demanding challenge. Although COVID-19 has been accepted as a public health problem, it is less common to consider it an occupational disease (Koh and Goh, 2020). Although vaccination is the most successful strategy to prevent the spread of the virus and the actual vaccines are highly effective, herd immunity is required to end the pandemic. In Europe, the complete vaccination figures do not reach the desired threshold to control the pandemic safely, so it is recommendable to maintain other preventive measures such as social distancing, face masks, and hand hygiene (Cihan, 2021). Every job involving contact with the public and physical proximity is subject to the risk of exposure, given the high incidence of the disease. This is a burden for this sector since, in addition to the risks inherent in each job, there is also the risk of being infected for many workers (Burdorf et al., 2020). The pandemic has required Spanish institutions to develop procedures facing the exposure to the new coronavirus and during the alarm state, those workers who required periods of isolation or who had been infected were in a situation considered as an occupational accident (Government of Spain, 2020; Instituto Nacional de Seguridad y Salud en el Trabajo, 2020). In March, during the coronavirus outbreak, sick leaves increased 116% in Spain, and the figures were particularly high among healthcare workers (457%) (Calvo-Bonacho et al., 2020). This measure has forced occupational health professionals to work in harsh conditions, under pressure, with an increase in their workload, and with wider schedules and limited human resources (Santarone et al., 2020). Authors have pointed out the relevant role of occupational health in the management of the response to the crisis, providing safety, surveillance, and health protection to the workers under their care (Fadel et al., 2020). Also, once the worst effects of the pandemic have been overcome, it is proposed to reactivate the economy, for which many workers must return to their jobs safely, and thus, the occupational health professionals should adapt their work environment to the new normality conditions (Rueda-Garrido et al., 2020). Therefore, occupational health workers, in addition to the risk of PD associated with being health workers, are under pressure to provide safe working conditions for workers and to prevent the spread of the virus in the workplace.

Maintaining the psycho-emotional wellbeing of health workers and fostering their resilience are crucial in addressing and containing COVID-19 (Chen et al., 2020). It has been proposed that institutions should implement training and confidence in prevention equipment and measures (Preti et al., 2020) and interventions aimed at creating a psychologically safe environment, sound leadership, clear organizational strategies, and meaningful support for the team (Blake et al., 2020). Work engagement (WE) could help professionals cope with work-related PD and contribute to their wellbeing and health (Malagón-Aguilera et al., 2019). Work engagement is a positive and satisfactory attitude related to work, characterized by vigor, dedication, and total absorption and concentration in the activity. Vigor refers to high levels of energy, persistence, and mental endurance. Dedication refers to being strongly involved in his/her work and experiencing a sense of importance and enthusiasm. Absorption refers to being fully concentrated and happily absorbed at work (Schaufeli et al., 2002). Work engagement is considered as one of the constructs of wellbeing, a way to reduce the prevalence of stress or burnout among healthcare workers from a positive organizational psychological perspective, and as an indicator of intrinsic motivation for work (García-Renedo et al., 2006).

The work environment plays an important role in the development of WE. It has been described how transformational leadership, structural empowerment, a positive work climate, and social support enhance WE (García-Sierra et al., 2016). In addition, the job characteristics, such as skill variety, task identity, task significance, autonomy, and job feedback, promote the feelings of WE among workers (Wan et al., 2018). Work engagement is fostered by labor resources (e.g., autonomy and social support by peers or higher professional roles) and recovery provided by emotional contagion outside of work, as well as personal resources, such as self-efficiency, or belief in the own ability to perform the job appropriately (García-Renedo et al., 2006). In contrast, workload and overtime work have a negative

effect on workers and reduce their WE capacity (Ando and Kawano, 2018). The distress generated by the frustration of being forced to adopt behaviors that are not considered morally acceptable also negatively influences WE (Lawrence, 2011).

Therefore, since WE fosters a positive attitude toward work and brings personal benefits for workers such as job satisfaction, decreased burnout, work effectiveness, and wellbeing, it could be a valuable resource to address the psychological impact of the pandemic (Lawrence, 2011; García-Sierra et al., 2016; Keyko et al., 2016). Both WE and a favorable work environment promote feelings of wellbeing in workers, positive toward work, and a desire to stay (Wan et al., 2018).

For all the above, the hypothesis proposed by this study is whether sociodemographic variables, work environment, and WE influence the level of PD of occupational health professionals. Many studies have centered on the impact of the COVID-19 pandemic on the mental health of healthcare professionals (Chew et al., 2020; Kang et al., 2020; Pappa et al., 2020; Preti et al., 2020; da Silva and Neto, 2021), but few studies have focused on the occupational health professionals. This study aimed to describe the impact of the COVID-19 pandemic on psychological welfare among the occupational health professionals in Spain, during the pandemic outbreak. Our objective was to assess the PD of occupational health workers and its relationship with their WE and work environment characteristics.

MATERIALS AND METHODS

Design

A cross-sectional study was conducted.

Participants

The study population was the occupational health professionals actively working during the first wave of the COVID-19 pandemic in Spain. As the inclusion criteria, it was established physicians or nurses working in an occupational health department during the first stage of the COVID-19 pandemic. Those professionals who did not live in Spain at the time of the study or were not actively working (sick leave, unemployed, or retired) were excluded.

Participants were recruited from the Spanish Association of Occupational Medicine (1,300 members) and the Spanish Association of Occupational Health Nursing (250 members) as they are the primary associations of occupational health in Spain. Considering a confidence level of 95%, a precision of 4.5%, and an adjustment for losses of 10%, an optimal sample size of 427 participants was estimated for our study population. After data collection, the sample was over the estimated size with 499 participants, 402 (30.9%) doctors, and 97 (38.8%) nurses.

Instruments

Sociodemographic and Work Environment Variables

Data regarding the sociodemographic and work environment variables were collected by an *ad hoc* questionnaire made for this purpose. The questionnaire included socio-labor variables such as sex, age, educational level (degree, master's, or Ph.D.), marital status, children, pets, type of housing (with or without outdoor space), teleworking, work center (public or private), and professional profile (nurse or physician). It also included variables related to the work environment such as perception of conflict, perception of safety, acceptance of risk, workload, perceived stress, and job satisfaction. The categorization of variables related to the work environment, with scores between 1 and 10, was transformed into the negative response for values less than or equal to 5 and the positive response otherwise.

General Health Questionnaire

The General Health Questionnaire (GHQ-12) (Goldberg et al., 1997) on its Spanish adapted version (Sánchez-López and Dresch, 2008) was used to measure PD. Each item had four response options, scoring 0 points with options 1 or 2, or 1 point with options 3 or 4. As the questionnaire has 12 items, the overall score ranged from 0 to 12. In this study, a cutoff point of 3 was agreed, with scores equal to or greater than 3 considered as signs of PD (Jackson, 2006). The internal consistency of the instrument has been previously tested, with Cronbach's index ranging from $\alpha = 0.76$ to $\alpha = 0.82$ for the Spanish population (Sánchez-López and Dresch, 2008; Padrón et al., 2012).

Utrecht Work Engagement Scale

The WE was measured by Utrecht Work Engagement Scale (UWES-9) in its short version (Schaufeli et al., 2006). It is an instrument designed to be self-managed and features nine items, with Likert-type response options ranging from 0 (Never) to 6 (Always). It consists of three dimensions, namely, vigor, dedication, and absorption. The score was calculated in each dimension, adding the items in each dimension and dividing the result by the number of items that make up each dimension. Scores obtained in each dimension of the UWES-9 were categorized, distinguishing between low, intermediate, or high categories, where the "low" category grouped participants who scored between the minimum and the 25th percentile, "intermediate" category grouped those who were scoring 50%, and "high" category grouped those who scored between the 75th percentile and the maximum value. The Spanish version of the instrument has achieved the following Cronbach's internal consistency indexes: vigor ($\alpha = 0.82$), dedication ($\alpha = 0.86$), and absorption ($\alpha = 0.8$) (García-Iglesias et al., 2021).

Procedure

The questionnaire was distributed online among the Spanish Association of Occupational Medicine and the Spanish Association of Occupational Health Nursing. All members who had given their consent to be contacted for research purposes were sent an invitation to participate *via* email, and a reminder. A link to the survey was also available at both Association websites. Participants were informed about the purpose and conditions of the study at the beginning of the questionnaire. Through informed consent, the participants voluntarily expressed their desire to participate in the study. Participants were free to leave the study at any time, as unfinished questionnaires were not included in the database. The anonymity and confidentiality of the data collected were maintained.

The online survey platform Qualtrics® was used for data collection and storage. The survey was to be completed from any electronic device (i.e., tablet, laptop, and mobile phone) with internet access. Data collection took place between April 23 and June 24, 2020 (the state of alarm began on March 13).

Statistical Analysis

Absolute frequencies and percentages of the variables collecting socio-labor information (i.e., sex, age, educational level, marital status, children, pets, type of housing, teleworking, work center, and professional profile) were calculated, as well as for those variables collecting data regarding the work environment (i.e., perception of conflict, perception of safety, acceptance of risk, workload, perceived stress, and job satisfaction). Work Engagement dimensions were evaluated by the median score. To contrast whether there is a relationship between these variables and the presence of PD, the χ^2 test of independence was performed; also, the Chi-square Automatic Interaction Detection (CHAID) method determined which variables played a remarkable role, choosing those predictors with lower adjusted p, as long as that value was less than or equal to the significance level set to $p = 0.05$. The CHAID method (Kass, 1980) is a hierarchical classification tool that determines which factors or predictors are most related to the classification criterion, using the chi-square test of independence and selecting the factor that has the smallest p-value, i.e., the most significant factor. The sample was then divided according to the levels of the chosen factor, and the same criterion was applied to each resulting group, dividing again repeatedly until it was not possible to continue dividing or no other significant factor was found ($\alpha = 0.05$). The level of significance to merge the two categories of a predictor and to divide a node by the most significant predictor was, in both cases, 0.05. The analyses were carried out with the statistical software SPSS 26.0© SPSS: (IBM Corporation, 2019) and R, version 4.0.0© R: (Fox and Bouchet-Valat, 2020).

Ethical Considerations

This study has the favorable report of the Research Ethics Committee of Huelva, belonging to the Andalusian Ministry of Health (PI 036/20), having complied with all the ethical principles contained in the Declaration of Helsinki.

RESULTS

Socio-Labor Variables and Psychological Distress

A total of 65.53% of the participants had PD (GHQ $\geq$ 3), with a similar percentage in occupational health physicians (65.67%) and occupational health nurses (64.95%). The sample is mostly composed of women (65.73%), and 50% were over 51 years old. Regarding the level of education, 55.51% had a postgraduate, MSc, or Ph.D. degree. Most of them (78.16%) were married or lived with a couple, 79.56% had children, 33.67% claimed to have pets, and 76.75% had a house with outdoor space. Neither of these variables influenced having higher PD. With respect to the type of work center, the highest percentage (63.33%) worked for a private company and the remaining 36.67% for the public sector. PD levels of older public sector workers were higher (72.68%) than those of private company workers (61.39%; $p = 0.011$) (**Table 1**).

Work Environment and Psychological Distress

Half of the participating professionals (50.22%) claimed that there was labor conflict in the company, presenting a higher percentage of PD for those participants working in settings where that conflict existed (76.34%) than those for which this conflict did not exist (52.70%; $p < 0.001$). The presence of risk was perceived by 83.63% of workers, and the risk of contracting the disease was accepted by 66.82%, without having the statistical significance of the ones with the highest PD as compared to those who claimed not to be. The higher workload for 91.48% of workers was related to a higher percentage of PD among them (67.16%) than among those who claimed not to have a higher workload (36.84%; $p < 0.001$). Notably, 88.34% stated that there was a stressful work situation, generating PD for 71.07% of them, being this PD significantly lower for those who do not feel stress at work (15.38%; $p < 0.001$). The percentage of those who are satisfied with their work (65.92%) is higher than those who are not satisfied (34.08%), with an influence on the development of PD, which is higher among those who are not satisfied (68.29%), as compared to those who are satisfied (57.48%; $p < 0.001$).

Among the variables related to the work environment, work stress was shown as the most significant variable in relation to PD. No work stress was mediated by accepting the risk of infection as part of the job; among those who accept it, 7.9% have PD vs. 35.7% of those who did not. Sex, a mediating variable regarding work stress, showed a higher risk of PD among women than among men. In the case of men, the percentage of cases with PD was 58.1%. For women with work stress who believed that the situation had not increased labor disputes, the percentage of cases with PD was 67.8%, while for those who considered that their job satisfaction had increased. This was a mediating factor, distinguishing 78.8% of cases when there was satisfaction and 92.4% when there was not (**Figure 1**).

Work Engagement and Development of Psychological Distress

The total mean score of the UWES-9 scale was 34.80 (SD = 10.69). Occupational health nurses and physicians with high overall engagement values had the lowest percentage of PD, i.e., 44.2%. This percentage increased in those with intermediate levels of engagement (65.2%) and was even higher in those with low engagement (76.7%; $p < 0.001$) (**Table 2**).

As shown in **Figure 2**, the degree of dedication was revealed as the most significant variable in the segmentation tree, $p < 0.001$. The participants with higher dedication had a lower percentage of PD among men (35.5%) than among women (53.8%), $p = 0.03$. With intermediate dedication, working in a private or associated center as compared to a public one was shown as a mediating factor ($p = 0.49$), as in public centers, 76.8% of professionals had PD, and in private or associated centers, depending on age, the

TABLE 1 | Socio-labor variables and psychological distress (PD).

	Total		GHQ < 3		GHQ ≥ 3			
	Cases (N)	% of total	Cases (N)	% line	Cases (N)	% line	Chi-square statistic	*p*-Value
	499	100%	172	34,47%	327	65,53%	χ^2	*p*
Sex								
Male	171	34.27%	83	48.54%	88	51.46%	22.80	< 0.001
Female	328	65.73%	89	27.13%	239	72.87%		
Age*								
51 or younger	249	50.00%	74	29.72%	175	70.28%	5.12	0.024
Older than 51	249	50.00%	98	39.36%	151	60.64%		
Educational level								
University degree	222	44.49%	69	31.08%	153	68.92%	2.03	0.154
Postgraduate: MSc or Ph.D.	277	55.51%	103	37.18%	174	62.82%		
Marital status								
With a partner	390	78.16%	142	36.41%	248	63.59%	2.98	0.084
Without a partner	109	21.84%	30	27.52%	79	72.48%		
Children								
No	102	20.44%	32	31.37%	70	68.63%	0.54	0.461
Yes	397	79.56%	140	35.26%	257	64.74%		
Pet								
No	331	66.33%	111	33.53%	220	66.47%	0.38	0.538
Yes	168	33.67%	61	36.31%	107	63.69%		
Type of housing								
Without outdoor space	116	23.25%	40	34.48%	76	65.52%	0.00	0.997
With outdoor space	383	76.75%	132	34.46%	251	65.54%		
You work*								
From home	117	26.23%	85	72.65%	32	27.35%	5.14	0.077
Away from home	312	69.96%	191	61.22%	121	38.78%		
Both from and away from home	17	3.81%	12	70.59%	5	29.41%		
Work center								
Public	183	36.67%	50	27.32%	133	72.68%	6.53	0.011
Private or associated	316	63.33%	122	38.61%	194	61.39%		
Profile								
Occupational health nurse	97	19.44%	34	35.05%	63	64.95%	0.02	0.893
Occupational medicine	402	80.56%	138	34.33%	264	65.67%		
Active								
Yes	499	1.00%	172	34.47%	327	65.53%		

**Total cases do not correspond because the information is not collected in all subjects.*

percentage of cases with PD was 50% at ages over 51 years and 77.4% among younger professionals. In terminal nodes deriving from low dedication, 60% of men had PD, and among women, 66.7% of nurses and 94.4% of doctors had PD.

Relationship Between Work Environment, Work Engagement, and Development of Psychological Distress

Figure 3 shows how the absence of work stress and the acceptance of the risk of infection as part of the job caused PD in 7.9% of the participants, while this percentage rose to 35.7% when the risk of infection was not accepted. Regarding work stress, the dedication was revealed as a mediating variable. High dedication in a conflictive environment caused PD in 72.5% of participants, decreasing to 36.5% in the absence of conflict. Notably, 82.8% of professionals working in public work centers with average dedication presented distress. However, in private and associated centers, age was a mediating variable, finding less cases of distress among participants over 51 years of age (55.2%) and increasing in younger to 68.4% for those with a lower degree of job satisfaction in the face of a new situation and to 93.1% when this degree of satisfaction was higher. The percentage of cases with distress in professionals with low work dedication reached 66.7% in men and increased to 76.9% in the case of female nurses and 95.7% in female physicians.

DISCUSSION

This study aimed to describe the PD of occupational health workers and its relationship with the WE and work environment

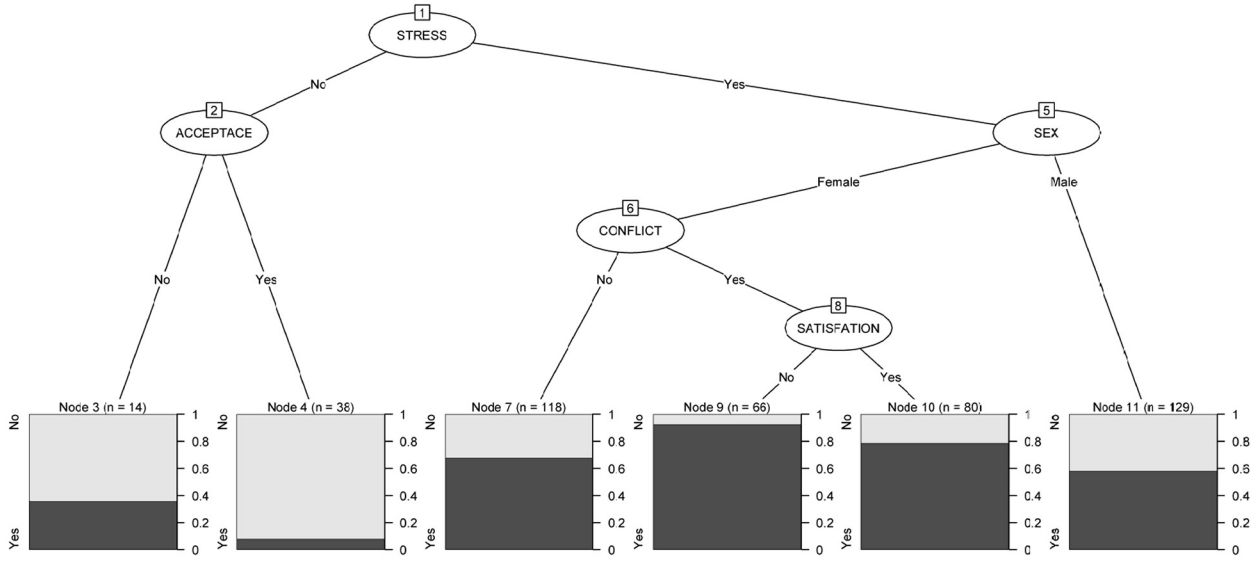

FIGURE 1 | Relationship of the work environment with developing psychological distress.

characteristics during the first months of the COVID-19 pandemic in Spain. According to the results, more than half of the participants showed PD and declared an intermediate level of WE. It was identified that a significantly higher level of PD in public sector workers than among private company workers. A relationship between WE and PD was found, and the lower WE score was related to higher PD. The dedication was the most significant dimension, and the higher scores in the dedication were related to lower PD. Regarding the work environment, those professionals who perceived conflict, stress, workload, and less job satisfaction showed more PD. Work stress was revealed as the most significant variable in relation to PD and was mediated by accepting the risk of infection as part of the job.

Occupational health professionals participating in this study showed lower PD (65.53%) than results obtained in a similar previous study conducted in Spain involving healthcare professionals (80.6%) (Gómez-Salgado et al., 2020). However, it was higher than PD identified by Rodríguez-Rey et al. (2020) (36.6%) and Odriozola-González et al. (2020) (47.5%) in Spanish general population at the same stage of the pandemic. Our results also differ from international studies, which found less PD among healthcare professionals, i.e., 41% (Krishnamoorthy et al., 2020) and 35% (Luo et al., 2020). Regarding WE, our results (34.80 SD = 10.69) are congruent with previous studies (37.93 SD = 8.52) (Buchanan et al., 2018).

Results from this study described more PD among public sector workers than in private company workers. In Spain, although the health system is mostly public, most occupational health professionals work in private companies, closer to workplaces instead of being in hospitals. Our results could be explained by the fact that the private sector involves most of the professionals of the sample. As Moretti et al. (2020) described, during the COVID-19 pandemic, workers felt less stressed since they started teleworking, thanks to avoiding traveling to the office, time flexibility, and better family life. The review conducted by Oakman et al. (2020) revealed the positive effect of working at home on mental health, reducing stress and emotional exhaustion, and improving wellbeing, quality of life, and perceived safety. However, negative effects associated with working from home during the pandemic that could increase PD have been described, such as an increased conflict between family and work and social isolation (Galanti et al., 2021). According to Xiao et al., the physical and mental wellbeing of people who work from home during the pandemic could be improved with physical exercise, healthy eating, good relationships with coworkers, adjusted working hours, control of distractions, and a suitable home environment dedicated to work (Xiao et al., 2021). The opportunity to work from home given to the participants of this study who worked at a private company may have led them to perceive less PD.

Regarding work environment, according to our results, those professionals who perceived conflict, stress, workload, and less job satisfaction claimed more PD, which is consistent with previous studies. Giorgi et al. (2020) described how work-related conditions influence moderating or worsening mental health of people during the COVID-19 pandemic. Their review pointed out that work-related stress led to mental health issues, as well as poor social support, prolonged working hours, and the perception of risk of contagion. The study conducted by Labrague and de Los Santos (2020) among frontline nurses identified that an increased level of fear of COVID-19 was associated with decreased job satisfaction and increased PD. Workload has already been identified as an influencing factor for PD suffered by healthcare workers during the COVID-19 pandemic, as well as burnout and the psychological pressure due to difficult moral decisions about care priorities in situations of emergency and shortage of resources (Sahebi et al., 2021). Additionally, Naldi et al. (2021) found an association between increased workload

TABLE 2 | Relationship between work environment, work engagement, and PD.

	Total		GHQ < 3		GHQ ≥ 3			
	Cases (N)	% of total	Cases (N)	% line	Cases (N)	% line	Chi-square statistic	*p*-Value
Work environment	**446**	**100%**	**158**	**35.4%**	**288**	**64.6%**	χ^2	*p*
Conflict								
No	222	49.78%	105	47.30%	117	52.70%	29.28	< 0.001
Yes	224	50.22%	53	23.66%	171	76.34%		
Risk								
No	73	16.37%	32	43.84%	41	56.16%	4.44	0.109
Yes	373	83.63%	126	33.78%	247	66.22%		
Acceptance								
No	148	33.18%	44	29.73%	104	70.27%	4.88	0.087
Yes	298	66.82%	114	38.26%	184	61.74%		
Workload								
No	38	8.52%	24	63.16%	14	36.84%	15.84	< 0.001
Yes	408	91.48%	134	32.84%	274	67.16%		
Stress								
No	52	11.66%	44	84.62%	8	15.38%	64.76	< 0.001
Yes	394	88.34%	114	28.93%	280	71.07%		
Job satisfaction								
No	152	34.08%	33	21.71%	119	78.29%	20.91	< 0.001
Yes	294	65.92%	125	42.52%	169	57.48%		
UWES	446	100%	158	35.4%	288	64.6%	χ^2	*p*
Vigor								
Low	111	24.9%	19	17.1%	92	82.9%	27.55	< 0.001
Intermediate	296	66.4%	116	39.2%	180	60.8%		
High	39	8.7%	23	59.0%	16	41.0%		
Dedication								
Low	119	26.7%	22	18.5%	97	81.5%	37.60	< 0.001
Intermediate	187	41.9%	60	32.1%	127	67.9%		
High	140	31.4%	76	54.3%	64	45.7%		
Absorption								
Low	115	25.8%	31	27.0%	84	73.0%	8.90	0.012
Intermediate	197	44.2%	67	34.0%	130	66.0%		
High	134	30.0%	60	44.8%	74	55.2%		
UWES-Total								
Low	118	26.5%	24	20.3%	94	76.7%	29.01	< 0.001
Intermediate	233	52.2%	81	34.8%	152	65.2%		
High	95	21.3%	53	55.8%	42	44.2%		

and moderate-to-severe symptoms of state anxiety, distress, and emotional exhaustion. It has also been identified as a major stress source for healthcare workers such as concerns about personal protective equipment, physical and emotional exhaustion, fear of being infected, and insufficient work experiences with COVID-19 (Leng et al., 2020).

The influence of perceived conflict on PD identified in this study could be related to the participants' resilience competence, as it is considered the ability to react to adversities in a healthy, adaptive way, minimizing the psychological and physical harm (Epstein and Krasner, 2013). Many authors have pointed to resilience as a strategy for addressing the psychological impact of the pandemic on healthcare professionals (Carmassi et al., 2020; Kang et al., 2020; Pollock et al., 2020). The review conducted by Carmassi et al. (2020) described the factors to enhance the resilience and reduce the risk of adverse mental health outcomes among healthcare workers facing the COVID-19 pandemic, such as support (from family, friends, supervisors, and colleagues), training, prompt work organization, and good coping strategies. Training programs aimed at building resilience can improve self-confidence and psychological skills and can encourage occupational health professionals to cope with dramatic situations (Kang et al., 2020).

In this study, a relationship between WE and PD was found, and high engagement values predicted lower levels of PD; dedication was the most significant dimension, and the higher scores in the dedication were related to lower PD. These results are in line with previous studies (Ruiz-Frutos et al., 2021) in which dedication was also the most valued dimension by healthcare professionals (Gómez-Salgado et al., 2020). Our

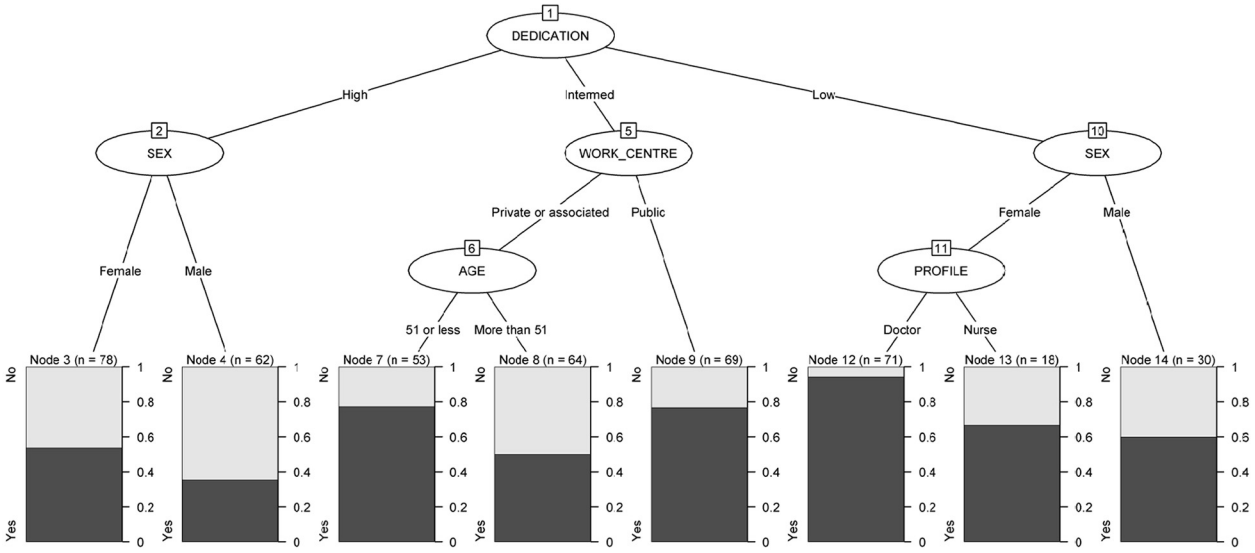

FIGURE 2 | Work engagement in the development of psychological distress.

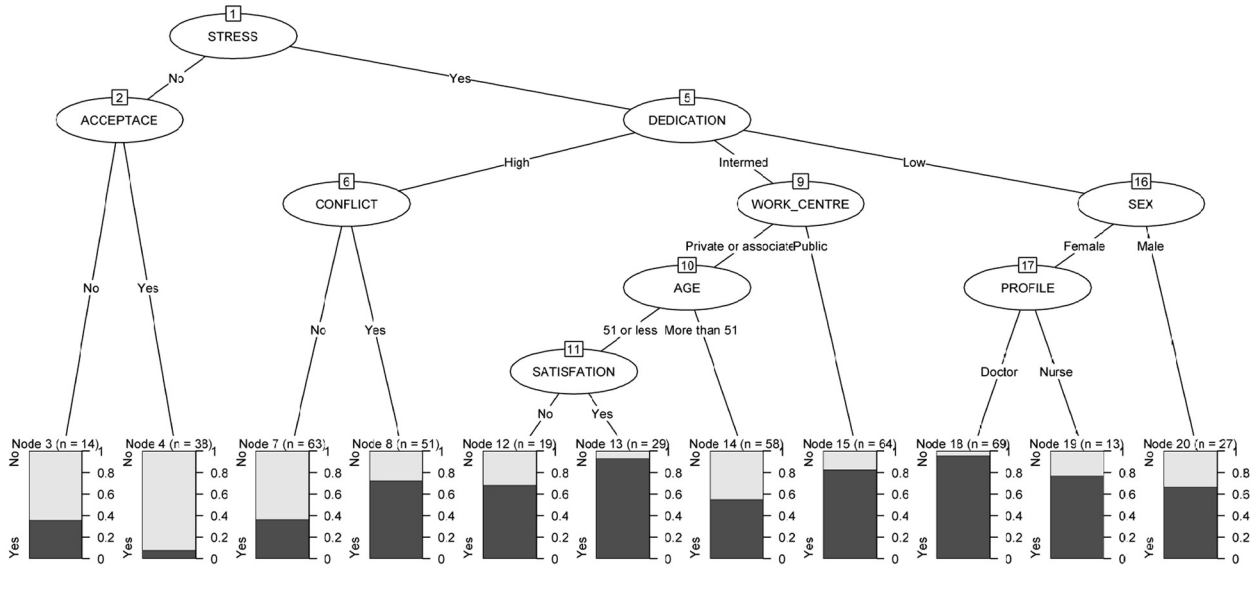

FIGURE 3 | Relationship between work environment, work engagement and development of psychological distress.

findings are expectable, as dedication refers to the significance of the work, to feel enthusiastic, proud, and inspired by the work done (Schaufeli et al., 2002), also keeping a positive attitude (Chew et al., 2020). As Carmassi et al. (2020) identified, support from supervisors and colleagues can play a protective role for mental health of healthcare workers when facing the COVID-19 outbreak.

When interpreting results related to PD, the effect of vaccination on workers should be considered. Vaccination against COVID-19 has been identified to improve the physical and mental wellbeing of workers, by reducing anxiety and improving mood and comfort in job performance (Haddaden et al., 2021). According to the study by Karayürek et al. (2021), vaccination had a positive effect on reducing the fear and anxiety levels of health professionals. However, reluctance on the part of some sectors of the population toward the vaccine has been described, based on fear of the side effects of the vaccine, doubts about its safety, the availability of scant or contradictory information about them, or beliefs in conspiracy theories (Akarsu et al., 2021; Di Gennaro et al., 2021; El-Elimat et al., 2021).

There is a need for those responsible for managing health of the workers to be aware of the status and factors associated with the mental health and work attitudes of employees during

the COVID-19 pandemic, such as WE and job satisfaction (Song et al., 2020). Thus, work organizations need to address emergent changes in daily work practices, such as virtual teamwork, leadership, and management, or even social distancing (Gómez-Salgado et al., 2021). These problems can occur in the context of home teleworking, raising concerns about work-family issues (Kniffin et al., 2021). Thus, alongside the public health measures, an appropriate occupational health response is also necessary. It is essential to maintain the health and psychological wellbeing of occupational health professionals so they can fulfill their mission.

As a limitation of this study, it should be acknowledged the convenience sample that could limit the generalization of the results and the non-inclusion of specific resilience measurement instruments in the survey, despite being an important factor in the generation of PD. The sample distribution is not equitable, more female participants, physicians, and from the private sector, which could induce some bias. In addition, due to the cross-sectional design of the study, although the relationship between variables has been identified, it prevents describing changes in variables over time, as well as the direction of relationships. Another limitation is the scarcity of articles focused on the psychological health of occupational health workers. This has made it difficult to compare the results, which have been contrasted with studies on health professionals, being able to introduce certain biases as they are a group of health professionals with differentiated and specific competencies and responsibilities. However, having carried out the study in the first phase of the pandemic will allow us to know the variation with respect to later phases or future pandemics.

CONCLUSION

The COVID-19 has made an impact in the workplace affecting all workers, so preventive and safety measures have to be undertaken so as to be able to adapt to the new requirements of the pandemic, such as protective measures against PD. In our study, 65.53% of the occupational health professionals who participated had PD (GHQ $\geq$ 3). No significant differences were found between physicians and nurses; however, PD was higher among women and public sector workers. Variables that facilitate developing PD were work stress, workload, the presence of labor conflict, and less job satisfaction. All the dimensions of WE acted as mediators in PD.

The results of this study could help to understand the vulnerable situation of occupational health professionals as a consequence of the pandemic with respect to mental health. Interventions are needed to alleviate the PD suffered by most of these workers, especially in the public sector. According to our results, they should help to deal with the workload, conflict, and an increase in job satisfaction. In light of our results, organizational and management strategies that promote WE are suggested, given the effect on mental health identified in this study. These measures could have an impact on the psychological wellbeing of workers by increasing their ability to cope and resilience.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Research Ethics Committee of Huelva. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CR-F, MO-M, MR-M, JC-M, and JG-S: conceptualization, data curation, formal analysis, investigation, methodology, project administration, resources, software, supervision, validation, visualization, writing—original draft, and writing—review and editing. GS-T: conceptualization, data curation, formal analysis, investigation, methodology, resources, software, supervision, validation, visualization, writing—original draft, and writing—review and editing. RA-C: conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, resources, software, supervision, validation, visualization, writing—original draft, and writing—review and editing. All authors contributed to the article and approved the submitted version.

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Professional Quality of Life Among Physicians and Nurses Working in Portuguese Hospitals During the Third Wave of the COVID-19 Pandemic

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Background: In the last 2 weeks of January 2021, Portugal was the worst country in the world in incidence of infections and deaths due to COVID-19. As a result, the pressure on the healthcare system increased exponentially, exceeding its capacities and leaving hospitals in near collapse. This scenario caused multiple constraints, particularly for hospital medical staff. Previous studies conducted at different moments during the pandemic reported that COVID-19 has had significant negative impacts on healthcare workers' psychological health, including stress, anxiety, depression, burnout, post-traumatic stress symptoms, and sleep disturbances. However, there are many uncertainties regarding the professional quality of life of hospital nurses and physicians. To address gaps in previous research on secondary traumatic stress, we focused on healthcare workers working in hospitals affected by a major traumatic event: the third wave of COVID-19.

Objectives: The aim of the present study was to identify the contribution of personal and work-related contextual variables (gender, age, parental status, occupation, years of experience, working with patients affected by COVID-19) on professional quality of life of healthcare workers.

Methods: Cross-sectional study with a web-based questionnaire given to physicians and nurses working in a hospital setting. A total of 853 healthcare professionals (276 physicians and 586 nurses; median age 37 years old) participated in the survey assessing professional quality of life compassion satisfaction, secondary traumatic stress, and burnout. Factors of professional quality of life were assessed using regression analysis.

Results: Most of the participants showed moderate (80%; n = 684) or high (18%; n = 155) levels of compassion satisfaction, whereas the majority of them experienced moderate levels of burnout (72%; n = 613) and secondary traumatic stress (69%; n = 592). The analyzed variables demonstrated no differences between professionals

who were directly or not involved in the care of COVID-19 patients. Parental status was found to be a significant factor in compassion satisfaction. Female gender was significantly associated with more susceptibility to secondary traumatization. Factors that may potentially contribute to burnout include years of professional experience and the number of work hours per week.

Conclusion: The COVID-19 pandemic has created a new challenge for the healthcare system. Burnout and secondary traumatic stress can lead to medical errors and impact standards of patient care, particularly compromising compassionate care. It is therefore recommended that hospitals develop psychoeducational initiatives to support professionals in dealing with barriers to compassion.

Keywords: COVID-19, professional quality of life (ProQOL-5), compassion satisfaction, compassion fatigue, burnout, secondary traumatic stress, nurses, physicians

INTRODUCTION

By January 2021, the World Health Organization (WHO) was reporting more than 98.2 million reported cases and over 2.1 million deaths globally since the start of the COVID-19 pandemic (World Health Organization [WHO], 2021). Portugal experienced its third wave of surging numbers of COVID-19 patients in early January 2021; consequently, the government imposed new, stricter safety measures on January 19. In Portugal, the peak of the third wave of the pandemic was reached on January 29. By this date there were 179,939 active cases, 6,544 hospitalized patients, and 843 patients in intensive care units (da Saúde, 2021). In the last 2 weeks of January, Portugal recorded the highest COVID-19 infection rate in the European Union: 1,429.43 per 100,000 inhabitants (European Center for Disease Prevention and Control [ECDC], 2021). During this period, Portugal had the highest number per capita of new infections and deaths from COVID-19 in the world. This increased the pressure on intensive care units exponentially, surpassing their capacities and leaving hospitals in near collapse (Demony, 2021). This scenario caused multiple issues, particularly for hospital medical staff, such as increased demand for healthcare, increased patient mortality, overwhelming workload, working with patients infected with COVID-19 (Du et al., 2020; Duarte et al., 2020; Lai et al., 2020), emotional overburden, and uncertainty (Spoorthy, 2020). In addition, medical staff from various specialties had to relocate to assist COVID-19 patients (Vieta et al., 2020). Furthermore, healthcare workers were exposed to a high level of patient suffering, and had to deal with patients' traumatic experiences (Brooks et al., 2020) and the unexpected loss of friends, family, and colleagues in an overwhelmed healthcare system. All of these experiences have the potential to affect professional quality of life.

Previous studies have reported that COVID-19 has had significant negative impacts on healthcare workers' psychological health, including stress, anxiety, depression (Duarte et al., 2020; Lai et al., 2020; Weilenmann et al., 2020; Chirico and Magnavita, 2021), burnout (Duarte et al., 2020; Khasne et al., 2020; Weilenmann et al., 2020; Lee et al., 2021; Serrão et al., 2021), post-traumatic stress symptoms (Arnetz et al., 2020; Luceño-Moreno et al., 2020), and sleep disturbance (Chirico and Magnavita, 2021). For example, in a study conducted by Duarte et al. (2020) during the first wave, more than half of the 2,008 participating Portuguese healthcare workers experienced high levels of work-related burnout, and more than 30% were found to suffer from anxiety, stress, and depression. Likewise, a study in Spain, one of the top five countries with the highest number of people infected, confirmed that 58.6% (n = 833) of health workers had a possible anxiety disorder, 46% (n = 648) suffered from depressive symptoms, and 56.6% (n = 805) presented symptoms of post-traumatic stress disorder (Luceño-Moreno et al., 2020). The symptoms of post-traumatic stress disorder were more severe when associated with the variables "hospital staff professionals," "female sex," and "likelihood of being infected with COVID-19." These findings contrast with a study in China (Zhang et al., 2020), where the variables "female sex" and "working on the frontline" were not predictive of high levels of post-traumatic stress disorder.

Another consequence of the COVID-19 outbreak is secondary traumatic stress. In this sense, other variables such as "secondary traumatic stress" and "compassion satisfaction" become important for a clearer understanding of the impact of COVID-19 on health professionals. Nevertheless, these constructs have hardly been investigated during this pandemic.

Compassion satisfaction, secondary traumatic stress, and burnout are dimensions of the construct of professional quality of life (Figley, 1995). The quality of life of the professional providing care to those who have experienced trauma is a recent area of interest among researchers (Stamm, 2010), and their secondary exposure to trauma is an essential pathway to be studied. Professional quality of life is the quality that an individual feels and derives from his or her work (Stamm, 2010). This quality incorporates negative and positive aspects (Figley, 1995). The negative aspects of this construct are explained through the concept of compassion fatigue, which includes two dimensions: secondary traumatic stress and burnout. Secondary traumatic stress refers to the negative feeling resulting from fear or work-related trauma due to secondary exposure to people who have experienced traumatic or extremely stressful events, manifested by feelings of fear,

sleep difficulties, intrusive images related to patients' traumatic experiences, or avoidance of anything that may recall such experiences (Figley, 1995). Burnout manifests through feelings of anger, frustration, sadness, discontentment, exhaustion, and depression and is related to feeling that one's efforts do not make a difference, overwork and difficulties coping with pressure, or little support in the work environment (Stamm, 2010). Burnout is defined as a response to prolonged exposure to demanding interpersonal situations and is characterized by "emotional exhaustion, depersonalization, and reduced personal accomplishment" (Maslach et al., 2002). Compassion fatigue is defined as the formal caregiver's reduced capacity or interest in being empathic or "bearing the suffering of clients" and consists of "the natural consequent behaviors and emotions resulting from knowing about a traumatizing event experienced or suffered by a person" (Figley, 1995, p. 7). It is the result of prolonged exposure to secondary traumatic stress derived from contact with patients and is facilitated by issues derived from the work environment.

The positive aspects of professional quality of life are explained through the concept of compassion satisfaction, which is defined as the pleasure derived from the opportunity to do a good job associated with feelings of accomplishment, fulfillment, or work-related satisfaction (Stamm, 2005). It can be a feeling of pleasure resulting from being able to help others or positive feelings that come from being part of something constructive in the workplace or a greater good at the societal level. Stamm (2010) suggests that this dimension acts as a factor that protects the professional from stressors at work.

In 2018, a meta-analysis including 21 studies on nurses detected high rates of compassion satisfaction (47.6%), compassion fatigue (52.6%), and burnout (52%) (Zhang et al., 2018a). In this regard, the authors warn that these professionals are especially prone to reduced compassion satisfaction, higher compassion fatigue, and burnout when they experience repeated exposure to situations with a high emotional and physical load originating from caring for patients, most of whom are seriously ill and many of whom are traumatized.

In a 2020 study involving 506 healthcare professionals from Spain, 94% showed medium to high compassion fatigue (depending on the version—secondary traumatic stress), 84% showed medium to high burnout, and 84.4% of the total sample experienced compassion satisfaction (Ruiz-Fernández et al., 2020). Secondary traumatic stress and burnout were more severe in physicians than in nurses. Furthermore, nurses scored higher on compassion satisfaction. In another Spanish survey of 973 healthcare professionals, 90.6% showed high levels of compassion satisfaction, highlighting a higher prevalence of this variable among people in the 35–55-year age range, as well as among more technicians than nurses, although nurses surpassed physicians (Dosil et al., 2020).

Unfortunately, burnout and secondary traumatic stress can lead to medical errors and impact standards of patient care, particularly compromising compassionate care (e.g., Dewar, 2013). In addition, levels of burnout and secondary traumatic stress can also affect relationships with coworkers and lead to physical and mental health conditions (Cocker and Joss, 2016).

Regardless of the effects of COVID-19, based on these findings, it is clear that healthcare workers must be prepared to deal with possible psychological and work-related consequences. Thus, this issue deserves particular attention in the context of a pandemic. These studies took place at different moments on the pandemic curve; however, none assessed compassion fatigue, burnout, and professional satisfaction in the third wave of a prolonged struggle against COVID-19.

To address gaps in previous research on compassion fatigue, we focused on healthcare workers working in hospitals affected by a major traumatic event: the third wave of COVID-19. The primary aim of the present study was to identify the contribution of personal and professional contextual variables (gender, age, marital status, working position, years of experience, working or not with patients affected by COVID-19) on professional quality of life—satisfaction compassion, burnout, and secondary traumatic stress—of physicians and nurses, during the third wave of COVID-19 in Portugal, using linear regression. As a secondary aim, a comparison between healthcare workers directly involved in caring for COVID-19 patients and those who were not was performed with regard to personal and professional contextual variables, compassion satisfaction, burnout, and secondary traumatic stress.

MATERIALS AND METHODS

Participants

A total of 853 healthcare professionals (586 nurses and 267 physicians) working in hospital units participated in the study, with a median age of 37 (31; 46) years old. The participants were divided into seven regions based on the Portuguese Territorial Units for Statistics Level II (NUTS II): North (371 participants; 43.5%), Center (210 participants; 24.6%), Lisbon (124 participants; 14.5%), Alentejo (18 participants; 2.1%), Algarve (21 participants; 2.5%), Autonomous Region of the Azores (83 participants; 9.7%), and Autonomous Region of Madeira (26 participants; 3%).

Measures and Instruments

Sociodemographic and vocational contextual variables were collected using a self-administered online questionnaire. Professional quality of life was evaluated with the Professional Quality of Life Scale—Version 5 (ProQOL-5; Stamm, 2009; Portuguese version by Duarte, 2017), consisting of 30 items with a Likert-type scale of 5 points (1 = Never 2 = Rarely 3 = Sometimes 4 = Often 5 = Very Often). This scale is composed of three subscales: compassion satisfaction, burnout, and secondary traumatic stress. Respondents were instructed to indicate how frequently they had experienced each item in the previous 30 days. The questionnaires were scored by summing the item responses for each 10-item subscale, with higher scores indicating higher levels of compassion satisfaction, secondary traumatic stress, and burnout. The scores from each of the subscales can be categorized into secondary traumatic stress, compassion satisfaction, and burnout: < 22 low; 23–41 medium; > 42 high. The Portuguese version of the ProQOL-5

has a Cronbach's alpha of 0.88 for compassion satisfaction, 0.82 for secondary traumatic stress, and 0.86 for burnout (Duarte, 2017). The Cronbach's alpha of the current study was 0.88 for compassion satisfaction, 0.81 for secondary traumatic stress, and 0.79 for burnout.

Procedure

Data collection took place from March 1 to May 2, 2021 (the last day of the state of emergency). A questionnaire created using the Google® Forms platform was made available to participants via a link shared through direct e-mail and social networks (Facebook, Instagram, Linked In, and WhatsApp) following a snowball approach. Additionally, different professional networks and companies were contacted to share the questionnaires. There was no missing data because all questions were mandatory, meaning that only completed questionnaires were collected.

Ethical procedures in accordance with the Declaration of Helsinki were accomplished via analysis and approval of the study by the Ethics Committee of São João Hospital Center (Ref 65/2021 on February 19, 2021). All respondents provided informed consent prior to accessing the questionnaires.

Data Analysis

Data was exported from Google® Forms to a Microsoft Excel® 2016 (United States) spreadsheet and all statistical analyses were performed using SPSS Statistics (version 26.0; SPSS® Inc., Chicago, Illinois, United States) and Jamovi 1.1.9.0 (datalab.CC, Sidney, Australia).

Categorical variables were described by absolute and relative frequencies, n (%). The normality of quantitative variables was verified by visual analysis of histograms, and those variables with assumed normal distributions were summarized by their mean and standard deviation (SD). Otherwise, quantitative variables were described by their median (Med) and interquartile interval $[Q_1; Q_3]$.

Differences between participants were analyzed using Mann-Whitney *U*-tests for quantitative non-normally distributed data, and chi-squared tests were used for categorical data. Pearson's correlation coefficient (r) was used to access the correlation between normally distributed quantitative variables. Cronbach's alpha was computed to assess the internal consistency of each subscale, and a value above 0.7 was considered acceptable (Kline, 2010).

For each outcome—compassion satisfaction, burnout, and secondary traumatic stress—a univariate multiple linear regression analysis was performed. In each multiple regression, the independent variables to be included were chosen by performing simple linear regressions with each variable in the dataset, including sociodemographic, professional (the working hours variable was codified into the following categories: Group 1 - $\leq$ 40 h; Group 2 - $>$ 40 and $\leq$ 55 h, Group 3 - $>$ 55 working hours for physicians and Group 1 - $\leq$ 35 h; Group 2 - $>$ 35 and $\leq$ 50 h, Group 3 - $>$ 50 working hours for nurses), and COVID-19-related variables. These results can be found in more detail in the Online Supporting Material. All variables correlating with the outcomes at $p \leq 0.2$ in the simple regression were included in the final linear regression models. Then, non-significant independent variables were removed, one at a time, in descending order of their *p*-values. Only the significant variables were maintained in the multiple models for compassion satisfaction, burnout, and secondary traumatic stress. The results of the linear regressions are presented with unstandardized coefficient values (β), 95% confidence intervals (95% CIs), and *p*-values. The final models were evaluated using the coefficients of determination (R^2), the F statistic of the overall model test, and respective *p*-values. The assumptions of the linear regression models were verified as follows: (a) visual analysis of histograms to verify the normality of residuals; (b) *t*-test to determine whether the mean of the residuals was equal to zero; and (c) visual analysis of residuals plots vs. the fitted predictive values to check for homoscedasticity. Values of $p \leq 0.05$ were considered significant.

RESULTS

Sample Characteristics of Participants

A total of 853 physicians and nurses working in Portuguese hospitals during the COVID-19 pandemic completed the questionnaire. Given the sample size of 853 participants, for a confidence level of 95%, and assuming the most conservative scenario of 50% estimated proportion, a margin of error of 3.3% is estimated for the proportions computed. At the time of the study, most of the sample worked in public hospitals (n = 832; 97.5%), were permanent employees (n = 780; 91.4%), and worked day shifts with nights or on-call (n = 568; 66.6%). Four hundred and forty-six healthcare workers (52.3%) were directly involved in caring for COVID-19 patients (i.e., intensive care units, infectious disease, pulmonary medicine, and internal medicine wards), while 407 (47.7%) were involved in different units (i.e., oncology, pediatric, and psychiatric wards). Approximately 85% indicated that they had already taken the COVID-19 vaccine. The characteristics of the participants are summarized in **Table 1**.

Results of Professional Quality of Life-5—Compassion Satisfaction, Secondary Traumatic Stress, and Burnout

The average levels of compassion satisfaction, secondary traumatic stress, and burnout among nurses and physicians were separated into low, moderate, and high groups. Moderate levels of compassion satisfaction, burnout, and secondary traumatic stress were found in 684 (80.2%), 613 (71.9%), and 592 (69.4%) participants, respectively. No statistically significant differences were found between healthcare workers who were directly involved in caring for COVID-19 patients and those who were not (Not-COVID) with regard to compassion satisfaction, burnout, and secondary traumatic stress (**Table 2**). Moreover, results show that burnout exhibits a high negative correlation with compassion satisfaction ($r = -0.687$, $p < 0.001$) and a high positive correlation with secondary traumatic stress ($r = 0.624$, $p < 0.001$), while secondary traumatic stress and compassion

TABLE 1 | Demographic and professional characteristics (n = 853).

Characteristics/Variables	Total (n = 853)	Directly involved in caring for COVID-19 patients (n = 446, 52.3%)	Not directly involved in caring for COVID-19 patients (n = 407, 47.7%)	P-value
Age (years), Med [Q_1; Q_3]	37 [31; 46]	37 [30; 44]	38 [32; 47]	0.007[a]*
Gender, n (%)				0.320[b]
Female	693 (81.2)	368 (53.1)	325 (46.9)	
Male	160 (18.8)	78 (48.8)	82 (51.2)	
Occupation, n (%)				0.004[b]*
Nurse	586 (68.7)	326 (55.6)	260 (44.4)	
Physician	267 (31.3)	120 (44.9)	147 (55.1)	
Marital status, n (%)				0.508[b]
Married or non-marital partnership	493 (57.8)	253 (51.3)	240 (48.7)	
Single or divorced or widowed	360 (42.2)	193 (53.6)	167 (46.4)	
Parents, n (%)				0.260[b]
No	428 (50.2)	232 (54.2)	196 (45.8)	
Yes	425 (49.8)	214 (50.4)	211 (49.6)	
Education level, n (%)				0.110[c]
Graduate and post-graduate	536 (62.8)	290 (54.1)	246 (45.9)	
Master	286 (33.5)	136 (47.6)	150 (52.4)	
Doctorate degree	6 (0.7)	5 (83.3)	1 (16.7)	
Others	25 (2.9)	15 (60.0)	10 (40.0)	
Length of work experience, n (%)				0.011[b]*
Five years or less	185 (21.7)	97 (52.4)	88 (47.6)	
From 6 to 10 years	150 (17.6)	96 (64.0)	54 (36.0)	
From 11 to 15 years	155 (18.2)	79 (51.0)	76 (49.0)	
More than 15 years	363 (42.6)	174 (47.9)	189 (52.1)	
Length of service in current unit, n (%)				0.229[b]
6 months or less	109 (12.8)	61 (56.0)	48 (44.0)	
Between 6 months and 1 year	117 (13.7)	71 (60.7)	46 (39.3)	
Between 2 and 5 years	216 (25.3)	113 (52.3)	103 (47.7)	
Between 6 and 10 years	126 (14.8)	62 (49.2)	64 (50.8)	
Between 11 and 15 years	100 (11.7)	53 (53.0)	47 (47.0)	
More than 15 years	185 (21.7)	86 (46.5)	99 (53.5)	
Working hours per week (N = 843), n (%)				
Group 1	296 (35.1)	115 (26.2)	181 (44.8)	<0.001[a]*
Group 2	412 (48.9)	240 (54.7)	172 (42.6)	
Group 3	135 (16.0)	84 (19.1)	51 (12.6)	
Diagnosed health problem, n (%)				0.098[b]
No	637 (74.7)	344 (54.0)	293 (46.0)	
Yes	216 (25.3)	102 (47.2)	114 (52.8)	
Exercises managerial duties, n (%)				0.220[b]
No	764 (89.6)	405 (53.0)	359 (47.0)	
Yes	89 (10.4)	41 (46.1)	48 (53.9)	

[a]*Mann Whitney test;* [b]*Chi-square test;* [c]*Fisher's exact test.* *$p < 0.05$.

satisfaction show a weak negative correlation ($r = -0.236$, $p < 0.001$).

Results of Professional Quality of Life-5—Compassion Satisfaction, Secondary Traumatic Stress, and Burnout: Multivariate Analysis

In the final linear regression model for compassion satisfaction as the outcome variable, the only significant associations were with the variable "parents," explaining approximately 1.3% of the variability existing in the dependent variable. Health professionals with children have an average of 1.31 more points on the compassion satisfaction scale. For secondary traumatic stress as the outcome variable, only the variable "gender" was significantly associated with the outcome, explaining approximately 2.4% of the variability existing in the dependent variable. Female health professionals scored an average of 2.33 more points on the scale of secondary traumatic stress than males. Concerning the final multiple linear regression model, with burnout scale as the outcome variable, the variables "work experience" and "working hours" were significantly

TABLE 2 | Professional quality of life—COVID or NOT_COVID.

Variables	Variables	COVID		NOT-COVID		*p*-value (Mann-Whitney U)
		Med [Q_1; Q_3]	N (%)	Med [Q_1; Q_3]	N (%)	
Compassion satisfaction	Low	37 [33; 41]	10 (2.2)	37 [33; 41]	4 (1.0)	0.631
	Medium		356 (79.8)		328 (80.6)	
	High		80 (17.9)		75 (18.4)	
Secondary traumatic stress	Low	26 [22; 29]	133 (29.8)	25 [22; 29]	123 (30.2)	0.424
	Medium		311 (69.7)		281 (69.0)	
	High		2 (0.4)		3 (0.7)	
Burnout	Low	26 [22; 30]	121 (27.1)	25 [22; 29]	116 (28.5)	0.387
	Medium		323 (72.4)		290 (71.3)	
	High		2 (0.4)		1 (0.2)	

associated with the outcome, explaining approximately 1.9% of the variability existing in the dependent variable. Health professionals with "6–10 years" of experience show on average 1.33 points more on the scale of burnout than those with "5 years or less" of professional experience. Moreover, professionals within Group 3 (physicians working > 50 h and nurses working > 55 h per week) scored, on average, 1.72 points higher on the burnout scale than professionals in Group 1 (physicians working ≤ 40 h and nurses working ≤ 35 h per week) (**Table 3**).

TABLE 3 | Regression coefficients for professional quality of life subscales as outcomes and socio-demographic, and professional variables as predictors from univariate simple and multiple linear regressions.

Variables	Compassion satisfaction β [95% CI]	Secondary traumatic stress β [95% CI]	Burnout β [95% CI]
Parents			
No	*Reference*		
Yes	1.31 [0.53; 2.09] ***		
Gender			
Male		*Reference*	
Female		2.33 [1.33; 3.33]***	
Work experience			
Five years or less			*Reference*
From 6 to 10 years			1.33 [0.06; 2.59]*
From 11 to 15 years			−0.06 [−1.31; 1.19]
More than 15 years			−0.07 [−1.11; 0.97]
Working hours			
Group 1			*Reference*
Group 2			0.67 [−0.20; 1.54]
Group 3			1.72 [0.53; 2.91]**
R^2	0.0126	0.024	0.0194
F	10.8***	20.9***	3.30**

CI, confidence interval.
*$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.*

DISCUSSION

This research aimed to assess professional quality of life among Portuguese healthcare workers (nurses and physicians) working in hospitals during the first months of 2021. In January and February, Portugal endured a third wave of the COVID-19 pandemic, and the national healthcare system faced possible collapse. As such, healthcare professionals are likely to experience compassion fatigue (burnout and secondary traumatic stress) triggered by the recurrent practice of empathy, prolonged exposure to secondary trauma, and the work environment (Cavanagh et al., 2020). In addition, limited resources and multiple healthcare demands during this period may also contribute to the risk of developing compassion fatigue.

Our findings show that healthcare workers exposed to the third wave of the COVID-19 pandemic presented both positive and negative psychological outcomes. The results revealed a moderate prevalence of burnout (72%) and secondary traumatic stress (69%), and moderate (80%) to high (18%) levels of compassion satisfaction. Similar findings were seen in Ecuador during the first wave of the COVID-19 pandemic, where healthcare professionals reported medium levels of burnout and compassion fatigue (Cuartero-Castañer et al., 2021). However, Cuartero-Castañer et al. (2021) found high levels of compassion satisfaction and argue that these results may have been due to strengthened recognition of the healthcare task force. Another study conducted during the first wave in Spain by Ruiz-Fernández et al. (2020) found that the majority of healthcare professionals had high levels of compassion fatigue and medium to high levels of burnout and compassion satisfaction. In contrast, Trumello et al. (2020) found that professionals working in areas with higher levels of contagion presented higher levels of burnout and lower levels of compassion satisfaction, which contradict our results. The results we achieved may be related with the fact that, by the third wave, the professionals could have developed mechanisms (such as resilience) to protect themselves, which may act as a protective factor during their contact with the COVID-19 pandemic (Serrão et al., 2021). Another possible explanation for this result may be that most of our sample (85%) had already been vaccinated against COVID-19. According to

Abdelghani et al. (2020) study, the perceived fear of COVID-19 virus infection was positively correlated with burnout emotional exhaustion, and depersonalization symptoms.

Obviously, these results must be interpreted with caution, and the timing and the countries where the studies were conducted must be kept in consideration. During wave peaks and in countries that reported higher COVID-19 infection rates per 100,000 inhabitants, hospitals were overcrowded and healthcare professionals were exposed to much more pressure and stress. Another important aspect is the pre-COVID-19 state of exhaustion of healthcare workers. A Portuguese study from 2016 (Marôco et al., 2016) concluded that 44 percent of physicians and fifty percent of nurses demonstrated high levels of burnout, which could influence the levels of burnout and fatigue compassion observed in healthcare workers during COVID-19 pandemic.

Moreover, results show that burnout exhibits a high negative correlation with compassion satisfaction and a high positive correlation with secondary traumatic stress, while secondary traumatic stress and compassion satisfaction show a weak negative correlation. These associations have been mentioned by other authors (Ortega-Galán et al., 2020; Ruiz-Fernández et al., 2020; Cuartero-Castañer et al., 2021; Lee et al., 2021) and could indicate that compassion satisfaction may be acting as a protective variable against burnout and secondary traumatic stress. In fact, the balance between those variables determines the degree of professional quality of life, so as observed in previous research, this relationship between the results was expected (Wee and Myers, 2003; Buselli et al., 2020; Dosil et al., 2020).

Compassion satisfaction is the capacity to receive consideration from providing care and is related with self-efficacy at work and more adequate coping mechanisms (Cuartero-Castañer et al., 2021). In our study, compassion satisfaction was higher in healthcare professionals who were parents compared to those who were not. This could be explained by the fact that professionals who have children may have developed coping mechanisms and often transfer their care toward patients since they are frequently away from their children and family.

The results showed that nurses experienced higher levels of compassion satisfaction than doctors, although these differences were not statistically significant. Our expectations were to obtain results similar to previous research (e.g., Buselli et al., 2020; Ruiz-Fernández et al., 2020). For example, Ruiz-Fernández et al. (2020) found that nurses were shown to have significant scores of compassion satisfaction compared to physicians. These results contradict those obtained by Buselli et al. (2020) who found that, compared to being a nurse, being a doctor had a positive impact on compassion satisfaction, probably related with the perception of personal success regarding the effects of the prescribed treatments and the feeling of "mission accomplished."

Health professionals who had been in direct contact with COVID-19 patients had higher levels of compassion satisfaction, secondary traumatic stress, and burnout than those who had not, although the differences were not statistically significant. These results are in line with previous studies (Dosil et al., 2020; Zhang et al., 2020) and suggest that, in hospital settings, both groups could face identical threats to COVID-19. However, this contradicts the results of previous studies showing poor mental health outcomes in professionals who directly care for and treat COVID-19 patients (Ruiz-Fernández et al., 2020; Trumello et al., 2020). Another interesting result was obtained by Li et al. (2020) and Wu et al. (2020), who found that healthcare workers who worked with COVID-19 patients had lower levels of secondary traumatic stress and burnout, respectively. The authors defended that these professionals have developed mechanisms of self and emotional control and are probably better informed about the evolution of the infection compared with those working in non-COVID-19 wards. This result may also be due to the particular characteristics of the health systems of different countries.

Our findings show that female healthcare professionals present a higher level of secondary traumatic stress than males, which is in line with previous research (Buselli et al., 2020; Luceño-Moreno et al., 2020; Ortega-Galán et al., 2020; Cuartero-Castañer et al., 2021). This could be related with the roles that women play in society both as professionals and at home (Duarte et al., 2020; Ortega-Galán et al., 2020), and these roles may have been more difficult to manage during the pandemic given the demands imposed on both. There was a lockdown during the third wave of COVID-19 in Portugal, which made it difficult for female healthcare professionals to balance caring for their homes and children with the demands of their workplace (Duarte et al., 2020). On the other hand, Hernández-Padilla et al. (2020) draw attention to the fact that being a female healthcare professional is associated with higher levels of stress and compassion fatigue because the female gender is the most prevalent gender among healthcare workers.

Our results show that healthcare professionals with 5–10 years of professional experience presented higher risk of burnout compared with professionals with less years of experience. This result can be justified by the fact that this period is for both nurses and physicians, the first years of practice as a specialist. These results are in line with previous research (e.g., Baptista et al., 2021).

Additionally, as working hours increased, so did burnout levels, which was expected. This finding was similar to the results presented by Weilenmann et al. (2020), where 40% of professionals said they were working more hours than before the COVID-19 pandemic. This should be a concern for employers, as burnout could lead to more fatigue, exhaustion, and reduced attention, which could lead to a higher number of adverse events and a reduced perceived quality of patient care (Kakemam et al., 2021) and absenteeism.

There is no doubt that the COVID-19 pandemic has had a profound impact on health services and health workers (e.g., Serrão et al., 2021; Weilenmann et al., 2021). Although many of the effects will only become apparent in the medium or long term, the available data highlights the need for psychoeducational initiatives and strategies to foster a compassionate organizational culture.

Although the concept of compassion fatigue is the construct that underlies the ProQOL instrument and has been extensively researched, several authors have raised criticisms in recent years regarding this denomination (e.g., Klimecki et al., 2014;

Sinclair et al., 2016; Vrtička et al., 2017; Hofmeyer et al., 2019), proposing the alternative concepts of "empathy fatigue" or "empathic distress fatigue." Although empathy and compassion are important social skills for the caregiving process, empathy is a socio-affective response and "the ability to 'feel with' others when we are exposed to their distress and suffering" (Hofmeyer et al., 2020). In turn, compassion is a socio-cognitive response and a "'feeling for' others who are in pain with warmth" (Hofmeyer et al., 2020). Neuroscience studies using functional magnetic resonance imaging (fMRI) support this proposal, concluding that empathy and compassion are associated with two different networks at the brain level (e.g., Klimecki et al., 2014; Vrtička et al., 2017). These important findings have shown that empathizing with the pain of others activates the same parts of the brain that are involved in self-pain processing (Klimecki et al., 2014). In this sense, and according to the authors, although "empathy is crucial for successful social interactions, excessive sharing of others' negative emotions may be maladaptive and constitute a source of burnout." Alternatively, an adaptive response to the suffering of others may involve developing compassion. Having compassion "increased activations in brain networks related to reward, affiliation" (Klimecki et al., 2014) and serves as a buffer against empathic distress fatigue.

Investing in programs that reduce empathic distress fatigue may decrease the high turnover rates seen among physicians and nurses, thereby improving quality of care (Duarte et al., 2016; Zhang et al., 2018b).

These results allow us to outline some recommendations to enhance compassionate care in health systems (Dewar et al., 2011; Dewar, 2013; Sinclair et al., 2016; Neff and Germer, 2018; Tehranineshat et al., 2019). As Tehranineshat et al. (2019) have described so well, compassionate care is a complex and multidimensional construct that integrates ethical, humanistic, spiritual, and communication dimensions. Compassion is an "ethical principle of care among healthcare professionals in order to provide high quality care" (Tehranineshat et al., 2019). However, the ability of healthcare professionals to perform in accordance with this ethical principle may be hindered by the levels of burnout and secondary traumatic stress experienced (Dev et al., 2018). In their systematic review, Dev et al. (2018) state that greater compassion fatigue (burnout and secondary traumatic stress) "predicted greater barriers to compassion" and this scenario may "have consequences for (and be reflected in) how" health workers experience their work context, their involvement with patients, and their professional responsibilities.

Training compassion, according to functional neural plasticity results, "may reflect a new coping strategy to overcome empathic distress and strengthen resilience" (Klimecki et al., 2014).

One possibility for fostering a compassionate organizational culture is to provide professionals with mindfulness self-compassion (MSC) programs (Neff, 2012; Duarte et al., 2016). Self-compassion, a core feature of Buddhist traditions, has recently been introduced into Western psychology. According to Neff (2012), it comprises three interconnected components: "Self-kindness (treating oneself with warmth, respect, and care), common humanity (understanding that being human inherently includes the experience of pain, imperfection, and difficulty), and Mindfulness (clear and balanced awareness of one's present moment experience of suffering)." MSC programs help develop compassion for self and others (Neff and Germer, 2018). Self-compassion "enhances the perspective-taking skills" (Neff, 2012), thus optimizing the ability to be compassionate with others (e.g., Duarte et al., 2016).

Several studies conducted in recent years on mindfulness-based programs offered to healthcare professionals have shown that these appear to affect a range of mental health outcomes, including anxiety, depression (e.g., Johnson et al., 2015), burnout (e.g., Martín-Asuero et al., 2014), compassion, self-compassion (e.g., West et al., 2014; Raab et al., 2015), and well-being (e.g., West et al., 2014).

These promising results highlight the advantage of investing in the capacities and resources of healthcare teams with a view to foster a compassionate organizational culture.

Limitations

While contributing empirically to the discussion regarding professional quality of life among Portuguese physicians and nurses working in hospitals, this study has a few limitations. First, the research was conducted online, which might be affected by self-selection bias (Wright, 2005). Second, a convenience sample was collected, which may not adequately represent the population and therefore does not permit extrapolation of the results to other contexts. Third, this study was cross-sectional in design, wherein the phenomenon of professional quality of life was assessed at a single point in time and carried out in the specific timeframe and context of the COVID-19 pandemic, so the data must be interpreted with caution. Four, the sample was recruited from different regions, that could have different infective incidence of the pandemic. Moreover, the sample was not homogeneous for gender. Finally, mental health variables (e.g., depression, anxiety, post-traumatic stress symptoms related to the pandemic) that could affect professional quality of life, as well as previous mental health disorders, were not evaluated.

Furthermore, this study suggests that there may be other variables that can shed light on professional quality of life. In this sense, it would be useful to consider, for example, personal coping strategies and work, client, and personal environments in future research (Stamm, 2010).

Finally, it would be interesting to extend this study to primary healthcare workers, given that Ortega-Galán et al. (2020) found that fatigue compassion was higher in primary care workers than in hospital care workers. Primary care centers are the core of the Portuguese National Health System and primary healthcare workers, too, must face excessive work and patient contact on a daily basis.

CONCLUSION

About 70% of Portuguese physicians and nurses were experiencing moderate likelihood of burnout and secondary traumatic stress based on ProQOL scoring. Additionally, their levels of compassion satisfaction were moderate or high. Factors that potentially contribute to the level of burnout of healthcare professional's include professional contextual variables (years of

experience and working hours). Gender and having children were found to be a potential predictor of secondary traumatic stress, and compassion satisfaction, respectively. Besides, no statistically significant differences were found between healthcare workers who were directly involved in caring for COVID-19 patients and those who were not, with regard to professional quality of life levels. These data can be positive, since a professional who has both compassion fatigue and compassion satisfaction may have a better chance of overcoming compassion fatigue and improving job satisfaction. Specific programs to alleviate mental health issues should be provided, particularly to assess the effect of mindfulness-based programs on increasing psychological resources and more adaptive responses to the work environment. More studies are needed in the medium and long term to determine the real impact of the COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of São João Hospital Center (Ref 65/2021 on February 19, 2021). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CS and ID contributed to conception and design of the study, project administration—supervision, and coordination. LC and AT organized the database and performed the statistical analysis. CS wrote the first draft of the manuscript, manuscript preparation, manuscript revision, reviewing, editing, and manuscript final version approval. CS, VM, RP, and LC wrote sections of the manuscript. PM provided input for the manuscript. All authors were involved in the data collection, and contributed to manuscript revision, read, and approved the submitted version.

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SUPPLEMENTARY MATERIAL

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Stress and Sleep Disorders in Polish Nursing Students During the SARS-CoV-2 Pandemic—Cross Sectional Study

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Introduction: The world pandemic of the virus SARS-CoV-2 , which causes COVID-19 infection was announced by the World Health Organization (WHO) on March 11, 2020. Due to the restrictions that were introduced in order to minimize the spread of the virus, people more often suffer from stress, depression, anxiety, and sleep disorders. The aim of this study was evaluation of the stress levels and sleep disorders among nursing students during the pandemic SARS-CoV-2 .

Materials and Study Methods: This is a cross-sectional study conducted among 397 nursing students on March 2020. The research tools used were original questionnaires, Perceived Stress Scale (PSS10), and the Athenian Insomnia Scale (AIS), as well as Coping with Stress Inventory (MiniCOPE).

Results: Respondents felt a high level of stress, which occurred in 68.8% of interviewees regarding whether there was a danger of contracting COVID-19. Respondents experienced 84% stress levels when a family member suffered from COVID-19. Sleep disorders were determined mainly by the fear of infection and contact with someone who might be infected with the virus. Nursing students who felt a high level of stress often suffered from sleep disorders (70.2%) more frequently than students who felt a low or average stress level (30.4%). The respondents decided to cope with stress by denial, taking psychoactive substances, ceasing action, or blaming themselves. The greater the intensity of stress experienced by students, the more often they undertook avoidance behaviors or showed helplessness.

Conclusion: During the pandemic, students experienced severe stress, which resulted in sleep disorders and avoidance behaviors.

Keywords: SARS-CoV-2, pandemic, sleep disorder, stress, student, coping

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INTRODUCTION

The COVID-19 pandemic caused by the SARS-CoV-2 coronavirus has changed the lives of people around the world. The first cases caused by the new type of SARS-CoV-2 coronavirus appeared in the City of Wuhan in the Hubei province in China in November 2019. The virus turned out to be highly contagious and spread rapidly in many parts of the world reaching the size of a pandemic, announced by the World Health Organization (WHO) March 11, 2020

(World Health Organization, 2020). In Poland, the first case of coronavirus infection was confirmed on March 4, 2020.

On March 16, 2020, an epidemiological emergency was introduced in Poland, people were ordered to wear masks and maintain social distance. International air connections were suspended, shopping malls, schools, and universities were closed. The period of distance learning began. Nursing students who worked in hospitals at that time had to deal with a heavy burden. Most of the second-cycle students in Poland worked in health care units, primarily in hospitals. They had to combine work in difficult conditions and distance learning in the beginning of the second semester. The lack of effective medicine and vaccine has forced national governments to take radical measures. Most public institutions were closed, and restrictions in the form of lockdown and quarantine were introduced. This situation caused changes in the economic situation of the country (Czarkowski et al., 2020; Długosz, 2020; Kawska et al., 2020). The speed with which changes were introduced and the disinformation that occurred, negatively affected people's mental and physical health around the world. Sudden changes and uncertainty about what the future would bring undoubtedly contributed to people experiencing a significant degree of stress, as well as an increase in the incidence of sleep disorders, depression, and anxiety (Cellini et al., 2020; Czarkowski et al., 2020; Długosz, 2020; Mukhtar, 2020; Nwachukwu et al., 2020; Romero-Blanko et al., 2020; Shigemura et al., 2020; Vindegaard and Eriksen Benros, 2020; Xiao et al., 2020).

Stress in today's world is an integral part of life. This term can be used to describe not only sudden, traumatic experiences, but also the constant difficulties and changes that happen in life that are just part of living; the majority of society encounters and situations that cause stress on a daily basis and affect overall well-being (Bodys-Cupak et al., 2016, 2019a,b; Kowalczuk et al., 2017; Kwak et al., 2018; Mukhtar, 2020; Nwachukwu et al., 2020).

Seyle (1977) believed that no person in his life was able to free himself from stress. Stress is ubiquitous; therefore, there are many biological and psychological theories and definitions. It is very often analyzed in terms of a stimulus or reaction. Selye focused on the adverse effects of long-term stress and described the concept of "general adaptation syndrome," in which he distinguished the phases of alarm, resistance, and exhaustion (Seyle, 1977). Selye divided stress into eustress and distress. He stated that stress does not have to be negative; it can be positive and even motivating. According to him, eustress is good, positive stress, which, in response to stressors, promotes the health of the body. Eustress is motivating and stimulating to development. On the other hand, distress is negative, difficult to control, and destructive to the organism (Seyle, 1977). According to Lazarus and Folkman (1984), stress in a psychological context is understood as the relationship between a person and the environment, which may be burdensome and threaten its well-being. The recognition of a particular relationship as stressful is determined by the individual cognitive assessment of the person participating in the relationship. The coping process is triggered in response to a stressful situation. It can be focused on an emotion or a problem (Lazarus and Folkman, 1984).

Due to its nature, a pandemic situation is a strong source of stress for people. The pandemic has changed the way we study and work. Medical personnel experience high levels of stress, anxiety, and sleep disorders (Kowalczuk et al., 2020; Rana et al., 2020; Xiao et al., 2020; Simonetti et al., 2021), as well as medical students, including nurses (Lund et al., 2010; Almojali et al., 2018; Aslan et al., 2020; Li et al., 2020; Aslan and Pekince, 2021; Dev Bhurtun et al., 2021). The increase in stress levels among nursing students due to COVID-19 may have various consequences. It can cause poor academic performance, lead to dropout, change in mental and physical health, and ultimately can affect the quality of care provided to patients (Wyatt et al., 2021).

The choice of coping methods depends on the assessment of the situation and may lead to a change of previous assessment. The concept of stress in the category of a stimulus is the concept of life changes, which is associated with a greater than usual mental and physical burden. In the concept of life changes, the environment in which the person experiences stress plays a significant role. Nursing students exhibit a variety of stress coping strategies, from active to avoidance (Bodys-Cupak et al., 2016, 2019a; McCarthy et al., 2018; Dev Bhurtun et al., 2021). Various factors also determine their coping strategies (Bodys-Cupak et al., 2021).

Stressogenic events negatively affect the body's immunity and may cause diseases (Kaczmarska and Curyło-Sikora, 2016). High-intensity chronic stress and not coping with it also negatively affects sleep quality.

Sleep is an essential factor when it comes to well-being as well as mental, physical, and cognitive functioning. After everyday activities, the body regenerates during sleep, ensuring later functioning (Troynikov et al., 2018). Slight shortening of sleep or its prolongation does not significantly affect physical and mental activity. However, if sleep is significantly shortened, it leads to disturbances in focus and deterioration of mood (Konturek, 2013; Troynikov et al., 2018). The importance of proper sleep has been confirmed in many areas of life, such as cognitive, emotional, social, and biological functioning. The role of sleep in the prevention of civilization diseases cannot be overlooked (Kaczor and Skalski, 2016). It is also noted that analyzing sleep problems becomes a useful indicator when it comes to assessing the risk of developing depression and the risk of relapse after remission (Heitzman, 2009).

More and more people are experiencing problems with sleep. Depending on the personality of the person and the accompanying diseases, 30–50% of people suffer from sleep disorders at some point in life (Pavlova and Latreille, 2018; Spielman et al., 2020).

Difficulty falling asleep causes anxiety, which makes the person agitated, which makes it difficult to fall asleep. It is a vicious cycle that leads to chronic insomnia, constant fatigue, and even symptoms of depression. There are many factors that influence insomnia and sleep disorders, such as age, stress, stimulants, exercise, and habits (Zhang et al., 2018; Spielman et al., 2020). Likewise, lack of exercise, low sun exposure, and increased use of electronic devices can also negatively impact sleep homeostasis (Cellini et al., 2020; Voitsidis et al., 2020). Previous studies suggest that pre-sleep negative cognitive

activities following stressful events are associated with poor sleep activity (Takano et al., 2014).

Taking into account the fact that the effectiveness of actions taken depends on the intensity of the stress experienced by a person, it should be stated that the ability to deal with stress is an extremely important factor determining proper functioning. In the Polish literature, there are few results of studies on the impact of stress on coping and the occurrence of sleep disorders among nursing students during a pandemic. The results of the conducted research will allow the presentation of the issue in a different socio-cultural context.

The aim of the study was to assess the level of stress, sleep disorders, and ways of coping with the stress of Polish nursing students during the SARS-CoV-2 pandemic.

The hypothesis of this study is: The greater the severity of stress, the more frequent sleep disturbances occurred among nursing students during the SARS-CoV-2 pandemic.

MATERIALS AND METHODS

Study Group Selection

At the design stage of the study, the criteria for inclusion in the study were established: participants needed to be studying nursing and able to give or obtain informed consent to participate in the study. The exclusion criterion was: individuals studying another medical field, and/or not having completed classes in a clinical ward. Participants were informed about the confidentiality and anonymity of the study and that participation was voluntary; also, that it was possible to withdraw/refuse to cooperate at any stage of the study. The participants were provided with information about the purpose of the study and given instructions on how to fill in the questionnaire. Completing the questionnaire was tantamount to giving consent to participate in the study.

The study was a cross-sectional study. It was carried out using the method of the diagnostic survey and method of estimation. The choice of doing a cross-sectional study was motivated by the fact that this type of study provides results in a relatively short time on a large group of respondents. The selection of the study group was purposeful. The study was developed and conducted in accordance with: (1) the principles of Good Scientific Practice; (2) the Act of May 10, 2018, on the protection of personal data; (3) the principles of the Helsinki Declaration; and (4) the Regulation of the European Parliament and the Council (EU) 2016/679 of April 27, 2016, on the protection of individuals with regard to the processing of personal data.

Study Procedure

The study was conducted among nursing students on March 2020 using an online survey. The questionnaire was sent to 550 nursing students studying at the Institute for Health Protection of the State Higher Vocational School in Tarnów, and at the Faculty of Health Sciences at the Jagiellonian University Medical College in Krakow. Of the questionnaires distributed, 397 correctly completed questionnaires were received (72% of those distributed), 8 questionnaires were rejected due to significant data gaps that could distort the analysis. Submitting the completed questionnaires was tantamount to consent to participation in the study. In order to maintain anonymity, identification marks were provided on the research instruments. Sample size was calculated on G*Power 3.1.9.2, which revealed that a minimum of 305 participants were needed to perform an analysis with a significance level of 0.05 and a statistical power of 0.95.

QUESTIONNAIRES AND APPLIED MEASURES

The study was carried out by applying the diagnostic survey method using the questionnaire technique. The research tools included the Perceived Stress Scale (PSS-10), the Athenian Insomnia Scale, the Coping with Stress Inventory (MiniCOPE), and the survey questionnaire developed by the authors of the study.

Perceived Stress Scale

Perceived Stress Scale, PSS-10, was used to assess the intensity of stress related to the participant's own life situation over the last month. The authors of the tool are S. Cohen, T. Kamarck and R. Mermelstein. The tool was adapted to Polish conditions by Z. Juczyński and N. Ogińska-Bulik. The scale contained 10 questions on subjective feelings related to problems and personal events. For each question, the respondent could choose one of the indicated answers on a 5-point scale (0 – "never;" 1 – "almost never;" 2 – "sometimes;" 3 – "quite often;" 4 – "very often"). The score was obtained by adding up points where participants could get from 0 to 40 points. The score in the range from 1 to 4 sten is low, in the range from 7 to 10 sten—high, and in the range 5 and 6 sten—average. The higher the respondent's score, the greater the intensity of the stress. The internal reliability of the scale, determined using Cronbach's alpha, ranged from 0.72 to 0.90 (Juczyński and Ogińska-Bulik, 2012).

The Athens Insomnia Scale

The Athens Insomnia Scale, AIS, is a self-descriptive tool for various symptoms of insomnia. It allows for assessing the quantitative measurement of insomnia symptoms taking into account the ICD-10 criteria. It consists of eight issues related to insomnia. Each criterion is assessed on a scale of 0–3 points. A score of 0–5 indicates a normal level, 6–10 indicates higher scores, and 11 or more suggests insomnia. The total score could reach 24 points. Validation in Polish was carried out by M. Fornal-Pawłowska, D. Wołyńczyk-Gmaj, and W. Szelenberger. The sensitivity of the scale is 93%, the specificity of the scale is 85%, and Cronbach's alpha coefficient was 0.88–0.91 (Fornal-Pawłowska et al., 2011).

Brief COPE

Brief COPE was used to assess typical ways of reacting and feeling in severe stress and difficult situations. The tool by C. Carver, adapted by Z. Juczyński and N. Ogińska-Bulik,

(called Inventory for Measuring Coping With Stress Mini-COPE) consisted of 28 statements, included in 14 strategies for coping with stress and difficult situations, which are divided into 7 factors, i.e., Active Coping, which included following strategies: Planning, Positive Reappraisal; Seeking Support, which on the other hand includes: Seeking Emotional Support and Seeking Instrumental Support; Helplessness, which consists of the Use of Psychoactive Substances, Suppression of Activities, Self-Blame; and Avoidance Behaviors, which include: Dealing with Something Else, Denial, Venting of Emotions. On the other hand, the strategies of Turning to Religion, Acceptance, and Sense of Humor were independent factors. For each statement, the respondents marked one of four possible answers: from "I almost never do this" (0 points) to "I almost always do this" (3 points). The score was calculated separately for each strategy, and the higher the score, the more often the strategy was used. In the in-depth analysis of the scores, problem-focused strategies were distinguished, including Active Coping, Planning, Seeking Instrumental Support, and strategies focused on emotions, including Seeking Emotional Support, Turning to Religion, and Denial. For example statements like *My efforts are focused on doing something about the situation* and *I am taking action to improve this situation* were included to Active Coping. Statements like *I am trying to work out a strategy or plan outlining what to do* and *I am seriously wondering what steps should be taken* were included to Planning. The reliability of the original version of the Inventory determined using Cronbach's alpha ranged from 0.62 to 0.89 (Juczyński and Ogińska-Bulik, 2012). Before using the questionnaires, the researchers obtained permission to use them.

The original questionnaire of the survey contained 12 questions: socio-demographic questions regarding, among others, gender, age, and year of study, as well as the COVID pandemic (e.g., work in a hospital dedicated to patients suffering from COVID-19; contact family member who takes care of a patient suspected of being infected with COVID-19, obligation to be on quarantine, obligation to use personal protective equipment). It made it possible to collect information that was used for an in-depth characterization of the study group and the assessment of factors influencing the perceived level of stress and insomnia.

STATISTICAL METHODS

During the analysis of the collected research materials, statistical methods were also used, allowing for the development of results and conclusions. Correlations between quantitative variables were analyzed using the Spearman's rank correlation coefficient or the Pearson's χ^2-test of independence. The strength of dependence was interpreted according to the following scheme: $|r| \geq 0.9$—very strong dependence; $0.7 \leq |r| < 0.9$—strong dependence; $0.5 \leq |r| < 0.7$—moderately strong dependence; $0.3 \leq |r| < 0.5$—weak correlation; $|r| < 0.3$—very weak relationship (negligible).

The collected data was entered into Microsoft Excel and subjected to statistical analysis, for which the Pearson test of independence was used. The level of significance was set at $p < 0.05$. The calculations were made using SPSS 20 software.

RESULTS

Study Group

Most of the study group of 397 students were between 20 and 30 years of age ($N = 69.3\%$). Of respondents, 9.1% ($N = 36$) were 31 and 40 years of age, and 15.6% of respondents ($N = 62$) were between 41 and 50 years of age. The age group of 51–60 years was 6.0% ($N = 24$). The study group consisted of more women than men, with 93.7% female respondents ($N = 372$) and 6.3% male respondents ($N = 25$).

First-year student made up 49.9% of the respondents ($N = 198$), and 50.1% ($N = 199$) were second-year students.

Most of the surveyed students ($N = 301$, i.e., 75.8%) were full-time students. Every fourth respondent ($N = 96$, i.e., 24.2%) studied at part-time studies.

Recently, 11.6% of respondents ($N = 46$) have been quarantined due to the spread of COVID-19.

Every fourth respondent ($N = 102$, i.e., 25.7%) admitted that someone from his or her immediate family was quarantined. A group of 59.4% of students ($N = 236$) admitted that they had a health care professional in their immediate family. Work in a hospital dedicated to patients suffering from COVID-19 was performed by 12.6% of students ($N = 50$). According to 9.3% of students ($N = 37$), someone in their family worked in a hospital dedicated to COVID-19 patients. According to 15.9% of respondents ($N = 63$), someone from their family was taking care of a patient suspected of being infected with COVID-19.

The COVID-19 cases among family members were indicated by 6.3% of respondents ($N = 25$). The majority of people ($N = 321$, i.e., 80.9%) indicated that there were no cases of the virus in their families. Of the respondents, 0.8% ($N = 3$) suffered from COVID-19; 39.8% of respondents ($N = 158$) dealt with patients suspected of having COVID-19 in their work; 46.6% of people ($N = 185$) did not come into contact with such patients; and 13.6% ($N = 54$) did not know if they had contact with patients suspected of having COVID-19. Facemasks were the most frequently mentioned PPE (personal protective equipment) used in the workplace ($N = 344$, 86.6%). Almost half of the respondents ($N = 193$, 48.6%) used face shields, and more often than every fourth person ($N = 104$, 26.2%) used overalls. Gloves were rarely used ($N = 47$, 11.8%), and 12.1% of the respondents did not use any protection ($N = 48$); Of the participants, 79.6% ($N = 316$) indicated the implementation of procedures in the workplace for the treatment of a patient suspected of COVID-19; 68.8% of respondents ($N = 273$) feared contracting COVID-19; 20.4% of respondents ($N = 81$) were not afraid of developing this disease; and 10.8% of respondents ($N = 43$) did not think about it.

Most of the respondents ($N = 261$, 65.7%) took showers, washed their clothes, and disinfected their hands and products after returning from work; 19.9% of the respondents ($N = 79$) avoided contact with their relatives after returning from work; 8.3% ($N = 33$) of people lived away from home to

avoid the risk of their family contracting COVID-19; and 6.0% of respondents ($N = 24$) did not answer the question about the protection of the family against transmission of the virus.

Based on the PSS-10 scale, it was found that 8.6% of the respondents ($N = 34$) experienced a low level of stress. The average level of stress was found in 25.4% of the respondents ($N = 101$). Most of the respondents ($N = 262$, 66.0%) experienced a high level of stress.

The results of the Athenian Insomnia Scale showed that 43.3% of respondents had no sleep disorders ($N = 172$). Sleep disturbances considered as normal occurred in every third person ($N = 132$, 33.2%). The probability of insomnia was 23.4% of the respondents ($N = 93$).

Factors Influencing the Level of Perceived Stress

A high level of stress was demonstrated among 64.4% of respondents aged 20–30 and 69.7% of people over 30 ($\chi^2 = 1.061$; $p = 0.3029$). Higher levels of stress were more common in women (66.7%) than in men (56.0%) ($\chi^2 = 1.188$; $p = 0.2758$).

The level of perceived stress did not significantly depend ($\chi^2 = 0.842$; $p = 0.3589$) on the year of study. Slightly more students in the 1st year (68.2%), than the 2nd year (63.8%), assessed their stress level as high. Part-time students experienced a high level of stress more often than part-time students (74.0%) than full-time students (63.5%) ($\chi^2 = 3.578$; $p = 0.0586$). It was shown that high levels of stress were more common among students whose closest family members were quarantined due to contact with someone suffering from COVID-19 (74.5%; $p = 0.0352$). The level of stress experienced by the respondents was not related to the medical profession performed by a family member of the respondent ($\chi^2 = 1.284$; $p = 0.2571$).

High levels of stress were experienced more often by people who worked in a hospital dedicated to patients suffering from COVID-19 (78.0%) than other respondents (64.3%) ($\chi^2 = 3.674$; $p = 0.0553$). This relationship (although not statistically significant) also occurred when someone from the family of the respondents worked in a hospital dedicated to patients suffering from COVID-19 (78.4%) than in people who did not have such relatives in their family (64.7%) ($\chi^2 = 2.788$; $p = 0.0950$).

A high level of perceived stress was significantly more frequent in students who had in their immediate family people taking care of patients suspected of having COVID-19 (82.5%) than in other respondents (17.5%) ($\chi^2 = 9.134$; $p = 0.0025$).

In the families of 25 students surveyed, a family member suffered from COVID-19. Respondents (84.0%) whose families had contracted COVID-19 experienced high levels of stress more often than respondents ($\chi^2 = 4.243$; $p = 0.1199$) whose family members had not contracted the virus. It has not been shown, however, that the fact that the surveyed students had COVID-19 had an impact on the level of stress they felt.

It was shown that having COVID-19 did not significantly affect the level of perceived stress by the respondents ($\chi^2 = 0.001$; $p = 0.9803$).

Respondents who came into contact with patients suspected of having COVID-19 (75.3%), more often had a high level of stress than respondents (58.4%) ($\chi^2 = 10.933$; $p = 0.0042$) who had not come into contact with patients suspected of having COVID-19.

High intensity of perceived stress was more common among people who had procedures for dealing with a patient suspected of having COVID-19 (68.0%) in the workplace compared to other respondents (58.0%) ($\chi^2 = 2.881$; $p = 0.0897$).

People who were afraid of contracting COVID-19 (71.8%) more often than other respondents (51.9%) declared a high level of perceived stress ($\chi^2 = 13.298$; $p = 0.0013$).

Students who scored high on the perceived stress scale were more likely to protect their families from the transmission of the virus in various ways. Respondents with low/average stress levels more often did not answer the question about the protection of loved ones, which suggests that they did not implement any measures in this direction ($\chi^2 = 17.374$; $p = 0.0006$).

Factors Influencing the Level of Insomnia

The occurrence of sleep disorders was significantly more frequent in people over 30 years of age (67.2%) compared to respondents ages 20–30 (52.0%) ($\chi^2 = 7.965$; $p = 0.0048$). The sex of the respondents did not significantly affect the occurrence of sleep disorders ($\chi^2 = 0.237$; $p = 0.6260$). It was not found that the occurrence of sleep disorders in the respondents differed significantly depending on the year of study ($\chi^2 = 0.202$; $p = 0.6534$). Both among the surveyed students of the 1st and 2nd year, the probability of sleep disorders occurred in a similar percentage of cases (55.6 and 57.8%, respectively). The occurrence of sleep disorders was more frequent among part-time students (72.9%) than full-time students (51.5%) ($\chi^2 = 13.603$; $p = 0.0002$).

It was not found that the occurrence of sleep disorders in the respondents was significantly related to someone from the immediate family of the respondent being quarantined due to contact with a person suspected of having COVID-19 ($\chi^2 = 0.944$; $p = 0.3313$).

Sleep disturbances were more common in people (60.6%) who had healthcare professionals in the family than the other respondents (50.9%) ($\chi^2 = 3.638$; $p = 0.0565$). It was noticed that sleep disturbances occurred more often in students who worked in a hospital dedicated to patients suffering from COVID-19 (68.0%) than in other respondents (55.0%) ($\chi^2 = 2.988$; $p = 0.0839$).

The respondents who had a family member working in a hospital dedicated to patients suffering from COVID-19 more often (73.0%) than the rest (55.0%) declared sleep disorders ($\chi^2 = 4.414$; $p = 0.0356$). Taking care of a patient suspected of having COVID-19 by a family member did not significantly affect students' occurrence of sleep disorders ($\chi^2 = 0.405$; $p = 0.5247$).

The occurrence of COVID-19 cases among family members did not significantly affect the sleep disorders of the respondents ($\chi^2 = 1.540$; $p = 0.4630$).

Having COVID-19 by the respondent did not significantly affect the occurrence of sleep disorders ($\chi^2 = 0.123$; $p = 0.7259$).

Sleep disturbances were more common among people who came into contact with patients suspected of having COVID-19

TABLE 1 | Occurrence of sleep disorders and the level of perceived intensity of stress.

			Level of stress (PSS-10)		Total
			Low/average	High	
The Athens Insomnia scale	Norm	*N*	94	78	172
		%	69.6%	29.8%	43.3%
	Borderline norm/probable insomnia	*N*	41	184	225
		%	30.4%	70.2%	56.7%
Total		*N*	135	262	397
		%	100.0%	100.0%	100.0%

$\chi^2 = 57{,}645$; $p < 0.0001$.
χ^2, *Pearson test; p, significance level.*

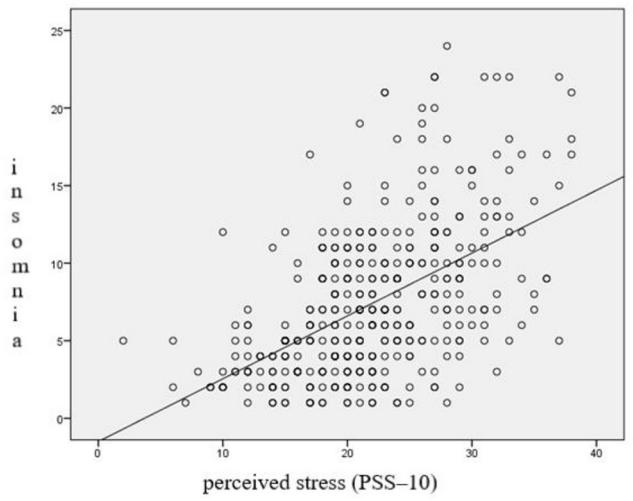

FIGURE 1 | Perceived stress level (PSS-10) and sleep disorders—insomnia (AIS).

(66.5%) and people who did not know whether they had contact with such patients (63.0%) ($\chi^2 = 14.846$; $p = 0.0006$).

The implementation of procedures in the workplace for taking care of a patient suspected of having COVID-19 did not significantly affect the occurrence of sleep disorders in the respondents ($\chi^2 = 2.204$; $p = 0.1377$).

It was found that people who were afraid of contracting COVID-19 had sleep disorders more often (65.9%) than the rest of the respondents (37.0%) ($\chi^2 = 30{,}569$; $p < 0.0001$).

The occurrence of sleep disorders in the respondents was not significantly related to their protection of the family against virus transmission ($\chi^2 = 4.345$; $p = 0.2266$).

The Influence of the Perceived Intensity of Stress on the Level of Insomnia

Students who felt stressed at a high level had more sleep disorders (70.2%) than those who experienced stress at a low or average level (30.4%). The differences were statistically significant ($\chi^2 = 57.645$; $p < 0.0001$) (**Table 1**; **Figure 1**).

The higher the intensity of the stress experienced by the respondents, the more often the respondents decided to cope with denial, taking psychoactive substances, ceasing action, or blaming themselves. The higher that the stress level was, the more often helplessness and avoidance behavior were chosen rather than active coping, strategies for seeking support, or sense of humor. Similarly, the more often the respondents experienced sleep disorders, the less often they undertook active forms of coping with stress and more often they chose avoidance behaviors (**Table 2**).

DISCUSSION

The emergence of the new SARS coronavirus-CoV2 has increased the level of stress perceived by people and revealed the need to treat the psychological aspects of epidemics and pandemics and to treat these events as phenomena that have psychological effects (Aslan and Pekince, 2021). Students and health care workers were the most exposed to stress (Simionescu et al., 2021).

They were concerned about their health as well as the health of their family members. In turn, the intensification of stress contributed to the occurrence of sleep disorders. It is noticeable in the results of this study.

A high level of stress was demonstrated among respondents. Similar results were achieved by Aslan and Pekince (2021). In a study conducted among Turkish nursing students, the results show that they experienced high levels of stress, mild anxiety, and moderate depression, with 5.6% reporting low levels of perceived stress, 23% moderate, and 71.2% high (Aslan and Pekince, 2021). A similar relationship with regard to gender has also been shown. More often, female students reported significantly higher levels of stress compared to male students (Andrzejewska et al., 2018; Becker et al., 2018; Piotrowski et al., 2020; Aslan and Pekince, 2021; Simionescu et al., 2021).

The results of other studies by Xiong et al. (2020), and other co-authors as well as Lai et al. (2020) also prove that women are more prone to higher levels of stress than men. It was noticed that the stress level varied and depended on the student's status, the number of days when the university was closed, the occurrence of unemployment, the occurrence of infections in close surroundings, and low self-evaluation of health (Xiong et al., 2020).

TABLE 2 | The level of perceived stress and sleep disorder and coping with stress of nursing students.

	The level of perceived stress (PSS-10) (0–40 points)		The Athens Insomnia scale (AIS) (0–24 points)	
	Rho	***p***	**Rho**	***p***
Mini-COPE detailed scales				
Active coping	−0.093	0.0653	−0.045	0.3689
Planning	−0.029	0.5692	−0.056	0.2689
Positive reappraisal	−0.174	**0.0005**	−0.177	**0.0004**
Acceptance	0.006	0.9093	−0.068	0.1792
Sense of humor	−0.127	**0.0112**	−0.186	**0.0002**
Turning to religion	0.071	0.1567	0.056	0.2652
Seeking emotional support	−0.088	0.0807	−0.055	0.2741
Seeking instrumental support	−0.019	0.7025	0.016	0.7494
Dealing with something else	0.060	0.2354	−0.007	0.8888
Denial	0.219	**0.0000**	0.194	**0.0001**
Venting of emotions	0.246	**0.0000**	0.126	**0.0117**
Use of psychoactive substances	0.141	**0.0050**	0.173	**0.0005**
Activities cessation	0.202	**0.0000**	0.147	**0.0034**
Self-blame	0.285	**0.0000**	0.232	**0.0000**

Rho, Spearman correlation; p, significance level. Bold values p value–level of statistical significance.

While analyzing the literature and comparing the results, an article was found on the impact of lockdown on the quality of sleep in students and administrative staff. Research by Marelli et al. (2021) , and other authors indicated that the lockdown period in the SARS-CoV-2 pandemic contributed to the deterioration of sleep quality. Problems with falling asleep, maintaining sleep, and its efficiency were mainly influenced by the risk of developing COVID-19. Difficulties with falling asleep occurred in 55% of students, and 30% of respondents had problems waking up early. It was also noticed that 34.3% of the nursing students developed symptoms of depression. In the study, women were found to be more prone to sleep disorders, but taking into account only students, no significant differences related to sleep disorders were found (Marelli et al., 2021). A study by Romero-Blanko et al. (2020) similarly showed that the lockdown period resulted in poorer sleep quality (with the exception of sleep duration). Moreover, it turned out that the decreased quality of sleep was found in people who reported problems with anxiety or depression and those who did not. The study by Xiao et al. (2020) showed that the sleep quality of the respondents in central China during the pandemic decreased in people with higher levels of perceived stress. The results of studies by Simonetti et al. (2021) carried out during the pandemic among Italian nurses showed a significant correlation between perceived anxiety and decreased quality of sleep.

The impact of stress on students' sleep is also confirmed by the studies of other authors (Lund et al., 2010). The study by Almojali et al. (2018), documents a high prevalence of stress and poor sleep quality in a sample of Saudi medical school students (Almojali et al., 2018). Similarly, the results of Lai et al. (2020) showed that full-time international university students experienced more intense stress and insomnia during a pandemic. The analysis of sleep disorders among respondents of the study by Piotrowski et al. (2020) showed that they occur in both women and men, but women are more prone to sleep problems. Similar results have been shown by this research conducted among nursing students.

In China, where people were the first to experience SARS-CoV-2 infections in the world, a mental health study was conducted among Chinese students. The incidence of stress, depression, and anxiety was 35.1, 22.4, and 12.1%, respectively (Li et al., 2020).

This study similarly observed that the higher levels of stress concerned women, and it was higher if the SARS-CoV-2 concerned someone from their nearest family. Sleep disorders appeared when someone in the family worked with SARS-CoV-2 patients, and the students worked in a hospital dedicated to COVID-19 patients. The vast majority did not complain about sleep disorders if someone in the family was in quarantine or when a family member was taking care of someone with COVID-19. It will be a purposeful task to look at people who suffer from stress at a very high level. The relationship between sleep disorders and the intensity of perceived stress was also confirmed in studies where it was additionally established that the effect of stress on sleep difficulties is strengthened by meditation and/or negative affects (Amaral et al., 2018).

The higher the stress level was, the more often helplessness and avoidance behaviors were chosen rather than active coping, strategies for seeking support, or sense of humor in own study. In the study of Simionescu et al. (2021), the most effective coping strategies against stress for nurses during the pandemic were based on self-control and spiritual dimension (Simionescu et al., 2021). In a study by Lai et al. (2020), the top three most commonly used coping strategies among students during the COVID-19 pandemic were listening to music (78%), eating, or cooking (66%), and video or mobile gaming.

One an article regarding students' coping strategies during the COVID-19 pandemic found that ∼35% of students experienced some level of anxiety and used four types of coping strategies: seeking social support, avoidance/acceptance, mental disengagement (Khoshaim et al., 2020). Before the pandemic, authors found that the most common coping behavior used by nursing students was transference, followed by remaining optimistic, and problem-solving, while the least used was avoidance (Zhao et al., 2015; Bodys-Cupak et al., 2016). Specific strategies of coping with stress are necessary for those nursing students who are preparing for future jobs, to safely care for their patients.

During the SARS pandemic in 2003, fear of infection was reported to have had negative psychological effects (Bai et al., 2004; Chua et al., 2004; Lee et al., 2007), so it seems appropriate to conduct research to determine the best ways to ensure safety and counteract PTSD (post-traumatic stress disorder). We should remember that students are important members of our health system; they are essential for the health of the patient, and possible future pandemics. It is important to support future medical personnel in creating the most effective stress-coping strategies. Today, the neglect of the needs related to maintaining mental comfort may result in increasing disorders that appear over the next years.

Limitation of the Study

The main limitations of the study are related to areas of data collection methods. Data collection was undertaken at one point in time rather than longitudinally. The characteristics of the participants—young people, mainly women—could represent a bias.

The selection of the group of respondents was deliberate. The research was carried out using nursing students from only two universities, thus the conclusions cannot be applied to the general population. More research is needed.

Implications to Practice

Nursing students in the face of a pandemic, like medical personnel, experience stress and are at risk of developing disorders, especially in the sphere of mental functioning. Therefore, it is important to quickly assess and recognize the individual's situation and needs in order to provide adequate support and shape active forms of coping with stress. Greater psychological support from academic institutions is needed to enhance female students' mental health and resilience. This will save students from serious consequences, such as developing depression or post-traumatic stress disorder. These findings are important for both nursing schools and hospitals.

CONCLUSION

1. During the pandemic, students experienced severe stress, which resulted in sleep disorders. The greater the intensity of stress experienced by students, the more often they undertook avoidance behaviors or showed helplessness.
2. The intensity of perceived stress was higher in students if there was a risk of contact with a sick or quarantined person, or the respondent worked in a hospital dedicated to patients suffering from COVID-19.
3. Sleep disorders intensified if the respondents had health care workers in their families, and they occurred in students who worked in a hospital dedicated to patients suffering from COVID-19.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The research was approved by the Bioethics Committee in Tarnów– No. of approval: 2/9277/2019. Additionally, the patients/participants provided their written informed consent to participate in this study. The study was developed and conducted in accordance with the protocols accept by the university authorities' and the principles of Good Scientific Practice; the Act on the protection of personal data; the principles of the Helsinki Declaration; and the Regulation on the protection of individuals with regard to the processing of personal data.

AUTHOR CONTRIBUTIONS

IB-C and AG: conceptualization, data curation, formal analysis, funding acquisition, and methodology. IB-C, AG, and KC: investigation and writing— review and editing. IB-C: supervision and writing—original draft. All authors have read and agreed to the published version of the manuscript.

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Major Impact of Coping Styles on Anxiety and Depression Symptoms in Healthcare Workers During the Outbreak of COVID-19

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Background: In the early days of COVID-19 outbreak, the normally orderly health system was severely challenged by large numbers of feverish patients and shortage of healthcare workers. The outbreak played a harmful role in the mental health of these healthcare workers.

Objective: We aim to assess the prevalence of moderate or severe anxiety and depression symptoms (ADSs) of healthcare workers in different regions during COVID-19 disaster and identify the potential risk factors.

Methods: We did a cross-sectional study on ADS of healthcare workers in epicenter-Hubei province and regions in lower epidemic-other provinces by questionnaire online. The data of ADS, the demographic characteristics, occupational exposure, physical condition, family situation, and coping styles were collected and analyzed.

Results: A total of 24.68% of the respondents had experienced moderate or severe ADS. Moderate or severe ADSs were in a higher prevalence in Hubei (32.39%) than other provinces (18.22%). Suspicious symptoms on their own and in family members were independent risk factors of moderate or severe ADS of all health workers. Working on the frontline was the independent risk factor for participants in Hubei province, whereas quarantine was the independent risk factor for those in other provinces. Moreover, among all participants, those with negative coping style were more than four times more likely to have moderate or severe ADS than those with positive coping style.

Conclusion: Moderate or severe ADSs were in a higher prevalence in healthcare workers of Hubei province during COVID-19 outbreak. The coping style may have major impact on ADS in such situation.

Keywords: COVID-19, healthcare workers, anxiety, depression, coping style

INTRODUCTION

On 30 January 2020, given the severity of the outbreak, the World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) as a Public Health Emergency of International Concern. By 24 o'clock on 10 February, the cumulative number of confirmed COVID-19 cases in China had reached 42,638, at the same time, Hubei province had 31,728 cumulative confirmed cases of COVID-19 according to the health commission[1,2]. The COVID-19 outbreak was unique in its rapidity of transmission and the large number of healthcare workers who were infected (China-WHO joint investigation report of novel coronavirus pneumonia). The normally orderly health system has been severely challenged by large numbers of feverish patients and shortage of healthcare workers. Great changes had taken place in the work and life of frontline healthcare workers. In addition, many frontline healthcare workers had more than 16 working hours per day on average (Huang and Zhao, 2020). Additionally, we had found that the increased workload was independently related to anxiety, depression, and job burnout among healthcare workers in the previous study (Chen et al., 2020; Liu et al., 2020). Worse still, they were great risk group for infection by the virus. This biodisaster as a life-threatening and life-altering event played a harmful role on the mental health of these healthcare workers.

Coping was defined as thoughts and behaviors that people use to manage the internal and external demands of situations that are appraised as stressful (Folkman and Lazarus, 1980). The earliest classification distinguished coping into problem-focused coping and emotion-focused coping, which were often fitted by later conceptualizations of coping, and also the concepts of positive coping and negative coping. In the majority of studies of coping and adjustment, negative coping has been associated with higher levels of distress (Folkman and Moskowitz, 2004). But it is still unknown whether the coping styles can have an important impact on how healthcare workers respond to this biodisaster and psychological distress. We hypotheses that coping styles and factors related to COVID-19 disaster may potentially contribute to anxiety and depression of healthcare workers in different provinces of China. Therefore, we aim to assess the psychological impact of COVID-19 disaster on Chinese healthcare workers and identify the possible risk factors, especially coping style, associated with anxiety and depression symptoms (ADSs) by a web-based cross-sectional study, to offer favorable conditions in times of extreme distress, such as the current and future pandemics.

MATERIALS AND METHODS

Study Design and Participants

From 9 February 2020 to 13 February 2020, we did a cross-sectional study of the epidemiology of ADSs of healthcare workers in China. Healthcare workers in hospitals both in epicenter-Hubei province and regions in low epidemic-other provinces who were still at work during the outbreak of COVID-19 were eligible in this survey. Healthcare workers were all local staffs except for support staffs from other regions during this outbreak. The study was conducted by convenience sampling online. The purpose, meaning, and confidentiality of personal information of the research were explained before eligible healthcare workers filled out the self-reported questionnaire. Healthcare workers were recruited when they gave their permission to participate and then voluntarily completed the questionnaire in WeChat small program[3] after scanning the specific two-dimensional code. Ethics approval was received from the research Ethics Committees of the Wuhan Union Hospital, Tongji Medical College, Huazhong University of Science and Technology.

The demographic characteristics, occupational exposure, physical condition, and family situation were collected in this questionnaire. The generalized anxiety disorder 7-item scale (GAD-7), 9-item Patient Health Questionnaire (PHQ-9), and the 20-item Trait Coping Style Questionnaire (TCSQ) were used to measure psychological status and coping styles (He et al., 2010; Wang et al., 2014; Zhou et al., 2016).

Basic Characteristics

The demographic characteristics include age, sex (male and female), occupation (doctor, nurse, and other healthcare workers), and title of occupation (primary title, senior title, and none). Primary title included medic, resident doctor, attending doctor, primary nurse, and primary nurse practitioner; senior title included associate chief physician or associate professor, chief physician or professor, nurse-in-charge, deputy chief nurse, and senior nurse. The occupational exposure characteristics included location (Hubei province and other provinces) and working environment (frontline and non-frontline). Hubei province was the epicenter of COVID-19 outbreak, whereas other provinces in China mainland were in lower epidemic. "Frontline" means that healthcare workers directly contacted with patients with COVID-19. Other healthcare workers in hospital were defined as "non-frontline."

Physical condition and family situation were collected by questions answering "yes" or "no." Physical condition was evaluated by "Did you have suspicious symptoms of COVID-19 (fever, shortness of breath, cough, sputum, fatigue, muscular soreness, diarrhea, nausea, and vomiting) in last 2 weeks?" Healthcare workers who had one of the suspicious symptoms can choose "yes." The family situation was assessed by the following questions: (1) Are there the old or the child in your family needing to be taken care of? (2) Are you quarantined from your family members? (3) Did your family members have suspicious symptoms in last 2 weeks? Participants who answered "yes" in "question (1)" were defined as family caregivers. Suspicious symptoms in family members were consistent with those in their own physical condition.

[1] http://www.nhc.gov.cn

[2] http://wjw.hubei.gov.cn

[3] https://web.wechat.com/

Measurement of Anxiety and Depression Symptoms

The degree of ADSs was assessed by GAD-7 and PHQ-9, respectively. There were seven items, each item ranges from 0 to 3, and the total score of GAD-7 can be divided into four severity levels: severe (>14), moderate (10–14), mild (5–9), and no (≤4) anxiety (Yang et al., 2019). Chinese version of GAD-7 was employed in this study, which has good reliability and validity in Chinese population, with Cronbach's alpha coefficient at 0.898 and Kappa value at 0.825 (He et al., 2010; Yang et al., 2019). Additionally, a cutoff score of 10 was recommended for none or mild anxiety and moderate or severe anxiety distinction (He et al., 2010; Kroenke et al., 2010; Tong et al., 2016). There were nine items with each item ranging from 0 to 3. According to the total score, the severity of depression is defined as follows: severe (>20), moderate to severe (15–20), moderate (10–14), mild (5–9), and no (≤4) depression (Wang et al., 2014; Yang et al., 2019). The Chinese version of PHQ-9 has also been proved to have high reliability and validity in general Chinese population, whose Cronbach's alpha equals to 0.86 (Wang et al., 2014; Du et al., 2017). Additionally, a total score larger than 9 was recommended as cutoff score to distinguish the none or mild and the moderate or severe depression (Kroenke et al., 2010; Wang et al., 2014; Du et al., 2017). In the analysis, participants who had moderate or severe anxiety or depression symptoms were combined into participants with moderate or severe ADS.

Measurement of Coping Style

The 20-item TCSQ was employed in this study to evaluate the coping style positive coping (PC) or negative coping (NC) of participants. There are 10 items for each coping style, with each item scores from 1 to 5. The Chinese version of TCSQ was proved to be valid and reliable in Chinese population, with Cronbach's alpha for each coping style dimension at 0.790 and 0.776, respectively (Ding et al., 2015; Qiao et al., 2016). Individuals are more likely to use the coping style, if its score is higher than that of another coping style (Ding et al., 2015; Zhou et al., 2016).

Statistical Analysis

Statistical difference in categorical variable was detected by chi-square (χ^2) test. Student's *t*-test was performed to detect statistical significance in continuous variables. Step-by-step multiple logistic regression was conducted to find independent risk factors for moderate and severe ADS and also calculate odds ratios (ORs) with adjusted for demographic characteristics, such as sex, age, occupation, and so on. The area under the receiver operating characteristic (ROC) curve, also known as C statistic, was employed to evaluate clinical usefulness of the regression model with a cutoff value of 0.7 (Meurer and Tolles, 2017). We used R 3.6.0[4] to perform all the statistical analyses with a significant double-tailed *p*-value of less than 0.05.

[4]https://www.r-project.org/

RESULTS

Basic Characteristics

Totally, 928 effective questionnaires were recovered online (**Table 1**). A total of 60.78% (564/928) of them were doctors, 34.05% (316/928) were nurses, and 5.17% (48/928) were other healthcare workers. A total of 45.58% (423/928) of them came from Hubei Province, which was hardest hit by COVID-19, and 54.42% (505/928) were from other provinces in China mainland. Almost a quarter of healthcare workers (24.68%, 229/928) experienced moderate or severe ADS, and 137 of them came from Hubei province. Moderate or severe ADSs were in a higher prevalence ($p < 0.001$) in Hubei (32.39%, 137/423) than other provinces (18.22%, 92/505). Coexistence of ADSs was more common ($p < 0.001$) in Hubei province (15.60%, 66/423) than other provinces (6.34%, 32/505) (**Figure 1**). Additionally, the detailed numbers of participants with different anxiety and depression status in Hubei and other provinces are contained in **Supplementary Table 1**.

Related Risk Factors of Anxiety and Depression Symptoms Across China

In the univariate analysis, all of the occupational exposure characteristic, physical condition, family situation, and coping styles had effects on moderate or severe ADSs (**Table 1**). In the step-by-step logistical analysis, multiple factors can independently influence the occurrence of moderate or severe ADSs (**Table 2**). The C statistic of the best regression model of the whole participants in China was 0.752. Participants with the location of Hubei province (OR 1.600, 95% CI: 1.116–2.294), suspicious symptoms in last 2 weeks (OR 2.254, 95% CI: 1.612–3.157), the suspicious symptoms of family members in last 2 weeks (OR 1.776, 95% CI: 1.083–2.890), and negative coping style (OR 4.350, 95% CI: 3.134–6.065) were more likely to have moderate or severe ADS than those without the exposures.

Major Impact of Coping Styles on Anxiety and Depression Symptom

About 31.25% (290/928) of healthcare workers had negative coping style and 68.75% (638/928) had positive coping style. Participants with negative coping style were more than four times more likely to have moderate or severe ADS than those with positive coping style, in both Hubei province and other provinces (**Table 3**). Therefore, negative coping style may have major impact on ADS both in Hubei and other provinces. The detailed prevalence and severity of AD0053 in groups categorized by coping styles and location can be seen in **Supplementary Tables 2–4**, which were in line with the result of the multiple logistic regressions.

Different Related Risk Factors of Anxiety and Depression Symptom of Hubei Province and Other Provinces

According to **Figure 2**, the proportion of the frontline ($p < 0.001$), suspicious symptoms ($p < 0.001$) on their own of

TABLE 1 | General characteristics of participants according to ADSs (n = 928).

Variables	Total	None/mild anxiety and depression (%)	Moderate/severe anxiety and depression (%)	Test value (χ^2/t)	p-value
Demographic characteristic					
Age	/	36.50 ± 8.57	36.59 ± 8.37	−0.135	0.893
Sex				1.060	0.303
Male	295	229 (77.63)	66 (22.37)		
Female	633	470 (74.25)	163 (25.75)		
Occupation				1.019	0.601
Doctor	564	422 (74.82)	142 (25.18)		
Nurse	316	243 (76.90)	73 (23.10)		
Others	48	34 (70.83)	14 (29.17)		
Titles of occupation				3.236	0.198
Primary title	552	407 (73.73)	145 (26.27)		
Senior title	328	258 (78.66)	70 (21.34)		
None	48	34 (70.83)	14 (29.17)		
Occupational exposure characteristic					
Location				24.109	<0.001 ∗ ∗∗
Hubei province	423	286 (67.61)	137 (32.39)		
Other provinces	505	413 (81.78)	92 (18.22)		
Working environment				15.059	<0.001 ∗ ∗∗
Frontline	258	171 (66.28)	87 (33.72)		
Non-frontline	670	528 (78.81)	142 (21.19)		
Physical condition					
Having suspicious symptoms related to COVID-19 in last 2 weeks				45.516	<0.001 ∗ ∗∗
Yes	347	218 (62.82)	129 (37.18)		
No	581	481 (82.79)	100 (17.21)		
Family situation					
Being family caregivers of the old or the child				4.976	0.026∗
Yes	585	426 (72.82)	159 (27.18)		
No	343	273 (79.59)	70 (20.41)		
Being quarantined from family				14.762	<0.001 ∗ ∗∗
Yes	212	138 (65.09)	74 (34.91)		
No	716	561 (78.35)	155 (21.65)		
Having suspicious symptoms related to COVID-19 in family members in last 2 weeks				16.267	<0.001 ∗ ∗∗
Yes	95	55 (57.89)	40 (42.11)		
No	833	644 (77.31)	189 (22.69)		
Coping styles					
Coping style assessed by Trait Coping Style Questionnaire				93.734	<0.001 ∗ ∗∗
Negative coping style	290	159 (54.83)	131 (45.17)		
Positive coping style	638	540 (84.64)	98 (15.36)		

*Values were expressed as n (%). *p < 0.05, ***p < 0.001.*

healthcare workers in Hubei province were significantly higher than those in other provinces. On the other hand, negative coping style was more common in Hubei province (p = 0.02).

Separate logistic regression analysis was done for different locations. The C statistic of Hubei province and other provinces was 0.720 and 0.765, respectively. Among the 11 variables, only three of them working on the frontline (OR 1.704, 95% CI: 1.092–2.679), suspicious symptoms (OR 1.926, 95% CI: 1.229–3.035) in last 2 weeks and negative coping style (OR 4.309, 95% CI: 2.760-6.798) were the independent factors for healthcare workers in Hubei province (**Table 3**). However, in other provinces, suspicious symptoms in last 2 weeks (OR 2.649, 95% CI: 1.600–4.390), quarantine (OR 3.381, 95% CI: 1.519–7.420), and negative coping style (OR 4.565, 95% CI: 2.792–7.536) were independent factors (**Table 3**). Suspicious symptoms in family members in last 2 weeks may be the potential factors to healthcare workers in Hubei and other provinces.

DISCUSSION

We found that 24.68% of 928 healthcare workers suffered moderate or severe ADS during the outbreak of COVID-19. Coping style increased the risk of ADS to a great extent. Suspicious symptoms on their own or in family members in last 2 weeks also had independent effect on moderate or severe

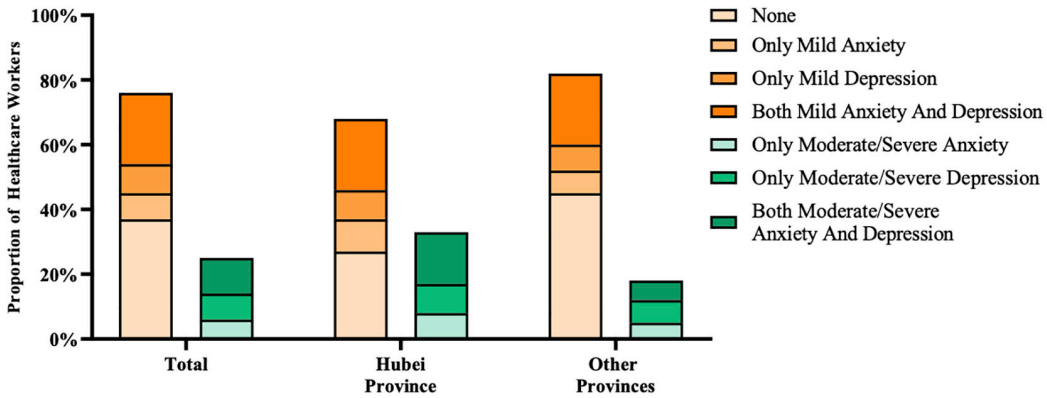

FIGURE 1 | Distribution of ADSs in Hubei province and other provinces. The occurrence of ADSs can be single or coexistent, although most participants in our study had both ADSs. Healthcare workers in Hubei province had a higher prevalence of moderate or severe ADS than those of other provinces.

TABLE 2 | Multiple logistic regression analysis with risk factors for moderate/severe ADSs (n = 928) (C statistic = 0.752).

Variables	*p*-value	OR (95% CI)
Occupational exposure situation		
Location		
Hubei province	0.011∗	1.600 (1.116, 2.294)
Other provinces		1
Work environment		
Frontline	0.062	1.431 (0.980, 2.084)
Non-frontline		1
Physical condition		
Having suspicious symptoms related to COVID-19 in last 2 weeks		
Yes	<0.001 ∗ ∗∗	2.254 (1.612, 3.157)
No		1
Family situation		
Being family caregivers of the old or the child		
Yes	0.080	1.370 (0.967, 1.954)
No		1
Having suspicious symptoms related to COVID-19 in family members in last 2 weeks		
Yes	0.022∗	1.776 (1.083, 2.890)
No		1
Coping style		
Coping style assessed by Trait Coping Style Questionnaire		
Negative coping style	<0.001 ∗ ∗∗	4.350 (3.134, 6.065)
Positive coping style		1

$^{*}p < 0.05$, $^{***}p < 0.001$.

ADS among all healthcare workers. However, working on the frontline was the independent risk factor for participants in Hubei province, whereas quarantine was an independent risk factor for those in other provinces.

Healthcare workers with both of ADSs were more than those with the single. The two sets of symptoms were different, but researchers have found that many showed a mixed anxious-depressed symptom picture that cannot be characterized as one type of disorder or the other (Downing, 1974). Thus, the two were perhaps mutually reinforcing each other (Davis et al., 2010). For example, the accumulation of stressful work experiences of COVID-19 plausibly underlined the development of depression following anxiety, and the sad mood induction of depression caused by the spreading and worsening of COVID-19 may sensitize and facilitate the anxiety. Mental disorder screening of healthcare workers should address both anxiety and depression to discover problems.

Hubei province was in a higher prevalence of moderate or severe ADS. Hubei province was the epicenter of the outbreak of COVID-19, and it is where healthcare workers fight the biodisaster first in China. During the outbreak of SARS in 2003–2004, Hong Kong was more seriously hit by SARS than other countries, such as Singapore and Canada. As reported in different studies, mental disorders assessed by General Health

TABLE 3 | Two separate multiple logistic regression analysis with risk factors for ADSs in Hubei province (C statistic = 0.720) and other provinces (C statistic = 0.765).

Variables	Hubei province (*n* = 423)		Other provinces (*n* = 505)	
	p-Value	OR (95% CI)	*p*-Value	OR (95% CI)
Occupational exposure characteristic				
Work environment				
Frontline	0.020*	1.704 (1.092, 2.679)	😐	😐
Non-frontline		1	😐	😐
Physical condition				
Having suspicious symptoms related to COVID-19 in last 2 weeks				
Yes	0.004**	1.926 (1.229, 3.035)	<0.001***	2.649 (1.600, 4.390)
No		1		1
Family situation				
Having suspicious symptoms related to COVID-19 in family members in last 2 weeks				
Yes	0.051	1.918 (0.995, 3.697)	0.073	1.963 (0.917, 4.054)
No		1		1
Being quarantined from family members				
Yes	😐	😐	0.002**	3.381 (1.519, 7.420)
No	😐	😐		1
Coping style				
Coping style assessed by Trait Coping Style Questionnaire				
Negative coping style	<0.001***	4.309 (2.760, 6.798)	<0.001***	4.565 (2.792, 7.536)
Positive coping style		1		1

😐 *This factor was not included in the optimization model in the multiple logistic regression analysis in its group of specific location (Hubei province or other provinces). For example, work environment was not included in the optimization model for risk factors of ADS in other provinces. *p < 0.05, **p < 0.01, ***p < 0.001.*

Questionnaire (GHQ) were more common in Hong Kong rather than other countries (Chan and Huak, 2004; Nickell et al., 2004; Tam et al., 2004). But the comparison among these results was lack of rigor, because of the various survey times and the different ways of data collection and analysis. However, the differences in mental symptoms in the epicenter and other regions were compared in our study during the biodisaster. More adverse, mental symptoms in Hubei province can partly be explained by the higher proportion of the frontline, more suspicious symptoms on their own and more negative coping styles. In the current phrase, online psychological assistance specially for healthcare workers, such as remotely delivered psychological therapies, chat lines, and psycho-education, should be provided in time.

Healthcare workers with suspicious symptoms, which were reported as the initial symptoms of SARS-CoV-2 infection (Guan et al., 2020), were more likely to have moderate or severe ADS. An intriguing study suggested that dyspnea one of the usual suspicious symptoms of COVID-19 can reflect an underlying anxiety disorder and there were pathophysiologic relationships between them (Smoller et al., 1996). On the contrary, suspicious symptoms would definitely increase the fear of illness and death, so we think that the scientific research on COVID-19 should be speeded to fight this disease, and necessary protective equipment for healthcare workers should be paid sufficient attention to decrease the incidence of infection.

Suspicious symptoms in family members and family members needing to be taken care of were also independent factors. Uncertainty about the physical health of the family, fear of losing the loved ones, and the decreased family support may contribute to the ADS among participants with poor family situation (Köse et al., 2016). Therefore, the family situation during this biodisaster should not be ignored in the development of ADS. It has been also proved that family caregivers reported increased psychosocial outcomes, so the challenges of caregiving and heavy workload in healthcare workers were exacerbated by the COVID-19 pandemic (Chen et al., 2020; Beach et al., 2021). Increased multifaceted support should be provided during this epidemic, such as facilitating access to telehealth support services for healthcare workers and accessible, affordable, and timely medical care for their family members.

More participants on the frontline (33.72%) had moderate or severe ADS than the non-frontline (21.19%), but the frontline was an independent risk factor in Hubei province not in others. In the epicenter-Hubei province, the workload of healthcare workers may be harder than those in other provinces. During the harder situation, the change in work environment, a lack of professionalism of emerging COVID-19, and the elevated risk of infection of the healthcare workers on the frontline may make them more adverse emotional reactions. Healthcare workers being quarantined from family members had over three times the odds of moderate or severe ADS in other provinces, but it was not the independent factor in Hubei province. The quarantine might be more common in the epicenter than others, so there might be more colleagues standing together and facing all the difficulties. In other provinces, being quarantined was rare, so healthcare workers may be more inundated with the fear of death, the loss of social supports, the shame of SARS-CoV-2 infection, and even feel like discriminated by the society (Im et al., 2018). Therefore, the regional differences should be taken into account when policymaking on mental health of healthcare workers.

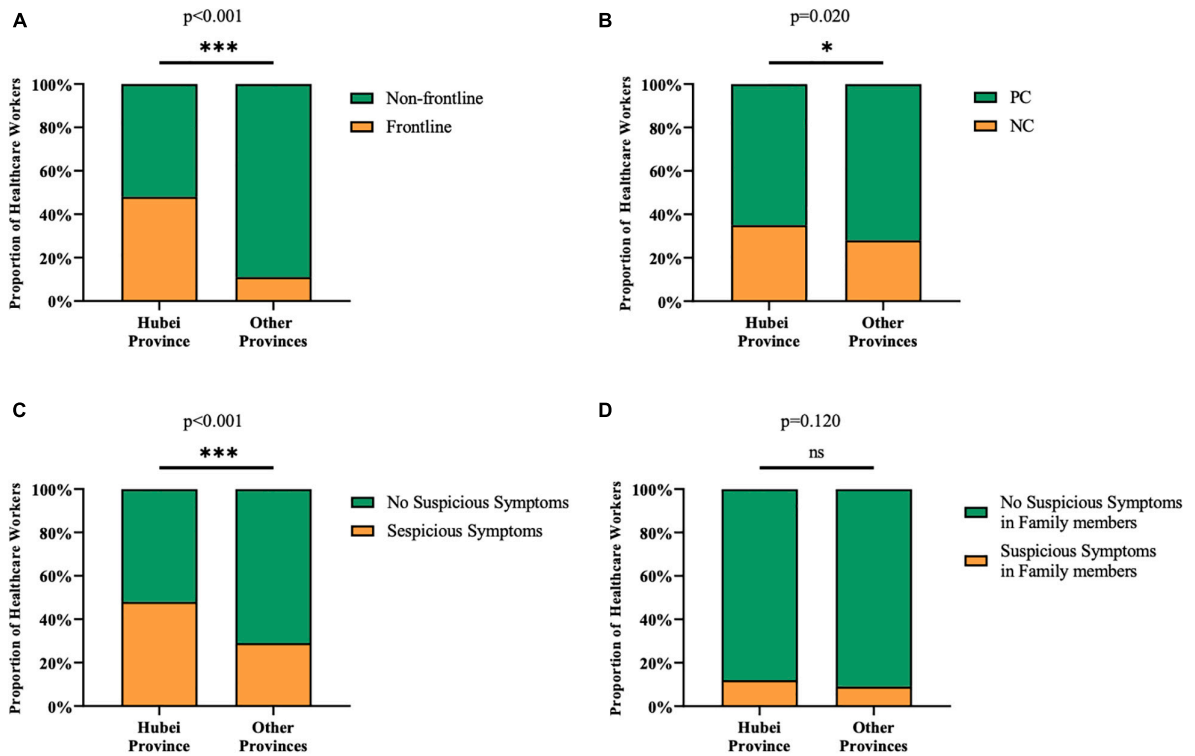

FIGURE 2 | Difference in potential risk factors on ADSs between Hubei province and other provinces. **(A)** More healthcare workers worked on the frontline in Hubei province (48%) than those in other provinces (11%). **(B)** The proportion of participants with negative coping style was slightly larger in Hubei (35%) than that of other provinces (28%). **(C)** Healthcare workers in Hubei province (48%) were more frequent to have suspicious symptoms compared with other provinces (29%). **(D)** There was no significant difference in the proportion of healthcare workers who had family members with suspicious symptoms between Hubei (12%) and other provinces (9%). $^{*}p < 0.05$, $^{***}p < 0.001$, $^{ns}p > 0.05$.

According to the result of multiple logistic regression analysis, coping style had a major impact on the occurrence of moderate or severe ADS both in Hubei and other provinces. A person who applied positive coping may regard stress as opportunities and challenges and then seek solutions to the emerging problems. On the contrary, participants with negative coping are more likely to focus on the negative emotions related to stress event rather than the solution of problem. As demonstrated in previous studies, negative coping would turn to high levels of emotional exhaustion, and positive coping was a positive source to fight against the depressed mood (Ding et al., 2015; Segerstrom and Smith, 2019). Therefore, healthcare workers with negative coping styles referred to negative emotions (such as ADS) when exposing to the stressor of this outbreak. Healthcare administrators should give special attention to coping styles of healthcare workers, and regard them as an important part of promoting the mental health of themselves. Some active interventions have been proved to be effective in the previous studies, including that foster connections of the team, provide education and training to develop active knowledge, skills, attitudes and behaviors, and learn from experiences of other biodisasters (e.g., SARS). Individual strategies and organizational support are both integral to equipping individuals to fight with work-related challenges (Phua et al., 2005; Gillman et al., 2015).

We hope that our findings may also make sense for the future public health crises. Healthcare workers always protect patients from any public health crisis, but the challenges of a public health crisis will inevitably spill over to themselves. At the same time dealing with their own physical health, mental health should also be emphasized. Targeted policy recommendations based on findings from researches could be implemented as soon as possible to avoid serious anxiety or depression disorders of healthcare workers. Besides, there are some limitations within this cross-sectional study. First of all, the only conclusion can be drawn is that those factors discussed above are possible risk factors related to ADS, since the cross-sectional study is not able to explain the relationship between causes and effects. Second, selective bias cannot be avoided when applying convenience sampling by online questionnaires. Even so, the results of our study may provide evidence for further psychological interventions and health policies. The psychological distress of healthcare workers during or post prevalence of COVID-19 still needs deep investigation.

CONCLUSION

During the outbreak of COVID-19, moderate or severe ADSs were in a higher occurrence rate in healthcare workers in

the epicenter-Hubei, China. Occupation exposure, physical condition, family situation, and coping style may have independent effects on ADS, but coping style may have a major impact on ADS.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Research Ethics Committees of Union Hospital, Tongji Medical College, Huazhong University of Science and Technology. Written informed consent for participation was not required for this study in accordance with the National Legislation and Institutional Requirements.

AUTHOR CONTRIBUTIONS

DW, JC, and XL designed the study. YJ and YM collected the data. LY and XX undertook the statistical analysis. DW and JC wrote the first draft of the manuscript. XL, TB, and JS revised the manuscript. TB and XH supervised the study. All authors actively participated in the study and reviewed and approved the final manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.813295/full#supplementary-material

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