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Exploring Psychological Factors Linking Burnout and Depression among COVID-19 Healthcare Workers Two Years Post-Pandemic

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Abstract: ***The objective was to study which psychological factors were more associated with burnout and depression in COVID-19 healthcare workers two years after pandemic onset. Between May 4 and June 17, 2022, 114 employees at a Romanian frontline Infectious Diseases Hospital, completed the Patient Health Questionnaire-9 (PHQ-9), the Maslach Burnout Inventory (MBI), the Copenhagen Burnout Inventory (CBI), and the Karasek Job Questionnaire (KJQ). Descriptive statistics, and multiple regression analysis were done. Moderate to severe depression was found in 30.6% of respondents, medium to high total Maslach burnout in 56.1%, medium to severe personal burnout (CBI-PB) in 45.6%, medium to high work-related burnout (CBI-WRB) and client-related burnout (CBI-CRB) in 44.7% and 22.8%, respectively. Regarding job variables, 30.7% expressed excessive demands, 82.5% claimed low job control, and 27.2% reported low social support. We highlight the correlation between emotional exhaustion (MEE) and Maslach burnout (rho=.958, p<.001), and between MEE and depression (rho=.885, p<.001). Furthermore, the regression analyses showed that MEE was significant predictors for CBI-PB/CBI-WRB and for depression (p<.001) suggesting overlapping interference. Personal achievement reduction was a significant predictor for depression (p<.05) not for burnout emphasizing its importance for depression. Our findings may help distinguish between burnout and depression and handle them more effectively.***

Keywords: COVID-19; healthcare workers; burnout; depression predictors

1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic changed everyone's lives and work habits, especially those of healthcare workers (HCWs), who played the most important role in public health pandemic containment. This global emergency generated great emotional distress among healthcare personnel, due to the fact that they were directly involved in treating a new disease, which exposed them to a major risk of getting sick and transmitting the disease to others, living with many or away from family to protect them from the risk of contagion, heavy workloads, coping difficulties generated by the uncertainty of the duration of the crisis, proven therapies, or a vaccine, and a possible lack of medical resources, including personal protective equipment [1,2,3,4]. In addition, changes in healthcare delivery, such as changing routine services, reorganizing clinical areas, and redeploying staff to unfamiliar clinical environments, added to everyday stressors [5].

2. Literature Survey

Previous literature focused on the psychological risks of HCWs related to other epidemics and reported high levels of anxiety, depression [6,7], stress, and burnout [8]. Anxiety and fear symptoms reached its peak promptly in the early phases of an epidemiological crisis but rapidly dropped in the later stages, whereas depression and post-traumatic stress symptoms persisted over time [9].

Frontline HCWs, directly involved in the diagnosis, treatment, and care of COVID-19 patients, have reported more severe symptoms of anxiety, depression, and stress than those not on the front line [10].

In the first year of the COVID-19 pandemic, the global prevalence of anxiety and depression increased by a massive 25% in the general population [11]. From the very beginning of the pandemic, it was thus assumed that burnout among HCWs would increase even more than in the general population [5].Accordingly, several observational studies conducted during the COVID-19 pandemic reported 54.60% overall prevalence of burnout, with regional differences [12, 14-20].In a previous study in Romania, in the same hospital, we reported a 63.1% prevalence of mild to severe depression [13].

There are also systematic reviews and meta-analyses regarding depression during COVID-19 (2020-2023) which reported a total prevalence of depression between 20 and 40% of HCWs [21-27].

Clinical depression involves a chronic (2 weeks or more) depressed mood, loss of interest, fatigue, and feelings of guilt or low self-esteem. One of the WHO reports, titled World failing in 'our duty of care' to protect mental health and well-being of health and care workers, found that at least a quarter of HCWs reported anxiety, depression, and burnout symptoms, confirming that in the third year of the COVID-19 pandemic, the levels of anxiety, stress, and

depression among HCWs have become a 'pandemic within a pandemic' [28].

The mental health problem during COVID-19 was expected to become a severe concern for HCWs, with long-term negative consequences, including the risk of suicide [29,30]. This is particularly alarming given the fact that physicians and nurses already represent the highest risk groups for suicide among the general population, and suicide can be regarded as an occupational hazard in the healthcare system [31]. According to research of Malaysian HCWs, clinical depression was the most important predictor of suicide ideation, followed by mild (sub threshold) sadness [32].

Regarding the factors associated with burnout, there is evidence that burnout is correlated with depression, but it is not yet clear whether depression is the cause or consequence of burnout, and further studies are needed to explore whether these are separate constructs or related [33].

Even burnout has been viewed as a job-induced syndrome combining pervasive fatigue and loss of motivation [34-36], there are qualitative and quantitative studies that have suggested that burnout is associated with difficulties inside and outside the occupational sphere [37].

Oquendo et al. also described the complex association of burnout with depression in the context of work stress [38].

When a phenomenological technique is used, three predominant issues are identified: job demands, life demands, and health concerns. It was evident that participants were subjected to difficult working conditions and personal lives, indicating burnout to be a multi-domain phenomenon [39]. In a study that examined the associations of job demands and resources, home demands and resources, and work-home interferences with burnout in 2115 male and female medical residents, it was found that, in both sexes, emotional demands at work and the interference between work and home were important contributors to burnout, especially when work interferes with home life [40].

Individuals experiencing burnout, in contrast to those experiencing depression, generally retain the ability to laugh, appreciate the comfort and support of relatives and neighbors, be consoled, and know that what they are experiencing will get better over time.

Cross-sectional research has connected physician burnout to a twofold increase in the probability of medical error and a 17% increase in the likelihood of being cited in a medical malpractice complaint. The longitudinal Internal Medicine Resident Well-Being Study (IMWELL) discovered that higher levels of burnout were connected with an increased likelihood of reporting a significant medical error in the next three months. Self-perceived medical errors were also linked to increased burnout, depressive symptoms, and a drop in quality of life, implying a bidirectional relationship between medical errors and discomfort[31]. Previous research has also connected burnout to a variety of personal and patient care consequences, namely diminished professionalism, empathy, patient safety, teamwork failure, and increased medical errors and attrition[5].

3. Problem Definition

It is well known that burnout is predominantly a job-related condition, the core feature of which is mental and emotional exhaustion related to ongoing work stress. Depression, on the other hand, is a persistent, pervasive, and pathological mental condition, the core features of which are unhappiness and anhedonism. In burnout, self-esteem is preserved, while feelings of low self-worth and even worthlessness often dominate one's self-view in depression [37].

However, there is ongoing debate as to whether burnout and depression are overlapping or distinct concepts. At first glimpse, depression and burnout share key features. The symptoms of depression comprise, as part of a wide range of dysphoric experiences, reduced energy or fatigue, social withdrawal, and feelings of failure, worthlessness, or excessive or inappropriate guilt [40]. On the other hand, burnout comprises emotional exhaustion, depersonalization, and diminished personal accomplishment [36]. The emotional depletion of burnout can be interpreted as similar to the sadness and fatigue of depression, and depersonalization can be seen as social withdrawal. Also, depression includes an element of poor self-efficacy that shares features with the burnout concept of reduced personal accomplishment. Those similarities are also demonstrated by their consistent correlations, particularly those of emotional exhaustion with depression measures [41].

Despite the fact that a confirmatory factor analysis provided support for differentiating burnout and depression [41], this issue remained one of the "Top 8 Issues in Major Depressive Disorder" described by Sidney Z in April 2022 because many doctors who complained of burnout were given antidepressant drugs, which had no positive effect on burnout, and others who experienced depression were not given antidepressants because the symptoms of depression were wrongly attributed to burnout [42]. The issue of distinguishing burnout from depression may not be primarily an either-or proposition—wondering if something is burnout or depression—but rather one of detecting when an individual presenting with burnout characteristics and symptoms may also have depression. Failure to do so risks losing the opportunity to identify and provide appropriate treatment for people suffering from serious, if not life-threatening, mental illnesses. The diagnostic confusion is at least in part explained by overlapping clinical features such as worthlessness, low energy, and a defeatist attitude [42, 43].

The objective of our study was to see which factors were more associated with burnout and depression, considering that some components of depression, burnout, and workplace stress factors in frontline healthcare workers two years after the COVID-19 pandemic onset overlap and that burnout might not be a distinct psychological phenomenon but another side of depression.

4. Materials and methods

4.1 Study design and participants

A cross-sectional, descriptive, exploratory study design using an anonymous, online survey of healthcare workers (physicians, nurses, or other healthcare personnel) from the Teaching Hospital of Infectious Diseases, Cluj-Napoca, Romania, who consented to participate in the study. The data collection process was performed over the Internet, through the online questionnaire program (Google Forms), from May 4 to June 17, 2022, two years after the COVID-19 outbreak. The hospital's ethical committee granted permission to conduct the survey on May 3, 2022 (permission number 8101).

All HCWs were invited to participate voluntarily in the study. The recruitment method was simple, with an e-mail invitation after a short presentation of the study's objectives in an online meeting explaining the purpose and name of the investigators. The response to the survey tools was recognized as implicit consent.

4.2 Data measurement

Four questionnaires were converted into online questionnaires via Google Forms to be completed: the Adult Depression Severity Scale adapted from the Patient Health Questionnaire-9 (PHQ-9), the Maslach Burnout Inventory (MBI), the Copenhagen Burnout Inventory (CBI), and the Karasek Job Factors questionnaire (KJQ). We centralized the data in an Excel file, and the results were calculated by the same investigator.

For depression, we used the Adult Depression Severity Scale (9 items) adopted by the American Psychiatric Association (APA) according to the PHQ-9 [APA_DSM5]. Research has proved the validity and reliability of the PHQ-9 for different kinds of people, and the internal consistency of the PHQ-9 is high (a=0.87) when the total PHQ-9 score was used to identify depression, the area under the curve (AUC) was 0.93 (95% confidence interval, 0.88–0.97) [44]. Using a cut-off of ≥13, the PHQ-9 demonstrated good sensitivity (.83) and specificity (.72)[45].

Due to the fact that it is the gold standard with good psychometric properties used by many authors, we also considered the Maslach Burnout Inventory (MBI) with 25 items for measuring the burnout syndrome [46-48].MBI assesses three subscales of burnout: Maslach Emotional Exhaustion (MEE) (9 items), Maslach Depersonalization (MDP) (6 items), and Maslach Personal Achievement Reduction (MPAR) (10 items) [47,48].

To evaluate the burnout syndrome, we also used the Copenhagen Burnout Inventory (CBI) with very satisfactory reliability and validity. It consists of 3 subscales that allow differentiation of Personal burnout (CBI-PB) (6 items) from Work-related burnout (CBI-WRB) (7 items) and Client-related burnout (clients, patients, social service recipients, elderly citizens, or inmates) (CBI-CRB) (6 items). In this manner, we can investigate if the emotional exhaustion was associated with personal or job-related factors [49]. The CBI-PB scale measures the participant's degree of physical and psychological exhaustion and includes items such as "How often do you feel tired?" and "How often do you feel worn out?" The CBI-WRB scale measures the extent of the participant's physical and psychological exhaustion with their workplace and includes seven items, such as "Do you feel burnt out because of your work?" and "Do you feel worn out at the end of the work day?" The CBI-CRB scale measures the extent of the participant's physical and psychological exhaustion with their patients and includes six items, such as "Do you find it hard to work with patients?" and "Are you tired of working with patients?" [49, 50].

For the evaluation of the job stress factors related to burnout and depression, we used the Karasek Job Factors Questionnaire (KJQ) with the following domains: Karasek Job Demands (KJD) (9 items), Karasek Job Control (KJC) (9 items), and Karasek Social Support (KSS) (8 items) [51]. The KJQ was found to be a valid tool for measuring psychosocial pressure in the working environment [52]. The KJD subscale refers to the quantity and rapidity of work, the complexity and intensity of work, and the interruptions and predictability of work; the KJC refers to the freedom and limits of decision, the freedom of action, and the development of professional skills; and the KSS reflects professional and emotional support from superiors and colleagues[51].

4.3 Statistical analysis

Demographic and questionnaire data were analyzed using various statistical techniques, including descriptive statistics, the Spearman correlation coefficient, and multiple regression analysis, with the assistance of IBM SPSS Statistics 23.0 (IBM, Armonk, NY, USA). Variables measured at a nominal scale were represented using proportions (%), and scale variables were presented as the median and interquartile range (IQR). The normality of variables was tested using the Shapiro–Wilk test. The Spearman correlationswere performed because of the non-normal distribution ofmost variables. Multiple regressionswere used in order to find the association and influence of one or more independent variables on a dependent variable. The dependent variables were PHQ-9, CBI-PB, and CBI-WRB scores, which were continuous variables. The independent variables were also continuous (MEE, MDP, MPAR, KJD, KJC, and KSS).

For statistical significance, we used p 0.05 and p 0.01.

5. Results & Discussion

5.1 Characteristics of participants

114 of the employees participated in the study out of 1052 hospital staff (10.83%), majority of them were women (82.50%). The median (IQR) age of the respondents was 42 (32-47). The demographic characteristics of the participants are shown in Table 1.

Table 1: Demographic characteristics of participants

Characteristic	Entire Sample n = 114
Age (years), Median (IQR)	42 (32-47)
women	42.50 (33-47.25)
men	37 (28-46)
Sex, n (%)	
women	94 (82.5)
men	20 (17.5)
Profession, n (%)	
infectious diseases physicians	48 (42.11)
infectious diseases nurses	34 (29.82)
other HCWs (pharmacists, radiologists, professional caregivers, physical therapists, social workers, psychologist and administrative hospital 'staff)	32 (28.07)

IQR, interquartile range

5.2 Prevalence of depression (PHQ-9), burnout (MBI, CBI), and job stress factors (KJQ)

First, we did the Shapiro-Wilk test in order to verify the normal distribution, and we found a normal distribution just for CBI-WRB. When we analyzed the prevalence and the range values, we found a prevalence of 30.6% for moderate, high, and severe clinical depression, 56.1% for medium and high Maslach burnout, 45.6% for medium, high, and severe CBI-PB, 44.7% for medium and high CBI-WRB, and 22.8% for medium and high CBI-CRB. In terms of job variables, 30.7% expressed excessive demands, 82.5% claimed low job control, and 27.2% reported low social support. The total median (IQR) scores at each scale and the prevalence of each clinical category are presented in Table 2.

Table 2: Cut-off values of the scales, overall prevalence of depression (PHQ-9), burnout (MBI, CBI), and job factors (KJQ), and range values of non-normal distribution (M, IQR)

Indicators	Scales and subscales	Cut-off values of scales	n (%)	M (IQR)
Depression	PHQ-9	0-4 (Absent)	42 (36.8)	7.00 (3.00-11.00)
		5-9 (Mild)	37 (32.5)	
		10-14 (Moderate)	20 (17.5)	
		15-19 (Moderately severe)	8 (7.0)	
		20-27 (Severe)	7 (6.1)	
Maslach burnout subscales	MEE	0-8 (Absent)	0 (0.0)	23.50 (15.00-33.00)
		9-18 (Low)	45 (39.5)	
		19-27 (Medium)	22 (19.3)	
		28-45 (High)	47 (41.2)	
	MDP	0-5 (Absent)	0 (0.0)	10.00 (7.00-14.00)
		6-12 (Low)	76 (66.7)	
		13-18 (Medium)	31 (27.2)	
		19-30 (High)	7 (6.1)	
	MPAR	0-9 (Absent)	0 (0.0)	22.00 (18.00-29.00)
		10-20 (Low)	50 (43.9)	
		21-30 (Medium)	41 (36.0)	
		31-50 (High)	23 (20.1)	
	Total Maslach Burnout	0-24 (Absent)	0 (0.0)	54.00 (40.00-74.25)
		25-50 (Low)	50 (43.9)	
		51-75 (Medium)	38 (33.3)	
		76-125 (High)	26 (22.8)	
Copenhagen burnout subscales	CBI- PB	0-49 (Low)	62 (54.4)	46.00 (29.75-63.62)
		50-74 (Medium)	33 (28.9)	
		75-99 (High)	17 (14.9)	
		100 (Severe)	2 (1.8)	
	CBI-WRB	0-49 (Low)	63 (55.3)	46.00 (28.50-61.00)
		50-74 (Medium)	44 (38.6)	
		75-99 (High)	7 (6.1)	
		100 (Severe)	0	
	CBI-CRB	0-49 (Low)	88 (77.2)	25.00 (8.00-46.00)
		50-74 (Medium)	20 (17.5)	
		75-99 (High)	6 (5.3)	
		100 (Severe)	0	
Karasek Job factors	KJD	≤ 20 (Low)	79 (69.3)	20.00 (18.00-21.00)
		>20 (High)	35 (30.7)	
	KJC	< 71 (Low)	94 (82.5)	62.00 (56.00-68.00)
		≥71 (High)	20 (17.5)	
	KSS	< 24 (Low)	31 (27.2)	24.00 (23.00-28.00)
		≥24 (High)	83 (72.8)	

PHQ-9, Patient Health Questionnaire–9; MEE, Maslach Emotional Exhaustion; MDP, Maslach Depersonalization; MPAR, Maslach Personal Achievement Reduction; CBI-PD, CBI Personal burnout; CBI-WRB, CBI Work-related burnout; CBI-CRB, CBI Client-related burnout; KJD, Karasek Job Demands; KJC, Karasek Job Control; KSS, Karasek Social support; IQR, a measure of where the "middle fifty" is in a data set; Range, the difference between the lowest and highest values.

5.3 Correlations between depression, burnout, and job factors

We used Spearman's rank correlation coefficient because it is a nonparametric measure of rank correlation (statistical dependence between the rankings of two variables), and we found that almost all scales and subscales of depression, burnout, and job factors were significantly correlated with each other. Among the many significant Spearman correlations, we highlighted the most relevant: a) depression (PHQ-9) and Maslach burnout, MEE, and CBI-PB; b) Maslach burnout, MEE, and MPAR; c) MEE and PHQ-9, Maslach burnout, MPAR, and CBI-PB; and d) CBI-PB and CBI-WRB, as presented in Table 3.

Table 3: Spearman's ρ (rho) correlations between variables concerning depression, burnout scales and subscales, and job factors

	PHQ-9	Maslach burnout	MEE	MDP	MPAR	CBI-PB	CBI-WRB	CBI-CRB	KJD	KJC	KSS
PHQ_9	1.000										
Maslachburnout	**.865****	1.000									
MEE	**.885****	**.958****	1.000								
MDP	.661**	.788**	.687**	1.000							
MPAR	.755**	**.922****	**.819****	.652**	1.000						
CBI-PB	**.807****	**.870****	**.879****	.653**	.763**	1.000					
CBI-WRB	.697**	.798**	.796**	.587**	.721**	**.852****	1.000				
CBI-CRB	.452**	.602**	.565**	.420**	.610**	.574**	.678**	1.000			
KJD	.504**	.574**	.609**	.433**	.457**	.660**	.596**	.373**	1.000		
KJC	-.119	-.173	-.144	-.072	-.254**	-.227*	-.210*	-.193*	-.090	1.000	
KSS	-.185*	-.369**	-.281**	-.326**	-.401**	-.321**	-.383**	-.316**	-.247**	.187*	1.000

** p less than 0.01, * p less than 0.05

PHQ-9, Patient Health Questionnaire–9; MEE, Maslach Emotional Exhaustion; MDP, Maslach Depersonalization; MPAR, Maslach Personal Achievement Reduction; CBI-PD, CBI Personal burnout; CBI-WRB, CBI Work-related burnout; CBI-CRB, CBI Client-related burnout; KJD, Karasek Job Demands; KJC, Karasek Job Control; KSS, Karasek Social Support; ρ, Spearman correlation coefficient

5.4 Depression and burnout predictors analysis

We did a multiple regression analysis in order to find which Maslach burnout subscales and job factors are predictors for depression, personal burnout, andwork-related burnout. Six independent variables were included in the analysis (MEE, MD, MPAR, KJD, KJC, and KSS). The variance inflation factor (VIF) was used to determine whether any burnout subscales (MEE, MD, MPAR) and job factors (KJD, KJC, KSS) contribute to depression and personal and work-related burnout. Indeed, VIF is used to calculate the amount of multicollinearity in variables, i.e, influencing factors. VIF > 1 means that the variables are subject to collinearity, and VIF > 5 means that the correlation (collinearity) between the variables is high. A value greater than 5 indicates a potentially severe correlation between a given predictor variable and other predictor variables in the model. In this case, the coefficient estimates and p-values in the regression output are likely unreliable.

Using G*Power (version 3.1.9.4), the post hoc power of the multiple regression analysis with a 114 total sample size and 6 predictors was 0.80.

The results of multiple regression analysis with PHQ-9, CBI-PB, and CBI-WRB scores as dependent variables are shown in Table 4.

Table 4: Multiple regression analysis of the factors associated with depressive symptoms (PHQ-9 score) and burnout symptoms (CBI-PB and CBI-WRB scores)

Dependent variable	Independent Variable	Beta	p-Value	VIF
PHQ-9 Adjusted R2 = 0.781, F = 68.004, p < 0.001.	**MEE**	**.661****	**.000**	**4.427**
	MD	.115	.079	2.173
	MPAR	**.172***	**.041**	**3.586**
	KJD	.048	.402	1.676
	KJC	.001	.982	1.102
	KSS	**-.117***	**.020**	**1.264**
CBI-PB Adjusted R2 = 0.818, F = 85.741, p < 0.001.	**MEE**	**.609****	**.000**	**4.427**
	MD	.089	.134	2.173
	MPAR	.067	.378	3.586
	KJD	**.207****	**.000**	**1.676**
	KJC	-.082	.054	1.102
	KSS	-.048	.292	1.264
CBI-WRB Adjusted R2 = 0.702, F = 45.466, p < 0.001.	**MEE**	**.529****	**.000**	**4.427**
	MD	.046	.544	2.173
	MPAR	.056	.566	3.586
	KJD	**.222****	**.001**	**1.676**
	KJC	-.093	.087	1.102
	KSS	**-.136***	**.020**	**1.264**

* p less than 0.05, ** p less than 0.01.

Beta is the standardized partial regression coefficient; VIF is the variance inflation factor;
PHQ-9, Patient Health Questionnaire–9; MEE, Maslach Emotional Exhaustion; CBI-WRB, CBI Work-related

burnout; KJD, Karasek Job Demands; KJC, Karasek Job Control; KSS, Karasek Social Support

The results of multiple regression analysis showed that the significant independent variables predicting the PHQ-9 score were MEE, MPAR, and KSS. For CBI-PB, it was MEE and KJD, and for CBI-WRB, it was MEE, KJD, and low KSS. None of the VIF values for the predictor variables in this case are greater than 5, indicating that multicollinearity will not be an issue in the regression model.

6. Discussions

Since the onset of the COVID-19 pandemic in January 2020, the attention paid to the impact on mental health among HCWs has grown exponentially, as reported in a large number of studies [21–24, 53].

Accordingly, the purpose of our study was to analyze the prevalence of depression, burnout, and job stressors and to clarify which factors are more associated with burnout and depression.

Our study findings demonstrate that burnout and depression remain at high levels and raise significant concerns regarding the psychological health of the HCWs, even two years after the COVID-19 outbreak.

The prevalence of moderate, high, and severe depression (PHQ-9 scores 10) was 30.6%, similar or higher compared to the worldwide data and different country assessments. Systematic reviews and meta-analyses published in 2022 and 2021 reported a pooled all-over-the-world HCW's prevalence of depression of 36% [26], 32.4% (95% CI: 25.9–39.3, I2 = 99%) [25], 37% (95% CI: 29–45%) [23], 24% (95% CI: 20–28%) [24], and 31.1% (95% CI: 25.7–36.8%) [54], with no specification of the depression severity. Notably, a large study in China that stratified the degree of depression among 65,706 HCW participants found that the prevalence of moderate or severe depression was 15% (13–16%) during the first six months of the pandemic [25]. As well, we considered moderate to severe depression to be more relevant than overall prevalence (including mild depression).

Regarding hospital evaluations in different countries, there are important discrepancies. One study conducted among three different academic hospitals in central Greece between April 2020 and March 2021 showed a 10.6% prevalence of medium and high depression (n = 170) [55], which is much lower compared to our results. In Italy, Lasalvia et al. [56] performed a repeated cross-sectional survey in 2020 and 2021 and found an increasing high prevalence of depression in HCW (26.6% versus 40.6%) (n = 1033), similar to our results suggesting that longer exposure to the pandemic was linked to increased mental health risks. A similar comparison, in the same years, was performed in Portugal [57], showing a high but constant prevalence of depression (25.3% versus 23.7%) (n = 2027). In Scotland, De Kock et al. [58] found moderate-to-severe depression at 30.8% (n = 169) using the PHQ-9 scale in 2020, which is close to our results.

Despite the fact that the median value of 7.00 (3.00–11.00) suggests mild depression, we consider that the proportion of moderate to severe depression (PHQ-9 scores ≥ 10) is more important from the clinical and action plan points of view. Tang et al. found similar results (8.31 ± 5.17) (n = 761Chinese HCWs), using the same scale, in the same period of time [59]. In the first pandemic year, two studies performed in Romania showed no or mild depression in HCWs as well as in the general population, using the Depression Anxiety Stress Scale (DASS-21) and Beck Depression Inventory (BDI)[60, 61]. We may presume that in HCWs, the longer pandemic exposure generated continuous stress, leading to depression.

In our study, the prevalence of moderate and high Maslach burnout (MBI scores ≥ 51) was 56.1%, lower than the 61.86% prevalence found in the same type of hospital in Romania in 2021 (n = 186) (no statistical difference) [16].Regarding burnout, in two surveys in 2020 and 2021, Lasalvia et al. found an increasing prevalence from 28.6% to 40.6%, p <0.001 (n = 1033) [56]. Instead, in Portugal, in two surveys conducted in 2020 and 2021, no change in burnout scores was found (29.8% vs. 29.5%, respectively) (n = 2027) [57]. A low level of MBI (32.4%) was found in a 2022 survey in Saudi Arabia's central region (n = 239) [62].

We also assessed burnout with the CBI scales,which revealed the following scores: 45.6% prevalence of moderate, high, and severe CBI-PB (CBI-PB scores ≥ 50); 44.7% prevalence of moderate and high CBI-WRB (CBI-WRB scores≥ 50); and 22.8% prevalence of moderate and high CBI-CRB (CBI-CRB scores ≥ 50). The lower prevalence of burnout assessed by the CBI scales compared with the higher Maslach score might be explained by the inclusion of emotional exhaustion in both scales, while the Maslach scale includes items related to coping (Maslach Depersonalization) and long-term consequences (Maslach Personal Achievement Reduction) [49].

In a previous cross-sectional online survey (n = 110) of frontline HCWs from Romania [63], conducted during the second wave (October 2020) of the COVID-19 pandemic, there were much lower scores in comparison with our results for all Copenhagen scales: 14.79 vs. 46 for the CBI-PB, 15.87 vs. 46 for the CBI-WRB, and 7.73 vs. 25 for the CBI-CRB, suggesting the increasing exhaustion during the pandemic.

Regarding the job stress factors, our results showed low job demand perception (KJD): 20.00 (18.00–21.00), low job control (KJC): 62.00 (56.00–68.00), and low social support (KSS): 24.00 (23.00–28.00) (Table 2), which might be favorable for burnout and depression.

The highly significant positive Spearman correlations between: a) depression (PHQ-9) and MEE/Maslach burnout/CBI-PB; b) Maslach burnout and MEE/MPAR/CBI-PB; c) CBI-PB and CBI-WRB (Table 3) demonstrate the association between burnout scores and depressive symptoms, previously considered as being virtually independent by Leiter et al. in 1994 and by Schwarzkopf et al. in 2019 [41,64]. Among all our correlations, we point out the association between emotional exhaustion (MEE)

strongly corelated with global Maslach burnout (rho=.958, p.001), and CBI-PB (rho=.879, p.001). The strong correlation between CBI-PB and CBI-WRB (rho=.852, p.001) suggests the interplay between personal and work-related burnout. Furthermore, we found a significant correlation between exhaustion and depression (rho=.885, p.001), particularly in the PHQ-9 assessment of depression, a scale that comprehensively covers the DSM-5's diagnostic criteria [65,44].This is similar to the results reported by Verkuilen et al. in 2020, who found that exhaustion, the core of Maslach burnout, was more strongly associated with depression than with either cynicism or professional inefficacy [66], suggesting that MEE may be considered a hallmark not just for burnout but also for depression. The significant inverse correlations between KJC, KSS and depression, burnout scales and subscales suggest that low job control and low social support are associated with depression and burnout.

From regression analysis, we found that emotional exhaustion was the most significant predictor for PHQ-9 depression, but also for CBI-PB and CBI-WRB ($p<.001$), which demonstrates that burnout and emotional exhaustion may lead to depression, knowing that in depression, a person is "feeling tired or having little energy". These results are consonant with the findings that burnout involves a depressive cognitive style [66, 67].

We also found that low social support was significant predictor for burnout and depression, as was demonstrated by the regression coefficients ($p<.05$). This is consistent with previous studies indicating that the group with 'no' perceived social support had the highest PHQ-9 ratings and vital fatigue.[68,69].

We found that professional inefficacy (MPAR) was a significant predictor of depression ($p=.041$), as He et al.discovered in a network analysis of 1322 pharmacists[70]. They revealed a partial overlap between burnout and depressive symptoms, mainly in the connection between the emotional exhaustion and reduced professional efficacy and the depressive symptoms. In our study, MPAR wasn't a significant predictor for CBI-PB and CBI-WRB; therefore, we can say that, in order to differentiate depression from burnout, we should also investigate MPAR. In contrast, regarding personal (CBI-PB) and work-related (CBI-WRB) burnout, an important predictor was the job demands score (KJD) ($p\leq.001$), which is reasonable considering the complex and emotional burden activities during the pandemic in frontline HCWs, such as the risk of infection and death due to COVID-19, the risk of infection of loved ones, self-imposed quarantine and social isolation, prolonged work shifts, reducing holidays, and worrying about being asked to care for patients in a more critical condition than they are trained for [15,71].

Our findings might improve understanding of the overlap between burnout and depression and provide potential targets for prevention and intervention in frontline HCWs, closely related to patients' safety and appropriate care.

We anticipate that the potential core targets identified in this study may enhance the efficacy of organizational strategies in addressing the psychosocial well-being of healthcare workers and strengthen their capacity to adapt to both acute and prolonged occupational stress.

A deeper understanding of the roots of burnout, anxiety, and depression among healthcare workers is critical to themselves, to patient care and safety, and to the welfare of the healthcare system. Currently, there is a lack of an organizational framework for addressing risks and protective factors and also fostering individual, organizational, and system-level resilience.

It would be useful to continue the study periodically, using the same scales, to assess the dynamics of burnout and depression. Given the possibility of delayed psychiatric difficulties, intervention should be available to healthcare providers anytime even after the crisis phase has passed.

Regarding limitations and strengths, first of all, the cross-sectional methodology of the research does not allow for speculation on causal relationships between the constructs.

Secondly, the sample size ($n = 114$) and the response rate (10.83%) from the total staff were the main limitations of the study. The mechanism of non-response and how the selection bias would modify the results of a survey are classical issues with this design and were present in other publications on this topic. The low response rate might be explained by 'pandemic fatigue' and by the lack of organizational culture regarding psychological support [72]. Therefore, the results can be underestimated. On the other hand, comparing with other studies on Romanian HCWs during the COVID-19 pandemic, the overall depression and burnout scores were not significantly different [16, 60, 61, 63], suggesting that our results were not overestimated.

The self-reported nature of measures should also be highlighted, so our data might be considered mediated by the personal response styles of participants.

The strength of our study lies in emphasizing the need for a combined evaluation of burnout and depression in frontline healthcare workers confronted with prolonged mental and physical stress during the ongoing COVID-19 pandemic. Another strength is the use of four different scales to assess the psychological response to the pandemic.

7. Conclusion

The COVID-19 epidemic continues to have a substantial influence on healthcare workers' mental health.

The results emphasize that, beyond emotional exhaustion and low social support, which are present both in burnout and depression, personal achievement perception might be more relevant for depression than burnout.

8. Future Scope

Further studies are needed to clarify what burnout means and how it can be linked to depression in order to prevent major depression disorders in HCWs.

While the possible long-term consequences of the COVID-19 pandemic remain unknown, knowledge of the risk factors for increased psychological distress, such as depression, may help in developing improved strategies to prevent, control, and reduce the mental health exacerbations of healthcare workers, thereby maintaining the effectiveness of health systems in critical scenarios.

Data Availability

Data are available by contacting Dr. Doina Colcear at colceardoina@gmail.com for researchers who meet the criteria for access to confidential data.

Conflict of interest

There is no competing interest nor financial aid for this study.

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Author Contributions

Conceptualization, M.M, D.C, methodology, A.R, D.C, formal analysis, D.C, A.R, G.E.T, investigation, V.B, D.C, data curation, V.B, D.C, writing—original draft preparation, M.M, D.C, writing—review and editing, V.B, D.C, M.L, supervision, M.M, A. R. All authors have read and agreed to the published version of the manuscript.

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