Comparison of the Psychological Impact of COVID-19 on Healthcare Workers between 2022 and 2023 in a Romanian COVID-19 Hub Hospital

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Article

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Abstract: We assessed depression, anxiety, and stress in healthcare workers (HCWs) in 2023 and the evolution of depression in 2023 compared with 2022. In September-November 2023, 181 HCWs from the Infectious Diseases Hospital, Cluj-Napoca, Romania, completed the Depression, Anxiety, and Stress 21 Scale (DASS-21 R), the Patient Health Questionnaire-9 (PHQ-9), and the Hamilton Anxiety Rating Scale (HAM-A). The prevalence of moderate-to-severe levels was 13.81% for DASS-Depression, 18.79% for DASS-Anxiety, 16.02% for DASS-Stress, 19.89% for PHQ-9, and 12.16% for HAM-A. Moderate-to-severe PHQ-9 clinical depression was found in 19.89% of respondents, and moderate-to-severe HAM-A clinical anxiety in 12.16%. Moderate-to-severe PHQ-9 depression was significantly lower in the 2023 study group (19.89%, N=181) compared with 2022 (30.60%, N=114) (p=0.036), also within the 2022-2023 follow-up study group (N=88) (p=0.026). We did not find significant statistical differences between those infected vs. non-infected, vaccinated vs. non-vaccinated, working with vs. non-working with SARS-CoV-2 infected patients. Males were significantly more stressed (p=0.018) and anxious (p=0.034), and physicians in training had the highest prevalence of moderate-to-severe depression (31.60%), followed by physicians (25.64%). In 2023, depression, anxiety, and stress symptoms decreased but remained within a concerning range. By addressing these psychological issues, we can prevent professional crises in the healthcare system.

Keywords: COVID-19; healthcare workers; depression; anxiety; stress

1. Introduction

When it comes to their mental health, healthcare workers (HCWs) all over the world have found the COVID-19 epidemic to be problematic. Several studies found that HCWs were more likely to experience negative psychological symptoms such as depression, anxiety, fear, stress, burnout, post-traumatic stress disorder (PTSD), and stigmatization [1–5].

Despite HCWs' strong social and professional identities that are based on experience and preparation to deal with intense emotional and cognitive demands (resilient personality or hardiness), the lack of knowledge, preparedness, and consistent protocols of action leads to demotivation and mental health issues such as increased stress, anxiety, or depression [2]. Working conditions, according to other researchers, had the greatest psychological influence on "frontline soldiers" [6].

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At the onset of the pandemic, HCWs were more concerned with occupational protection, social support, and getting more rest [7,8]. Following the first shock, numerous studies were published indicating an increased prevalence of burnout, depression, anxiety, and stress in frontline HCWs directly involved in the diagnosis, treatment, and care of COVID-19 patients [9–14].

Fewer studies followed the progression of anxiety, depression, and stress among HCWs as the pandemic continued [15–17].

There are studies providing strong evidence of a high burden of anxiety and depression in HCWs during the pandemic, which were summarized in systematic reviews and meta-analyses. Sahebi et al. (2021) showed that the overall prevalence of anxiety and depression among healthcare workers during the COVID-19 pandemic, from the beginning of January to the end of October 2020, was 24.94% (95% CI: 21.83–28.05) and 24.83% (95% CI: 21.41–28.25), respectively [18]. Fernandez et al., (2021), in a systematic umbrella review conducted in accordance with the Joanna Briggs Institute (JBI) methodology on 169,157 HCWs from 35 countries in March 2021, found that the prevalence of anxiety ranged from 22.2% to 33.0% and the prevalence of depression ranged from 17.9% to 36% [19].

There have been few longitudinal studies worldwide on the evolution of the psychological impact of the COVID-19 pandemic on HCWs. Using the Depression-Anxiety-Stress-21 (DASS-21) scale, a study from Turkey found that HCWs experiencing the pandemic waves had significantly higher levels of depression, anxiety, and stress during the second peak (November-December 2020) compared to the first peak (April-May 2020) ($p<0.001$) [15].

Another study comparing the first wave (April 2020) and the second wave (December 2020) on 152 intensivists from a COVID-19 hub hospital in Rome found that the prevalence of workers manifesting symptoms of depression on the Goldberg Anxiety and Depression Scale (GADS) significantly increased from 49.4% to 63.6% ($p=0.028$), while the number of workers manifesting symptoms of GADS anxiety increased but not significantly from 49.4% to 63.6% ($p=0.442$) [16].

Following the confirmation of the first positive case on February 26th, 2020, the Romanian government implemented a number of formal preventive measures. Thus, two years after the pandemic got started, Romania had 3,043,205 reported cases of COVID-19 infection, including 65,906 (2.2%) deaths [20]. Despite the previously implemented procedures, which proved effective in the first three waves, the fourth (September-November 2021) and fifth (January-March 2022) waves had severely impacted Romania. Our World in Data, Romania, reported in the Coronavirus Pandemic Country Profile, close to 35,000 daily infections, with more than 1,000 daily deaths, by mid-December 2021[21].

Previous research has indicated that COVID-19 generated a substantial level of distress among emergency department (ED) staff, with three major factors contributing to the distress level: loss of control or vulnerability, worry for self-health, and virus spread [22]. It was assumed that COVID-19 would have a greater psychological impact on medical personnel than on the general population, but unlike other countries, there are few studies in the Romanian general population. Vancea and Apostol (2021) published a report about mental health levels at the end of the first wave of the pandemic from May 9 to May 15, 2020 (t1) and amidst the third wave from November 8 to November 14, 2020 (t2). At t1, 23.8% of participants were anxious and 19.2% were depressed, and at t2, 25.7% and 17.8% of participants were anxious and depressed, respectively, with no statistical differences between t1 and t2 [23].

There are several studies on the prevalence of mental problems among HCWs in Romania, although most of them are cross-sectional rather than longitudinal. Burnout was the most investigated topic during the early phases of Romania's COVID-19 pandemic. Accordingly, a study released in 2022 on the prevalence of burnout syndrome in an Infectious Diseases Hospital in Constanta, Romania, following the first year of the pandemic revealed that 69.2% suffered moderate to severe Maslach burnout [24]. Behind burnout, there are some reports regarding depression, anxiety, and stress in the late stages of the COVID-19 pandemic. At the Teaching Hospital of Infectious Diseases in Cluj-Napoca, Romania, another institution of the same type, our team reported a 71.4% incidence of moderate to high Maslach burnout and a 63.1% prevalence of mild to severe depression after two years of the pandemic (May-June 2022), between the fifth and sixth pandemic

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waves [25]. Also, our team investigated which psychological characteristics were more strongly connected with burnout and depression in COVID-19 healthcare professionals. We discovered that emotional exhaustion was a significant predictor of both personal and work-related burnout and depression, implying overlapping interference, and that personal achievement reduction was only a significant predictor of depression, not of burnout, emphasizing its importance for depression [26].

In the same period (spring of 2022), it was reported that there were lower levels of anxiety, depression, and stress in different types of public hospitals in Timisoara, Romania, on 300 healthcare professionals who were assessed using the Beck Anxiety Inventory (BAI), the Beck Depression Inventory (BDI), and the Perceived Stress Scale (PSS-10) (47.7% prevalence of mild anxiety, 33% prevalence of mild depression, and 65.3% prevalence of moderate stress). The severity of anxious, depressive, and stress symptoms differed considerably depending on the professional degree, the frequency of on-calls per month, the type of medical unit where the participants worked, and the number of SARS-CoV-2 patients treated [27].

In the previous study, taking place between the fifth (January-March, 2022) and sixth (July-September, 2022) waves of the COVID-19 pandemic in Romania, when the daily number of confirmed cases decreased significantly under 5,000, we found a high prevalence of mild to severe depression (63.1% of HCWs) [25]. Until September 2023, Our World in Data. Romania: Coronavirus Pandemic Country Profile (available on-line), reported another two peaks: one on August 28th, 2022, with 40.000 new daily confirmed COVID-19, and another on April 16th, 2023, with 6,400 new daily confirmed COVID-19 [21]. Fifth months after the last wave, in September 2023, we initiated a study to find out whether the psychological problems of the medical staff had improved.

1.1. General Aim of This Study

The aim of this study is to investigate depression, anxiety, and stress in HCWs three years of the COVID-19 outbreak and to examine the course of depressive symptoms between 2022 and 2023 among HCWs in the Clinical Hospital of Infectious Diseases Cluj-Napoca, Romania, a tertiary mono-specialty hospital that provided medical services for patients with COVID-19 from Cluj County and neighboring counties. We have chosen to assess depression, anxiety, and stress because they can have an impact on professional activity, possibly resulting in medical errors or bad outcomes that may create emotional scars, known as the "second victim" syndrome [28].

1.2. Main Hypotheses

Three years following the initial outbreak of COVID-19, we anticipate that (1) the prevalence of moderate-to-severe depression, anxiety, and stress among HCWs will be much lower than reported levels in the first two years of the pandemic, and (2) the prevalence of moderate-to-severe depression will be significantly lower in 2023 compared with 2022 in the same hospital.

2. Materials and Methods

2.1. Study Design, Participants, and Original Data Collection

The present study had a descriptive cross-sectional, exploratory study design regarding psychological status (depression, anxiety, and stress) on HCWs in the third year of the COVID-19 pandemic (September–November, 2023) and a follow-up study comparing the levels of depression among some of the healthcare workers initially evaluated between May–June, 2022.

HCWs from the Teaching Hospital of Infectious Diseases in Cluj-Napoca, Romania, who voluntarily agreed to participate in the study, responded to anonymous online surveys. 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.

Three questionnaires were converted into online questionnaires via Google Forms to be completed: the Depression, Anxiety, and Stress 21 Items Scales -Romanian version (DASS-21 R), the Adult Depression Severity Scale adapted from the Patient Health Questionnaire-9 (PHQ-9), and the Hamilton Anxiety Rating Scale (HAM-A). Forms that did not meet the inclusion criteria and were

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not filled out properly were excluded from the study. The forms were evaluated and scored according to their instructions, recorded in the data set, and statistically analyzed. We centralized the data in an Excel file, and the results were calculated by the same investigator.

DASS-21 R

For evaluating the negative emotional states, we used DASS-21 R. According to Lovibond and Lovibond (1993) DASS is a set of three self-rating scales constructed to assess negative emotional states in the field of depression, anxiety, and stress and was built to assess states rather than traits. The DASS scales were built to capture the non-clinical syndromes of depression, anxiety, and stress, to ensure maximum discrimination between them, and to be able to establish their degree of severity. It is a questionnaire that can be used in both research and clinical contexts [29]. In this research, the Romanian version of DASS-21 standardized on the Romanian population (DASS-21 R), proposed by Perţe and Albu (2011), adapted from Lovibond and Lovibond (1993), was used [30]. DASS-21R has 21 items, equally divided into 3 scales: anxiety, depression, and stress. DASS-Depression scale evaluates symptoms like self-depreciation, demoralization, discouragement, hypochondria, the belief that life has neither meaning nor value, pessimism, the inability to feel joy or satisfaction, the inability to get involved, slowness, and lack of initiative. The DASS-Anxiety Scale evaluates the subjective experience of the state of anxiety (fear, panic, fright), the activation of the autonomic nervous system (dry mouth, respiratory disorders, increased heart rate, sweating, musculoskeletal effects), the possibility of losing control and performance anxiety, and the DASS-Stress-Stress evaluates manifestations of stress like the difficulty of relaxation, tension, hypersensitivity, and the characteristic of becoming easily irritable, hyperreactive, impatient, or agitated as a result of psychological or physical demands that can't be reasonably managed.

The reliability analysis showed that the internal consistency coefficients for the scales in DASS-21R have values higher than 0.8. A detailed account of scale development, normative data, and research applications is provided in the DASS manual. Each item was scored on a basic numeric scale of 0 (it didn't suit me) to 3 (it suited me a lot or almost all the time) [29,30].

PHQ-9

It is a scale for clinical depression, with 9 items, which evaluates the severity of DSM-5 clinical symptoms like little interest or pleasure in doing things, feeling down, depressed, or hopeless, trouble falling or staying asleep, or sleeping too much, feeling tired or having little energy, poor appetite or overeating, feeling bad about yourself—or that you are a failure or have let yourself or your family down, trouble concentrating on things, such as reading the newspaper or watching television, moving or speaking so slowly that other people could have noticed, or the opposite—being so fidgety or restless that you have been moving around a lot more than usual, and thoughts that you would be better off dead or hurting yourself in some way. All items are rated on a Likert scale in 4 steps from 0 to 3 (not at all=0, on some days=1, half of the days=2, almost every day=3) [31].

The PHQ-9 has proved to be a valid and reliable instrument for various individuals, with a high internal consistency (α=0.87) when used to identify depression with an area under the curve (AUC) of 0.93 (95% confidence interval, 0.88–0.97) [32]. Using a cut-off of ≥13, the PHQ-9 demonstrated good sensitivity (0.83) and specificity (0.72) [33]. Gilbody et al. (2007), reported a sensitivity of 0.80 (95% CI: 0.71–0.87) and a specificity of 0.92 (95% CI: 0.88–0.95) [34].

HAM-A

It is a scale for the global assessment of anxiety and the severity of anxiety symptoms. HAM-A was originally developed over 40 years ago as a clinician-rated instrument for quantifying anxiety symptoms (items 1-6) with somatic (items 7–13) and behavioral manifestations (item 14) [35]. The 14-item version remains the most commonly used outcome measure in multiple clinical trials, and the data can be pooled for meta-analyses [36]. The HAM-A demonstrated adequate reliability, validity, and sensitivity. Hamilton (1959) calculated an internal reliability coefficient of 0.89 for the entire questionnaire [35]. Maier et al. (1988) calculated a coefficient of reliability of 0.74 for the entire questionnaire, 0.73 for the psychic anxiety subscale, and 0.70 for the somatic anxiety subscale [37], and Shear et al. (2001) demonstrated high internal consistency (alpha) (a=0.85) [38]. The Hamilton Anxiety Scale, Rates level of anxiety based on clinical questions is an observation scale that should

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be completed by an experienced therapist, but it can also be used as a self-report, on line, questionnaire available at www.mdcalc.com [39]. There are studies that demonstrated its good reliability at self-assessment: an intraclass correlation coefficient (ICC) test-retest of 0.86 (95% confidence interval, 0.78-0.91) and an ICC inter-rather reliability of 0.98 (95% confidence interval, 0.97-0.99) [38,40] which succeeded in identifying anxious subjects in a very diverse population [41]. It consists of 14 symptom-defined elements for both psychological and somatic symptoms, comprising anxious mood; tension (including startle response, fatigability, restlessness); fears (including of the dark/strangers/crowds); insomnia; 'intellectual' (poor memory/difficulty concentrating);depressed mood (including anhedonia); somatic symptoms (including aches and pains, stiffness, bruxism); sensory (including tinnitus, blurred vision); cardiovascular (including tachycardia and palpitations); respiratory (chest tightness, choking); gastrointestinal (including irritable bowel syndrome-type symptoms); genitourinary (including urinary frequency, loss of libido); autonomic (including dry mouth, tension headache) and observed behavior at interview (restless, fidgety, etc.). Each item was scored on a basic numeric scale of 0 (not present) to 4 (severe) [40].

The data collection process was performed over the Internet through the online questionnaire programme (Google Forms).

2.2. Ethical Considerations

The responses to the online questionnaires were recognized as implicit consent. The participants agreed to share their sociodemographic data (age, sex, profession, History of COVID-19, SARS-CoV-2 vaccination, and working with COVID-19 patients).

2.3. Data Analysis

Demographic and questionnaire data were analyzed using various statistical techniques, 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 (M) and interquartile range (IQR). The normality of variables was tested using the Shapiro-Wilk test. To highlight the difference in the number of participants between the different groups, we used a t-test with bootstrapping. For comparing the continuous variables between non-parametric groups, we used the Mann-Whitney test (between two groups) and Scheffe Multiple Comparisons with One-Way Anova (between more than two groups).

A $p<0.05$ value was considered statistically significant.

3. Results

3.1. Characteristics of Participants

In the 2023 survey, 181 out of 818 hospital employees (22.13%) took part, with women accounting for the vast majority (79.01%). The respondents' M(IQR) age was 43.00 (range 31.00–49.00). In the 2022 survey, 114 out of 1052 hospital personnel (10.83%) took part, with women accounting for the vast majority (82.50%). The respondents' M(IQR) age was 42.00 (range 32.00–47.00). Out of 114 participants from the 2022 study, 88 (77.19%) agreed to participate in the 2023 study, with a M(IQR) age of 45.00 (38.50-52.50). Table 1 shows the demographics of the 2023, 2022, and 2022-2023 follow-up participants.

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Table 1. Demographic characteristics of the 2023, 2022 and 2022-2023 participants.

Characteristic	2023 Entire Sample, N=181	2022 Entire Sample, N=114	2022-2023 Follow-up sample, N= 88
Age (years), M(IQR)	43.00 (31.00-49.00)	42.00 (32.00-47.00)	45.00 (38.50-52.50)
women	43.00 (34.00-49.00)	42.50 (33.00-47.00)	45.00 (39.50-53.00)
men	34.00 (29.00-47.00)	37.00 (28.00-46.00)	43.00 (32.50-49.00)
Sex, N (%)			
women	143 (79.01)	94 (82.50)	76 (86.36)
men	38 (20.99)	20 (17.50)	12 (13.64)
Profession, N (%)			
infectious diseases physicians	39 (21.55)	33 (28.95)	25 (28.41)
physicians in training	38 (20.99)	15 (13.16)	5 (5.68)
infectious diseases nurses	55 (30.39)	34 (29.83)	33 (37.50)
other HCWs (pharmacists, radiology technicians, chemists, professional caregivers, physical therapists, social workers)	31 (17.13)	19 (16.67)	12 (13.64)
administrative hospital 'staff	18 (9.94)	13 (11.39)	13 (14.77)
History of COVID-19, N (%)			
infected	131 (72.38)	Not measured	53 (60.23)
non-infected	50 (27.62)		35 (39.77)
SARS-CoV-2 Vaccination, N (%)		Not measured	
vaccinated	166 (91.71)		73 (82.95)
non-vaccinated	15 (8.29)		15 (17.05)
Work with COVID-19 patients, N (%)		Not measured	
working	125 (69.06)		77 (87.50)
non-working	56 (30.94)		11 (12.50)

Legend: M, median value; IQR, the interquartile range.

3.2. Depression, Anxiety and Stress (DASS 21-R, PHQ-9, and HAM-A) in the 2023 Study

Firstly, we did the Shapiro-Wilk test in order to verify the normal distribution, and we didn't find a normal distribution for DASS 21-R results, for depression (PHQ-9) and for anxiety (HAM-A).

When we analyzed the prevalence and the range values, we found a prevalence of 13.81% for moderate, severe, and extremely severe negative emotional states of depression (DASS-Depression), 18.79% for moderate, severe, and extremely severe negative emotional states of anxiety (DASS-Anxiety), 16.02% for moderate, severe, and extremely severe negative emotional states of stress (DASS-Stress). We also found a prevalence of 19.89% for moderate, high, and severe clinical depression (PHQ-9), and 12.16% for moderate and severe clinical anxiety (HAM-A). The total median (IQR) scores at each scale and the prevalence of each clinical category are presented in Table 2

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Table 2. Cut-off values of the scales, prevalence of Depression, Anxiety and Stress and range values of non-normal distribution (M, IQR) in the 2023 study (N=181).

Indicators	Scales and subscales	Cut-off values of scales	N (%)	N (%) of moderate and higher values	M (IQR)
DASS-21-R [29,30]	DASS-Depression				4.00 (2.00-10.00)
		0-9 (no/normal)	129 (71.27)		
		10-13 (low)	27 (14.92)		
		14-20 (medium)	19 (10.50)	25 (13.81)	
		21-27 (severe)	2 (1.11)		
		≥28 (extremely severe)	4 (2.21)		
	DASS-Anxiety				4.00 (2.00-8.00)
		0-7 (no/normal)	133 (73.48)		
		8-9 (low)	14 (7.73)		
		10-14 (medium)	21 (11.60)	34 (18.79)	
		15-19 (severe)	6 (3.32)		
		≥20 (extremely severe)	7 (3.87)		
	DASS-Stress				8.00 (4.00-14.00)
		0-14 (no/normal)	138 (76.24)		
		15-18 (low)	14 (7.73)		
		19-25 (medium)	18 (9.95)	29 (16.02)	
		26-33 (severe)	10 (5.53)		
		≥34 (extremely severe)	1 (0.55)		
Depression [31]	PHQ-9 - Depression				5.00 (3.00-8.00)
		0-4 (no/normal)	66 (36.46)		
		5-9 (mild)	79 (43.65)		
		10-14 (moderate)	25 (13.81)	36 (19.89)	
		15-19 (moderately severe)	9 (4.97)		
		20-27 (severe)	2 (1.11)		
Anxiety [35]	HAM-Anxiety				5.00 (2.00-12.00)
		0-7 (no/normal)	116 (64.09)		
		8-14 (mild)	32 (17.68)		

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		15-23 (moderate)	24 (13.26)	22 (12.16)
		≥24 (severe)	9 (4.97)	

Legend: DASS-21 R, Romanian Standardized Depression, Anxiety and Stress 21 Items Scales; PHQ-9, Adult Depression Severity Scale adapted from Patient Health Questionnaire–9; HAM-A, Hamilton Anxiety Rating Scale; M, median value; IQR, the interquartile range.

When we looked at the prevalence and range values of depression, anxiety, and stress severity, we found that moderate to severe or extremely severe values were present among physicians in training, infectious diseases physicians, and nurses. The most relevant was moderate to severe/extremely severe depression on the PHQ-9 scale in physicians in training (31.60%), infectious diseases physicians (25.64%), and nurses (18.18%). In terms of moderate-severe anxiety on the HAM-A scale, we found a higher level in physicians in training (23.68%). The prevalence of depression, anxiety, stress, and the range values for different professions in the 2023 study are presented in Table 3.

Table 3. Prevalence of the depression, anxiety, and stress and range values for different professions in the 2023 study (N=181).

Indicators	**Severity**	**Profession N (%)**					
		Infectious diseases physicians	**Physicians in training**	**Infectious diseases nurses**	**Pharmacists, radiology technicians, chemists, and social workers**	**Professional caregivers, physical therapists**	**Administrative hospital 'staff**
DASS-Depression	no/normal-low	32 (82.05)	29 (76.32)	47 (85.46)	9 (100.00)	22 (100.00)	17 (94.45)
	medium-severe	7 (17.95)	5 (13.15)	8 (14.54)	0 (0.00)	0 (0.00)	1 (5.55)
	extremely severe	0 (0.00)	4 (10.53)	0 (0.00)	0 (0)	0 (0.00)	0 (0.00)
DASS-Anxiety	no/normal-low	34 (87.18)	27 (71.05)	44 (80.00)	8 (88.89)	20 (90.90)	14 (77.78)
	medium-severe	5 (12.82)	10 (26.32)	9 (16.36)	0 (0.00)	2 (9.10)	1 (5.55)
	extremely severe	0 (0.00)	1 (2.63)	2 (3.64)	1 (11.11)	0 (0.00)	3 (16.67)
DASS-Stress	no/normal-low	31 (79.50)	27 (71.05)	48 (87.27)	8 (88.90)	22 (100.00)	16 (88.89)
	medium-severe	8 (20.50)	11 (28.95)	6 (10.91)	1 (11.11)	0 (0.00)	2 (11.11)
	extremely severe	0 (0.00)	0 (0.00)	1 (1.82)	0 (0.00)	0 (0.00)	0 (0.00)
PHQ-9 - Depression	no/normal-low	29 (74.36)	26 (68.40)	45 (81.82)	8 (88.89)	21 (95.46)	16 (88.89)
	moderate	8 (20.51)	6 (15.80)	7 (12.73)	1 (11.11)	1 (4.54)	2 (11.11)

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	moderately - severe	2 (5.13)	4 (10.50)	3 (5.45)	0 (0.00)	0 (0.00)	0 (0.00)
	severe	0 (0.00)	2 (5.30)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
HAM-Anxiety	no/normal-low	35 (89.74)	29 (76.32)	49 (89.09)	8 (88.89)	22 (100.00)	16 (88.89)
	medium-severe	4 (10.26)	9 (23.68)	6 (10.91)	1 (11.11)	0 (0.00)	2 (11.11)

Legend: DASS-21 R, Romanian Standardized Depression, Anxiety and Stress 21 Items Scales; PHQ-9, Adult Depression Severity Scale adapted from Patient Health Questionnaire–9; HAM-A, Hamilton Anxiety Rating Scale.

When we compared DASS-Depression, DASS-Anxiety, DASS-Stress, PHQ-9, and HAM-A between female and male groups, SARS-CoV-2 history of infection vs. non-infection groups, SARS-CoV-2 vaccination vs. non-vaccination groups, working vs. non-working with COVID-19 patients' groups, and between various professionals, we found significantly higher DASS-Stress and HAM-A in men than in women, and significantly higher DASS-Stress in physicians in training vs. nurses, and also significantly higher PHQ-9 values in physicians in training vs. professional caregivers. We used the Mann-Whitney test (between two groups) to compare continuous variables between non-parametric groups, as well as Scheffe Multiple Comparisons using One-Way Anova. Table 4 shows comparative DASS-21R, PHQ-9, and HAM-A scores among different groups of the 2023 participants (N=181).

Table 4. Comparative DASS-21R, PHQ-9, and HAM-A scores among different groups of the 2023 participants (N=181) **.**

N (%)				**M (IQR)**				
Criteria				**DASS-Depression**	**DASS-Anxiety**	**DASS-Stress**	**PHQ-9**	**HAM-A**
Sex	Female		143 (79.01)	4.00 (2.00-10.00)	4.00 (0.00-7.00)	6.00 (2.00-14.00)	5.00 (3.00-8.00)	5.00 (2.00-9.50)
	Male		38 (20.99)	8.00 (4.00-10.00)	4.00 (2.00-8.00)	11.00 (6.00-18.00)	6.00 (3.00-10.0)	8.50 (2.00-15.00)
		X^2	***121.52***					
		p	***<0.0001***[a]	*0.174*[b]	*0.233*[b]	*0.018*[b]	*0.116*[b]	*0.034*[b]
History of COVID-19	Infected		131 (72.38)	4.00 (2.00-10.00)	4.00 (2.00-6.00)	8.00 (4.00-14.00)	6.00 (3.00-8.00)	5.00 (2.00-10.00)
	Non-Infected		50 (27.62)	8.00 (2.00-10.00)	4.00 (2.00-8.00)	9.00 (2.00-14.00)	5.00 (4.00-9.00)	6.00 (1.00-13.00)
		X^2	***72.35***					
		p	***<0.0001***[a]	*0.250*[b]	*0.625*[b]	*0.690*[b]	*0.934*[b]	*0.595*[b]
SARS-CoV-2 Vaccination	Vaccinated		166 (91.71)	4.00 (2.00-10.00)	4.00 (2.00-8.00)	8.00 (4.00-14.00)	6.00 (3.00-9.00)	5.00 (2.00-12.00)
			15 (8.29)	2.00 (1.00-9.00)		8.00 (2.00-11.00)		4.00 (1.00-11.00)

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	Non-Vaccinated				2.00 (0.00-7.00)		4.00 (3.00-7.00)	
		X^2	***251.21***					
		p	***<0.0001***[a]	*0.351*[b]	*0.355*[b]	*0.539*[b]	*0.215*[b]	*0.521*[b]
Working with COVID-19 patients	Working		125 (69.06)	4.00 (2.00-10.00)	4.00 (2.00-8.00)	8.00 (4.00-16.00)	5.00 (3.00-9.00)	5.00 (2.00-12.00)
	Non-working		56 (30.94)	4.00 (2.00-8.00)	4.00 (2.00-6.00)	7.00 (3.00 - 12.00)	5.00 (3.00-8.00)	5.00 (1.00-11.50)
		X^2	***52.45***	*0.879*	*0.739*	*0.220*	*0.797*	*0.723*
		p	***<0.0001***[a]					
Profession	Infectious diseases physicians		39 (21.55)	6.00 (4.00-11.00)	4.00 (2.00-8.00)	10.00 (6.00-18.00)	7.00 (5.00-9.50)	6.00 (4.50-8.50)
	Physicians in training		38 (20.99)	6.00 (2.00-12.00)	6.00 (2.00-10.0)	14.00 (6.00-20.00)	6.00 (5.00-1.00)	9.00 (3.00-15.00)
	Infectious diseases nurses		55 (30.39)	4.00 (0.00-10.00)	2.00 (0.00-6.00)	6.00 (3.00-11.00)	5.00 (3.00-8.00)	4.00 (2.00-11.50)
	Pharmacists, radiology technicians, chemists, and social workers		9 (4.97)	2.00 (0.00-8.00)	2.00 (2.00-2.00)	4.00 (2.00-6.00)	4.00 (3.00-4.00)	3.00 (1.00-6.00)
	Professional caregivers, physical therapists		22 (12.15)	2.00 (0.00-6.00)	3.00 0.00-6.00)	3.00 (2.00-10.00)	3.00 (2.00-6.00)	3.00 (1.00-7.00)
	Administrative staff		18 (9.95)	7.00 (2.00-10.00)	4.00 (2.00-6.00)	8.00 (0.00-12.00)	5.50 (1.00-7.00)	3.00 (0.00-12.00)
		p		***0.025***[b]	*0.279*[b]	***<001***[b]	***0.001***[b]	***0.029***[b]
	Physicians in training vs. nurses	*p*				***0.03***[c]		
	Physicians in training vs. professional caregivers	*p*				***0.006***[c]	***0,031***[c]	

Legend: in bold—results with p-value ≤ 0.05. M, median value; IQR, the interquartile range; X2, Chi-squared test used to compare differences between categorical variables; p, significance level; a - comparison of proportions; b-Man Whitney non-parametric test used to compare two groups; c- Scheffe Multiple Comparisons with One-Way Anova.

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3.3. Depression (PHQ-9) in the 2023, 2022, and 2022-2023 Participants

When we analyzed the PHQ-9 depression of the 2023 participants (N=181), we found a median (IQR) of 5.00 (3.00-8.00), which is lower compared with a M(IQR) of 7.00 (3.00-11.00) in 2022 (N=114), but not statistically significant and also a non-significant difference between PHQ-9 scores among 2022 participants (N=114) and 2022-2023 follow-up participants (N=88). Instead, a significant lower proportion of the moderate-severe PHQ-9 score (≥10) was observed between the first and second survey (p=0.036) and also within the follow-up study group (p=0.026).

There were no significant differences between men and women.

The PHQ-9 scores (IQR) and the comparative analyses among 2023 (N=181), 2022 (N=114), and 2022-2023 follow-up participants (N= 88) are presented in Table 5.

Table 5. Comparative PHQ-9 scores among 2023 (N=181), 2022 (N=114), and 2022-2023 participants (N=88) **.**

Criteria	Sex	N (%)	Comparison of proportions[a]	PHQ-9, M (IQR)	Comparison of means	PHQ-9 Total, M (IQR)	Man-Whitney comparison between groups[b]	Moderate-severe PHQ-9, N (%)	Comparison of moderate-severe PHQ-9 proportions[a]
2023 participants (N=181)	F	143 (79.01)	X^2=121.52, p<0.0001[a]	5.00 (3.00-8.00)	p=0.116[b]	5.00 (3.00-8.00)	p=0.134	36 (19.89)	X^2=4.37 **p=0.036**
	M	38 (20.99)		6.00 (3.00-10.00)					
2022 participants (N=114)	F	94 (82.46)	X^2=53.59, p<0.0001[a]	7.00 (3.00-10.00)	p=0.777[b]	7.00 (3.00-11.00)	p=0.196	35 (30.60)	X^2=4.92 **p=0.026**
	M	20 (17.54)		7.50 (3.00-12.00)					
2022-2023 participants (N=88)	F	76 (86.36)	X^2=92.54, p<0.0001[a]	6.00 (3.00-8.00)	p=0.399[b]	6.00 (3.00-8.50)		15 (17.00)	
	M	12 (13.64)		7.50 (2.00-9.50)					

Legend: in bold—results with p-value ≤ 0.05. F, female; M, male; M, median value; IQR, the interquartile range; X^2, Chi-squared test used to compare differences between categorical variables; p, significance level; [a] - comparison of proportions; [b]-Man Whitney non-parametric test used to compare two groups.

4. Discussion

The long duration of the COVID-19 pandemic has exposed the frontline HCWs to an unprecedented strain [16]. From a psychopathological perspective, the epidemic is a relatively new type of stressor or trauma for mental health practitioners [8], comparable to natural disasters such as earthquakes or tsunamis [42].

Many studies reported the prolonged negative effects of the COVID-19 pandemic on HCWs mental health in the first year [15–17].

There is a lack of longitudinal research examining the long-term stress impact of the COVID-19 epidemic on the mental health of HCWs. Most of these were undertaken in the United States [43,44]. Shanafelt et al. (2022) reported that, in the second year of the pandemic (2021), the levels of

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psychological distress continued to be elevated among HCWs by surveying US physicians between December 2021 and January 2022, approximately 21 months after the epidemic began. In 2021, 62.8% of physicians reported burnout symptoms, up from 38.2% in 2020 ($p<0.001$). Satisfaction with work-life integration decreased from 46.1% in 2020 to 30.2% in 2021 ($p<0.001$), and depression scores increased by 6.1% (2020 mean, 49.54; 2021 mean, 52.59; $p<0.001$) [44].

Furthermore, in Romania, few studies followed the evolution of depression, anxiety, and stress among health-care workers due to COVID-19 work-related stress [27].

Therefore, the purpose of our study was to analyze the prevalence of depression, anxiety, and stress after three years of the COVID-19 outbreak and to examine the course of depressive symptoms between 2022 and 2023 among HCWs in the Clinical Hospital of Infectious Diseases Cluj-Napoca, Romania, a tertiary mono-specialty hospital that provided medical services for patients with COVID-19 from Cluj County and neighboring counties.

In terms of depression, 13.81% of respondents reported moderate to severe DASS-Depression states, while 19.89% reported moderate to severe PHQ-9 clinical depression, which are close to the prevalence found in a systematic umbrella review of global evidence by Fernandez et al. (2021) [19]. They found that the prevalence of depression among all HCWs ranged from 17.9% to 36% in ten systematic reviews (100 unique studies), comprising 169,157 HCWs from 35 countries.

Our study suggests that three years after the COVID-19 outbreak, the prevalence of HCWs with moderate to severe depression symptoms is decreasing but within the concerning range reported in the umbrella review.

Since the most concerning mental health problems are severe or extremely severe depression, anxiety, and stress, we focused on physicians in training and infectious disease physicians. Using the DASS-21 scale for physicians in training, we found the following prevalences of severe-to-extremely severe depression, anxiety, and stress: 10.53%, 5.26%, and 7.89%, respectively, and for infectious disease physicians, we found 2.56%, 2.56%, and 12.82%, respectively. If we compare our results on physicians with the results from the pre-pandemic period, using the same scale, Hayes et al. (2017) found a higher prevalence of severe-to-extremely severe symptoms for depression (7.2%), anxiety (6.1%), but lower levels of stress (9.5%) (N=1,749) in 2017 [45]. The disparities can be explained by the participants' professional profiles, as physicians in Hayes' study represented all hospital specialties.

We found similar values for M(IQR) for DASS-Depression [4.00 (2.00-10.00)] and PHQ-9 clinical depression [5.00 (3.00-8.00)]; the unsignificant difference may be explained by the variable aspects and intensity of the symptoms measured on each scale. Thus, the DASS-Depression Scale evaluates depression state, a subthreshold depression clinical disorder; hence, PHQ-9 is more reliable for the assessment of clinical depression. A great body of knowledge is favorable to evaluating depression with PHQ-9 because this approach has become increasingly popular over the past decade for detecting major depressive disorders in various clinical settings [25,46–49].

Given a global maximum of 10% for the 12-month prevalence of depression in the general population [50,51], our 2023 findings revealed a 1.3 (DASS) and 2 (PHQ-9)-fold higher prevalence of depression in HCWs, even three years after the pandemic began.

Regarding anxiety, 18.79% of respondents indicated moderate to severe DASS-Anxiety, and 12.16% expressed moderate to severe HAM-A clinical anxiety, probably due to minor differences between the two scales. The DASS-Anxiety assesses the subjective sense of anxiety, autonomic nervous system activation, the risk of losing control, and performance anxiety [29,30], whereas the HAM-A assesses psychological and somatic symptoms such as anxious mood, fear, tension, insomnia, and somatic, sensory, cardiovascular, respiratory, gastrointestinal, genitourinary, and autonomic nervous system symptoms with behavioral impact [40]. Our results showed lower values than those reported by Fernandez et al. (2021), who found 22.2%- 33.0% prevalence of anxiety [19]. According to the American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, 2013, in Europe, the reported prevalence of General Anxiety Disorder was 0.4-3.6% in general population [51]. Using HAM-A scale, which evaluates mostly symptoms of General Anxiety Disorder [38], we found the prevalence of anxiety 5-6 folds greater than in the general population.

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Regarding stress symptoms, 16.02% of the respondents reported moderate to severe DASS-Stress manifestations as a result of psychological or physical demands that can't be reasonably managed. Symptoms of stress mean that the respondents don't have good stress management, as presented by Kushal et al. (2018) [52]. Stress factors in HCWs are well documented, mostly during the COVID-19 pandemic [53–55]. In comparison with a 41.2% prevalence of moderate to severe stress manifestations reported by Elbay et al. (2020) in Turkiye on 442 physicians with the same DASS scale, our results showed a 2.5-fold lower value [56].

The median values M(IQR) of DASS-Depression, DASS-Anxiety, DASS-Stress, PHQ-9, and HAM-A did not indicate psycho-emotional disorders for the entire group; however, we did find variances amongst profession groups. Infectious disease physicians reported the greatest degree of PHQ-9 clinical depression [M(IQR)=7.00 (5.00–9.50)]. Physicians in training exhibited the highest level of DASS-Stress [M(IQR)=14.00 (6.00-20.00)], and HAM-A anxiety [M(IQR)=9.00 (3.00–15.00)] with significant differences between resident doctors vs. nurses at DASS-Stress (p=0.03) and between physicians in training vs. professional caregivers at DASS-Stress (p=0.006) and PHQ-9 (p=0.031). The results are consistent with the studies that emphasized the emotional impact of COVID-19 on the physicians in training with less work experience [25,56,57]. In a systematic review and meta-analysis regarding the prevalence of depression and depressive symptoms among resident physicians, Mata et al. (2015) found lower prevalence for moderate to severe PHQ-9 Depression (20.9%) in 2015, compared with the 31.6% prevalence observed in our study (2023). The explanation could be the increased and ongoing stress caused by the COVID-19 pandemic [58].

We also found differences between genders, with males having much more DASS-Stress (p=0.018) and much more HAM-A (p=0.034) in comparison with females. Even though most studies reported much more psychological issues in females [56,59–61], our study's findings can be explained by the higher proportion of physicians in training (20.99%), with 24.21% being males.

Comparing all cross-sectional surveys, the M(IQR) values of PHQ-9 were: 5.00 (3.00-8.00) in 2023 (N=181), 7.00 (3.00–11.00) in 2022 (N=114), and 6.00 (3.00–8.50) in 2022-2023 follow-up group (N=88) with no statistically significant differences. The decreasing level of clinical depression can be explained by the reduced level of stress in the third year of the pandemic or by the coping strategies [53] and posttraumatic growth and resilience at the individual and organizational levels [62]. Many studies have demonstrated that resilience development is associated with lower levels of depression, anxiety, and burnout [62–66].

Strengths and limitations

Our study's strength is that we used three separate scales to examine HCWs' psychological response to the pandemic three years after its beginning, as well as repeated cross-sectional investigations to determine the progression of the COVID-19 pandemic's psychological impact on HCWs.

There are several limits to our study. Firstly, and foremost, it was conducted in a single center, with participants exclusively from a hospital in Cluj-Napoca; therefore, the results might not actually depict the entire situation in HCWs, Romania. Secondly, our sample size was rather small (181 out of 818 hospital employees - 22.13%) which is a classical issue found in another study [48] with the same design. The non-response rate and how selection bias affected the survey findings are classical difficulties that might lead to underestimation which may be explained by 'pandemic fatigue' according by WHO Regional Office [67] and by the lack of organizational culture regarding psychological aspects. However, compared with other studies on Romanian HCWs during the COVID-19 pandemic [55,65] the participation of front-line COVID-19 HCWs in psychological studies was not significantly different. Thirdly, the study variables were measured by a self-reported questionnaire, which could have had an impact on the results as a consequence of the common bias-variance method and also because the cross-sectional methodology excludes inferences about causal relationships.

Future directions

Further studies are needed to determine if personal and organizational resilience played a role in the psychological improvement caused by the negative impact of the COVID-19 pandemic.

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Organizations should implement interventions to promote resilience and adaptive coping, such as counselling services, social connection initiatives, and focused training, with the aim of developing a positive mindset.

5. Conclusions

Three years after the COVID-19 outbreak, the prevalence of depression, anxiety, and stress symptoms decreased but remained within a concerning range, mainly among physicians in training, followed by physicians, with males having much more stress and anxiety in comparison with females. Factors like the history of COVID-19 illness, SARS-CoV-2 vaccination, and work with COVID-19 patients did not have significant influences on psychological health.

By addressing these psychological issues, we can prevent professional crises in the healthcare system.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. The responses to the online questionnaires were recognized as implicit consent. The participants agreed to share their sociodemographic data (age, sex, profession, History of COVID-19, SARS-CoV-2 vaccination, and working with COVID-19 patients).

Data Availability Statement: data and analytical script are not available at URL/DOI; data are available by contacting Dr. Doina Colcear at colceardoina@gmail.com for researchers who meet the criteria for access to confidential data.

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